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Article

Relationship of ESG scores on firm performance: Moderating roles of board size and CEO duality

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Abstract: The aim of this study is to examine the relationship between Environmental, Social and Governance (ESG) activities and the performance of Thai listed firms. The moderating roles of board size and CEO duality on this relationship are also assessed. The ESG score provided by LSEG (formerly Refinitiv) is chosen to measure ESG activities, both as an overall ESG combined scores and as Environment, Social, and Governance pillar scores. Multiple regression analysis is used to test the impact of ESG on firm performance while the PROCESS macro is used to test the moderating effects. Results reveal that the overall ESG combined score demonstrates no statistically significant effect on firm market-based performance. However, it shows the significant effects on firm performance for both the ESG combined score and the Environmental and Social pillar scores when moderated by board size and CEO duality; Governance pillar score exhibits no significant effect. Additionally, it is found that when the CEO operates only as the managing director and small board size and average board size are evident, higher ESG disclosure scores enhance firm performance. However, when the CEO serves as both managing director and chairman of the board of directors, and where there is a large board size, higher ESG disclosure scores diminish firm performance. This study contributes to the ESG literature and encourages companies to enhance their performance by implementing ESG combined activities with good governance policies.

Keywords: environment; social, governance; Tobin's Q; sustainability; corporate governance

1. Introduction

By the year 2020, the term "sustainability" had been stated in thousands of studies. One of the most important events of that year was the COVID-19 pandemic and the shutdown of many societies and their economies, so sustainability suddenly became very real. The pervasiveness of COVID-19 wielded huge impacts on many countries, politics, social cohesion and most aspects of economic activity were hugely affected. Business sectors slowed down and thousands of organizations suffered losses due to the severe global crisis caused by the pandemic. Scholarly studies set out to find new ways to sustain and save businesses in the long term. One solution was to develop better environmental, society, and good governance protocols, to improve investors' confidence in the idea of "companies' sustainability". Many government or industry regulators, especially in emerging economies, reviewed and developed the rules, regulations, etc., to become more efficient, particularly in sustainability reporting (Li and Gong, 2018).

Thailand, like other countries, has witnessed the development of *ESG*-related assumptions and practices, reflecting a global trend towards responsible business practices. Several organizations have played a role in promoting *ESG* reporting and

practices in Thailand. For example, Thailand Sustainability Investment (THSI) project, led by the Stock Exchange of Thailand (SET), encourages listed companies to disclose their *ESG* information and have their own *ESG* index to highlight sustainable practices. The project is monitored by the Securities and Exchange Commission (SEC) of Thailand which has been actively involved in promoting *ESG* disclosure and sustainability reporting. In 2022, the SEC established regulations requiring Thai listed companies to disclose *ESG*-related information in their annual reports, known as the One report (formally called Form 56-1). This regulation is part of Thailand's commitment to align with international *ESG* reporting standards. This development focuses on investors, especially institutional investors, and asset managers, who increasingly factor *ESG* into their investment decisions. International organizations and rating agencies have also assessed the *ESG* performance of Thai companies. Being included in *ESG* rankings and indices enhances a company's reputation and attractiveness to investors (Black et al., 2022; SET, 2023).

This opens research opportunities to investigate the relationship of *ESG* activities on firm market-based performance. Previous studies have dealt with whether *ESG* activities enhance businesses' market value (Aras and Kazak, 2022; Aydoğmuş et al., 2022; Dincă et al., 2022; Quintiliani, 2022; Sritanee, 2023; Tahmid et al., 2022). However, their results are inconclusive, and a few scholars have attempted to extend the existing literature by introducing moderating variables such as board of director characteristics and ownership structure in order to find out whether these variables moderate the relationship between *ESG* disclosures and firm performance (Li et al., 2018; Rastogi et al., 2023; Wu et al., 2022).

Moreover, other research has found that board size wields a direct effect on firm performance (Kalsie and Shrivastav, 2016). O'Connell and Cramer (2010) contended that board size had a negative effect on firm performance. Hence, this study seeks to establish whether the effect of *ESG* activities on firm performance depends on board size. This is because the latter can directly affect the value of oversight or monitoring mechanisms put in place for *ESG* practices. A larger board may have more resources and expertise to dedicate to *ESG* issues, leading to more rigorous oversight and accountability. In such cases, large boards of directors may mean that *ESG* practices greatly improve firm performance. In addition, instead of using CEO duality as the main way to measure firm performance, this study also introduces CEO duality as a moderating variable on the relationship between *ESG* activities and firm performance because companies tend to have CEO duality, and where decision-making is centralized in one person. If the CEO has a strong commitment to *ESG* principles and initiatives, their centralized authority can lead to more effective and immediate implementation of *ESG*, potentially enhancing their firm's performance. However, if the CEO does not prioritize *ESG*, the lack of checks and balances that should be given by an independent chairperson may hinder *ESG* integration. Therefore, the authors question whether and how the interactions between *ESG* activities and board size and CEO duality affect firm market-based performance.

This study aims to confirm the direct effect of *ESG* scores on firm market-based performance and to examine the effect of *ESG* scores on firm performance when moderated by board size and CEO duality. The study fills the research gap in emerging economies, especially in the Thai emerging market. This study successfully makes

significant findings in two folds. Firstly, the combined *ESG* scores wield an insignificant direct impact on firm performance; however, the Environment and Social activities has a significant direct positive influence on firm performance. Secondly, *ESG* scores significantly relate to firm performance negatively when moderated by board size and CEO duality. More importantly, when a CEO serves only as the managing director, and works with both small and average board sizes, more *ESG* scores enhance firm performance. Moreover, when the CEO serves as both managing director and chairman of the board, and where this board is large, more *ESG* scores diminish firm performance.

This research is organized as follows. Beginning with the introduction, Section 2 deals with the literature review with the theoretical underpinning and hypothesis development. Section 3 covers the methodology including data and samples together with model specifications. This is followed by Section 4 in which the findings are documented. Section 5 comprises the discussion. Lastly, Section 6 concludes the findings of this study and what they mean for research on this topic.

2. Literature review and hypothesis development

2.1. Underpinned theories

The main objective of this study is to observe the relationship of *ESG* scores on firm performance when moderated by board size and CEO duality. The underpinned theories include voluntary disclosure theory, agency theory, and stakeholder theory. The following briefly explains these theories.

Voluntary disclosure theory delves into why companies voluntarily disclose information beyond regulatory requirements. It posits that companies engage in such disclosure to lessen information asymmetry with stakeholders, thereby reducing agency costs. Voluntary disclosure can also bolster a company's reputation and credibility among stakeholders (Leftwich et al., 1982). Agency theory examines the dynamic between principals (shareholders) and agents (managers) within a corporation, suggesting that managers might prioritize their self-interest over shareholders' interests, leading to agency costs. To alleviate these costs, shareholders may request managers to provide disclosures that enable monitoring of managerial actions (Jensen and Meckling, 1976). Stakeholder theory expands corporate governance beyond shareholders to encompass other stakeholders like employees, customers, suppliers, and the community. It argues that companies should consider all stakeholders' interests, not just shareholders', in their decision-making. From a disclosure standpoint, stakeholder theory suggests that companies should furnish information relevant to all stakeholders, not just shareholders (Freeman, 1984). In essence, these theories are interconnected by their shared emphasis on disclosure's significance in corporate governance. Agency theory underscores the need for disclosure to mitigate agency costs, stakeholder theory advocates for disclosure that addresses all stakeholders' interests, and voluntary disclosure theory explains the motivations behind voluntary information disclosure.

2.2. Tobin's Q as firm performance measurement

This study uses *Tobin's Q* as a metric to gauge firm performance. *Tobin's Q* compares a firm's market asset value to its net book value (Aydoğmuş et al., 2022; Chen and Xie, 2022). The study also examines other financial indicators like enterprise value, share price, and net income, but finds *Tobin's Q* to be the most effective. Enterprise value, for instance, doesn't consider the worth of non-operating assets like investments or intangible assets, which can greatly impact a firm's performance (Yang et al., 2023). Share price, influenced by short-term market factors, is less reliable in this context. Net income, based on historical cost accounting, may not accurately reflect a firm's asset value. *Tobin's Q*, by comparing market and book values, provides a more current and insightful assessment of a firm's financial stability and resilience in economic downturns.

2.3. Main effect of *ESG* scores on firm performance

Stakeholder theory introduced by Freeman (1984) provides a valuable framework for understanding the underlying mechanisms and potential outcomes of *ESG* disclosure. The disclosure of *ESG* information serves as an indication of an organization's commitment to the concept. When companies make decisions regarding initiatives such as enhancing their 'green' innovation strategies or capabilities to demonstrate their *ESG* performance through social responsibility reports, their real goal is to enhance the overall market value of the company. It is important to acknowledge that enterprises operate with finite internal resources, and both of these endeavors entail additional costs, thereby influencing the cost-benefit dynamics. The fundamental essence lies in evaluating the relationship between the costs incurred and the benefits derived from such endeavors. If the input costs are disproportionately high compared to the incremental benefits obtained, it may seriously compromise firm value. Furthermore, in contrast to the direct and tangible effects of green innovation on expanding the enterprise, the influence of *ESG* factors on companies is more indirect and complex. It is primarily realized through meeting the expectations of key stakeholders such as the government and the general public.

In addition, *ESG* is also underpinned by voluntary disclosure. Voluntary disclosure theory implies that companies may choose to disclose their *ESG* practices, performance, and impacts voluntarily to address the information needs of stakeholders beyond regulatory requirements. By doing so, companies can demonstrate their commitment to sustainability, social responsibility, and good corporate governance, which can improve their relationships with stakeholders, attract socially responsible investors, and enhance their overall reputation and competitiveness.

ESG-related research grew in the latter half of the 20th century. Recent studies have focused on the informative value of *ESG*. For example, Saini et al. (2023) asserted that *ESG* determined firm performance; better *ESG* performance enabled companies to enjoy lower capital costs. Habib (2023) stated that *ESG* performance made it possible for firms to not suffer financial distress. Wang et al. (2023) found that *ESG* performance was related to stock price scenarios, and good *ESG* performance reduces or removes stock price failures. Höck et al. (2023) found that the implementation of an *ESG* strategy significantly influenced credit risk exposure but

there were no difficulties in any performance or diversification strategy.

In certain areas of the sustainable development concept, *ESG* is seen as an extension of a narrow focus solely on maximizing profits without considering social responsibility, and this may lead to resistance from stakeholders, including investors and related parties. *ESG* has revealed a significant effect on business strategies and corporate decisions. *ESG* commitment can boost the value of the public sector and the quality of corporate and stakeholder communication. Previous studies confirm the informative value of *ESG* on companies' overall market value. For example, Quintiliani (2022) discovered a positive and significant relationship between *ESG* and firm performance (ROE and stock price). Aras and Kazak (2022) argued that *ESG* performance had a positive influence on firm value (price-to-book value ratio and *Tobin's Q*). Tahmid et al. (2022) detected a positive impact made by *ESG* through both overall and individual elements on firm value and performance. Also recently, Behl et al. (2022) found a relationship between the combined and individual elements of *ESG* and firm value. In addition, lag years directed the association between *ESG* and firm value.

Chang and Lee (2022) stated that *ESG* related to firm value in a positive way. Industrial concentration and industrial growth rate moderated the association between *ESG* and firm value. Aydoğmuş et al. (2022) examined the effects of *ESG* on firm value and operational results. They discovered that the *ESG* combined score related positively and significantly to firm value. Individual social and governance scores related positively and significantly to firm value, while environment score had no significant relationship with firm value. Conversely, *ESG* combined score and individual scores related significantly to firm profitability in a positive way. Zhang (2022) stated that during the COVID-19 pandemic, *ESG* performance played a positive role in the establishment of firm value, but this was ruined by COVID-19 crisis *ESG* activities became too costly to continue with.

Some studies have thrown doubt on the informative value of *ESG* on firm performance. For example, Dincă et al. (2022) found inconclusive evidence for the influence of *ESG* scores on firm value, especially the social score. Fuadah et al. (2022) found that *ESG* performance positively impacts *Tobin's Q*. However, *ESG* performance did not greatly help a company's ROA. Furthermore, audit committees moderated the relationship between *ESG* performance and firm value. While Chen et al. (2023) found that *ESG* performance positively related to firm performance, *ESG* rating significantly influenced large but not small firms. The positive impact of *ESG* rating on financial performance was more evident in high risk than low-risk cases. Rastogi et al. (2023) found that *ESG* had a positive and nonlinear (U-shaped) influence on firm value, rather than a linear association.

In Thailand, research observing the informative value of *ESG* is limited. For example, SET found a good overall disclosure for 61 companies. The study depicted better disclosure rates amongst the largest firms measured by market capitalization versus the smaller ones. Disclosure rates were mainly published by large companies that were in a position to realize *ESG* disclosure than smaller ones could (Black et al., 2022). Suttipun and Yordudom (2022) found that environmental and social performance is positively related to market or industry reaction. Their work found that governance performance exerted a negative influence on how the market reacted.

Suttipun (2023) explained that the increase in *ESG* disclosures of Thai listed companies during 2017–2021, nonetheless revealed a negative association between *ESG* performance and corporate financial risk. Sritanee (2023) recently noted that family-run businesses preferred to focus on good financial outcomes (i.e. profits) rather than *ESG* practices, and their businesses did better financially. While lower *ESG* scores were evident in family-owned businesses, larger companies reported higher *ESG* scores, indicating much stronger sustainability practices. Higher leverage levels are associated with lower *ESG* scores, posing challenges for debt-financed firms.

Based on the above inconclusive finding of *ESG* research as well as not many studies have been done on this topic in Thailand, the hypothesis posited is as follows:

- Hypothesis 1. *ESG* scores relate to firm performance.

2.4. Moderating effects of board size and CEO duality on *ESG* performance

2.4.1. Board size

Corporate governance has been discussed by proponents of agency theory. One important aspect of corporate governance is the composition of a company's board of directors because they play a crucial role in overseeing its affairs (Jensen and Meckling, 1976). Previous studies have investigated which characteristics of the board benefit firm performance (Abidin et al., 2009; Alhossini et al., 2021; Carter et al., 2010; Khan, 2010; Muchemwa et al., 2016; Ntim, 2015). One vital characteristic is board size as it can dictate the effectiveness of a board executing its responsibilities. The ideal board size can vary depending on the company's size, industry it operates in, and specific circumstances. The relationship between board size and firm performance is a topic of ongoing debate among researchers. The impact of board size on firm performance can vary depending on a variety of factors, including the company's specific circumstances and its industry. Potential reasons why a larger board size might be associated with improved firm performance in certain circumstances include diverse expertise, better oversight, lower agency costs, and improved accountability. On the other hand, a larger board potentially causes coordination challenges, confusion, or miscommunication, compromised decision-making or factions among its members.

Studies on the association between board size and firm performance have been carried out over the last few decades. For example, O'Connell and Cramer (2010) discovered that board size exhibited a significant and negative relationship with firm performance. It has been noted that the association between board size and firm performance was significantly less problematic for smaller companies. Kalsie and Shrivastav (2016) found that board size related positively and significantly to firm performance. Vaidya (2019) contended that board size had no impact on a firm's market value or performance. Shahid et al. (2020) detected a significant and negative association between sales growth and board size, while an increase in board size would undermine sales growth. According to Nuwagaba et al. (2021) the link between board size and firm performance was inconclusive. However, they suggested that the ideal board size should be between nine and ten members. Cao et al. (2023) discovered that board size was negatively related to firm performance. After separating high-tech and non-high-tech industries, their study reported a negative correlation in the latter. In

addition, the analysis showed that the odd number of directors was more efficient than having an even number. Wu et al. (2022) concluded that *ESG* performance improved firm value, whereby executive ownership and institutional ownership positively and significantly raised firm value. Furthermore, *ESG* performance related significantly to firm value when moderated by executive ownership and institutional ownership.

Based on the above inconclusive findings regarding the effect of board size on firm performance, the intention here is to introduce board size as a moderating role on the relationship between *ESG* scores and firm value. This study proposes the related hypothesis as follows:

- Hypothesis 2. Board size moderates the relationship between *ESG* scores and firm performance.

2.4.2. CEO duality

The correlation between CEO duality and firm performance has been the subject of much debate. CEO duality refers to the circumstance where the same individual serves as both the chief executive officer (CEO) and chairman of the board of directors. The effect of CEO duality on firm performance is not universally agreed upon. Positive aspects of CEO duality include faster decision-making which advocates of CEO duality argue is a much more decisive form of leadership, as the CEO has direct control over the board. Previous studies indicate that the CEO also serving as the chairman can help align the company's strategic vision more effectively, reducing conflicts and promoting clear directions. Conversely, negative aspects of CEO duality include lack of checks and balances, potential for conflicts of interest, and limited accountability. Research on this topic has produced mixed results. For example, the impact of CEO duality can vary depending on such issues as the company environment, industry, corporate governance, and attention paid to ethics. As a result, the association between CEO duality and firm performance is inconclusive. In recent years, a trend toward separating the roles of CEO and chairman in many large corporations has occurred. This situation is driven by corporate governance principles that advocate for increased independence and oversight. This separation is often seen to relieve potential conflicts of interest and improve integrity in business dealings and full disclosure. Ultimately, whether CEO duality was favorable or detrimental to firm performance varies on the specific circumstances, governance structure among others (Yu, 2023).

Previous studies have examined the influence of CEO duality on firm performance. For instance, Duru et al. (2016) believed that CEO duality statistically and significantly impacted firm performance in a negative way. The relationship was moderated by board independence in a negative way as well. Fan et al. (2019) showed that board-CEO friendships or interests that were too closely aligned, related to firm value negatively. They also find social ties tend to destroy firm value whereas professional ties do not. Mutlu et al. (2018) did not find strong support for criticisms against CEO duality from the company performance perspective. Board monitoring mechanisms and government ownership or major shareholdings in a business supported good firm performance, whereas board incentive mechanisms were more likely to diminish performance.

Based on the above inconclusive findings and the intention to investigate CEO duality as a moderating role on the relationship between *ESG* scores and firm

performance, the suggested hypothesis to be tested is written below:

- Hypothesis 3. CEO duality moderates the relationship between *ESG* scores and firm performance.

2.4.3. Board size and CEO duality effects on *ESG* scores—firm performance

As claimed in hypothesis 2, the relationship between *ESG* and firm performance is moderated by board size, while in hypothesis 3, the relationship between *ESG* and firm performance is moderated by CEO duality. This study intends to investigate further by observing the impact of both board size and CEO duality on the relationship between *ESG* and firm performance. This is because boards are mainly responsible for setting the company's overall strategic direction and long-term goals as well as selecting and evaluating the company's CEO. In addition, the structure of CEO duality is whether the CEO also serves as the board chair as part of their governance framework. Recently, boards have tended to prioritize *ESG* activities as one of the companies' strategies to increase firm performance. Previous studies have shown that board size can impact a board's effectiveness (Cao et al., 2023). In addition, separating the roles of CEO and chairperson can lead to better oversight of *ESG* issues by the board, as it reduces the concentration of power in a single individual (Mutlu et al, 2018). Therefore, further analysis is conducted by observing how both board size and CEO duality moderate the relationship between *ESG* and firm performance. This is because the interaction outcomes of *ESG* with board size and *ESG* with CEO duality is still unknown. Consequently, this study attempts to identify the features of firm performance based on difference board size and CEO duality since they both powerfully enhance investors' confidence to put their money into firms where good business performance is evident. This study suggests that board size and CEO duality are hidden variables as far as effects of *ESG* and firm performance are concerned. Hence, this study hypothesizes that board size and CEO duality are important determinants of how *ESG* affects firm performance. The question is asked: what might be the moderating effects on this association? The hypothesis for this issue is proposed here:

- Hypothesis 4. Both board size and CEO duality moderate the relationship between *ESG* scores and firm performance.

2.5. Control variables

The study controls firm performance including firm size, leverage, auditor types and industry. The study measures firm size using a natural log of total assets (Aydoğmuş et al., 2022; Chen and Xie, 2022; Shin et al., 2023; Suttipun, 2023) because the descriptive statistics indicate the wide range of total assets. Leverage is measured as total debt divided by total assets and captures the degree of financial risk (Aydoğmuş et al., 2022; Chen and Xie, 2022; Suttipun, 2023; Shin et al., 2023). In addition, the study controls financial statements' quality using Big4 and non-Big4 firms (Suttipun, 2023). Lastly, the study controls industry types. The company belongs to an industry that is seen as being sensitive to the environment, including major socio environmental impact, energy (oil and gas), chemicals, paper and pulp, mining, and steel productions (Garcia et al., 2017; Lee and Faff, 2009; Richardson and Welker, 2001).

Figure 1 depicts the conceptual framework devised for this study. In this model, the impact of *ESG* scores on *Tobin's Q* ratio is the same for firms with CEO duality, firms with non-CEO duality and firms with boards of all sizes.

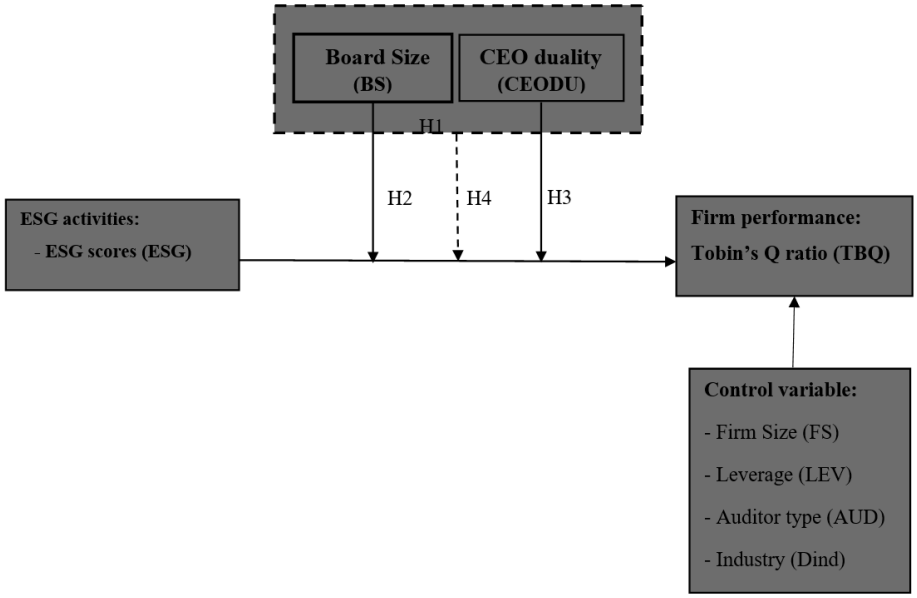

Figure 1. Conceptual framework.

3. Methodology

3.1. Data and samples

Currently, there is a growing emphasis on measuring *ESG* scores by various institutions, both domestically and internationally, such as *ESG* Book, SET THSI Index, Dow Jones Sustainability Index (DJSI), Moody's *ESG* Solutions, Morgan Stanley Capital International (MSCI), Bloomberg, LSEG (formally Refinitiv), and S&P Global. This study adopts the LSEG scores for measuring disclosure quantity. LSEG does not interpret what 'good' looks like. The disclosures are divided into three main scores: environmental pillar, social pillar, and governance pillar. The *ESG* pillar score is the relative sum of category weights. This varies from industry to industry for both environmental and social pillar scores. Meanwhile, the weight of the governance category remains the same for all industries (LSEG, 2023). At the end of 2022, the LSEG disclosed the *ESG* performance of 168 out of 683 Thai companies listed on the SET. However, the three listed companies provide incomplete other data. Therefore, the 165 listed companies constitute the sample employed in this study and the period of time stipulated is one year—2022. This study also intends to scrutinize the moderating effects of variables and PROCESS macro for SPSS, requiring cross sectional data; this is not suitable for panel data. Other secondary data including financial information and board characteristics are collected from SETSMART (SET Market Analysis and Reporting Tool), the SET database which has been published in electronic media format and the One report system.

Descriptive statistics are used to capture the basic data characteristics and to deliver a general indication of the basic statistical distribution. Following Baron and Kenny (1986), hierarchical multiple regression analysis together with the PROCESS

macro for SPSS written by Hayes (2018) is used to test the hypotheses. The direct terms were transformed to mean-centered to avoid multicollinearity problems (Aiken, 1991). PROCESS calculates the outcomes estimated by the best fitting *OLS* regression model and investigates the interaction effects. In order to test the interaction effects in hypotheses 2 and 3, which is two-way interaction model with one moderator, the PROCESS macro for SPSS model template 1 is applied, whereas for the interaction effect in hypothesis 4, which is a two-way interaction model with two moderators, model template 2 is used. Also, the pick-a-point approach is employed to probe the interaction effects.

3.2. Measurements for the variables

The study employs the variables as follows. The dependent variable is firm performance (*Tobin's Q*). Secondly, the analysis uses *ESG* combined and individual activities as the main effect (predictor) for observing the influence of informative value on firm performance. Thirdly, the moderating variables include board size and CEO duality. Lastly, firm size, leverage, auditor type and industry serve as the control variables and their measurements are summarized in **Table 1**.

Table 1. Measurement of study variables.

Variables	**Acronym**	**Measurements**	**Recent studies**
Dependent variable			
Tobin's Q	*TBQ*	(Market Capitalization + Total Liability) divided by total assets	Chen and Xie (2022); Aydoğmuş et al. (2022)
Main effect variables			
ESG scores	*ESG*	Environment, Social and Governance Score	Aydoğmuş et al. (2022)
Environment scores	*ENV*	Environment Score	Aydoğmuş et al. (2022)
Social activity	*SOC*	Social Score	Aydoğmuş et al. (2022)
Governance scores	*GOV*	Governance Score	Aydoğmuş et al. (2022)
Moderating variables			
Board Size	*BS*	Total number of board members	Cao et al. (2023); Wu et al. (2022)
CEO duality	*CEODU*	"1" if board's chairman serves as a CEO and managing director; "0" otherwise.	Daru et al. (2016); Mutlu et al. (2018); Fan et al. (2019)
Control variables			
Firm Size	*FS*	Natural logarithm of total assets	Aydoğmuş et al. (2022); Chen and Xie (2022); Suttipun, (2023); Shin et al. (2023)
Leverage	*LEV*	Debt to equity ratio	Aydoğmuş et al. (2022); Chen and Xie (2022); Suttipun, (2023); Shin et al. (2023)
Auditor type	*AUD*	"1" if financial statements are audited by one of the Big 4 audit firms; "0" otherwise.	Suttipun (2023)
Industry	*Dind*	"1" if sensitive industry; "0" otherwise.	Richardson and Welker (2001); Lee and Faff (2009); Garcia et al. (2017)

3.3. Model specifications

Model 1 is applied to test hypotheses 1–4. Model 1.1 is applied to test the main effect of *ESG*, while Models 1.2, 1.3 and 1.4 are applied to test the interaction effects of *ESG* and *BS*, *ESG* and *CEODU*, and the interaction effects of *ESG* and both *BS* and

CEODU, respectively.

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ESG + e \quad (1.1)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ESG + \beta_6 BS + \beta_7 ESG \times BS + e \quad (1.2)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ESG + \beta_6 CEODU + \beta_7 ESG \times CEODU + e \quad (1.3)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ESG + \beta_6 BS + \beta_7 CEODU + \beta_8 ESG \times BS + \beta_9 ESG \times CEODU + e \quad (1.4)$$

Subsequently, each *ESG* pillar, namely environmental pillar (Model 2), social pillar (Model 3), and governance pillar (Model 4), are established here to affirm the findings' validity. Thus, Model 2.1 is applied to test the main effect of *ENV*, while Models 2.2, 2.3 and 2.4 are implemented to test the interaction effects of *ENV* and *BS*, *ENV* and *CEODU* and the interaction effects of *ENV* and both *BS* and *CEODU*, respectively.

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ENV + e \quad (2.1)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ENV + \beta_6 BS + \beta_7 ENV \times BS + e \quad (2.2)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ENV + \beta_6 CEODU + \beta_7 ENV \times CEODU + e \quad (2.3)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 ENV + \beta_6 BS + \beta_7 CEODU + \beta_8 ENV \times BS + \beta_9 ENV \times CEODU + e \quad (2.4)$$

Model 3.1 tests the main effect of *SOC*, while Models 3.2, 3.3 and 3.4 are applied to test the interaction effects of *SOC* and *BS*, *SOC* and *CEODU* and the interaction effects of *SOC* and both *BS* and *CEODU*, respectively.

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 SOC + e \quad (3.1)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 SOC + \beta_6 BS + \beta_7 SOC \times BS + e \quad (3.2)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 SOC + \beta_6 CEODU + \beta_7 SOC \times CEODU + e \quad (3.3)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 SOC + \beta_6 BS + \beta_7 CEODU + \beta_8 SOC \times BS + \beta_9 SOC \times CEODU + e \quad (3.4)$$

Model 4.1 is implemented test the main effect of *GOV*, while Models 4.2, 4.3 and 4.4 function to test the interaction effects of *GOV* and *BS*, *GOV* and *CEODU* and the interaction effects of *GOV* and both *BS* and *CEODU*, respectively.

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 GOV + e \quad (4.1)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 GOV + \beta_6 BS + \beta_7 GOV \times BS + e \quad (4.2)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 GOV + \beta_6 CEODU + \beta_7 GOV \times CEODU + e \quad (4.3)$$

$$Tobin's\ Q = \beta_0 + \beta_1 FS + \beta_2 LEV + \beta_3 AUD + \beta_4 Dind + \beta_5 GOV + \beta_6 BS + \beta_7 CEODU + \beta_8 GOV \times BS + \beta_9 GOV \times CEODU + e \quad (4.4)$$

4. Findings

4.1. Descriptive statistics

Table 2 summarizes the descriptive statistics for all the variables. Results indicate that in terms of firm performance (*TBQ*), the mean and standard deviation are 1.54 and 1.29, respectively, with a minimum of 0.10 and a maximum of 11.78, accentuating marked discrepancies in firm performance. It suggests that the market value of the company's assets is higher than their book value. Total *ESG* disclosure scores are as follows: The average score is 51.41%, the minimum score is 4.49%, and the maximum score is 91.21% with the standard deviation of 18.84%, signifying substantial variation in companies' *ESG* performance. Specifically, based on the three pillars of *ESG* scores, namely, *ENV* pillar, *SOC* pillar, and *GOV* pillar, *SOC* pillar has the highest average score of 60.27, followed by *GOV* pillar (51.04) and *ENV* pillar (45.71). The *ENV* pillar has the highest score (97.05), followed by *SOC* pillar (96.49)

and *GOV* pillar (95.35) whereas *ENV* pillar has the lowest score (0.00), followed by *GOV* pillar (4.69) and *SOC* pillar (5.85), respectively. Further, the result reveals that the mean and standard deviation of board size (*BS*) is 11.17 people and 2.52, respectively. Referring to CEO duality (*CEODU*), 59% of the sampled companies have it and 41% do not. This suggests that the CEO also serves as the board chair more than half. Furthermore, the average value of audit firms (*AUD*) is 0.92 indicating that 92% of the whole firms are audited by Big4 audit firms. Finally, the mean of industry types is 0.41 which shows that 41% of the companies in the dataset are companies in the sensitive industries, while the other 59% are from the non-sensitive industries.

Table 2. Descriptive statistics.

Variable	Min	Max	Mean	SD
TBQ	0.10	11.78	1.54	1.29
ESG	4.49	91.21	51.41	18.84
ENV	0.00	97.05	45.71	24.48
SOC	5.85	96.49	60.27	19.92
GOV	4.69	95.35	51.04	20.39
BS	7.00	18.00	11.17	2.52
CEODU	0	1	0.59	0.49
FS	6.52	15.30	10.71	1.74
LEV	0.12	9.81	1.66	1.78
AUD	0	1	0.92	0.27
Dind	0	1	0.41	0.49

4.2. Data validity and reliability

The data sources for this study comprised companies' annual reports stored in the SET database. SETSMART is a reliable source of information that meets the accuracy requirements for companies listed on the SET. LSEG data (formerly Refinitiv) for *ESG* scores is employed as recommended by Aras and Kazak (2022). Therefore, the study ensured content validity. After data collection is completed the regression assumption tests are executed. First of all, Mahala Nobis Distance is used to observe outliers. Each deviation is subjected to an independent test or assessed for automatic relationships. To mitigate the problem of multicollinearity, it is essential to ensure that no correlation between the independent variables exists. This can be checked by analyzing the statistical values of the variance inflation factor (VIF). Indicated here is the absence of multicollinearity issues if all independent variables have tolerance values above 0.5 or VIF values below 10 (Hair et al., 2010). Moreover, the direct terms were transformed into mean-centered to avoid multicollinearity problems. After those techniques were employed, it emerged that the VIF value < 10, and Pearson correlation among all predictor variables is lower than 0.8 as shown in **Table 3**. Therefore, all assumption tests indicate there are no problems in the multivariate regression analysis assumptions.

Table 3. Correlation matrix and VIF of variables.

	ESG	**ENV**	**SOC**	**GOV**	**BS**	**CEODU**	**FS**	**LEV**	**AUD**	**Dind**	**TBQ**	**VIF**
ESG	1	-	-	-	-	-	-	-	-	-	-	4.588
ENV	0.738**	1	-	-	-	-	-	-	-	-	-	3.039
SOC	0.806**	0.758**	1	-	-	-	-	-	-	-	-	3.958
GOV	0.511**	0.278**	0.256**	1	-	-	-	-	-	-	-	1.563
BS	0.180*	0.261**	0.268**	−0.066	1	-	-	-	-	-	-	1.379
CEODU	0.095	−0.027	0.019	0.152	−0.072	1	-	-	-	-	-	1.099
FS	0.327**	0.429**	0.467**	0.020	0.427**	0.007	1	-	-	-	-	2.119
LEV	0.197*	0.167*	0.274**	−0.015	0.231**	−0.038	0.541**	1	-	-	-	1.492
AUD	0.114	0.127	0.142	0.093	0.102	0.166*	0.258**	0.108	1	-	-	1.119
Dind	−0.034	0.098	−0.058	0.074	0.178*	0.101	−0.157*	−0.233**	0.062	1	-	1.265
TBQ	0.078	0.089	0.053	0.085	−0.041	−0.007	−0.098	−0.135	0.093	−0.088	1	-

Note: significant at *$p < 0.05$, **$p < 0.01$.

4.3. Regression results

Table 4 shows the regression results of Model 1, consisting of the model with control variables (control variable model) and Model 1.1–1.4. The result of the control variable model shows that auditor type (*AUD*) positively relates to *Tobin's Q* ($B = 0.653$, $p < 0.10$), while industry (Dind) negatively relates to *Tobin's Q* ($B = -0.370$, $p < 0.10$). Model 1.1 is designed to explain the main effects of *ESG* on firm performance and the finding confirms only an insignificant influence of *ESG* on *Tobin's Q* ($B = 0.009$, $p > 0.10$). This means that *ESG* has no effect on *Tobin's Q*, suggesting that *ESG* performance cannot enhance firms' performance. Consequently, H_1 is not supported.

Table 4. Regressions analysis of *ESG* on *Tobin's Q*, moderated by *BS* and *CEODU*.

Variables	**Control variable model**		**Model 1.1: Main effect**		**Model 1.2: *ESG*BS* moderation**		**Model 1.3: *ESG*CEODU* moderation**		**Model 1.4: Two-way interaction**	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Constant	1.890*** (2.649)	0.009	1.777** (2.488)	0.014	2.051** (2.547)	0.011	2.125*** (2.886)	0.004	1.931** (2.422)	0.017
Controls										
FS	−0.059 (−0.842)	0.401	−0.087 (−1.209)	0.229	−0.062 (−0.975)	0.428	−0.079 (−1.106)	0.270	−0.045 (−0.588)	0.557
LEV	−0.102 (−1.507)	0.134	−0.105 (−1.558)	0.121	0.109* (−1.656)	0.099	−0.999 (−1.498)	0.136	−0.103 (−1.586)	0.115
AUD	0.653* (1.711)	0.089	0.635* (1.670)	0.097	0.587 (1.564)	0.119	0.651* (1.705)	0.090	0.585 (1.562)	0.120
Dind	−0.370* (−1.782)	0.077	−0.376* (−1.820)	0.071	−0.375* (−1.764)	0.079	−0.366* (−1.783)	0.077	0.585* (−1.698)	0.091
Main Effect										
ESG	-	-	0.009 (0.154)	0.125	0.007 (1.266)	0.857	0.480** (2.414)	0.016	0.022*** (2.752)	0.007
BS	-	-	-	-	0.017 (0.424)	0.957	-	-	0.013 (.328)	0.742
CEODU	-	-	-	-	-	-	−0.057 (−0.148)	0.883	−0.073 (−0.367)	0.713

Table 4. (*Continued*).

Variables	Control variable model		Model 1.1: Main effect		Model 1.2: *ESG*BS* moderation		Model 1.3: *ESG*CEODU* moderation		Model 1.4: Two-way interaction	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Interaction Model										
*ESG*BS*	-	-	-	-	−0.005*** (−2.616)	0.009	-	-	−0.006*** (−2.934)	0.003
*ESG*CEODU*	-	-	-	-	-	-	−0.023** (−2.163)	0.032	−0.026** (−2.541)	0.012
R	0.228		0.257		0.326		0.307		0.377	
R^2	0.052		0.066		0.106		0.094		0.142	
R^2 *change*	-		0.014		0.039		0.027		0.074	
F-statistic	2.193*		2.244*		2.667**		2.326**		2.862***	

Notes: Significant at *$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$; 1) *TBQ*: *Tobin's Q*; 2) *ESG*: *ESG* scores; 3) *BS*: Board Size; 4) *CEODU*: CEO duality; 5) *FS*: logarithm of total assets; 6) *LEV*: Debt to equity; 7) AUD: Auditor type; and 8) Dind: Industry dummy.

Model 1.2 is designed to test the moderating effect of board size (BS) on the relationship between *ESG* and *Tobin's Q*. It is found that *ESG* and board size have no significant effect on *Tobin's Q,* but it reveals a negative and statistically significant effect of the interaction between *ESG*BS* on *Tobin's Q* ($B = -0.005$, $p < 0.01$), and accounts for about 3.9% of the variance in support for firm performance. Thus, the effect of *ESG* on support for firm performance depends on a company's board size when the effect of *ESG* on firm performance drops by 0.005 as board size increases by one unit. This finding supports Hypothesis 2 that board size moderates the relationship between *ESG* performance and firm performance.

Model 1.3 examines the moderating effect of CEO duality (*CEODU*) on the relationship between *ESG* and *Tobin's Q*. *ESG* have a positive and statistically significant effect on *Tobin's Q* ($B = 0.480$, $p < 0.05$) while *CEODU* demonstrates no effect on *Tobin's Q*. Moreover, a negative and statistically significant effect is evident for the interaction between *ESG*CEODU* on *Tobin's Q* ($B = -0.023$, $p < 0.05$), and accounts for about 2.7% of the variance in support for firm performance. Thus, the effect of *ESG* on support for firm performance depends on *CEODU*, when the effect of *ESG* on firm performance declines by 0.480 as *CEODU* = 1. This finding supports Hypothesis 3 that CEO duality moderates the relationship between *ESG* performance and firm performance.

Finally, Model 1.4 is a two-way interaction model, which is designed to analyze the moderating effect of both board size and CEO duality on the relationship between *ESG* and firm performance. The analysis strongly suggests that the main effect of *ESG* is a positive one on firm performance ($B = 0.022$, $p < 0.01$), while board size and CEO duality have no significant effect. The regression coefficients for the interaction effects of both the *ESG* and board size (*ESG*BS*) and the *ESG* and *CEODU* (*ESG*CEODU*) are negative and statistically significant ($B = -0.006$, $p < 0.01$; $B = -0.026$, $p < 0.05$), respectively. They account for about 7.4% of the variance in support for firm performance. Hence, the effect of *ESG* on support for firm performance depends on both board size and CEO duality. This finding supports Hypothesis 4 that both board size and CEO duality moderate the relationship between *ESG* performance and firm

performance.

4.4. Further analysis: Moderating effect of both board size and CEO duality on the relationship between *ESG* and firm performance

According to the results for Model 1.4, **Table 4** indicates the interaction effect of *ESG* and board size, and it emerges that *ESG* and CEO duality are negatively related to firm performance. To further evaluate how board size and CEO duality as moderating variables shape firm performance, the PROCESS analysis results of the two-way interaction model (specifying model = 2) are shown in **Table 5**, showing that both board size and CEO duality moderate the effects of *ESG* on firm performance. The two interaction terms function as a set accounting for 7.44% of the variance in support for firm performance, F (2, 155) = 6.7246, $p < 0.01$. Moderation by board size uniquely accounts for 4.76% of variance in support for firm performance [F(1, 155) = 8.6101, $p < 0.01$], whereas the moderation by CEO duality uniquely accounts for 3.57% of variance in support for firm performance, F(1, 155) = 6.4584, $p < 0.05$.

Table 5. The results of PROCESS macro for SPSS: Conditional Effect of the focal predictor at values of the moderator (s).

Model Summary						
R	***R-sq***	***MSE***	***F***	***df1***	***df2***	***p***
0.3775	0.1425	1.5034	2.8621	9	155	0.0038
Test(s) of highest order unconditional interaction(s)						
	R2-chng	***F***	***df1***	***df2***	***p***	
X*W	0.0476	8.6101	1	155	0.0039	
X*Z	0.0357	6.4584	1	155	0.0120	
BOTH	0.0744	6.7246	2	155	0.0016	
Focal predict: *ESG* (X), Mod var: BS (W), Mod var: CEODU (Z)						
BS	***CEODU***	***Effect***	***se***	***t***	***p***	***LLCI***	***ULCI***
Small	No	0.0399	0.0101	3.9322	0.0001	0.0198	0.0599
Small	Yes	0.0132	0.0086	10.5374	0.1262	−0.0038	0.0303
Average	No	0.0220	0.0080	2.7525	0.0066	0.0063	0.0378
Average	Yes	−0.0046	0.0071	−0.6454	0.5196	−0.0187	0.0095
Large	No	0.0042	0.0100	0.4181	0.6764	−0.0155	0.0238
Large	Yes	−0.0225	0.0101	−2.2269	0.0274	−0.0424	−0.0025

Notes: For board size (BS), Small (8.65 people) refers to the mean minus one standard deviation; Average (11.17 people) refers to the mean; and Large (13.69 people) refers to the mean plus one standard deviation. For CEODU, No refers to non-CEO duality, that is, CEO serves as managing director, while Yes refers to CEO duality, that is, CEO serves as both managing director and chairman of the board of the directors.

Table 5 also shows the conditional effect of *ESG* on *Tobin's Q* for various values of board size and CEO duality. The effects of *ESG* on *Tobin's Q* are found to be positive and statistically significant in two cases: firstly, when board size is small and there is non-CEO duality (*Effect* = 0.0399, $p < 0.01$); and secondly, when board size is average and there is no CEO duality (*Effect* = 0.0220, $p < 0.01$). Also, the effect of *ESG* on *Tobin's Q* is negative and statistically significant when the board is large and CEO duality exists (*Effect* = −0.0225, $p < 0.05$). A visual representation of the effects

of *ESG* on *Tobin's Q* when moderated by board size and *CEODU* is shown in **Figure 2**.

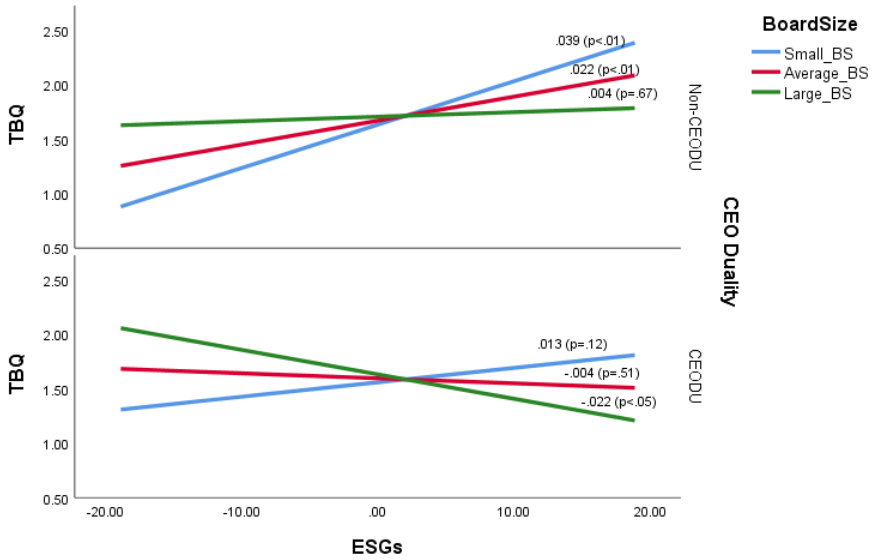

Figure 2. A visual effects of *ESG* on *Tobin's Q* moderated by *BS* and *CEODU*.

The results show that conditional effects of *ESG* on *Tobin's Q* are statistically positive for non-CEO duality firms which have both small (8.65 people) and average (11.17 people) board sizes; the conditional effect in small board size firms (0.0399) is greater than the effect in firms with average board size (0.0220). Nevertheless, the conditional effect of *ESG* on *Tobin's Q* is insignificant in firms with large (13.69 people) boards of directors. This means that for non-CEO duality firms, where the CEO is the managing director and small board size and average board size are evident, more *ESG* scores enhance firms' performance. Specifically, the ability of *ESG* to improve firm performance is greater in firms with small boards than those employing large ones. Nevertheless, *ESG* scores have no effect on firm performance where large boards are operating. Moreover, the study indicates that any conditional effect of *ESG* on *Tobin's Q* is statistically negative for firms having CEO duality and large boards (-0.0225). Nevertheless, the conditional effect of *ESG* on *Tobin's Q* is insignificant in firms having small boards and average-sized boards. This means that for CEO duality firms, where the CEO serves as both managing director and chairman of a large board of directors, higher *ESG* scores diminish firm performance. However, *ESG* scores have no effect on firm performance in CEO duality firms with boards that are small and average in size.

4.5. Regression results for the impact of each *ESG* pillar on firm performance

Table 6 summarizes the regression results of Model 2: The moderating roles of both board size and CEO duality on the relationship between environment activities and firm performance. The results of Model 3: The moderating roles of both board size and CEO duality on the relationship between social activities and firm performance, are shown in **Table 7**. Meanwhile the results of Model 4: moderating roles of both board size and CEO duality on the relationship between governance

activities and firm performance, are presented in **Table 8**. These results demonstrate that the relationship between environment-based activities and firm performance (**Table 6**, Model 2.4) along with the relationship between social activities and firm performance (**Table 7**, Model 3.4) are moderated by both board size and CEO duality. These findings are similar to what is reported in **Table 5** for Model 1.4 where both board size and CEO duality moderate the relationship between *ESG* performance and firm performance. Interestingly, it emerges that governance activities confirm there is no statistically significant effect on firm performance as shown in **Table 8**, Model 4.4.

Table 6. Regressions analysis of environment scores on *Tobin's Q*, moderated by *BS* and *CEODU*.

Variables	Control variable model		Model 2.1: main effect		Model 2.2: *ENV*BS* moderation		Model 2.3: *ENV*CEODU* moderation		Model 2.4: Two-way interaction	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Constant	1.890*** (2.649)	0.009	2.174*** (3.027)	0.003	2343*** (2.767)	0.006	2.597*** (3.325)	0.001	2.225** (2.665)	0.008
Controls										
FS	−0.059 (−0.842)	0.401	−0.125 (−1.644)	0.102	−0.086 (−1.052)	0.294	−0.123 (−1.163)	0.103	−0.072 (−0.889)	0.375
LEV	−0.102 (−1.507)	0.134	−0.094 (−1.405)	0.162	.106 (−1.602)	0.111	−0.083 (−1.255)	0.211	−0.094 (−1.448)	0.149
AUD	0.653* (1.711)	0.089	0.655* (1.735)	0.085	.591 (1.584)	0.115	0.637* (1.677)	0.095	0.552 (1.481)	0.140
Dind	−0.370* (−1.782)	0.077	−0.446** (−2.141)	0.034	−0.416** (−1.939)	0.054	−0.458** (−2.206)	0.028	−0.414* (−1.949)	0.053
Main Effect										
ESG	-	-	0.010** (2.121)	0.036	0.007* (1.735)	0.084	0.009** (2.214)	0.028	0.020*** (3.142)	0.002
BS	-	-	-	-	0.032 (0.797)	0.426	-	-	0.029 (0.742)	0.459
CEODU	-	-	-	-	-	-	−0.022 (−0.109)	0.912	−0.018 (−0.093)	0.926
Interaction Model										
*ESG*BS*	-	-	-	-	−0.004*** (−2.551)	0.011	-	-	−0.005*** (−3.021)	0.002
*ESG*CEODU*	-	-	-	-	-	-	−0.017** (−2.121)	0.035	−0.021*** (−2.652)	0.008
R	0.228		0.279		0.340		0.322		0.392	
R^2	0.052		0.078		0.115		0.103		0.154	
R^2 *change*	-		0.026		0.036		0.025		0.075	
F-statistic	2.193*		2.692**		2.940***		2.600**		3.144***	

Notes: Significant at *$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$; 1) *TBQ*: *Tobin's Q*; 2) *ESG*: *ESG* scores; 3) *BS*: Board Size; 4) *CEODU*: CEO duality; 5) *FS*: logarithm of total assets; 6) *LEV*: Debt to equity; 7) AUD: Auditor type; and 8) Dind: Industry dummy.

Table 7. Regressions analysis of social scores on *Tobin's Q*, moderated by *BS* and *CEODU*.

Variables	Control Variable model		Model 3.1: Main effect		Model 3.2: SOC*BS moderation		Model 3.3: SOC*CEODU moderation		Model 3.4: Two-way interaction	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Constant	1.890*** (2.649)	0.009	1.864** (2.622)	0.010	2.090** (2.447)	0.015	2.316*** (2.978)	0.003	0.952** (2.303)	0.022
Controls										
FS	−0.059 (−0.842)	0.401	−0.102 (−0.842)	0.180	−0.068 (−0.827)	0.409	−0.094 (−1.253)	0.212	−0.047 (−0.577)	0.564
LEV	−0.102 (−1.507)	0.134	−0.105 (−1.561)	0.121	0.096 (−1.445)	0.150	−0.111* (−1.664)	0.098	−0.102 (−1.546)	0.124
AUD	0.653* (1.711)	0.089	0.640* (1.682)	0.095	0.599 (1.583)	0.115	0.622 (1.620)	0.107	0.556 (1.464)	0.145
Dind	−0.370* (−1.782)	0.077	−0.376* (−1.818)	0.071	−0.358* (−1.669)	0.097	−0.372* (−1.803)	0.073	−0.343 (−1.604)	0.110
Main Effect										
SOC	-	-	0.008 (1.492)	0.138	0.005 (0.880)	0.379	0.008 (1.559)	0.120	0.018** (2.279)	0.024
BS	-	-	-	-	0.024 (0.602)	0.547	-	-	0.023** (0.569)	0.569
CEODU	-		-	-	-	-	−.060 (−0.300)	0.764	−0.044** (−.219)	0.826
Interaction Model										
*ESG*BS*	-	-	-	-	−0.004** (−2.078)	0.039	-	-	−0.005** (−2.494)	0.013
*ESG*CEODU*	-	-	-	-	-	-	−.018* (−1.815)	0.066	−0.023** (−2.307)	0.022
R	0.228		0.255		0.301		0.292		0.348	
R^2	0.052		0.065		0.091		0.085		0.121	
R^2 *change*	-		0.013		0.025		0.020		0.055	
F-statistic	2.193*		2.213		2.249**		2.098**		2.383**	

Notes: Significant at *$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$; 1) *TBQ*: *Tobin's Q*; 2) *SOC:* Social activities; 3) *BS*: Board Size; 4) *CEODU*: CEO duality; 5) *FS*: logarithm of total assets; 6) *LEV*: Debt to equity; 7) AUD: Auditor type; and 8) Dind: Industry dummy.

Table 8. Regressions analysis of governance scores on *Tobin's Q* moderated by *BS* and *CEODU*.

Variables	Control Variable model		Control Variable model		Model 4.1: Main effect		Model 4.2: *GOV*BS* moderation		Model 4.3: *GOV*CEODU* moderation	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Constant	1.890*** (2.649)	0.009	1.669** (2.250)	0.026	2.040** (2.532)	0.012	1.903*** (2.649)	0.008	2.039** (2.519)	0.012
Controls										
FS	−0.059 (−0.842)	0.401	−0.060 (−0.858)	0.392	−0.066 (−0.855)	0.393	−0.058 (−0.832)	0.406	−0.063 (−0.809)	0.419
LEV	−0.102 (−1.507)	0.134	−0.101 (−1.491)	0.138	0.114* (−1.652)	0.100	−0.095 (−1.407)	0.161	−0.109 (−1.572)	0.118
AUD	0.653* (1.711)	0.089	0.619 (1.617)	0.108	0.612 (1.593)	0.113	0.640 (1.649)	0.101	0.628 (1.610)	0.109
Dind	−0.370* (−1.782)	0.077	−0.384* (−1.849)	0.066	−0.410* (−1.877)	0.062	−0.375* (−1.794)	0.074	−0.399* (−1.814)	0.071

Table 8. (*Continued*).

Variables	Control Variable model		Control Variable model		Model 4.1: Main effect		Model 4.2: *GOV*BS* moderation		Model 4.3: *GOV*CEODU* moderation	
	B(t)	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***	***B(t)***	***p***
Main Effect										
GOV	-	-	0.005 (1.074)	0.284	0.005 (0.999)	0.319	0.005 (1.062)	0.289	0.010 (1.440)	0.151
BS	-	-	-	-	0.013 (0.310)	0.756	-	-	0.011 (0.262)	0.793
CEODU	-	-	-	-	-	-	−0.095 (−0.461)	0.645	−0.078 (−0.375)	0.707
Interaction Model										
GOV*BS	-	-	-	-	−0.001 (−0.847)	0.398	-	-	−0.001 (−0.885)	0.377
GOV*CEODU	-	-	-	-	-	-	−0.009 (−0.970)	0.333	−0.010 (−1.010)	0.313
R	0.228		0.257		0.326		0.307		0.269	
R^2	0.052		0.066		0.106		0.094		0.072	
R^2 *change*	-		0.014		0.004		0.005		0.010	
F-statistic	2.193*		2.244*		2.667**		2.326**		1.345	

Notes: Significant at *$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$; 1) *TBQ*: *Tobin's Q*; 2) *GOV:* Governance activities; 3) *BS*: Board Size; 4) *CEODU*: CEO duality; 5) *FS*: logarithm of total assets; 6) *LEV*: Debt to equity; 7) AUD: Auditor type; and 8) Dind: Industry dummy.

5. Discussion

5.1. Theoretical contributions

As mentioned above, this study aims to examine whether board size and CEO duality moderate the relationship between *ESG* scores and market-based performance of Thai listed companies. Before examining the moderating roles of board size and CEO duality, this study examines the effect of *ESG* scores on firm performance. The results show that *ESG* scores do not have a statistically significant impact on the performance of the listed companies on the SET. This supports the findings of Dincă et al. (2022), Sritanee (2023) and Tao (2023) who found inconclusive evidence on the influence of *ESG* scores on firm performance. Moreover, this finding contradicts the postulated hypothesis that *ESG* scores are related to firm performance. However, this finding supports the stakeholder theory, which provides a valuable framework for understanding the underlying mechanisms and potential outcomes of *ESG* scores. The mechanism of this phenomenon, *ESG* scores have no impact on firm performance, explaining that there is a relationship between the costs incurred and the benefits derived from such efforts, that is, the costs of *ESG* activities is proportional to the additional benefits. Therefore, they compensate each other and do not affect firm performance. The indication obtained from this study documents that stakeholder theory can be used to understand the mechanisms and possible outcomes of *ESG* disclosures. In addition, as mentioned that *ESG* scores do not significantly relate to firm performance, this finding contradicts the voluntary disclosure theory. This is because *ESG* scores often involve externalities and long-term risks that may not be

fully captured by market forces or disclosed voluntarily. This can lead to underestimation of risks associated with *ESG* issues. Furthermore, *ESG* factors are non-financial in nature, and companies may not prioritize their disclosure due to the perception that such information is not material to financial performance or that it may be costly to disclose.

In addition, the result shows that board size and CEO duality moderate the relationship of *ESG* scores on firm performance. This finding supports the agency theory. This is because the board of directors acts as an intermediary between shareholders (principals) and management (agents). The number of boards can potentially provide more or less diverse expertise, perspectives, and oversight, which can help reduce agency costs by ensuring that management decisions are in the best interest of shareholders. Also, agency theory suggests that separating the roles of CEO and chairperson can help mitigate conflicts of interest and enhance corporate governance. When the CEO also serves as the chairperson, there may be less independent oversight of management, potentially leading to agency problems.

5.2. Practical implications

The implications of this study are mainly for investors, management teams and regulators. For investors, while this study indicates that *ESG* factors may not be a significant indicator of firm performance, it is important to recognize that *ESG* activities can still help assess the long-term risks associated with investing in a company. Companies that fare poorly on *ESG* metrics could be vulnerable to regulatory, legal, and reputational risks, which can impact their financial performance. Furthermore, *ESG* factors can offer companies a competitive edge. For instance, environmentally sustainable companies may attract environmentally conscious consumers and investors. Additionally, combining *ESG* practices with other factors such as corporate governance mechanisms should enhance investor confidence.

For management team, although the study's empirical findings indicate that *ESG* factors are not statistically significant, they do show a positive relationship with firm performance. *ESG* factors are becoming increasingly integrated into regulatory and legal frameworks worldwide. Investors who take these factors into account are better equipped to identify companies that comply with current and future regulations, thus reducing the risk of facing regulatory penalties and fines. Moreover, investors are increasingly acknowledging the significance of corporate reputation and brand value. Companies that exhibit a dedication to *ESG* principles are often viewed more favorably by customers, employees, and other stakeholders, which can boost their long-term competitiveness and value. Additionally, top management should consider implementing other corporate governance mechanisms alongside *ESG* activities. The study reveals that board size and CEO duality significantly support *ESG* activities. There may be other corporate governance mechanisms that the management team should continually explore to enhance firm performance.

For regulators, despite the global trend of *ESG* practices, enforcing their implementation may not fully satisfy companies. This is because integrating *ESG* practices often involves significant upfront investments in technology, infrastructure, and employee training. Some companies may be apprehensive about these costs and

their potential impact on short-term profitability. Moreover, implementing *ESG* practices typically necessitates changes to existing business practices, structures, and cultures. Some companies may encounter internal resistance to such changes, especially if they perceive a threat to established ways of working or existing power dynamics. Therefore, regulators should carefully consider implementing *ESG* practices in conjunction with other corporate governance mechanisms that are essential for companies' sustainability. In addition, as mentioned that this study finds the Environment and Social scores potentially increase firm performance, regulators should recommend companies to implement *ESG* as a whole (Nuansa-Ard et al., 2023). In the meantime, Governance pillar checklists should be timely developed. This is to update corporate governance principles in achieving sustainability.

5.3. Limitations

This study does have some limitations that need to be addressed, which could be considered as cues for future research to expand on. Firstly, this study concentrates on Thai listed companies and it limits the ability to generalize the findings. Therefore, future studies could include more countries and examine certain industries which may be affected by *ESG* policies and activities such as manufacturers and resource extractors. Secondly, despite the fact that this study investigates the moderating role of board size and CEO duality, there are other moderators that should be considered.

6. Conclusion

Using Thai listed companies, the study examines the relationship between *ESG* scores and firm performance, and the moderating role played by board size and CEO duality on the relationship between *ESG* scores and firm performance. The main conclusions are as follows. First, *ESG* scores do not have a significant impact on firm performance; environment and social activities do. Secondly, the conditional effects of *ESG* scores on firm performance when moderated by both board size and CEO duality indicates that when a CEO serves as only managing director and small and average board sizes exist, engaging more in *ESG* activities enhances firm performance. Contrarily, when the CEO serves as both managing director and chairman of the board which has a large board size, *ESG* activities undermine how well the company performs.

This study has made significant contributions. The study extends the existing *ESG* and firm performance studies by focusing on Thai listed companies as examples of what is happening in emerging market economies, thus offering clues to other countries how to go about *ESG* implementation. Furthermore, the current study highlights the moderating role of board size and CEO duality, which should motivate future scholars to research and make recommendations on how companies can modify and improve their *ESG* performance.

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