



Environmental, Social, and Governance Disclosures, Green Chief Executive Officers, and Sustainable Value of Enterprises in High Environmental Risk Industries

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ABSTRACT

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Environmental, Social, and Governance (ESG) initiatives and executive leadership characteristics enhance sustainable value by signaling credible sustainability commitments to the market. Firstly, ESG disclosures reduce information asymmetry and lessen environmental risks that lead to a better market perception. Second, the appointment of a green chief executive officer (CEO) serves as third-party certification that legitimizes a firm's environmental seriousness, distinguishing it from mere greenwashing. Third, internal governance mechanisms, specifically board gender diversity, can significantly alter how these sustainability signals are prioritized and capitalized into sustainable value. This study explores the impacts of ESG disclosure and green CEO on sustainable value, together with the moderating role of gender diversity. Utilizing panel data from 154 entities in Indonesian high environmental risk industries covering 2012 to 2021, the results support the notion that both ESG disclosures and a green CEO significantly enhance sustainable value. The hypothesis concerning the moderating role of gender diversity is not robustly supported. Given the limited robustness of gender diversity as a moderating mechanism, organizations may instead prioritize proactively communicating the long-term economic rationale of their ESG investments and actively cultivate or recruit executives with verifiable sustainability credentials leveraging their leadership as a strategic asset to strengthen market trust and maximize valuation.

1. INTRODUCTION

Environmental, Social, and Governance (ESG) criteria have transitioned from voluntary corporate social responsibility (CSR) initiatives to strategic imperatives, particularly for firms operating in high environmental-risk sectors. Energy, mining, and basic materials sectors face unprecedented institutional scrutiny and regulatory pressure regarding their carbon footprint and ecological impact. For these carbon-intensive entities, ESG disclosure is no longer merely a communication strategy to gain stakeholder legitimacy [1]; it is a fundamental survival mechanism that directly dictates long-term competitiveness, cost of capital, and firm valuation in the eyes of global investors [2, 3]. Sound ESG execution helps reduce risk, enhance operational efficiency and create sustained competitive differentiations. ESG disclosure acts as a strategic communication strategy and ensures the development of unity and legitimacy among stakeholders [1], consequently, ensuring the vital resources towards to organizations is efficiently fulfilled [4]. Furthermore, if consumers see and respect an organization's commitment to sustainability they are more likely to exhibit brand loyalty which would result in higher profits and revenue [5].

The connection among ESG disclosures and firms' value is theoretically ambiguous. From an agency theory perspectives,

environmental disclosure may represent an additional compliance cost that diverts managerial resources from value-maximising activities [6, 7]. Within an agency framework, ESG engagement can intensify principal-agent conflicts when managers prioritize personal interests over organizational objectives. Divergences between managerial incentives and shareholder wealth maximization may encourage managers to divert resources away from ESG initiatives or allocate funds to preferred projects that enhance private benefits rather than sustainable value [8]. CSR and related ESG activities may reflect managerial opportunism rather than value creation [9]. From this agency perspective, ESG engagement may therefore represent an inefficient allocation of corporate resources.

By contrast, stakeholder theory offers a broader governance framework based on the premise that companies have responsibilities not only to shareholders but also to other stakeholders including employees, suppliers and customers as well as society more broadly. Freeman [10] argued that organizations are capable of creating sustainable and long-term value in order to sustainably maintain stakeholder interests. Thus, from this point of view, ESG practice strengthens legitimacy and increases stakeholder confidence through a long-term value. Companies that take the initiative to disclose their ESG information will accumulate reputational capital and find more talented human resources [11], thereby

enhancing sustainable value. Moreover, it has been found that ESG disclosure promotes corporate innovation by lowering financing costs [12] and by gaining access to government support and subsidies. Transparency in ESG reporting also helps to reduce the information asymmetry between companies and investors, resulting in higher company valuations, lower capital costs, and reduced financial risks [5]. Aboud and Diab [13] also backed this argument and note that companies included in ESG indices usually perform better than their counterparts.

Although the views of agency theory and stakeholder theory point out the complicated connection within ESG disclosures and sustainable value, institutional reporting is generally insufficient for investors to distinguish between real sustainability initiatives and mere greenwashing. This study addresses an important empirical issue by incorporating green chief executive officer (CEO) into this market uncertainty and exploring how it uniquely influences sustainable value. According to the upper echelons theory, strategic decisions both reflect and result from the cognitive values, experience, and leadership style of the executives within an organization. A green CEO therefore serves as a clear signal to the market about the authenticity of a firm's environmental policy [14]. In Indonesia, a green CEO designation is given to leaders who are evaluated along three key criteria: having a vision and mission focused on sustainable business, acting in an environmentally friendly way (through initiatives and activities aimed at mitigating environmental degradation), and being committed in a green manner (by formulating strategies and policies that balance operational goals with environmental integrity) [15].

However, while executive characteristics such as a green CEO independently drives valuation, not all ESG disclosures are created equal in terms of their ability to be capitalized into sustainable value. Instead, it is closely contingent on the effectiveness of the overall corporate governance system that governs executive decision making and strategy execution. Governance frameworks are monitoring and counsels mechanisms that align the interests of managers with those of stakeholders/shareholders to make ESG initiatives credible and operable. Gender diversity in this context is an important governance mechanism as well which can shape the manner in which ESG indices are interpreted, prioritized and administered. Having women on boards increases the value of boardroom discussions by diversifying opinions and quality of strategic decisions [16-19], especially in areas related to social responsibility and stakeholder engagement [20]. Yet, strides in gender diversity remain limited globally (especially in the global South), with strong social norms and institutional gate-keeping that bars women's access to strategic positions [18]. Wasiuzzaman and Subramaniam [21] also found that the addition of women in a board is positively related to good ESG performances in developed countries although this connection is less noticeable in emerging economies. Although researchers have devoted significant interest to the effects of diverse gender on ESG, scarce empirical work has analyzed its moderating influence in the relation among ESG practices and sustainable value. With the aim of addressing this research gap, it is the purpose of this study to explore the impact of ESG index on sustainable value and whether board gender diversity moderates this connection.

This study offers two primary contributions to literature. First, it disentangles the drivers of sustainable value in high-risk industries by simultaneously examining the direct impact

of ESG disclosure and green CEO presence. Second, it evaluates the moderating influences of gender diversity on this interrelation, offering novel insights into how gender composition at the board level may either reinforce or attenuate the influence of ESG practices on sustainable value. Drawing on panel data from high environmental risk industries entities on Indonesian stock market from 2012 to 2021, the analysis yields empirical findings that contributes to the academic discourse and offers actionable recommendations for decision-makers, regulators, and corporate decision-makers in developing markets.

The structure of this article is arranged as follows: Section 2 performs a literature review followed by research hypothesis development. Section 3 clarifies research methodology where it presents the sampling methodology as well as measurement of variables and the selected empirical model design. Section 4 reports the empirical findings from the data analysis. Section 5 discusses the results, while Section 6 summarized the study.

2. LITERATURE REVIEW

2.1 Environmental, Social, and Governance index

These ESG activities are seen to be trending as core pieces of a corporation's strategic operating system to achieve long-term sustainability. These activities have evolved beyond the traditional definitions of CSR to become part of corporate governance, risk management and stakeholder engagement. ESG application is critical to improve corporate transparency, decrease vulnerability from environmental and reputational risks, and increase long-term corporate resilience [22]. The embedding of ESG on the company's core operations acts as both a defensive and offensive move to respond to stakeholder concerns while also providing value along several dimensions. Firms with broad ESG policies are in a better position to cope with uncertainty arising from regulation, satisfy the demands of socially responsible investors and handle operational disruptions related to environmental or social catastrophes [23]. In this context, the implementation of ESG has already been empirically associated with greater access to capital, stronger brand value and more investor confidence. The results are aligned with the stakeholder theory. Corporates that don't interact with these stakeholders may find themselves exposed to reputation risk, regulatory penalties and less competitive in the marketplace.

At the technical level, ESG disclosure enhances transparency and accountability on one hand that enables to narrow information asymmetry among corporates and external stakeholders [24, 25]. A transparent lens into ESG reporting yields trust among investors, and it can communicate a demand from the ethically minded consumer as well as the institutional investor. There's a sort of spin that this takes in emerging markets which are still forming their rules, voluntary disclosures demonstrate the commitment to follow global best practice. Evidence demonstrates that the firms tend to be accompanied by higher performance, and their corporations become more valuable if they display strong ESG performance [26-28].

Further, the literature in strategic management and resource-based theory (RBV) have deployed ESG activities as organizational capabilities which are considered as intangible assets resulting in sustaining competitive advantage. Companies profiled with ESG orientation enhances firm

innovation abilities and possess strong internal controls and organizational culture, which yield financial & reputational value over time [29]. Every ESG pillar is significantly connected with corporate value for Asian companies based on Tobin's Q [30]. Rather than regarding ESG disclosure as an obligation or perfunctory action to satisfy legislative pressure, it makes sense to improve its operational effectiveness for stakeholder. Rather, it can serve as an important strategic tool to ensure that corporate interests are consistent with stakeholder concerns and drives continued long-term wealth creation and preservation of the company's competitive position in a world where sustainability is becoming a more significant force influencing business globally. Based on this discussion, the main hypothesis is established as follows:

H1: *ESG disclosure positively affects sustainable value.*

2.2 Green chief executive officer

The Upper Echelons Theory postulates that corporate strategic choices are not solely driven by agency pressures or stakeholder demands, but are profoundly influenced by the personal characteristics, historical experiences, and cognitive values of the organization's top executives. Strategic decisions serve as a direct reflection of an executive's orientation and interpretation of business environment dynamics. A green-experienced CEO continually infuses this eco-consciousness into the long-term direction of the firm within the sustainability continuum [31]. In the Indonesian context, green CEO is awarded in relation to three main aspects: (1) vision and mission towards sustainable business, (2) green action; initiatives and activities aimed at mitigating global warming, and (3) commitment-to-green strategies and policies; balancing operational targets with environmental sustainability agenda carried out by corporations over the years [15]. Such executive leadership traits innovatively reform internal practices that proactively redirect investment portfolios and cultural orientation of the organization towards a systemic sustainability paradigm.

Green CEO influences sustainable value through Signaling Theory, wherein a CEO that rewarded as a green CEO by Warta Ekonomi magazine in Indonesia distributes positive signals regarding long-term resilience prospects and superior ESG risk management [31]. This signal makes the company

more attractive to investors who consider ESG indicators in their investment decisions [32]. Executives with clear environmental credentials have greater capacity to accelerate the legitimacy and sustainment of their institutional reputation of organizations under increasingly stringent global sustainability conditions. Empirically, Mao et al. [14] demonstrated that CEOs with green experience substantially accelerate corporate capital allocation toward green projects and eco-friendly initiatives. The execution of these green investments simultaneously mitigates the probability of stakeholder friction and reduces potential corporate environmental liabilities and costs [33]. These pro-environmental executive characteristics are directly capitalized in the capital market through enhanced investor perception of the firm's capability to generate long-term value. Accordingly, this leads to the following hypothesis:

H2: *Green CEO positively affects sustainable value.*

2.3 Board gender diversity and board monitoring

Several studies have demonstrated the effect of diverse gender on ESG disclosure and corporate outcomes. Boards that are gender diverse are increasingly seen as a way to improve board performance, better oversight of ESG issues and to be more accountable to broader stakeholder groups. Gender diversity policies have the potential to stem on quality of ESG disclosures, thus strengthening sustainable value [21]. The introduction of sustainability committees in corporate boards could enhance ESG supervision and explain the connection among gender diversity, ESG performance, and corporate value [34]. Empirical studies conducted in the European markets where there is a regulation favoring gender balance indicate that female board representation enhances the scope and quality of ESG activities ultimately leading to stronger competitiveness among firms [34]. Similar findings are obtained from studies in the GCC countries, where there is more traditional corporate governance setting than other countries, it indicates a gender-diversified board reinforce the linkage among ESG and financial performance [35]. These results lend support to the idea that diversity in gender will result in a wider spectrum of perspectives, ethical dialogue and contributing to incorporating social and environmental into strategic decisions.

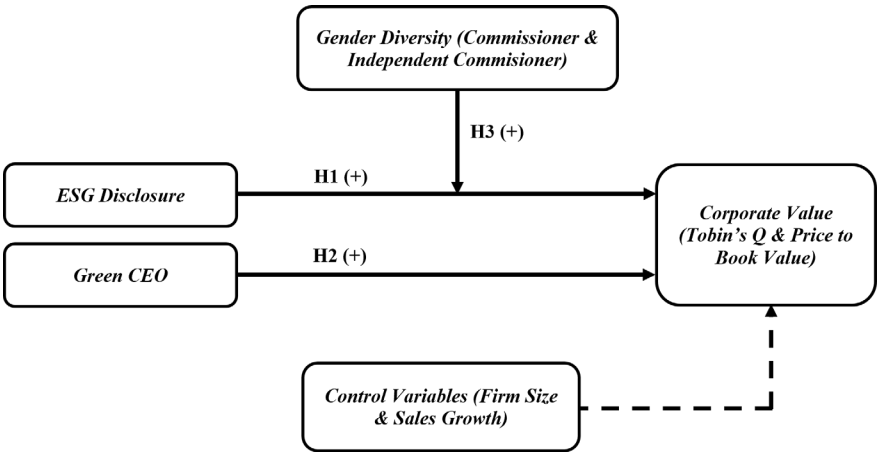


Figure 1. Conceptual framework

Soesetio et al. [36] found that women on the board of commissioners made more conservative decisions and avoided high-risk ones. The authors report that Indonesian financial

sector entities headed by women were more likely to keep the cash from the IPO, as “they might invest in low-risk short-term assets instead of utilizing them for long-term high-risk

investments". This caution has the potential to result in a tendency for female commissioners to view long-term ESG investments heuristically as short-term financial risk. This would limit companies' ability to translate ESG initiatives into value-enhancing strategies and erode the market capitalization that drives ESG disclosure into sustainable value. This cautious approach aligns with social role theory, which explains that societal perceptions of gender roles guide individual behavior, including in the context of leadership and/or organizational decision-making. The theory posits that men and women develop different behaviors in response to long-standing social norms and gender-based divisions of labor. In the workplace, traditional roles correlated with women tend to promote communal behaviors, such as being caring, cautious, and cooperative, whereas men are more often related to agentic roles that emphasize dominance, assertiveness, and risk-taking [37, 38]. Accordingly, this leads to the following hypothesis:

H3: *Board gender diversity moderates the effect of ESG disclosure on sustainable value.*

Based on previous research, Figure 1 depicts the conceptual framework.

3. METHODOLOGY

3.1 Sample and data

The population definition is based on the Indonesian high environmental risk industries (basic materials and energy) covering 2012 to 2021 that become increasingly exposed to ESG topics. The operational/technical activities in these two industries have a direct impact on the usage of natural resources, production of carbon and addressing social communities. Therefore, the implementation of ESG principles is more likely to affect sustainable value enormously. Purposive sampling was used to confirm the relevance of data regarding the research variables. Among the original set of 165 high environmental risk industries companies, filtering was performed according to availability of annual and sustainable reports over the entire period of observation. After this screening, the sample size was about 154 high environmental risk industries companies and 1,540 firm-year observations. The data are acquired from the annual and sustainability reports, and other official company documents that were publicly available on official sources.

3.2 Measures of variables

Tobin's Q (TOBINSQ) and Price to Book Value (PBV) were used as proxies for sustainable value and were derived from the companies' annual reports. These indicators strictly reflect components of sustainable value. Tobin's Q is commonly utilized to represent a corporate's competitive advantage and provides valuable insights into debt, equity capital, and asset utilization, elements relevant to both investors and stakeholders [39, 40]. PBV, on the other hand, reflects the corporate's stock performance and indicates a company's capability to create returns on investment [41]. A high PBV ratio indicates stronger investor confidence and can enhance shareholder value.

ESG indexes are proxies for ESG disclosure, drawn from the companies' sustainability reports. Previous literature commonly measures ESG performance using ESG scores or

ratings provided by established agencies such as Thomson Reuters, Bloomberg ESG Ratings, and KLD Sustainability Scores [4, 42, 43]. However, comprehensive ESG score data for Indonesian entities is not consistently available on these platforms. A limitation often observed across developing countries [26]. Thus, this paper builds on a manually constructed ESG disclosures score consistent with the approaches of [24, 44, 45]. This approach is appropriate for the Indonesian context. ESG index is comprised of three sub-indices, including environmental, social and governance disclosures. The sub-indexes are made up of as many as eight disclosure items, assessed on a 4-point (0 to 3) scale. A score of 0 is given when an item is not revealed in either the sustainability or annual reports. A score of 1 is awarded if the item is only presented in narrative style. A score of 2 is assigned when the item is disclosed using quantitative data or KPI, without substantial narrative. A score of 3 is awarded when both narrative and quantitative disclosures are provided. The disclosure items are derived from relevant prior studies and aligned with the Global Reporting Initiative (GRI) standards to ensure their appropriateness for the Indonesian reporting context.

Executive environmental orientation is captured by the green CEO variable. This study uses a dummy variable with a value of 1 if the CEO receive the 'Green CEO Award' from Warta Ekonomi magazine in Indonesia, and 0 otherwise [31]. This proxy serves as relatively robust empirical measure of the demographic and cognitive backgrounds that characterize prominent executive leaders with incentives to implement ethical environmental governance amidst high-risk industries, rather than simply a reflection of corporate publicity. The score from this award is based on a multi-dimensional assessment encompassing three primary factors of executive orientation; (1) Green Vision & Mission assesses how well the CEO integrates sustainability values into her or his lens/strategic outlook, (2) Green Action measures what concrete initiatives the executive spearheads as well what direct actions he or she participates in to address environmental problems, and (3) Green Commitment gauges whether the CEO will allocate resources effectively by balancing short-term performance targets with pro-environmental capital investment [15]. Table 1 summarizes the measurements for all variables used in this research.

3.3 Models and data analysis procedure

This study uses moderated regression analysis and lagged model to test the direct influence of these moderating and the interaction variables on the dependent variables. This approach allows testing whether the moderating variables have an independent influence on sustainable value as well as if the interaction among ESG performance and gender diversity factors alters significantly sustainable value.

To rigorously address dynamic endogeneity, reverse causality, and unobserved firm-specific heterogeneity, this study employs the two-step difference Generalized Method of Moments (GMM) estimator. The dynamic specification classifies ESG disclosure, green CEO, and sales growth as predetermined variables. Therefore, lags t-1 to t-3 are employed. The lagged dependent variable is treated separately, with instruments beginning at t-2 to t-3. While firm size treated as exogenous variable. Furthermore, to address the well-documented instrument proliferation problem, which can overfit endogenous variables and artificially inflate the Hansen

J-test p-values, this study apply the *collapse* option to the instrument set. Finally, this study implement the *Windmeijer* finite-sample correction to the two-step covariance matrix,

effectively mitigating the severe downward bias in standard errors that typically afflicts standard two-step GMM specifications.

Table 1. Variable measurements

Variables	Abbreviation	Formula
Dependent Variable		
	Tobin's Q (TOBINSQ)	$\frac{(\text{Market Value of Equity} + \text{Total Debt})}{\text{Total Assets}}$
Sustainable Value	Price to Book Value (PBV)	$\frac{\text{Market Price per Share}}{\text{Book Value per Share}}$
Independent Variable		
ESG Disclosure	ESG Index (ESG) (Appendix 1)	$I_{ESGi} = \frac{I_{ENVi}}{3} + \frac{I_{SOci}}{3} + \frac{I_{GOVi}}{3}$
Green CEO	GREEN_CEO	Dummy, worth 1 if the CEO receives the green CEO title from Warta Ekonomi and 0 otherwise
Moderating Variable		
Board Gender Diversity	Blau's Gender Diversity (BGD) Independent Gender Diversity (IGD)	$\text{Blau Index} = 1 - \sum_{i=1}^N P_i^2$
Control Variables		
Firm Size	SIZE	$\frac{\text{Natural logarithm of total assets}}{\text{Sales}_{\text{current year}} - \text{Sales}_{\text{previous year}}}$
Sales Growth	SG	$\frac{\text{Sales}_{\text{previous year}}}{\text{Sales}_{\text{previous year}}}$

Note: Environmental, Social, and Governance (ESG), Chief Executive Officer (CEO).

The dependent variable in the regression models is Tobin's Q (TOBINSQ). Similar models were estimated with PBV to test the robustness of the tests.

$$TOBINSQ_{i,t} = \alpha_{i,t} + \beta_1 ESG_{i,t} + \beta_2 GREEN_CEO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SG_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$TOBINSQ_{i,t} = \alpha_{i,t} + \beta_1 ESG_{i,t} + \beta_2 GREEN_CEO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SG_{i,t} + \beta_5 BGD_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$TOBINSQ_{i,t} = \alpha_{i,t} + \beta_1 ESG_{i,t} + \beta_2 GREEN_CEO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SG_{i,t} + \beta_5 BGD_{i,t} + \beta_6 ESG \times BGD_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$TOBINSQ_{i,t} = \alpha_{i,t} + \beta_1 ESG_{i,t} + \beta_2 GREEN_CEO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SG_{i,t} + \beta_5 IGD_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$TOBINSQ_{i,t} = \alpha_{i,t} + \beta_1 ESG_{i,t} + \beta_2 GREEN_CEO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SG_{i,t} + \beta_5 IGD_{i,t} + \beta_6 ESG \times IGD_{i,t} + \varepsilon_{i,t} \quad (5)$$

Eqs. (1)–(5) directly operationalize the three hypotheses. Model (1) is the baseline specification testing H1 (ESG disclosure positively affects sustainable value) and H2 (green CEO presence positively affects sustainable value). Models (2) and (4) introduce, respectively, the direct effects of aggregate BGD and independent female commissioners (IGD) as preliminary specifications prior to testing moderation. Models (3) and (5) test H3 (Gender diversity moderates the ESG-sustainable value relationship) through the interaction terms $ESG \times BGD$ and $ESG \times IGD$.

Robustness was assessed by employing an alternative proxy for sustainable value, PBV, in addition to Tobin's Q. PBV captures market-based perceptions of equity value and is sensitive to shifts in investor sentiment driven by non-financial

disclosures such as ESG. Including PBV as a dependent variable ensures that findings are not limited to a single financial metric. To control heteroskedasticity and autocorrelation in panel data, clustered robust standard errors were applied across models.

4. RESULTS

4.1 Descriptive statistics and correlation matrix

Table 2 displays statistic descriptives for all variables included in this investigation. The main sustainable value proxy, TOBINSQ, has a mean of 1.275, which implies that the market value of firms in the sample on average exceeds the replacement cost of their tangible assets. PBV has a mean of 1.416 indicating that markets are generally optimistic about future earnings of firms in these industries. ESG disclosure index has a mean of 0.478. This level suggests that even with a baseline of sustainability reporting, the majority of firms across these environmentally sensitive industries have considerable space to improve their commitment to holistic sustainable development and responsible corporate governance. In addition, as the GREEN_CEO variable shows a mean of 0.026, only 2.6% of the observations are led by CEOs who have received an external award in terms of environmental leadership, which indicates that such environmental credentials are rather scarce.

In terms of the moderating variables for board gender demographics, the results verify a serious underrepresentation of women in corporate governance. The Blau index for general BGD shows a highly marginal mean of 0.082. Consequently, the presence of independent female commissioners (IGD) is even scarcer, with a mean of merely 0.029. This result indicates that female representation on these boards has not reached a critical mass, functioning potentially

as mere tokenism rather than a substantial governance force. The high environmental risk industry firms which are mainly concentrated in inventory-intensive, eco high-risk, and capital-intensive industries (for example, energy, mining and basic materials) in the sample show an obvious lack of diversity. These are the structural and cultural drivers that have meant these industries have naturally been very male-dominated (given their technical / operational nature), which is a trend that obviously extends as well to the corporate leadership phase of top management teams or boardroom composition.

The correlation matrix presented in Table 3 indicates that the pairwise correlation coefficients among the independent

variables are below 0.80. The correlation between green CEO and ESG is 0.154, indicating that the award criteria did not overlap statistically with ESG. Nonetheless, because Warta Ekonomi's award criteria explicitly incorporate firms' green vision, green action, and green commitment, the GREEN_CEO measure cannot be fully disentangled from ESG-related firm behavior on conceptual grounds, independent of the modest empirical correlation reported above. This ex-post, reputation-based selection process may introduce residual endogeneity that the correlation coefficient alone cannot rule out, and this is acknowledged as a limitation of the proxy.

Table 2. Descriptive statistics and correlation matrix

	Mean	Std. dev.	TOBINSQ	PBV	ESG	GREEN_CEO	SIZE	SG	BGD	IGD
TOBINSQ	1.275	0.858	1.000							
PBV	1.416	1.648	0.773	1.000						
ESG	0.478	0.163	0.354	0.261	1.000					
GREEN_CEO	0.026	0.160	0.080	0.061	0.154	1.000				
SIZE	28.771	1.735	0.490	0.317	0.577	0.092	1.000			
SG	0.136	0.752	0.082	0.086	0.034	0.004	0.077	1.000		
BGD	0.082	0.159	0.071	0.047	0.224	0.067	0.183	0.018	1.000	
IGD	0.029	0.088	0.016	-0.029	0.159	-0.008	0.104	0.031	0.621	1.000

Note: Environmental, Social, and Governance (ESG), Price to Book Value (PBV), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD).

Table 3. Pooled least squares-dependent variable: Tobin's Q

	Model 1	Model 2	Model 3	Model 4	Model 5
ESG	0.510*** (0.059)	0.541*** (0.060)	0.578*** (0.063)	0.571*** (0.060)	0.585*** (0.061)
GREEN_CEO	0.252** (0.105)	0.175* (0.097)	0.183* (0.099)	0.184* (0.102)	0.180* (0.103)
SIZE	0.025*** (0.001)	0.025*** (0.001)	0.025*** (0.001)	0.025*** (0.001)	0.025*** (0.001)
SG	0.037*** (0.014)	0.040*** (0.014)	0.039*** (0.014)	0.041*** (0.014)	0.039*** (0.014)
BGD		-0.227*** (0.082)	0.382* (0.229)		
ESG×BGD			-1.230*** (0.458)		
IGD				-0.730*** (0.133)	1.039 (0.691)
ESG×IGD					-3.616*** (1.293)
Constant	0.002 (0.004)	0.003 (0.004)	-0.000 (0.004)	0.004 (0.004)	-0.001 (0.004)
R-squared	0.526	0.525	0.529	0.535	0.535

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

4.2 Empirical results

According to Table 3, ESG disclosure demonstrates a consistent and highly significant positive impact on Tobin's Q across all model specifications (coefficients ranging from 0.510 to 0.585, $p < 0.01$). The executive profile variable that displays the appreciation of market to environmentally conscious leadership (GREEN_CEO) also shows a positive direction with its coefficient ($p < 0.05$ in Model 1; $p < 0.1$ in Model 2-5). For the moderation effect, as shown in Model 3, the interaction term of ESG disclosure and Blau's gender diversity (ESG×BGD) has shown to be negative and statistically significant (-1.230, $p < 0.01$). The interaction of ESG with independent female commissioner (ESG×IGD in Model 5) has a larger attenuation effect, shown by a negative coefficient (-3.616; $p < 0.01$).

As an additional mitigation measure against reverse causality, Table 4 presents a Lagged Model specification that reinforces the robustness of the baseline findings. Past sustainability performance (L.ESG) and the presence of a green-oriented executive in the previous period (L.GREEN_CEO) consistently drives current sustainable value ($p < 0.01$ to $p < 0.05$). These results validate the presence of a substitution effect, where the lagged interactions of L.ESG×BGD (-2.547, $p < 0.01$) and L.ESG×IGD (-4.617, $p < 0.01$) persistently suppress the valuation premium generated by ESG activities.

Further analysis employs GMM in Table 5 to control dynamic endogeneity issues. The model specification is validated through the Arellano-Bond test, the AR(2) test is not statistically significant and the Hansen Test ($p > 0.05$). Within this dynamic specification, the positive coefficient direction of

ESG and GREEN_CEO generally persists, despite variations in significance levels. The sparse distribution of GREEN_CEO might limit its variation within companies, and

as a result, the accuracy in identifying its effects in dynamic GMM specifications could also be limited.

Table 4. Lagged model-dependent variable: Tobin's Q

	Model 1	Model 2	Model 3	Model 4	Model 5
L.ESG	0.097* (0.050)	0.112** (0.052)	0.362*** (0.064)	0.100** (0.048)	0.111** (0.047)
L.GREEN_CEO	0.235*** (0.079)	0.238*** (0.078)	0.265*** (0.091)	0.209*** (0.080)	0.200** (0.080)
L.SIZE	0.029*** (0.001)	0.030*** (0.001)	0.027*** (0.001)	0.030*** (0.001)	0.030*** (0.001)
L.SG	0.004 (0.011)	0.003 (0.011)	0.005 (0.011)	0.007 (0.009)	0.001 (0.010)
L.BGD		-0.117* (0.068)	1.132*** (0.203)		
L.ESG×BGD			-2.547*** (0.398)		
L.IGD				-0.569*** (0.094)	1.918*** (0.595)
L.ESG×IGD					-4.617*** (1.092)
Constant	-0.000 (0.002)	-0.000 (0.002)	-0.006* (0.004)	0.001 (0.002)	0.004* (0.002)
R-squared	0.679	0.681	0.619	0.715	0.729

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

Table 5. Generalized Method of Moments (GMM)-dependent variable: Tobin's Q

	Model 1	Model 2	Model 3	Model 4	Model 5
L.TOBINSQ	0.451*** (0.135)	0.507*** (0.129)	0.402*** (0.122)	0.455*** (0.136)	0.373** (0.149)
ESG	0.960*** (0.298)	1.143*** (0.320)	1.076*** (0.330)	1.110*** (0.316)	1.112*** (0.333)
GREEN_CEO	0.470** (0.225)	0.504** (0.223)	0.461** (0.209)	0.474** (0.223)	0.416* (0.245)
SIZE	0.028*** (0.005)	0.028*** (0.005)	0.029*** (0.006)	0.028*** (0.005)	0.026*** (0.006)
SG	0.022 (0.020)	0.026 (0.021)	0.023 (0.020)	0.026 (0.021)	0.022 (0.020)
BGD		-0.733 (1.000)	-1.136 (0.945)		
ESG×BGD			1.834 (2.076)		
IGD				-1.221 (1.777)	-1.952 (2.575)
ESG×IGD					6.832 (9.253)
AR1	0.002	0.001	0.003	0.001	0.007
AR2	0.112	0.105	0.160	0.115	0.153
Hansen Test	0.346	0.382	0.361	0.406	0.216

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

Although the extreme rarity of the GREEN_CEO variable (average 0.026) poses significant statistical power challenges, as evidenced by its elevated GMM coefficient, this study retains it, given its importance as a proxy for environmental governance, a novelty among similar global studies. Rather than indicating a data shortage, this rarity accurately reflects the reality of emerging markets where elite, externally validated green leadership remains scarce. The sparse nature of the binary executive award variable may limit its identification in the GMM specification due to insufficient within-firm variation.

The loss of statistical significance in moderation interactions (ESG×BGD and ESG×IGD) indicates that the

moderating role of gender diversity observed in baseline models is not robust to endogeneity corrections. Given the potential dynamic nature of sustainable value and the possibility of endogeneity between ESG-related corporate policies and sustainable value, the GMM specification is treated as the primary basis for the main conclusion, while the pooled least squares and lagged specifications are retained as baseline evidence. Accordingly, this study does not find robust evidence that gender diversity moderates the ESG-sustainable value relationship after accounting for dynamic dependence and potential endogeneity.

Table 6 reproduces the pooled least squares model with PBV as a proxy. The core impacts of ESG and GREEN_CEO

on PBV are shown to be positive and significant ($p < 0.01$ in most model specifications). In the moderation analysis model, while the interaction between ESG×BGD does not reach

statistical significance, the main effect of independent female commissioner (ESG×IGD; Model 5 in Table 3) remains a statistically significant negative coefficient (-2.297 , $p < 0.01$).

Table 6. Pooled least squares-dependent variable: Price to Book Value (PBV)

	Model 1	Model 2	Model 3	Model 4	Model 5
ESG	0.697*** (0.073)	0.728*** (0.074)	0.771*** (0.080)	0.789*** (0.075)	0.830*** (0.076)
GREEN_CEO	0.417*** (0.149)	0.426*** (0.149)	0.439*** (0.152)	0.369** (0.150)	0.428*** (0.158)
SIZE	0.017*** (0.001)	0.017*** (0.001)	0.017*** (0.001)	0.017*** (0.001)	0.016*** (0.001)
SG	0.084*** (0.027)	0.081*** (0.027)	0.081*** (0.027)	0.087*** (0.026)	0.088*** (0.026)
BGD		-0.261** (0.111)	0.034 (0.220)		
ESG×BGD			-0.761 (0.463)		
IGD				-1.227*** (0.160)	-0.098 (0.199)
ESG×IGD					-2.297*** (0.498)
Constant	0.003 (0.005)	0.003 (0.005)	0.002 (0.005)	0.003 (0.005)	0.003 (0.005)
R-squared	0.333	0.336	0.339	0.348	0.354

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

Table 7. Lagged model-dependent variable: Price to Book Value (PBV)

	Model 1	Model 2	Model 3	Model 4	Model 5
L.ESG	0.573*** (0.077)	0.581*** (0.080)	0.704*** (0.084)	0.635*** (0.079)	0.691*** (0.081)
L.GREEN_CEO	0.475*** (0.144)	0.484*** (0.144)	0.441*** (0.154)	0.434*** (0.144)	0.415*** (0.143)
L.SIZE	0.016*** (0.001)	0.016*** (0.001)	0.015*** (0.001)	0.016*** (0.001)	0.016*** (0.001)
L.SG	-0.001 (0.022)	-0.002 (0.021)	-0.002 (0.022)	0.001 (0.021)	-0.000 (0.022)
L.BGD		-0.174 (0.116)	1.673*** (0.407)		
L.ESG×BGD			-3.637*** (0.782)		
L.IGD				-0.925*** (0.173)	0.332 (0.652)
L.ESG×IGD					-2.551** (1.261)
Constant	0.018** (0.009)	0.015** (0.007)	0.005 (0.006)	0.018** (0.009)	0.014* (0.007)
R-squared	0.352	0.354	0.367	0.364	0.372

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

Table 8. Generalized Method of Moments (GMM)-dependent variable: Price to Book Value (PBV)

	Model 1	Model 2	Model 3	Model 4	Model 5
L.PBV	0.536*** (0.130)	0.540*** (0.131)	0.479*** (0.121)	0.557*** (0.130)	0.567*** (0.140)
ESG	1.164** (0.499)	1.518** (0.650)	1.131** (0.499)	1.153** (0.527)	0.989* (0.536)
GREEN_CEO	0.937*** (0.354)	0.987*** (0.365)	0.919*** (0.330)	0.960*** (0.354)	0.697 (0.457)
SIZE	0.045*** (0.011)	0.045*** (0.011)	0.047*** (0.011)	0.045*** (0.011)	0.043*** (0.011)
SG	0.048 (0.057)	0.044 (0.058)	0.049 (0.055)	0.052 (0.059)	0.044 (0.059)
BGD		-1.955 (1.934)	-2.596 (1.984)		
ESG×BGD			5.564		

			(3.648)		
IGD				-0.064	-1.399
				(2.655)	(4.118)
ESG×IGD					12.019
					(8.053)
AR1	0.000	0.000	0.001	0.000	0.000
AR2	0.119	0.152	0.224	0.109	0.108
Hansen Test	0.210	0.334	0.454	0.348	0.151

Note: Environmental, Social, and Governance (ESG), Chief Executive Officers (CEOs), Blau's Gender Diversity (BGD), Independent Gender Diversity (IGD). Statistically significant levels shown by *, **, and *** symbolizes 0.1, 0.05, and 0.01 levels, correspondingly.

Similar lagged model findings for PBV (Table 7) confirm earlier specification patterns. Prior sustainability practice (L.ESG) and previous green CEO (L.GREEN_CEO), have a statistically highly significant positive effect ($p < 0.01$). In the moderation analysis model, the interaction variable L.ESG×BGD significant in a negative direction (-3.637, $p < 0.01$), and the L.ESG×IGD specification consistently producing a negative coefficient as well (-2.551, $p < 0.05$).

Table 8 present specification of dynamic testing (GMM) results, with the lagged dependent variable (L.PBV) is significant, indicates historical dynamics of valuation. The ESG and GREEN_CEO retain their positive signs, indicates of continued investor demand for corporate sustainability. Consistent with the pattern observed in Table 5, results of moderation interactions of gender diversity are no longer statistically significant when these dynamic specifications are investigated.

5. DISCUSSION

The results of this study proved that the ESG disclosure consistently has a positive and significant impact to sustainable value at 1% level from Tobin Q or PBV. This result is also robust to all model specifications, which is in accordance with the previous literature [27, 46]. Factors contributing to the importance of ESG in these emerging economies include growing attention from institutional investors, awareness among stakeholders and regulatory enforcement for responsible corporate behavior. ESG disclosures enhance corporate reputation and perceived transparency, which are two crucial elements for fostering investor confidence in capital market performance [47, 48]. ESG in this sense functions not only as a normative and symbolic commitment, but also as a strategic tool for achieving differentiation from competitors in the market. Firms that voluntarily disclose sustainability performance are also seen to be more forward looking and prepared to cope with long-term risks, especially adverse environmental and social impacts. Such assurance increases investor confidence and helps increase sustainable value.

These results theoretically align more closely with the stakeholder theory. Stakeholder theory is based on the premise that firms must be accountable and coexist successfully with multiple categories of stakeholders (customers, regulators, etc.) as a means of ever maintaining their right to exist over time. For contrast, agency theory posits that CSR and broader ESG movements may articulate managerial self-interest rather than maximization of shareholder value [9]. Thus, as per agency's perspective, ESG practices are usually considered as rent-displaying expenses and are inconsistent with wealth-maximization objective of shareholders. Thus, ESG capability is a strategic asset that firms can leverage to attain higher levels of trust, brand value and risk prevention, defined as

superior market-based performance.

Furthermore, integrating the green CEO variable broadens the corporate governance perspective through Upper Echelons Theory, wherein the characteristics and value orientations of top executives guide the organization's strategic direction. The positive market response to the green CEO figure indicates that market evaluation extends beyond the quality of sustainability reporting to focus directly on the central actors behind strategy implementation. Executive characteristics, environmental experience, and sustainability orientation substantially shape the firm's ESG quality [49], while simultaneously influencing market perceptions of sustainable value. According to signaling theory, external awards give a positive signal to investors and enhance the credibility of ESG commitments among investors. A CEO's green track record or orientation sends a robust signal to the market that sustainability strategies are integrated at the highest level of strategic decision-making rather than acting as mere symbolic compliance. Environmental experience at the executive tier directly drives the allocation of green investments and fortifies the architecture of the organization's sustainability strategies [14]. Executives with sustainability-oriented managerial capacity elicit positive stakeholder responses due to their perceived higher competence in sustaining long-term business continuity and credibly managing ESG risks. The transmission of this green leadership signal is empirically captured through the appreciation of market-based valuation metrics [32].

The lack of a robust moderating effect for gender diversity carries a theoretical implication. While initial baseline models show an attenuating relationship, the non-persistence of this effect suggests that structural board demographics alone do not universally dictate how ESG strategies are valued by the market. The critical-mass perspective provides a theoretical explanation for why a gender-diversity measure may not generate a stable moderation effect. Prior study suggests that the influence of women on boards may depend on whether their representation reaches a sufficient level to move beyond token participation and facilitate substantive influence in board deliberations [50, 51]. The limited representation of female independent commissioners in the high environmental-risk sector, as reflected in the low average IGD value of 0.0291, indicates that firms fall far short of achieving a critical mass. Without reaching a critical mass, minority female commissioners may lack the strategic authority to actively shape or moderate board deliberations on complex ESG investments. Consequently, while ESG disclosures and green CEOs emit strong signals, gender diversity has not yet matured into a structural catalyst capable of amplifying these signals. However, the present study does not directly test a critical-mass threshold. Therefore, this explanation should be regarded as a plausible interpretation rather than an empirically established mechanism. Similarly, the Blau index captures board-level gender heterogeneity but does not directly measure the substantive authority or strategic influence of

female commissioners. These considerations suggest that heterogeneous or threshold-dependent effects may be obscured by a linear interaction specification.

6. CONCLUSION AND IMPLICATIONS

With the growing demand for sustainable economic development in emerging economies, ESG considerations have become increasingly important for firms operating in high environmental-risk industries. This study examined the effects of ESG disclosure and green CEO on sustainable value and explored whether gender diversity conditions the association between ESG disclosure and sustainable value. Using panel data from 154 firms operating in environmentally high-risk sectors listed on the Indonesian stock market from 2012 to 2021, the study employed baseline regression (ordinary least squares (OLS) and lagged specifications) and dynamic GMM specifications to provide both static and endogeneity-adjusted evidence. The results indicate that ESG disclosure and green CEO presence are positively associated with sustainable value, suggesting that sustainability-related transparency and credible environmental leadership serve as vital market signals rather than mere symbolic compliance. However, the moderating role of gender diversity requires careful interpretation. While baseline specifications indicate an attenuating relationship from gender diversity, this effect is not robust across dynamic specifications. The observed divergence may reflect the dynamic and endogenous nature of the ESG-value relationship.

From a managerial perspective, the findings suggest that firms should view ESG disclosure and credible environmental leadership as complementary components of their broader value-creation and governance strategies. However, managers should not interpret gender diversity as a standalone mechanism for enhancing or reducing the market value of ESG investments, given the absence of robust moderation in the GMM specification. Instead, board diversity may be incorporated into a broader governance strategy that considers the substantive participation of commissioners, the organizational context, and the long-term objectives of ESG initiatives. For firms operating in environmentally intensive industries, improving the credibility and transparency of ESG disclosure and developing credible environmental leadership may be more directly relevant to communicating the economic value of sustainability initiatives. At the policy level, standardized ESG reporting frameworks and appropriate access to sustainable financing may further support firms in communicating and implementing long-term environmental investments. Gender-diversity policies remain important from a broader corporate governance and social perspective, but the present findings do not provide sufficient evidence to recommend gender diversity specifically as a mechanism for improving the sustainable value of ESG disclosure.

This study is subject to several limitations. First, its focus on high environmental-risk industries in the Indonesian capital market limits the generalizability of the findings to other sectors and institutional settings. Second, the relatively limited prevalence of green CEOs and the distribution of female commissioners within the sample constrain the ability to investigate nonlinear or critical-mass effects of these characteristics. Future study could therefore examine whether the moderating role of gender diversity varies according to critical-mass thresholds rather than assuming a linear

relationship. Cross-country studies could also assess whether institutional and industry characteristics condition the ESG-gender diversity-sustainable value relationship across emerging markets. In addition, future research may incorporate other dimensions of board diversity, including educational background, nationality, age, expertise, and tenure, to provide a more comprehensive understanding of how board characteristics shape the economic consequences of corporate sustainability strategies.

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