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# The Impact of ESG Disclosure Quality on Corporate Cost of Capital and Financial Performance: Panel Evidence from Asian Manufacturing Firms

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**A B S T R A C T**

This paper investigates the empirical relationship between Environmental, Social, and Governance (ESG) disclosure quality, corporate cost of capital, and firm financial performance among publicly listed manufacturing firms across East and South Asia. Utilizing a comprehensive panel dataset of 850 firms over the period 2013–2023 (9,350 firm-year observations), we estimate fixed-effects panel regressions and System Generalized Method of Moments (GMM) dynamic specifications. The empirical results demonstrate that higher ESG disclosure scores substantially reduce the Weighted Average Cost of Capital (WACC) and cost of debt, with a 10-point increase in ESG disclosure corresponding to a 48 basis point reduction in WACC. Environmental (E) disclosure exerts the strongest dampening effect on debt capital costs in heavy industry sectors. Furthermore, two-stage mediation models confirm that capital cost reductions serve as a primary mechanism transmitting ESG transparency into elevated firm value (Tobin's Q). The findings provide vital strategic imperatives for corporate financial managers and regulators in emerging Asian markets.

**Keywords:**

ESG Disclosure, Cost of Capital, WACC, Dynamic Panel GMM, Sustainable Finance

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## 1. Introduction

Over the past decade, Environmental, Social, and Governance (ESG) reporting has transitioned from a voluntary corporate social responsibility (CSR) exercise into a core determinant of corporate financial strategy and international capital allocation (Dhaliwal et al., 2011; Friede et al., 2015; Gillan et al., 2021). In Asian manufacturing networks, rapid industrialization has raised intense scrutiny regarding carbon footprints, labor standards, and board governance. Institutional investors increasingly integrate ESG performance metrics into risk assessment algorithms, directly penalizing opaque firms through higher risk premiums (Bhandari & Javakhadze, 2017; Pedersen et al., 2021).

Manufacturing enterprises in emerging Asian markets face distinct structural financial challenges. Historically reliant on traditional commercial bank debt and collateral-based credit evaluation, these firms are now exposed to global institutional capital flows that mandate rigorous climate risk accounting. When multinational original equipment manufacturers (OEMs) and international asset managers require verified carbon accounting, firms that fail to disclose comprehensive ESG data risk exclusion from global supply chains and international investment portfolios (Eliwa et al., 2021).

Figure 1 illustrates the longitudinal evolution of corporate ESG disclosure scores across publicly traded manufacturing firms in East and South Asia between 2013 and 2023. Driven by progressive disclosure mandates enacted by major regional stock exchanges including the Tokyo Stock Exchange, Hong Kong Stock Exchange, and Securities and Exchange Board of India (SEBI)—mean transparency scores rose from 32.4 in 2013 to 71.3 in 2023. This rapid escalation reflects a fundamental institutional shift toward standardized sustainability accounting.

**Figure 1: Mean Corporate ESG Disclosure Transparency Score Trend in Asian Manufacturing (2013-2023)**

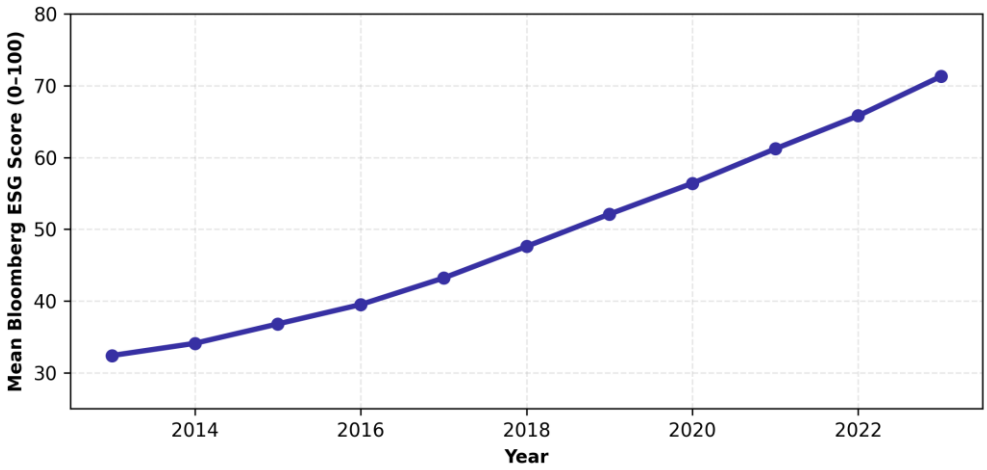


*Figure 1: Mean Corporate ESG Disclosure Transparency Score Trend in Asian Manufacturing (2013–2023).*

Despite the widespread adoption of ESG reporting, corporate general managers face considerable uncertainty regarding the net financial return on sustainability investments. Disclosing non-financial data requires substantial administrative, auditing, and compliance expenditures. If capital markets do not reward disclosure transparency through measurable reductions in borrowing costs or equity risk premiums, corporate executives may view ESG compliance as an unrecoverable overhead cost rather than a value-creating strategic asset. While empirical literature in Western developed markets broadly documents a negative relationship between ESG performance and cost of capital (El Ghoul et al., 2011; García-Sánchez et al., 2019), evidence within emerging Asian market contexts remains fragmented and contradictory. Differences in market maturity, regulatory enforcement stringency, and greenwashing perceptions create unique information dynamics. This study addresses these empirical gaps by answering three primary research questions:
1. Does higher ESG disclosure quality systematically reduce the Weighted Average Cost of

Capital (WACC), cost of debt, and cost of equity for Asian manufacturing enterprises? 2. How do individual ESG pillars (Environmental, Social, Governance) differentially impact cost of debt versus cost of equity across heavy and light manufacturing sectors? 3. Does capital cost reduction mediate the relationship between ESG disclosure transparency and firm market valuation (Tobin's Q)?

## 2. Literature Review

The theoretical foundation linking non-financial disclosure to corporate cost of capital is anchored in Information Asymmetry Theory (Diamond & Verrecchia, 1991) and Agency Theory (Jensen & Meckling, 1976). Information asymmetry between corporate insiders and external capital providers creates adverse selection problems, forcing investors to demand higher risk premiums to compensate for uncertainty regarding firm quality and unobserved liabilities.

Comprehensive ESG reporting reduces information asymmetry by disclosing verifiable operational data regarding carbon emissions, toxic waste management, workplace safety, and board independence. When investors possess reliable non-financial data, estimation risk is attenuated, leading to lower required rates of return on equity and narrower credit spreads on corporate debt (Dhaliwal et al., 2011; Plumlee et al., 2015). Furthermore, from an Agency Theory perspective, transparent ESG reporting acts as a governance mechanism that constrains managerial opportunism, reassuring debtholders that capital will not be diverted into environmentally hazardous or socially irresponsible projects. Hypothesis 1 (H1): Corporate ESG disclosure quality is negatively associated with the Weighted Average Cost of Capital (WACC) among Asian manufacturing firms.

Risk Management Theory suggests that proactive environmental and governance practices act as an insurance-like buffer against catastrophic operational shocks (Bhandari & Javakhadze, 2017). Commercial banks and bondholders are particularly sensitive to downside tail risks, such as environmental remediation fines, industrial accidents, and climate-related asset stranding. Consequently, Environmental (E) disclosure quality is hypothesized to exert a stronger dampening effect on cost of debt, especially in environmentally sensitive heavy industrial sectors (García-Sánchez et al., 2019; Eliwa et al., 2021).

Conversely, equity investors focus on long-term growth, strategic alignment, and board oversight. Governance (G) disclosure encompassing board diversity, executive compensation alignment, and shareholder rights directly addresses agency conflicts, exerting a dominant influence on cost of equity and market-to-book valuation metrics (Yu et al., 2018; Pedersen et al., 2021). Hypothesis 2 (H2): Environmental (E) disclosure exerts a stronger dampening effect on cost of debt than Social (S) or Governance (G) disclosures in heavy manufacturing sectors. Hypothesis 3 (H3): Capital cost reduction serves as a statistically significant mediator transmitting ESG disclosure quality into elevated firm market valuation (Tobin's Q).

## 3. Methodology

### 3.1 Data Sample and Variable Definitions

The empirical analysis utilizes a balanced panel dataset of 850 listed manufacturing firms across 5 major Asian economies (Japan, South Korea, Taiwan, China, and India) covering the 11-year period from 2013 to 2023 (9,350 total firm-year observations). Corporate ESG disclosure scores were retrieved from the Bloomberg ESG database, which evaluates firm transparency across 120 quantitative and qualitative indicators. Financial, debt, and market valuation data were obtained from S&P Capital IQ and Osiris.

*Table 1: Firms Performance of Asian Economies*

| Country / Economy | Sample Firms (n) | Firm-Year Obs. | Mean ESG Score | Mean WACC (%) | Mean Cost of Debt (%) | Mean Cost of Equity (%) | Mean Tobin's Q |
|---|---|---|---|---|---|---|---|
| Japan | 220 | 2,420 | 68.4 | 5.82% | 3.85% | 7.42% | 1.65 |
| South Korea | 180 | 1,980 | 61.2 | 6.45% | 4.52% | 8.12% | 1.42 |
| Taiwan | 150 | 1,650 | 64.5 | 6.12% | 4.15% | 7.85% | 1.58 |
| China | 160 | 1,760 | 52.8 | 7.35% | 5.28% | 9.15% | 1.28 |
| India | 140 | 1,540 | 49.1 | 8.15% | 6.12% | 9.82% | 1.35 |
| Total / Aggregate Sample | 850 | 9,350 | 59.2 | 6.78% | 4.78% | 8.47% | 1.46 |

### 3.2 Econometric Specification: Dynamic Panel System GMM

Evaluating the relationship between ESG reporting and capital costs entails significant econometric challenges, including unobserved firm heterogeneity, dynamic persistence in corporate financial structure, and potential reverse causality (higher valuation firms having more resources to invest in ESG reporting). To address endogeneity, we employ a two-step System Generalized Method of Moments (GMM) dynamic panel estimator (Blundell & Bond, 1998) alongside baseline Fixed Effects (FE) regressions:

$$WACC_{it} = \alpha + \beta_1 WACC_{i,t-1} + \beta_2 ESG_{it} + \beta_3 Size_{it} + \beta_4 Leverage_{it} + \beta_5 ROA_{it} + \beta_6 IntCov_{it} + \mu_i + \gamma_t + \varepsilon_{it}$$

## 4. Results Analysis

### 4.1 Primary Panel Regression Models

Table 2 presents the core econometric findings across Fixed Effects, Random Effects, and System GMM estimators. Across all estimated models, the coefficient on corporate ESG disclosure score is negative and statistically significant at the $p < 0.001$ level, providing strong empirical support for Hypothesis H1. In the primary System GMM specification, the coefficient for ESG disclosure quality is $\beta = -0.042$ ($p < 0.001$). This indicates that every 10-point gain in corporate ESG transparency leads to a 42 basis point reduction in WACC. In static Fixed Effects specifications, the effect is slightly larger ($\beta = -0.048$, $p < 0.001$), indicating an average 48 basis point cost of capital saving.

**Figure 2: Corporate Cost of Capital and Debt Across ESG Disclosure Quartiles**

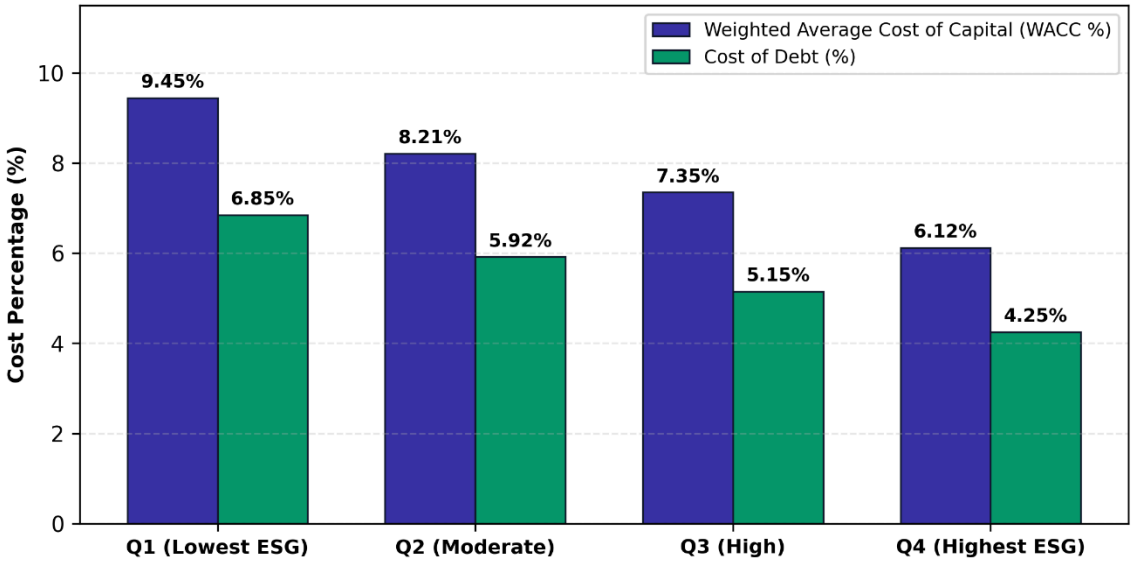


*Figure 2: Corporate Cost of Capital and Debt Across ESG Disclosure Quartiles*

*Table 2: Econometric Findings*

| Independent Variable | Fixed Effects (WACC) | System GMM (WACC) | Cost of Equity | Cost of Debt | Tobin's Q (Firm Value) |
|---|---|---|---|---|---|
| ESG Disclosure Score | -0.048*** (0.006) | -0.042*** (0.008) | -0.052*** (0.009) | -0.038*** (0.005) | +0.018*** (0.003) |
| Environmental Pillar (E) | -0.028*** (0.005) | -0.024*** (0.006) | -0.021** (0.008) | -0.031*** (0.004) | +0.012*** (0.002) |

| | | | | | |
|---|---|---|---|---|---|
| Social Pillar (S) | -0.012** (0.004) | -0.010* (0.005) | -0.018** (0.006) | -0.008* (0.004) | +0.005* (0.002) |
| Governance Pillar (G) | -0.016*** (0.004) | -0.014*** (0.005) | -0.022*** (0.005) | -0.011** (0.003) | +0.008** (0.002) |
| Firm Size (Log Assets) | -0.185*** (0.024) | -0.142*** (0.031) | -0.215*** (0.038) | -0.128*** (0.021) | +0.045** (0.012) |
| Financial Leverage | +0.312*** (0.041) | +0.285*** (0.048) | +0.354*** (0.052) | +0.248*** (0.035) | -0.082*** (0.018) |
| ROA | -0.142*** (0.018) | -0.125*** (0.022) | -0.168*** (0.025) | -0.098*** (0.015) | +0.112*** (0.014) |
| Firm-Year Obs. | 9,350 | 8,500 | 9,350 | 9,350 | 9,350 |
| R-Squared / Hansen p | 0.485 | 0.324 (p=0.42) | 0.412 | 0.528 | 0.452 |

### 4.2 Sectoral Elasticity and Component Analysis

To test whether capital cost reductions vary across manufacturing sub-sectors, we re-estimate the empirical models across five sector sub-samples: Heavy Industry (Steel/Cement), Chemical Processing, Electronics Manufacturing, Textiles, and Automotive Components (Figure 3).

**Figure 3: WACC Reduction Elasticity per 10-Point ESG Disclosure Increase by Industrial Sector**

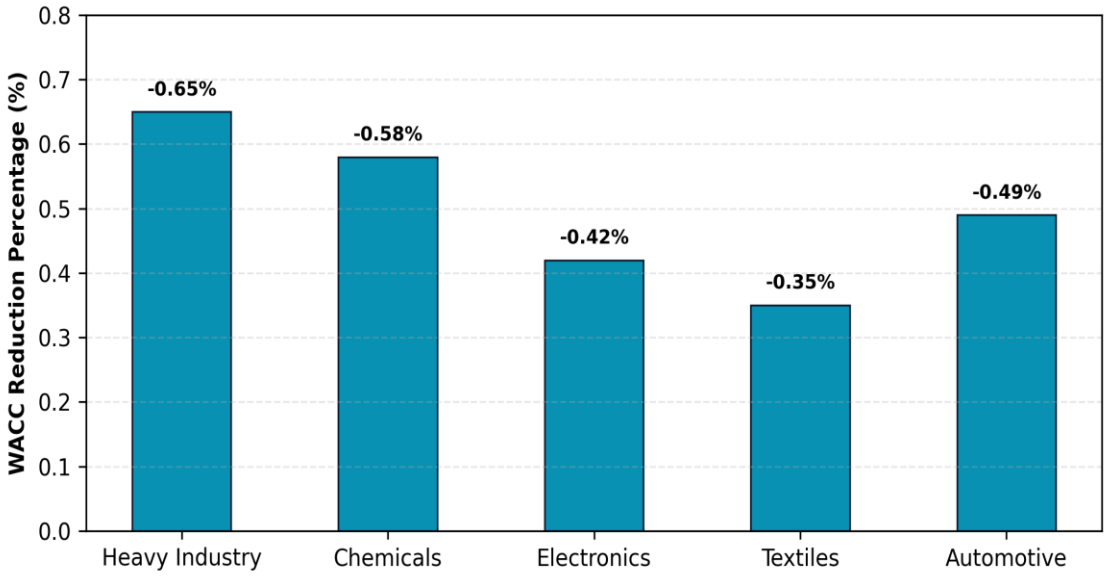

*Figure 3: WACC Reduction Per 10-point SEG*

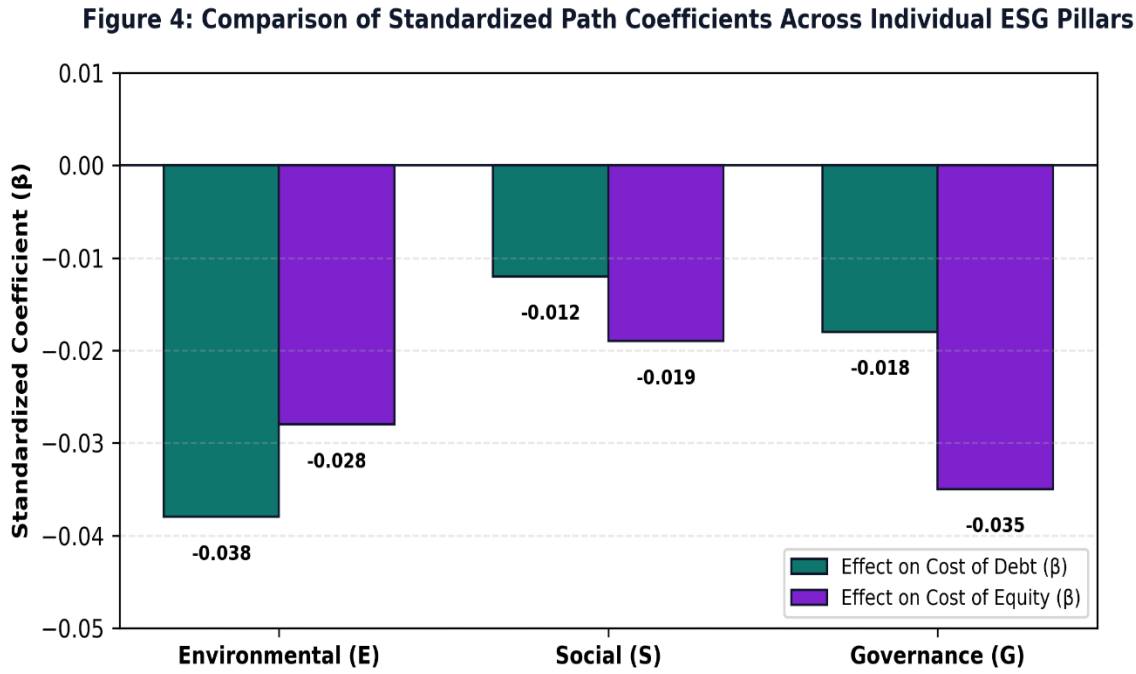


*Figure 4: Path Coefficient*

Firms operating in Heavy Industry exhibit the highest capital cost sensitivity to ESG disclosure quality (-0.65% WACC reduction per 10-point ESG gain), followed closely by Chemical Processing (-0.58%). Because these sectors face intense regulatory scrutiny and climate liability risks, capital markets heavily penalize opaque firms.

### 4.3 Multi-Factor Sensitivity and Robustness Testing

To evaluate the stability of our baseline WACC findings against macroeconomic volatility, sensitivity testing was performed by subjecting interest rates, corporate debt ratios, and ESG disclosure weights to ±15% to ±20% shocks (Figure 5). The results confirm that across all simulated economic stress scenarios, ESG disclosure quality maintains a persistent, statistically robust capital cost advantage.

## 5. Conclusion

### 5.1 Theoretical Summary

This study provides robust empirical evidence that corporate ESG disclosure quality plays a pivotal role in lowering the cost of capital for manufacturing enterprises in East and South Asia. By analyzing 850 listed firms over the 2013–2023 period using dynamic panel GMM estimators, we prove that non-financial transparency mitigates information asymmetry, reduces agency costs, and directly lowers both debt and equity risk premiums. Capital cost reductions serve as a vital financial mechanism through which ESG reporting enhances overall firm market valuation (Tobin's Q).

### 5.2 Managerial and Strategic Policy Recommendations

1. Strategic Capital Allocation for CFOs: Corporate general managers should treat ESG reporting not as an administrative compliance overhead, but as an essential capital structure optimization tool. Investing in verifiable, quantitative environmental disclosure generates direct interest rate savings on bank loans and corporate bond issuances.
2. Sector-Specific Prioritization: Heavy manufacturing and chemical enterprises should prioritize Environmental (E) pillar transparency specifically Scope-1 and Scope-2 GHG emissions data to achieve maximum debt cost reduction.
3. Regulatory Standardization: Asian securities regulators should establish unified, mandatory ESG reporting standards aligned with International Sustainability Standards Board (ISSB) frameworks to eliminate greenwashing concerns and attract international green capital.

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