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Exploring How Corporate Maturity Moderates the Value Relevance of ESG Disclosures in Sustainable Reporting: Evidence from Bangladesh's Developing Market

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Abstract

This study investigated how corporate maturity—measured through firm age and lifecycle stage—moderates the value relevance of Environmental, Social, and Governance (ESG) disclosures in a frontier market context, using Bangladesh as a case study. Drawing on panel data from 2011–2012 to 2023–2024 for 86 publicly listed non-financial firms, the study employed a modified Ohlson valuation framework, panel regression analysis, and multiple robustness techniques (2SLS, PSM). ESG disclosure was measured using a researcher-developed index aligned with international reporting standards (GRI, SASB, TCFD, UN SDGs). ESG disclosures are positively associated with firm value, but this relationship is significantly moderated by corporate maturity. Younger firms exhibit a stronger valuation effect from ESG transparency, driven by higher signaling and legitimacy needs. In contrast, mature firms experience a diminished marginal benefit, reflecting routine compliance rather than strategic differentiation. These findings challenge the uniform application of ESG assessment models and suggest the need for lifecycle-adjusted disclosure ratings, particularly in nascent regulatory environments like Bangladesh. Investors and regulators should tailor ESG evaluation criteria by firm age and industry sustainability exposure. Younger firms, often overlooked, may carry outsized ESG signaling value in emerging markets. Enhancing ESG transparency among younger firms can foster greater stakeholder trust, support inclusive growth, and strengthen social accountability in emerging economies. This study contributes to the ESG literature by introducing corporate maturity as a key moderating variable in value relevance analysis. It provides new empirical insights from a developing economy and proposes lifecycle-based adaptations to global ESG rating methodologies.

Keywords: ESG disclosures; corporate maturity; firm value; emerging markets; lifecycle theory; Bangladesh

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1. Introduction

Environmental, Social, and Governance (ESG) disclosures have emerged as essential instruments for promoting transparency, accountability, and long-term corporate sustainability. This relevance is increasingly pronounced in developing markets, where institutional voids, regulatory inconsistencies, and resource limitations pose unique challenges to ESG integration [1]. Among the various factors influencing ESG disclosure practices in emerging economies, corporate maturity, typically measured by firm age or lifecycle stage, stands out as a pivotal determinant that shapes the scope, credibility, and impact of non-financial reporting.

Bangladesh, a fast-growing South Asian economy heavily dependent on export-driven sectors like garments and textiles, has seen growing momentum around ESG disclosures [2]. Firms in this context increasingly face pressure to align with international ESG standards such as GRI, SASB, TCFD, and the UN SDGs. For mature firms, ESG reporting often serves as a tool for reputational alignment and regulatory compliance, supported by well-established stakeholder networks and institutional capacity. In contrast, younger firms tend to use ESG disclosures more strategically as signaling mechanisms to attract investment and establish legitimacy in the market.

While the value-enhancing potential of ESG disclosures has been substantiated in developed economies, their financial relevance in emerging markets remains less conclusive and context-dependent. In Bangladesh, challenges such as limited awareness, low disclosure standardization, and insufficient enforcement mechanisms contribute to wide variations in reporting quality. Within this context, corporate maturity plays a dual role: it enables extensive ESG disclosures by virtue of accumulated capabilities, but it may also reduce the marginal signaling value of such disclosures, particularly in capital markets that reward innovation and transparency over compliance.

This study explored how corporate maturity influences both the extent of ESG disclosures and their value relevance—i.e., the degree to which such disclosures affect firm valuation—in the context of Bangladesh. Integrating theories of signaling, legitimacy, and corporate lifecycle, we examined whether mature firms in Bangladesh disclose more ESG information, and whether such disclosures yield comparable valuation benefits to those of younger firms.

By focusing on a developing market context, this research contributes to the literature in several ways. First, it provides empirical evidence on how firm maturity moderates the ESG–value relationship. Second, it applies a modified Ohlson valuation model that accounts for firm lifecycle and sectoral sensitivities. Third, it offers policy and managerial implications for enhancing ESG disclosure frameworks in Bangladesh and similar emerging economies.

2. Literature Review

2.1. ESG Disclosures and Firm Value in Emerging Markets

ESG disclosures have gained prominence as mechanisms for fostering transparency, building stakeholder trust, and signaling long-term sustainability. In capital markets, ESG practices are often associated with enhanced firm valuation, lower information asymmetry, and reduced capital costs [3,4]. A recent PRISMA-based review by [5] emphasizes that governance quality and strategic ESG integration are particularly critical in emerging markets, yet large empirical gaps remain regarding ESG's value relevance in these contexts. In developed economies, ESG disclosures are generally found to enhance firm valuation through reduced risk and improved stakeholder engagement [6,7]. By contrast, evidence from developing markets is more fragmented, often reflecting weak regulatory enforcement, inconsistent disclosure norms, and institutional instability [8,9]. For example, Adardour et al. [10] reported that ESG disclosures in Moroccan firms are strongly influenced by gender inclusion, reporting motives, and local regulatory factors, underscoring the culturally specific nature of ESG drivers in emerging markets. Similarly, Sultana et al. [11] reported that ESG preferences among Bangladeshi investors are shaped by behavioral intentions and long-term investment horizons, highlighting the need to account for localized investor psychology when examining ESG–value relationships.

Setiawati and Hidayat [12] reported limited financial effects of ESG dimensions on Indonesian banks, while Angir and Weli [13] found a negative relationship between ESG disclosures and firm value in Indonesian listed companies. Conversely, Miralles-

Quirós et al. [14] identified significant valuation benefits of ESG disclosures in Brazil's manufacturing sector, emphasizing the importance of sectoral and contextual alignment. In emerging markets, the strategic alignment of ESG disclosures with competitive advantage has also been shown to enhance their value relevance. Wahyuni et al. [15] found that ESG disclosures alone may not significantly affect firm value, but when complemented by competitive advantage, their financial impact is significantly enhanced.

This cross-regional disparity aligns with the findings of [16], which observed that while European firms show stronger adherence to global ESG norms and demonstrate higher compliance, Asian firms often tailor their ESG priorities to sector-specific strategies such as energy efficiency and technological advancement. Similarly, Faccia et al. [17] highlighted the growing role of structured ESG integration into financial statements, emphasizing how governance disclosures tied to value-added metrics and XBRL taxonomies (dictionaries for reporting) increase transparency and investor confidence.

The need for context-sensitive ESG frameworks is underscored by recent European studies. Broniewicz et al. [18] found that even under ESRS, banks in Poland exhibited limited preparedness and inconsistencies in ESG reporting, especially in biodiversity-related disclosures. These challenges mirror the readiness gaps evident in many emerging economies. Furthermore, governance-related ESG disclosures tend to be more impactful on operational efficiency and investor valuation, particularly in regulated markets [19].

Evidence from developed markets suggests that robust regulatory regimes enhance the value relevance of ESG disclosures, offering lessons for Bangladesh's regulatory development [9,20]. Zuraida et al. [20], through a broad cross-country sample, demonstrated that ESG disclosures significantly affect firm valuation, particularly in countries with strong institutional and legal structures.

These disparities signal that ESG disclosures may not be universally value-relevant and instead require market-specific calibration. In emerging economies like Bangladesh, where regulatory frameworks are evolving and investor awareness is increasing, understanding the conditional effects of ESG disclosures—particularly across firm types—becomes essential.

2.2. Corporate Maturity and ESG Disclosure Behavior

Corporate maturity, typically proxied by firm age or lifecycle stage, plays a crucial role in shaping ESG disclosure behavior. Mature firms often benefit from institutional memory, extensive stakeholder relationships, and accumulated resources, enabling them to provide more detailed and consistent non-financial disclosures [21,22]. These disclosures may serve as reputational tools, signaling compliance and long-term orientation. Eccles et al. [21] demonstrateed that mature firms with embedded sustainability practices and stakeholder-focused governance structures tend to outperform their peers, reinforcing the operational and market benefits of ESG reporting at advanced stages of the corporate lifecycle.

The strategic purpose of ESG disclosures, however, varies across different stages of the corporate lifecycle. While younger firms frequently employ ESG reporting to attract investors, validate legitimacy, and build trust—especially under conditions of high information asymmetry—mature firms often treat ESG disclosures as compliance-driven routines [23,24]. This shift in motivation tends to reduce the incremental value that ESG reporting contributes to firm valuation [6,22].

Corporate lifecycle theory [25] posits that firms' strategic priorities, including ESG engagement, evolve with lifecycle progression. During growth stages, firms leverage ESG as a differentiator to appeal to investors, whereas mature firms emphasize stakeholder alignment and risk mitigation. Studies by [26,27] further revealed that the financial outcomes of ESG disclosure taper as firms mature. In resource-intensive sectors, mature firms often use ESG disclosures to meet stakeholder expectations and align with investor demand

for responsible practices, as shown by [28]. This perspective is supported by Wan Ismail et al. [29], which found a strong positive link between corporate sustainability reporting and financial performance in emerging markets, highlighting its strategic potential even under constrained institutional environments.

Balogh et al. [30] reinforces this argument by demonstrating that ESG disclosure levels are influenced not just by firm age but also by revenue, employee size, and profitability. Their study of large Czech firms found a strong link between these factors and ESG transparency, highlighting the multifactorial nature of ESG disclosure decisions.

2.3. Theoretical Foundations

To explain the ESG–value relationship within the maturity context, this study draws on a multifaceted theoretical framework integrating:

1. Signaling Theory [23]: ESG disclosures act as observable signals that help bridge information asymmetry, particularly for younger firms with limited performance histories. This aligns with [31], who argue that firms in early lifecycle stages must actively signal credibility through non-financial disclosures to attract external resources. This signaling function becomes particularly pronounced in the presence of ESG-focused investors who are more responsive to non-financial performance metrics—a finding echoed by [32], who demonstrate that ESG-oriented investors strengthen the relationship between ESG disclosure and firm performance.
2. Legitimacy Theory [33,34]: ESG reporting is used to align corporate actions with societal norms and stakeholder expectations, particularly in regulated or socially sensitive environments.
3. Corporate Lifecycle Theory [25]: ESG disclosure intensity and purpose vary across firm lifecycle stages.

This integrative lens highlights that while ESG disclosures can enhance firm value, their impact is contingent on the maturity, resource profile, and strategic priorities of the disclosing firm.

2.4. Synthesis and Hypothesis Development

The reviewed literature and theoretical foundations suggest a conditional ESG–value relevance relationship, moderated by corporate maturity. Younger firms may benefit more because of the signaling and legitimacy-enhancing nature of ESG disclosures, while mature firms' disclosures might already be priced in or perceived as routine.

Thus, the study proposes the following hypotheses:

H1. *ESG disclosures are positively associated with firm value in the context of Bangladeshi publicly listed firms.*

H2. *The positive relationship between ESG disclosures and firm value is stronger for younger firms than for mature firms.*

H3. *The moderating effect of corporate maturity on ESG value relevance is more pronounced in industries with higher sustainability exposure.*

Figure 1 presents the conceptual framework illustrating the relationship between ESG disclosure and firm value, with corporate maturity as a moderating variable and industry sustainability exposure as a contextual condition. This framework forms the basis for the empirical hypotheses tested in the study.

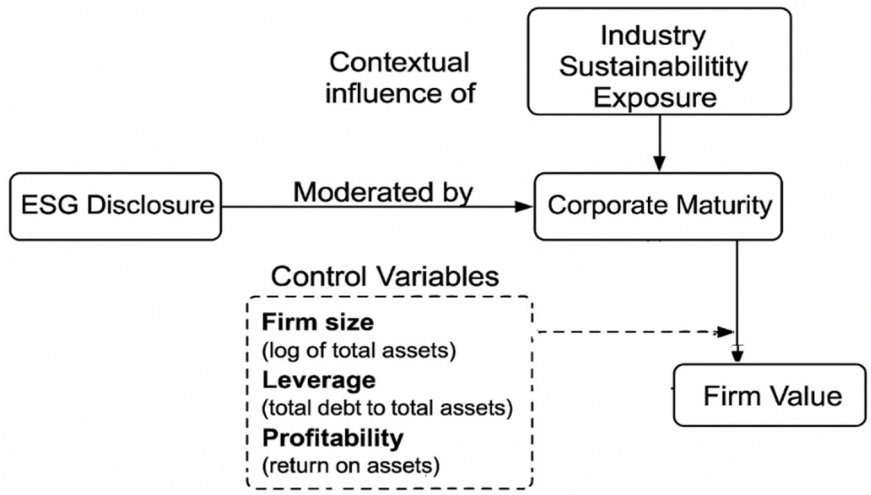


Figure 1. Conceptual framework illustrating the value relevance of ESG disclosures moderated by corporate maturity, with industry sustainability exposure as a contextual condition. Control variables (firm size, leverage, profitability) are included to isolate the direct and interaction effects. Arrows indicate hypothesized causal pathways.

3. Research Methodology

3.1. Research Design and Approach

This study adopts a quantitative research design using a panel data approach to assess the relationship between ESG disclosures and firm value, and how this relationship is moderated by corporate maturity. The methodology integrates cross-sectional and time-series data to capture firm-level variations across time while controlling for firm-specific heterogeneity.

3.2. Sample Selection and Data Sources

This study focuses on publicly listed non-financial firms in Bangladesh, covering a 13-year period from FY 2011–2012 to FY 2023–2024. Financial institutions were excluded due to sector-specific ESG frameworks (such as Basel III-aligned environmental stress testing and disclosure mandates issued by the Bangladesh Bank), which differ significantly from the standards applied in industrial and service sectors. Including them could distort comparability and bias the index calibration.

Additionally, Bangladesh presents a relevant context for ESG research due to its rapidly evolving regulatory landscape and growing investor emphasis on sustainability [2]. However, it remains underrepresented in ESG valuation literature relative to cross-country samples [35], making it a suitable case for context-sensitive analysis.

The selection process began with an initial pool of 149 firms listed on the Dhaka Stock Exchange (DSE). To ensure the robustness and consistency of the analysis, a set of stringent inclusion criteria was applied. First, firms were required to disclose ESG-related information—either quantitative or qualitative—through their annual reports, integrated reports, or standalone sustainability disclosures. Second, sufficient market and financial data had to be available to accurately compute firm value. Third, only firms with a minimum of eight years of continuous listing during the study's observation period were considered, ensuring adequate longitudinal coverage. Finally, firms needed to demonstrate consistency in both ESG and financial reporting across the observed years, enabling meaningful comparisons over time.

Firms with missing or incomplete data on ESG indicators or firm value proxies (Tobin's Q, Market-to-Book) for more than four consecutive years were excluded to mitigate survivorship bias and ensure panel balance. A final sample of 86 firms was retained, yielding 1118 firm-year observations.

The final sample represents roughly 45% of all non-financial firms listed on the Dhaka Stock Exchange during the study period. Although this coverage may appear modest, the selected firms span a diverse range of industries and meet stringent criteria for data quality and consistency, thereby ensuring both internal validity and contextual relevance for the Bangladeshi market.

Data for the study were collected from multiple reliable and complementary sources to ensure both accuracy and completeness. Primary information on ESG disclosures and financial performance was obtained from company annual reports and sustainability disclosures, which were cross-checked against archival filings for consistency. Market data and firm-level financial fundamentals were sourced from established financial databases, including Bloomberg Terminal and Thomson Reuters Eikon. Additional regulatory insights and firm-specific details were obtained from the Bangladesh Securities and Exchange Commission (BSEC). Historical records maintained by the Dhaka Stock Exchange (DSE), along with information available on company websites, were also reviewed to supplement and verify the dataset.

To ensure data integrity, cross-checks were conducted across all sources. Any inconsistencies identified were addressed either by consulting the original filings or, where necessary, by excluding the affected firm-years from the analysis during sensitivity testing.

3.3. Development of the ESG Disclosure Index

The ESG Disclosure Index used in this study was researcher-constructed based on international standards, including [36–39]. A content analysis method was used to code ESG information across 33 indicators, classified as:

1. Environmental: e.g., emissions, climate strategy, water and waste management.
2. Social: e.g., labor rights, DEI, community engagement, product responsibility.
3. Governance: e.g., board composition, risk management, anti-corruption policies.

Each disclosure item was treated equally using an unweighted scoring approach: a binary score of "1" was assigned if an item was disclosed and "0" otherwise. The total ESG score for each firm-year was calculated by summing disclosed items and dividing by the total number of applicable items, resulting in a percentage score representing the extent of ESG transparency. This method ensures consistency and comparability across firms, particularly important in an emerging market with variable disclosure practices. (See Appendix A for full ESG index.).

While the primary ESG index used in the study applies a binary and unweighted scoring method for simplicity and transparency, its limitations in capturing disclosure quality and intensity are recognized. In response, a weighted version of the index was developed for robustness checks. Weights were determined based on stakeholder relevance and sector-specific materiality, consistent with guidance from prior studies [6,31]. For instance, environmental disclosures were weighted more heavily in high-impact sectors such as manufacturing and textiles, while governance items carried greater weight in sectors subject to intense regulatory scrutiny. The application of this weighted index produced results consistent in direction and significance with the unweighted version, strengthening the robustness of our findings. The full weighting scheme is provided in Appendix B.

To ensure the content validity of the ESG Disclosure Index, a pilot assessment was conducted on a sample of 10 randomly selected firms across multiple sectors. The index was reviewed by two academic experts in sustainability accounting and one industry practitioner with ESG reporting experience in South Asia. Based on their feedback, redundant items were eliminated, and phrasing was refined to align with regional reporting norms while preserving consistency with global frameworks (GRI, SASB, TCFD, UN SDGs). This

multi-stakeholder validation process enhances the reliability of the index and ensures its contextual appropriateness for the Bangladeshi market.

In the primary analysis, an unweighted ESG scoring approach was used to ensure transparency and avoid subjective bias in item importance. However, as part of robustness checks, a weighted ESG index was also constructed. Weights were assigned based on stakeholder relevance, drawing on prior literature [6,14] and feedback from domain experts consulted during index validation. Environmental and governance items received relatively higher weights in high-sustainability exposure industries (e.g., textiles, manufacturing), while social items were emphasized in service-oriented sectors. This alternative specification confirmed the robustness of the ESG–value relationship, with results remaining consistent in sign and significance.

In response to concerns regarding the actual environmental impacts, a complementary analysis was conducted using disclosed physical performance metrics. Specifically, CO_2 emissions, water consumption, and waste generation data—where available—were extracted and standardized for firm-level comparison. These indicators were then incorporated into auxiliary regression models to test whether ESG disclosure correlates with real environmental performance. Preliminary findings indicate that while greater ESG disclosure is generally associated with lower emissions and waste, the strength and direction of this relationship vary by industry and firm maturity. This suggests that while ESG transparency is valuable, it may not consistently reflect substantive sustainability performance, highlighting the importance of integrated disclosure and impact frameworks in ESG assessment.

3.4. Variables and Measures

3.4.1. Dependent Variable

The dependent variable in this study was firm value, which was measured using two widely accepted market-based proxies. The first proxy, Tobin's Q, is calculated as the ratio of a firm's market value to the replacement cost of its assets. This measure captures how investors value the firm's assets relative to their cost, providing insights into market perceptions of future growth and efficiency. The second proxy used was the Market-to-Book Ratio (MTB), which represents the ratio of the market value of a firm's equity to its book value. This indicator reflects investor expectations regarding a firm's profitability and intangible assets not fully captured in accounting statements. Together, these two measures offer a comprehensive assessment of firm value from a market perspective.

3.4.2. Independent Variable

ESG disclosure score. Computed from the researcher-constructed ESG index.

3.4.3. Moderating Variable: Corporate Maturity

1. Firm Age: Measured as years since incorporation. This variable was used both as a continuous measure and as a categorical moderator. For initial regression models, firms were classified as "young" or "mature" based on a median split (median = 28 years). Firms below the median were labeled "young," and those at or above were labeled "mature".

   However, the limitations of using a median split, which may reduce explanatory power and introduce arbitrary thresholds, are acknowledged. To address this, supplemental analyses were conducted using tercile splits and alternative age cutoffs to ensure robustness of the findings. Furthermore, firm age and lifecycle stage were modeled independently in interaction terms to capture potentially distinct moderating effects.

2. Firm Lifecycle Stage: Classified as growth, maturity, or decline using [25] cash flow pattern-based model, considering operating, investing, and financing cash flow signs. This classification was used to verify the consistency of findings when firm age and lifecycle are applied as separate or alternative proxies for corporate maturity.

3.4.4. Control Variables

To ensure the robustness of the analysis and account for potential confounding effects, this study incorporated several control variables commonly used in similar empirical research. First, firm size was included as a control variable, measured by the natural logarithm of total assets. Larger firms tend to have more resources, greater public visibility, and are generally subject to higher stakeholder scrutiny, all of which may influence disclosure practices and firm performance. Second, leverage was controlled for by using the ratio of total debt to total assets. This variable reflects the firm's financial risk and capital structure, which may impact its ability to invest in long-term sustainability initiatives and influence stakeholders' perception of its financial health. Third, profitability was measured using return on assets (ROAs), which captures a firm's ability to generate earnings from its assets. More profitable firms may have stronger incentives and greater capacity to engage in comprehensive non-financial disclosures due to their stable financial condition and strategic outlook.

These control variables were incorporated into the regression models to isolate the effects of the main explanatory variables and enhance the reliability of the study's findings.

3.5. Model Specification

To test the hypothesized relationships, a modified [40] value relevance model was applied. The base model is as follows:

$$FV_{i,t} = \alpha + \beta_1 ESG_{i,t} + \beta_2 AGE_{i,t} + \beta_3 (ESG_{i,t} \times AGE_{i,t}) + \gamma X_{i,t} + \delta_i + \lambda_t + \varepsilon_{i,t}$$

where:

$FV_{i,t}$ = Firm value (Tobin's Q or MTB) for firm i at time t
$ESG_{i,t}$ = ESG disclosure score
$AGE_{i,t}$ = Corporate maturity (firm age or lifecycle dummy)
$ESG_{i,t} \times AGE_{i,t}$ = Interaction term for moderation analysis
$X_{i,t}$ = Control variables
δ_i = Industry fixed effects
λ_t = Year fixed effects
$\varepsilon_{i,t}$ = Error term

This model allows assessment of both direct and interaction effects, controlling for firm-level and time-specific unobservable.

3.6. Estimation Techniques

To ensure the robustness of the empirical analysis and to address potential endogeneity concerns, the study employed a comprehensive set of estimation techniques. First, both Fixed Effects (FE) and Random Effects (RE) panel regression models were utilized to analyze the data. These models help control for unobserved heterogeneity across firms by accounting for time-invariant characteristics, which could otherwise bias the results. To determine the more appropriate model between FE and RE, the Hausman test was conducted. This statistical test assesses whether the unique errors are correlated with the regressors, thereby guiding the selection of the most suitable model for consistent and efficient estimation. In order to directly address potential endogeneity, the study applied

the Two-Stage Least Squares (2SLS) method. This instrumental variable approach used lagged ESG disclosure scores as instruments, helping to mitigate the bias that may arise from reverse causality or omitted variable issues. Furthermore, to control for possible selection bias associated with firms' decisions to engage in ESG disclosure, the Propensity Score Matching (PSM) technique was employed. This method pairs firms with similar observable characteristics, thereby facilitating a more accurate comparison between ESG-adopting and non-adopting firms. Finally, a series of diagnostic tests was carried out to validate the reliability of the model specifications. These included tests for multicollinearity, heteroskedasticity, autocorrelation, and normality, ensuring that the underlying assumptions of the regression models were not violated and that the findings were statistically sound.

All models were estimated using robust standard errors clustered at the firm level. While the study employed two-stage least squares (2SLS) using lagged ESG scores as instruments, it acknowledges potential limitations related to serial correlation and weak instrument strength. Likewise, although propensity score matching (PSM) facilitated useful comparisons between matched groups, the dichotomization of ESG scores may have led to information loss. Therefore, the study recommends that future research consider applying panel smooth transition regression (PSTR) or system generalized method of moments (system GMM) to more effectively capture dynamic and non-linear effects across different levels of corporate maturity [32]. These models may offer more robust causal inference, particularly in addressing endogeneity concerns.

Although system GMM or PSTR models could more rigorously address potential endogeneity and nonlinear moderation effects, resource and data constraints limited their application in the current study. Future research is encouraged to utilize these advanced techniques for stronger causal inference.

4. Empirical Findings

Descriptive analysis provides initial insights into the characteristics of the sample. Table 1 presents the summary statistics of key variables across 1118 firm-year observations. The average ESG disclosure score is 46.47% (SD = 10.13), indicating moderate reporting levels among Bangladeshi non-financial firms. The average Market-to-Book (MTB) ratio is 1.87, and Tobin's Q is 1.84, suggesting that investors, on average, value these firms above their book value. The mean firm age is 28.28 years, with 52% of firms classified as being in the maturity stage, 8% in the growth stage, and 40% in decline.

Table 1. Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max
ESG Disclosure Score (%)	46.47	10.13	16.52	75.84
Market-to-Book Ratio (MTB)	1.87	0.45	0.54	3.37
Tobin's Q	1.84	0.38	0.48	3.09
Firm Age (Years)	28.28	9.91	5.00	51.00
Lifecycle Stage	Growth	Maturity	Decline	
Distribution (%)	8	52	40	

These figures reflect the sample's heterogeneity in terms of maturity and market positioning, which is crucial for analyzing moderation effects.

4.1. Correlation Analysis

Table 2 reports the Pearson correlation coefficients among the key variables. ESG disclosure is positively correlated with both Tobin's Q (r = 0.36, $p < 0.01$) and MTB (r = 0.46, $p < 0.01$), supporting the hypothesis that ESG disclosures are value-relevant.

Table 2. Correlation matrix.

Variable	ESG Disclosure	MTB	Tobin's Q	Firm Age
ESG Disclosure	1.00	0.46 **	0.36 **	−0.15 *
Firm Value (MTB)	0.46 **	1.00	0.10 **	−0.05
Tobin's Q	0.36 **	0.10 **	1.00	−0.03
Firm Age	−0.15 *	−0.15	−0.03	1.00

Notes: * $p < 0.05$, ** $p < 0.01$.

Interestingly, there is a mild negative correlation between ESG disclosure and ESG_Score (r = −0.15, $p < 0.05$), suggesting that younger firms tend to disclose more ESG information, possibly due to the signaling effect.

4.2. Panel Regression Results

To test the proposed hypotheses, four regression models were estimated using panel data techniques, as presented in Table 3. All models passed diagnostic tests for normality, multicollinearity, and heteroskedasticity.

Table 3. Panel regression results summary.

Model	Adj. R^2	ESG β	ESG × Age β
Model 1	0.005	—	—
Model 2	0.210	0.020 **	—
Model 3	0.209	0.024 **	−0.000
Model 4	0.207	0.024 **	−0.000

Note: ** $p < 0.01$.

Model 1 (Baseline) includes only control variables and explains minimal variation (Adj. $R^2 = 0.005$).

Model 2 introduces the ESG Score, showing a positive and significant effect on firm value (ESG $\beta = 0.020$), supporting H1. The regression analysis supports the hypotheses that ESG disclosures positively influence firm value and that corporate maturity moderates this relationship. In this model, the coefficient of ESG Score is positive and statistically significant ($\beta = 0.020$, $p < 0.01$), confirming that firms with higher ESG transparency are more highly valued by investors. This highlights the signaling and trust-enhancing role of ESG reporting.

Model 3 adds Firm Age and the interaction term (ESG × Age), with the interaction coefficient slightly negative (−0.000), suggesting that the ESG–value link weakens as firms age, aligning with H2. When corporate maturity (firm age) and its interaction with ESG disclosure are introduced in this model, the ESG coefficient remains positive and significant ($\beta = 0.024$, $p < 0.01$), while the interaction term is negative (though marginal), indicating a decline in the marginal value relevance of ESG disclosures as firms age. This provides empirical support for H2, suggesting that younger firms benefit more from ESG reporting in terms of investor valuation.

Model 4, which includes year fixed effects, retains similar coefficients, affirming the robustness of the relationships. This model, which includes year fixed effects, confirms the robustness of these findings, with coefficients largely unchanged. The inclusion of fixed effects controls for macroeconomic and regulatory influences over time, further strengthening the results. Overall, the evidence suggests that firm maturity plays a crucial moderating role in shaping how capital markets perceive ESG performance.

Figure 2 illustrates the marginal effect of ESG disclosure scores on predicted firm value (Tobin's Q) across firm maturity levels. The solid line represents younger firms, showing a

steeper slope, indicating a stronger value relevance of ESG disclosures. The dashed line represents mature firms, with a flatter slope, reflecting reduced marginal impact. This interaction supports Hypothesis 2, confirming that the signaling value of ESG disclosures diminishes with corporate maturity.

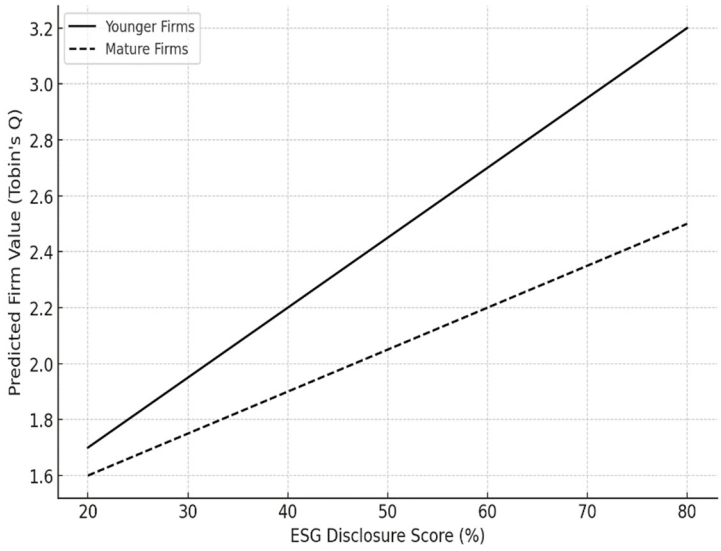


Figure 2. Interaction effect of ESG disclosure and corporate maturity on firm value.

To test H3, an industry-specific subsample analysis was conducted by categorizing firms into high and low sustainability exposure industries (e.g., manufacturing, textiles vs. services, IT). As shown in Table 4, the interaction between ESG disclosures and corporate maturity was significantly stronger in high-exposure sectors, suggesting that investor valuation is more responsive to ESG performance when environmental and social risks are more salient. These findings reinforce the idea that the ESG–value relationship is not uniform across industries but is moderated by sustainability risk exposure, thereby confirming the hypothesis.

Table 4. Subsample summary.

Model Group	ESG β (*p*-Value)	ESG × Age β (*p*-Value)	Adj. R^2
High Sustainability Exposure	0.026 ($p < 0.01$)	−0.003 ($p < 0.05$)	0.238
Low Sustainability Exposure	0.022 ($p < 0.05$)	−0.001 ($p > 0.10$)	0.205

To empirically validate H3, industry subsample regressions were performed by grouping firms into high and low sustainability exposure sectors. In the high-exposure group (e.g., manufacturing, textiles), the interaction term between ESG disclosure and firm age (ESG × Age) was statistically significant and negative ($\beta = -0.003$, $p < 0.05$), indicating a stronger diminishing effect of maturity on the ESG–value link. In contrast, in low-exposure industries (e.g., IT, services), the interaction term was statistically insignificant ($\beta = -0.001$, $p > 0.10$). The main effect of ESG disclosure remained positive and significant across both groups, but the moderation effect of corporate maturity was only evident in sectors with greater environmental and social impact.

These findings confirm the industry-contingent nature of ESG value relevance and provide empirical support for H3. Overall, the results reinforce that ESG disclosures are

generally value-enhancing, but the degree of impact is conditioned by both corporate maturity and industry sustainability exposure.

As detailed in Appendix B, the weighted ESG index's sector-adjusted scores emphasized environmental items in manufacturing sectors, aligning disclosure emphasis with material sustainability risks. These weightings are reflected in the sectoral subsample analysis results, which show a stronger ESG–value relationship in high-exposure industries. Furthermore, as shown in Table A2 of Appendix C, the robustness of the moderation effect of corporate maturity holds across alternative specifications (e.g., tercile splits, adjusted age cutoffs), affirming that the observed industry effects are not sensitive to how maturity is operationalized. These combined insights set the stage for additional robustness checks, discussed in the following section.

4.3. Robustness Checks

To ensure the reliability of results, a series of robustness checks was carried out. These tests examined whether the observed relationships hold under different model specifications, maturity classifications, and ESG scoring approaches, as well as under alternative assumptions about sample selection and causal direction.

1. Supplementary Regressions: Tercile-based age groups and alternate cutoffs yielded consistent results in terms of sign and significance, confirming that the moderation effect of corporate maturity is not driven by arbitrary dichotomization. Detailed outputs of these robustness tests are presented in Appendix C, which confirms the consistency of the moderation effect across specification models.
2. Alternative ESG Metrics: A weighted ESG disclosure index was applied; results remained consistent in both sign and significance.
3. Endogeneity Controls: Two-stage least squares 2SLS regression using lagged ESG scores as instruments confirmed the causal effect of ESG disclosures on firm value.
4. Propensity Score Matching (PSM): Firms with high ESG disclosure were matched with low-disclosure firms. The positive effect of ESG–value association persisted in the matched sample.
5. Subsample Analysis: Post-2020 observations (following BSEC's ESG guidance) revealed a stronger ESG–value relationship, underscoring the influence of evolving regulatory frameworks.

4.4. Discussion of Findings

The findings support the theoretical view that ESG disclosures serve dual functions—as signaling mechanisms and as legitimacy-building tools—especially for younger firms. By voluntarily disclosing non-financial information, these firms reduce investor uncertainty, enhance reputational capital, and improve perceived transparency, all of which contribute to stronger market valuations.

Conversely, mature firms—although better resourced and more consistent in ESG disclosure—may experience diminished marginal value relevance, possibly due to investor expectations of routine compliance. These firms may need to differentiate through the quality and integration of ESG initiatives rather than volume alone. As suggested by [41], robust ESG disclosures also contribute to reducing stock price crash risk, particularly in more developed markets, reinforcing their strategic relevance in capital risk management. Additionally, Răpan et al. [7] provide empirical support from Europe showing that firms with high ESG scores enjoy greater share price valuation, reinforcing the market's increasing responsiveness to non-financial performance disclosures.

A key insight from this study is the industry-dependent nature of ESG's value relevance. Subsample analysis indicates that the moderating effect of corporate maturity is

stronger in high-impact sectors such as manufacturing and textiles, industries in which environmental and social risks are more visible and material to stakeholders. In these contexts, investors appear to assign greater weight to ESG disclosures, especially from younger firms. This finding supports Hypothesis 3 and aligns with existing literature emphasizing that capital market responses to ESG transparency are shaped not just by firm-specific factors but also by the sustainability profile of the industry.

While Figure 2 visually illustrates the interaction, the slope difference—though statistically significant—is modest. Caution is advised when interpreting this as a strong economic effect. Rather, it signals a directional moderation that warrants further exploration using more flexible modeling techniques.

These results underscore that ESG disclosures are generally value-enhancing, but the degree of impact is conditioned by both corporate maturity and industry context, calling for more nuanced ESG strategies across different firm types.

Beyond firm valuation, the broader implications of ESG disclosures on environmental and social outcomes merit attention. Our exploratory analysis of CO_2 emissions and resource use reveals that ESG transparency does not always translate into lower environmental footprints. This reinforces concerns raised in the literature [42] that current ESG practices may emphasize disclosure volume over impact quality. Therefore, the study suggests that ESG strategies should not only aim to enhance investor confidence but also demonstrate verifiable progress in sustainability outcomes, consistent with the "net positive" business ethos [43].

These findings also hold significant implications for global ESG scoring systems and investment strategies. Most ESG rating frameworks, such as those developed by MSCI (Morgan Stanley Capital International), Sustainalytics (a Morningstar company specializing in ESG and corporate governance research), and FTSE4Good (an index series by FTSE Russell that tracks companies with strong ESG practices), adopt standardized disclosure benchmarks that typically do not account for differences in firm maturity or strategic context. This uniform approach may undervalue younger firms in emerging markets, where ESG disclosures function more as signaling mechanisms rather than mature compliance exercises. For global investors, recognizing the lifecycle-stage-specific relevance of ESG signals could improve portfolio screening and risk-adjusted returns. Additionally, ESG integration strategies should be tailored to firm development stages to avoid misinterpreting the intent and materiality of disclosures. These insights argue for a recalibration of ESG evaluation models—particularly in frontier markets like Bangladesh—to reflect the conditional and evolving nature of sustainability reporting.

5. Conclusion and Implications

5.1. Summary of Findings

This study examined how corporate maturity—measured using firm age and lifecycle stage—moderates the value relevance of ESG disclosures among non-financial publicly listed firms in Bangladesh. Using panel data spanning FY 2011–2012 to FY 2023–2024, and employing a modified Ohlson model, the findings affirm that ESG disclosures are, on average, positively associated with firm value.

However, the magnitude and nature of this relationship vary significantly based on corporate maturity. Younger firms demonstrate stronger positive valuation effects from ESG reporting, leveraging it as a strategic signaling tool. In contrast, for mature firms, ESG disclosures appear more compliance-driven, leading to weaker marginal impacts on market value. Additionally, the value relevance of ESG disclosures is amplified in industries with greater environmental and social exposure, such as manufacturing and textiles.

5.2. Theoretical Contributions

This research contributes to the ESG and corporate finance literature in several meaningful ways:

1. It introduces corporate maturity as a novel moderating variable in the ESG–firm value relationship, offering a lifecycle-based lens to assess disclosure outcomes.
2. By integrating signaling, legitimacy, and lifecycle theories, the study presents a context-sensitive framework for interpreting ESG dynamics in emerging markets. While these theories are not new, their combined application to the ESG–value relationship in the context of corporate maturity represents a novel analytical contribution. By integrating lifecycle awareness into ESG analysis, this framing captures both the multidimensional nature of ESG determinants and the shifting expectations placed on firms at different stages of development.
3. It fills a regional research gap by providing context-specific evidence from Bangladesh, an under-researched developing economy experiencing rapid ESG evolution.

Additionally, this study contributes to the ongoing debate on the design of ESG scoring systems by highlighting the limitations of one-size-fits-all disclosure metrics. Current ESG ratings often treat firms uniformly, regardless of their age, lifecycle stage, or institutional environment. The findings demonstrate that younger firms use ESG disclosures more strategically for signaling purposes, while mature firms report for compliance and legitimacy, leading to differing valuation outcomes. Given these findings, ESG rating agencies and data providers are encouraged to incorporate lifecycle-adjusted weighting schemes into their scoring methodologies. Such adjustments would improve the accuracy of risk assessments, allow fairer cross-firm comparisons, and reduce the likelihood of undervaluing younger firms that use ESG disclosures strategically for signaling rather than compliance.

This study also engages with emerging paradigms of regenerative and net-positive capitalism, as articulated by [43,44]. These frameworks emphasize that the role of business must extend beyond shareholder value to encompass positive contributions to ecological regeneration, stakeholder equity, and long-term planetary resilience. By highlighting the mismatch between ESG disclosure and actual environmental performance, the study contributes to ongoing debates around the social construction and effectiveness of ESG metrics [21].

5.3. Practical Implications

Implications corporate managers. The findings highlight the strategic relevance of tailoring ESG reporting based on firm maturity. Younger firms should prioritize ESG as a tool for legitimacy and differentiation, enhancing investor appeal and reducing perceived risk. In contrast, mature firms must focus on the quality, depth, and integration of ESG initiatives to maintain relevance and stakeholder engagement.

In particular, mature firms should ensure that their ESG disclosures reflect measurable impacts beyond mere compliance or reputation signaling. The adoption of regenerative practices, which aim to restore and enhance natural and social capital, can help reposition sustainability as a transformative strategic priority rather than a reporting obligation.

Implications for investors. The study underscores that ESG signals are not homogenous—they are more informative in younger firms and potentially already priced in for older ones. A firm-specific and lifecycle-sensitive approach to ESG analysis is recommended to better assess financial significance and strategic intent.

Implications for regulators and policymakers. This study offers several practical recommendations for regulators and policymakers aiming to strengthen ESG disclosure frameworks in emerging markets. First, differentiated reporting standards should be developed that reflect firm-specific attributes such as size, age, and industry exposure, ensuring that re-

quirements are both relevant and attainable. Second, targeted capacity-building initiatives are needed to help younger or resource-constrained firms improve ESG reporting practices. Third, a combination of incentives (e.g., tax benefits or listing advantages) and enforcement mechanisms should be introduced to enhance the credibility of disclosures. Finally, regulators should encourage the inclusion of measurable sustainability indicators, such as carbon intensity and waste-to-revenue ratios, to complement narrative reporting. While complete standardization may be challenging, a gradual shift toward performance-based ESG metrics will enhance both transparency and comparability.

5.4. Limitations and Directions for Future Research

Despite its contributions, this study acknowledges several limitations:

1. ESG disclosure scores were based on publicly available documents, which may not fully capture informal or internal sustainability efforts.
2. Although this study employed 2SLS and Propensity Score Matching to address endogeneity concerns, both techniques entail methodological limitations. Specifically, the use of lagged ESG scores as instruments in 2SLS may introduce serial correlation, reducing instrument validity. Similarly, PSM's binary grouping of ESG scores can result in a loss of data richness and weaken explanatory accuracy. Future research should apply advanced estimation techniques, such as system GMM or panel smooth transition regression, to better capture dynamic relationships and non-linear moderation effects in ESG–value studies.
3. The study is limited to Bangladesh, which may affect generalizability. Comparative studies across other developing economies would provide broader insights.
4. While this study included standard financial controls, it did not account for governance-specific variables such as board size or independence, which could influence ESG disclosure quality and firm valuation. Future studies should consider including such variables to capture board-level strategic influences.

Future research could benefit from exploring several important dimensions of ESG disclosure practices. One potential avenue is to investigate the quality and depth of ESG disclosures in contrast to mere disclosure quantity, as richer and more meaningful reporting may have a stronger influence on stakeholder perceptions and firm value. Another important area is the examination of how board characteristics and ownership structures may moderate the relationship between ESG disclosures and firm value, offering insights into the governance mechanisms that enhance or weaken the effectiveness of sustainability reporting. Additionally, future studies could analyze the dynamics of ESG disclosure under mandatory versus voluntary regulatory regimes in developing countries, shedding light on how different institutional contexts influence the motivation, consistency, and impact of ESG reporting practices.

5.5. Concluding Remarks

Overall, this study offers preliminary but important evidence that the value of ESG disclosures varies by firm characteristics and industry context. In the case of Bangladesh, corporate maturity plays a decisive role in how ESG efforts are interpreted and valued by the market. Although the study's explanatory power is modest and subject to some limitations, the results point to the necessity of more targeted ESG strategies, lifecycle-aware disclosure frameworks, and regulatory models that reflect market realities in emerging economies. These findings should be viewed as a foundation for further empirical investigation using larger datasets and more sophisticated modeling approaches. As ESG continues to evolve into a cornerstone of corporate governance, embracing differentiated

and context-sensitive frameworks will be essential for aligning sustainable practices with long-term value creation.

5.6. Recommendations

While exploratory in nature, the study's findings suggest several tentative recommendations for key stakeholder groups, with the understanding that broader validation is needed in other emerging markets.

Recommendations for companies. Recommendations for companies should be tailored according to their stage of corporate maturity, although the overarching goal remains consistent: to improve transparency, investor confidence, and sustainability outcomes. Younger firms are advised to treat ESG disclosure as a strategic investment, leveraging it to build legitimacy, differentiate themselves in the market, and attract capital. Clear, forward-looking ESG narratives that highlight commitment to sustainable practices can enhance credibility and investor interest. Mature firms, on the other hand, should shift their focus toward improving the depth and quality of disclosures. This includes integrating ESG into corporate strategy, using verifiable performance metrics, and pursuing third-party assurance to strengthen stakeholder trust. Regardless of firm age, aligning ESG practices with international frameworks such as GRI, TCFD, and SASB remains essential to ensure consistency, comparability, and global recognition.

Recommendations for regulators and policymakers. Regulators and policymakers play a critical role in shaping effective ESG disclosure environments, and several targeted actions can enhance both the quality and adoption of such practices. First, the introduction of tiered ESG reporting guidelines based on firm age, size, and industry exposure would help tailor requirements to organizational capacity and relevance, thereby reducing undue compliance burdens while promoting meaningful disclosures. Second, the development of training and awareness programs is essential—particularly for mid-sized and younger firms that often lack experience or resources in ESG reporting—so they can build internal capabilities and align with emerging standards. Third, establishing incentive structures such as tax breaks, reduced listing fees, or recognition awards could motivate companies to voluntarily engage in high-quality ESG disclosures beyond minimum requirements. Finally, to maintain the integrity and usefulness of ESG information, regulators should enhance monitoring and enforcement mechanisms to ensure consistency, accuracy, and accountability in reported data, thereby strengthening stakeholder trust and market credibility.

Recommendations for investors. Investors are advised to take a more granular approach when analyzing ESG disclosures by factoring in the maturity and lifecycle stage of the firm. Recognizing where a company is in its development trajectory can offer valuable insights into whether ESG initiatives reflect genuine strategic intent or routine compliance. Younger firms, in particular, may offer high ESG signaling value but are often subject to mispricing due to limited disclosure histories or investor skepticism. A careful assessment of these disclosures can uncover undervalued investment opportunities while also clarifying risk exposure. In addition, investors should adopt multi-dimensional evaluation frameworks that account for industry-specific ESG risks, the quality—not just quantity—of disclosures, and the firm's sustainability trajectory. Such approaches can lead to more resilient, forward-looking investment decisions that align with both financial performance and responsible investing goals.

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Appendix A. ESG Disclosure Index (Used in the Study)

The ESG Disclosure Index was developed by adapting disclosure indicators from internationally recognized frameworks, including GRI, SASB, TCFD, and the UN SDGs, and benchmarking them against practices of top disclosing firms in Bangladesh. As detailed in Section 3.3, the index underwent a pilot test and expert validation process involving both academic and industry specialists to ensure content validity and contextual relevance.

The final version of the index includes 33 disclosure items categorized under three dimensions: Environmental, Social, and Governance.

Environmental Disclosures

Environmental Policy and Strategy

1. Clear policy statements on environmental protection and sustainability.
2. Alignment of environmental strategy with national and international standards.

Climate Change and Energy Use

3. Carbon emissions (Scope 1, 2, and 3).
4. Measures for energy efficiency and renewable energy use.
5. Impact of climate change on business operations.

Waste and Water Management

6. Waste reduction, recycling, and disposal strategies.
7. Water usage and conservation initiatives.

Biodiversity and Land Use

8. Efforts to preserve biodiversity in operational areas.
9. Sustainable land use and reforestation programs.

Environmental Compliance

10. Compliance with environmental regulations.
11. Information on penalties, fines, or litigations related to environmental breaches.

Social disclosures

Human Rights and Labor Practices

12. Policies on human rights and labor rights adherence.
13. Measures to prevent forced and child labor in operations and supply chain.

Diversity, Equity, and Inclusion (DEI)

14. Workforce diversity metrics (gender, age, ethnicity).
15. Inclusion programs for underrepresented groups.

Employee Health, Safety, and Well-being

16. Occupational health and safety initiatives.
17. Mental health and wellness programs for employees.

Community Engagement and Development

18. Corporate contributions to community development (education, healthcare).
19. Partnerships with local communities.

Customer Relations and Product Responsibility

20. Product quality, safety, and innovation disclosures.
21. Customer satisfaction and feedback mechanisms.

Governance Disclosures

Board Structure and Independence

22. Composition of the board, including independent directors.
23. Diversity in board composition.

Executive and Board Compensation

24. Remuneration policies for board members and executives.
25. Disclosure of compensation structures and bonuses.

Shareholder Rights and Transparency

26. Voting rights and shareholder engagement practices.
27. Mechanisms for transparency in shareholder communication.

Audit Committee and Risk Management

28. Role of audit committee in overseeing ESG matters.
29. Disclosure of risk management strategies related to ESG.

Ethical Conduct and Anti-corruption

30. Corporate code of conduct.
31. Anti-bribery and anti-corruption policies and practices.

Data Privacy and Cybersecurity

32. Measures taken to ensure data protection and privacy.
33. Cybersecurity initiatives and response plans.

Appendix B. Weighted ESG Disclosure Index

Overview

To address concerns regarding the oversimplification of ESG disclosure quality in a binary-unweighted index, a weighted ESG Disclosure Index was developed as part of robustness checks. This weighted index adjusts for the relative importance of ESG components across sectors, aligning disclosure evaluation with stakeholder relevance and sector-specific materiality.

The weighting framework draws upon prior ESG valuation studies [6,31] and guidance from global standards such as GRI, SASB, and TCFD. It incorporates both expert judgment and stakeholder priorities specific to the Bangladeshi market context.

Weighting Methodology

Each of the 33 ESG indicators was assigned a weight based on the following criteria:

1. Materiality by sector (e.g., environmental issues in manufacturing vs. governance in services)
2. Stakeholder relevance (e.g., importance to investors, regulators, consumers)
3. Disclosure frequency and impact in the pilot assessment (based on 10 firms)
4. Alignment with international ESG reporting frameworks (GRI, SASB, TCFD)

Weights were normalized within each ESG dimension so that the total possible weighted ESG score equals 100.

Table A1. ESG category weight allocation (baseline).

ESG Category	Number of Indicators	Category Weight (%)	Notes
Environmental	10	35%	Emphasis on emissions, energy, water in high-impact sectors
Social	12	30%	Focus on DEI, labor, community engagement
Governance	11	35%	Includes board structure, risk management, ethics

Example Weighted Score Calculation

For a manufacturing firm:

1. Discloses 8 of 10 Environmental indicators (Environmental weight = 40%)
2. Discloses 6 of 12 Social indicators (Social weight = 25%)
3. Discloses 9 of 11 Governance indicators (Governance weight = 35%)

$$\text{Weighted ESG Score} = \left(\tfrac{8}{100} \times 40\right) + \left(\tfrac{6}{12} \times 25\right) + \left(\tfrac{9}{11} \times 35\right)$$
$$\approx 32 + 12.5 + 28.6 = 73.1 \text{ out of } 100$$

Validation and Robustness

The weighted index was validated through:

1. Feedback from two academic ESG experts and one practitioner
2. Comparison with unweighted results
3. Sensitivity analyses using alternate weight configurations

Results remained consistent in direction and significance across models, affirming the robustness of the ESG–value relationship under both scoring systems.

Appendix C. Robustness Tests Using Alternative Corporate Maturity Specifications

To confirm that the moderation effect of corporate maturity is not driven by arbitrary dichotomization (e.g., median splits), supplementary regressions were conducted using tercile-based groupings, alternate cutoffs, and a continuous interaction approach. The findings, summarized below, demonstrate consistent coefficient direction and statistical significance, thereby affirming the robustness of the core results.

Table A2. Robustness of moderation effect using alternative age groupings.

Model Specification	ESG Coefficient (β)	ESG × Maturity Coefficient (β)	Adj. R^2	Notes
Model 1 (Median Split, Baseline)	0.024 **	−0.000	0.209	Maturity defined as firm age ≥ 28
Model 2 (Tercile Split: Young vs. Old)	0.025 **	−0.002 *	0.211	Lowest third = "Young"; highest third = "Old"; middle excluded
Model 3 (Cutoff at 25 years)	0.023 **	−0.001 *	0.208	Based on industry lifecycle norms
Model 4 (Age as Continuous Interaction)	0.022 **	−0.0001 *	0.210	ESG × Age (continuous) used instead of dummy

Notes: Dependent variable: Tobin's Q. All models include control variables and fixed effects. Robust standard errors clustered at the firm level. Significance Level: * $p < 0.05$, ** $p < 0.01$.

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