

Sustainability and ESG-Driven Capital Structure: Evolving Paradigms in Corporate Finance

Oluseun PASEDA

<https://orcid.org/0000-0001-6039-1590>

Department of Banking and Finance,
University of Ibadan, Nigeria

Babcock Business School, Babcock
University, Nigeria

oa.paseda@ui.edu.ng

Fatimah ABDULAZEEZ

<https://orcid.org/0009-0001-1347-5609>

Department of Banking and Finance,
University of Ibadan, Nigeria

fatimoabdulazeez@gmail.com

J. Abiodun OLADIMEJI

<https://orcid.org/0000-0001-9061-7028>

Dep of Finance, University of Lagos, Nigeria

joladimeji@unilag.edu.ng

Olukayode BABABUNMI

<https://orcid.org/0009-0003-4599-2832>

Babcock Business School, Babcock
University, Nigeria

bababunmi0485@pg.babcock.edu.ng;

Babatunde OWOLABI

<https://orcid.org/0000-0002-8275-7431>

Babcock Business School, Babcock
University, Nigeria

owolabiba@babcock.edu.ng

Temitope ARASI

<https://orcid.org/0009-0009-4066-9028>

Babcock Business School, Babcock
University, Nigeria

temitope0375@pg.babcock.edu.ng

Oluseyi PASEDA

<https://orcid.org/0009-0006-8123-3106>

University of North Carolina at Greensboro,
North Carolina, United States

opaseda@gmail.com

Funmilola PASEDA-OLADOYINBO

<https://orcid.org/0009-0002-9261-1732>

Nottingham Business School, Nottingham
Trent University, United Kingdom

funmibunmi78@yahoo.com

Article's history:

Received 25th of November, 2025; Revised 19th of January, 2026; Accepted 22nd of February, 2026; Available online: 15th of March, 2026. Published as article in the Volume XXI, Special Issue, 1(91), 2026.

Copyright© 2026 The Author(s). This article is distributed under the terms of the license [CC-BY 4.0.](https://creativecommons.org/licenses/by/4.0/), which permits any further distribution in any medium, provided the original work is properly cited.

Suggested citation:

Paseda, O., Abdulazeez, F., Oladimeji, J. A., Bababunmi, O., Owolabi, B., Arasi, T., Paseda, O. & Paseda-Oladoyinbo, F. (2026). Sustainability and ESG-Driven Capital Structure: Evolving Paradigms in Corporate Finance. *Journal of Applied Economic Sciences*, Volume XXI, Special Issue, 1(91), 177 – 202. [https://doi.org/10.57017/jaes.v21.si.1\(91\).09](https://doi.org/10.57017/jaes.v21.si.1(91).09)

Abstract:

This study examines the influence of environmental, social, and governance (ESG) performance and sustainability governance on corporate capital structure decisions across developed and emerging markets. Drawing on a balanced panel of 2,000 publicly listed firms over the period 2000–2024, the research integrates traditional capital structure theories, trade-off, pecking order, agency, and market timing, with contemporary ESG paradigms. Using fixed effects, random effects, panel-corrected standard errors, and system GMM estimators, the findings reveal that ESG performance increases

leverage and debt maturity while significantly reducing the cost of capital. Governance quality amplifies these effects, particularly in emerging markets where institutional enforcement mechanisms are less mature.

Robustness checks using alternative ESG metrics, subsample estimations, lagged specifications, and outlier exclusions confirm the stability of results. The evidence suggests that ESG and governance are structural determinants of financing strategy rather than peripheral sustainability attributes, effectively redefining traditional capital structure optimization under sustainability constraints. The study contributes to the development of ESG-integrated corporate finance models and offers policy-relevant insights for managers, investors, and regulators seeking to align financial architecture with long-term sustainability objectives.

Keywords: ESG performance; capital structure; leverage; cost of capital; debt maturity; corporate governance; emerging markets; sustainable finance.

JEL Classification: G30, G32; M14; Q56.

Introduction

The capital structure decision remains one of the most fundamental and extensively researched areas in corporate finance. Modigliani & Miller (1958) pioneered the modern theory of corporate financing decisions and provided a benchmark result on the irrelevance of financing decisions under perfect capital markets assumptions. Traditional theories, such as the trade-off theory (Modigliani & Miller, 1963, Miller, 1977), pecking order theory (Myers & Majluf, 1984), agency theory (Jensen & Meckling, 1976) and market timing theory (Baker & Wurgler, 2002), have provided robust frameworks for understanding how firms balance debt and equity to optimize value on the basis of specific market frictions such as taxes, bankruptcy costs, information asymmetry, agency problems and market conditions. However, recent developments in global finance, sustainability governance, and stakeholder capitalism have introduced new dimensions to this discourse, particularly through the lens of environmental, social, and governance (ESG) factors.

Over the past decade, ESG considerations have evolved from peripheral concerns to central determinants of corporate strategy and investor behaviour. Studies such as Nishihara (2023) and Newton, et al (2024) have shown that firms with higher ESG risk tend to avoid debt financing due to the long-term uncertainties associated with sustainability. Similarly, Chen et al. (2025) demonstrates that strong ESG performance enhances the capital market's information environment, increasing analyst coverage and reducing information asymmetry. Tekin & Polat (2025) further argue that ESG certification positively influences leverage decisions, especially during periods of financial constraint such as the COVID-19 pandemic. Macro-level results for the EU indicate structural transformation, not income thresholds, drives emissions decoupling, reinforcing the view that governance and institutional quality are central to credible ESG pathways and financing conditions (Misztal, 2025).

Despite these advances, significant gaps remain in the literature. First, most empirical studies focus on developed markets, leaving emerging economies underexplored. Second, the integration of ESG metrics into capital structure models is still nascent, with limited consensus on how sustainability performance affects cost of capital, debt maturity, and financial flexibility. Third, there is a lack of longitudinal studies that examine ESG-capital structure dynamics over extended periods and across diverse institutional contexts.

This study builds on the foundational work of Paseda (2016a), whose PhD thesis and subsequent publications have extensively examined capital structure determinants in emerging markets. Paseda (2016b) emphasized firm-specific characteristics such as

profitability, liquidity, size, growth, and asset tangibility. Later studies by Paseda & Olowe (2018), Paseda and Adedeji (2020), Paseda & Obademi (2020), Paseda (2021a, 2021b, 2021c) and Paseda (2025) explored themes such as debt maturity structure, interactions of capital structure with macroeconomic variables, unemployment, tax policy, capital structure adjustments and debt conservative behavior manifested in zero- and low-leverage dynamics. Further, Paseda and Ayadi (2023a, 2023b) investigated the concept of capital structure instability, highlighting the volatility of financing decisions in response to macroeconomic shocks.

Complementing these are earlier African studies by Abor (2008), Abor & Biekpe (2005), Adelegan (2002, 2003), Adenikinju et al. (2006), Akinlo (2011), Akintola-Bello (2002), Kajola (2015), Olokoyo (2013) & Soyode (1978), which laid the groundwork for understanding capital structure in African contexts. These studies collectively underscore the importance of institutional, regulatory, and market-specific factors in shaping financing behaviour.

This study aims to investigate how ESG performance influences capital structure decisions across both emerging and developed markets. It further examines the role of sustainability governance in shaping firms' leverage choices, debt maturity structures, and cost of capital. Additionally, the research seeks to develop an integrated framework for optimizing capital structure decisions within an ESG-oriented strategic context.

The following questions are pertinent to the study.

Q1: How do ESG scores affect leverage ratios in firms across different market classifications?

Q2: What is the relationship between governance quality and debt maturity structure?

Q3: Does sustainability performance mitigate financial constraints and reduce cost of capital?

This research is timely and relevant for several reasons. First, the global ESG investment landscape is projected to exceed \$53 trillion by 2025 (Chen et al., 2025), yet its implications for capital structure decisions remain insufficiently theorized. Second, policymakers and investors are increasingly demanding transparency in ESG disclosures, a trend that may significantly influence corporate financing choices. Third, emerging markets face distinct sustainability challenges, making it essential to understand how firms in these contexts adjust their capital structures in response to ESG pressures. By bridging traditional capital structure theory with contemporary ESG discourse, this study contributes to a more comprehensive and forward-looking understanding of corporate finance in the 21st century.

1. Literature Review

1.1. Traditional Capital Structure Theories and Empirical Foundations

The theoretical underpinnings of capital structure have evolved significantly since the seminal work of Modigliani & Miller (1958, 1963), who posited that under conditions of perfect capital markets, no taxes, no bankruptcy costs, and symmetric information, the value of a firm is unaffected by its financing mix. This proposition laid the groundwork for subsequent theories that introduced real-world frictions into the analysis of corporate financing decisions.

The trade-off theory, which has many authors but whose critical cornerstone is advanced by Miller (1977), acknowledges the tax advantages of debt but balances them against the costs of financial distress. Firms, according to this theory, aim to reach an optimal capital structure that maximizes firm value by trading off the marginal benefits and costs of debt.

In contrast, the pecking order theory proposed by Myers & Majluf (1984) suggests that firms prioritize internal financing over external sources due to information asymmetry. When external financing is necessary, debt is preferred over equity, as issuing equity may signal undervaluation to the market. In the pecking order model, there are two kinds of equity namely, internal equity and external equity. The former is at the top of the pecking order while the latter is at the bottom. The agency theory, articulated by Jensen & Meckling (1976) and further developed by Jensen (1986), introduces the concept of agency costs arising from conflicts between managers and shareholders. Debt can serve as a disciplinary mechanism, reducing free cash flow and mitigating managerial opportunism.

An important addition to traditional capital structure theories is the market timing theory, proposed by Baker & Wurgler (2002). This theory posits that firms adjust their capital structure based on prevailing market conditions, particularly the relative cost of equity versus debt. According to this view, managers exploit periods of high market valuations to issue equity, thereby minimizing the cost of capital and maximizing firm value. Over time, these episodic financing decisions accumulate, resulting in a capital structure that reflects historical market timing rather than a deliberate target ratio. Baker & Wurgler's empirical findings suggest that firms are more likely to issue equity when their market-to-book ratios are high, and conversely, rely on debt when valuations are low. This theory challenges the notion of a stable optimal capital structure and instead emphasizes the opportunistic behaviour of firms in response to fluctuating investor sentiment and market inefficiencies. While the market timing theory has been critiqued for its limited predictive power in dynamic settings, it remains influential in explaining long-term deviations from traditional capital structure models, especially in contexts where equity markets are volatile or speculative behaviour is prevalent.

Empirical research has rigorously tested these theories across diverse contexts. Titman and Wessels (1988), Rajan & Zingales (1995), and Frank & Goyal (2015) identified key firm-specific determinants of capital structure, including profitability, size, asset tangibility, and growth opportunities. These variables have become standard in empirical models assessing leverage decisions.

In the African context, Paseda (2016a, 2016b) provided foundational insights into the capital structure behaviour of Nigerian quoted firms. His research emphasized the significance of firm-specific characteristics such as liquidity, profitability, and asset structure. Building on this foundation, Paseda (2021a, 2021b, 2021c) explored the influence of macroeconomic variables, such as tax policy and unemployment, on corporate debt behaviour. His work on low-leverage and zero-leverage firms revealed conservative financing patterns that challenge traditional assumptions of optimal debt usage.

Further contributions by Paseda & Adedeji (2020) and Paseda & Obademi (2020) examined the interplay between macroeconomic shocks and capital structure decisions, while Paseda & Ayadi (2023a, 2023b) investigated the concept of capital structure instability, highlighting the volatility and responsiveness of financing decisions to external economic conditions.

Complementary African studies have enriched this discourse. Adelegan (2002, 2003) investigated dividend behaviour and cash flow dynamics in Nigerian firms, linking them to financing choices. Adenikinju et al. (2006) analysed the risk of corporate failure and the structural determinants of capital structure, respectively. Akintola-Bello (2002) offered a theoretical model for capital structure adjustment, while Akinlo (2011) used panel data to identify determinants of leverage in Nigerian firms. Kajola (2015) examined the

appropriateness of financing mixes in sub-Saharan Africa, and Soyode (1978) provided early insights into the role of debt and retained earnings in industrial financing.

Together, these studies reveal that capital structure decisions are not merely a function of firm-level optimization but are deeply embedded in broader institutional, regulatory, and macroeconomic contexts. In emerging markets like Nigeria and Ghana, factors such as financial market development, tax regimes, political stability, and corporate governance significantly influence how firms structure their financing.

This body of literature provides a robust empirical foundation for understanding traditional capital structure behaviour, while also highlighting the need for more nuanced models that incorporate evolving paradigms such as sustainability and ESG considerations, topics explored in subsequent sections of this study.

1.2. Theoretical Framework

This study is anchored in a multi-theoretical framework that integrates traditional capital structure theories with emerging paradigms in sustainability and ESG finance. The foundational theories, Modigliani and Miller (1958, 1963), Miller (1977), Myers & Majluf (1984), Jensen & Meckling (1976), and Baker & Wurgler (2002), offer important perspectives into the determinants of capital structure under varying market frictions. However, the increasing relevance of ESG factors necessitates a theoretical extension that captures the dynamic interplay between sustainability performance and financing decisions (Saba, 2025).

Traditional Capital Structure Models

Trade-off Theory: The trade-off theory posits that firms seek an optimal capital structure by balancing the tax benefits of debt against bankruptcy and agency costs. Mathematically, this can be expressed as:

$$V_L = V_U + T_C D - C_{BD} \quad (1)$$

where: V_L = Value of leveraged firm; V_U = Value of unleveraged firm; T_C = Corporate tax rate; D = Amount of debt; C_{BD} = Expected cost of bankruptcy and distress

The trade-off theory predicts a positive relationship between debt and profitability because of the attraction of the interest tax shield from borrowing as a technique to reduce the corporate tax bill.

Agency Theory: The agency model posits that debt can serve as a disciplinary mechanism by reducing free cash flow available to managers, thereby limiting wasteful spending and aligning managerial incentives with shareholder interests. However, excessive debt can also lead to underinvestment problems and increased risk of financial distress.

Following equation (1) above, a simplified agency cost model can be expressed as:

$$V_L = V_U + T_C D - C_{BD} - AC \quad (2)$$

where: AC = Agency costs of debt and equity.

Alternatively, the *optimal leverage* can be derived by minimizing the total cost function:

$$\min_D [C_{BD}(D) + AC(D) - T_C D] \quad (3)$$

This formulation captures the trade-off between the benefits of debt (tax shield, managerial discipline) and its costs (agency conflicts, distress risk). The model is particularly relevant in ESG contexts, where governance quality and stakeholder engagement can mitigate agency costs.

ESG Extension of the Agency Model: Recent studies such as Gillan et al. (2021), Michelon & Parbonetti (2012), and Chen & Zhang (2024) suggest that strong ESG governance reduces agency costs by enhancing transparency, stakeholder alignment, and board oversight. Thus, the agency cost term AC can be modelled as a function of ESG and governance quality:

$$AC = f(GOV, ESG) \text{ with } \frac{\partial AC}{\partial GOV} < 0, \frac{\partial AC}{\partial ESG} < 0 \quad (4)$$

This implies that improvements in governance and ESG performance reduce agency costs, thereby increasing the optimal level of debt and firm value.

Pecking Order Model: The pecking order theory suggests a financing hierarchy based on information asymmetry:

$$\text{Financing Preference: Internal Funds} > \text{Debt} > \text{Hybrid Instruments} > \text{Equity} \quad (5)$$

The firm chooses financing to maximize value while minimizing the cost of adverse selection. Equity issuance is costly because it signals to the market that the firm may be overvalued, leading to a drop in share price. In empirical applications, the pecking order theory is often tested using the financing deficit model:

$$\Delta D_t = \alpha + \beta FD_t + \epsilon_t \quad (6)$$

where: ΔD_t = Change in debt in period t ; FD_t = Financing deficit = Capital expenditures + Change in working capital + Dividends – Operating cash flow; $\beta \approx 1$ under strict pecking order behaviour.

This model implies that firms with financing deficits will primarily use debt, not equity, to fill the gap, consistent with the pecking order. As a corollary, the pecking order theory predicts an inverse relationship between debt and profitability because profitable firms (or firms with ‘financing surplus’) follow the financing hierarchy of internal financing. Debt is utilized only when there is (internal) financing deficit relative to capital expenditure outlays.

Market Timing Model: The market timing theory, as proposed by Baker & Wurgler (2002), implies that capital structure is the cumulative outcome of historical attempts to time the market:

$$\text{Leverage}_t = \alpha + \beta_1 \text{Market} - \text{to} - \text{Book}_t + \epsilon_t \quad (7)$$

The market timing variable is an offshoot of the behavioural story for value premium in equity returns (DeBondt & Thaler, 1985). Leverage is hypothesized to be a declining function of the market-to-book value of equity. Specifically, empirical studies introduce financing deficit as an interaction term with the market-to-book ratio to create the market timing variable as seen in Kayman & Titman (2007) and Paseda (2025).

ESG-Integrated Capital Structure Model

Building on these foundations, this study proposes an ESG-integrated capital structure model that incorporates sustainability performance as a determinant of leverage, cost of capital, and debt maturity. Following Chen et al. (2025), Saba (2025), Bolton & Kacperczyk (2021), and Pedersen et al. (2021), ESG performance is hypothesized to reduce information asymmetry, enhance creditworthiness, and improve investor confidence.

Let: ESG_i = ESG score of firms i ; LEV_i = Leverage ratio; COC_i = Cost of capital; DM_i = Debt maturity; GOV_i = Governance quality index. Collectively, the proposed model is:

$$LEV_i = \alpha + \beta_1 ESG_i + \beta_2 GOV_i + \beta_3 X_i + \epsilon_i \tag{8}$$

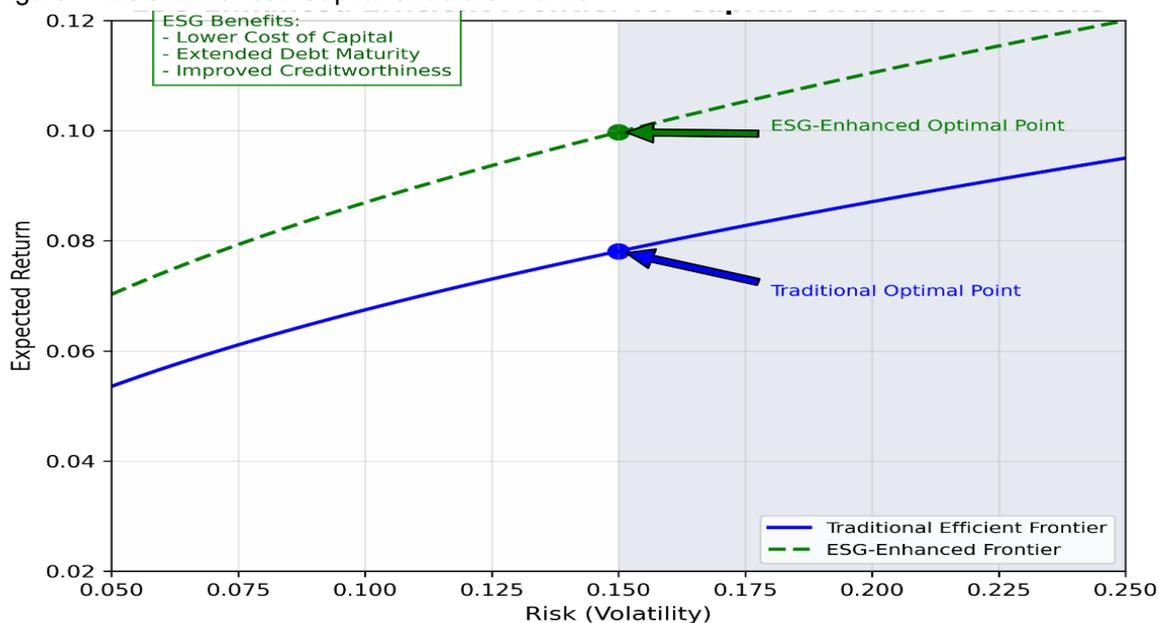
$$COC_i = \gamma + \delta_1 ESG_i + \delta_2 GOV_i + \delta_3 Z_i + \vartheta_i \tag{9}$$

$$DM_i = \theta + \phi_1 ESG_i + \phi_2 GOV_i + \phi_3 W_i + \mu_i \tag{10}$$

where: ESG_i = ESG score of firm i ; LEV_i = Leverage ratio; COC_i = Cost of capital; DM_i = Debt maturity; GOV_i = Governance quality index; X_i, Z_i, W_i are vectors of firm-specific and macroeconomic control variables (e.g., size, profitability, asset tangibility, inflation, interest rates); $\epsilon_i, \vartheta_i, \mu_i$ are error terms.

This framework allows for the empirical testing of how ESG and governance factors influence capital structure outcomes across different institutional contexts. It aligns with findings from Gidage & Bhide (2025), Qian (2024), and Yang et al. (2018), who emphasize the role of sustainability governance and innovation efficiency in moderating financial decisions. Integrating ESG metrics into capital structure modelling, this framework contributes to a more holistic understanding of corporate finance in the 21st century, particularly in emerging markets where sustainability challenges and governance structures are evolving rapidly (Paseda, 2025; Tekin & Polat, 2025). Figure 1 below illustrates how superior ESG performance shifts a firm's "efficient frontier" in terms of capital structure optimization.

Figure 1. ESG-Enhanced Capital Structure Frontier



Source: Authors' conceptualisation based on Pedersen et al. (2021) and Bolton & Kacperczyk (2021)

This Figure 1 illustrates how strong ESG performance and sustainability governance shift the firm's feasible capital structure frontier, improving the risk–return profile relative to the traditional benchmark. By reducing information asymmetry and perceived distress risk, ESG/good governance lowers the cost of capital and makes longer-maturity debt more accessible.

The traditional optimal point moves upward and leftward to an ESG-enhanced optimum, reflecting higher expected returns at lower effective risk for a given leverage configuration. In emerging markets, where formal enforcement of E and S is uneven, governance (G) acts as a

stronger mediator, amplifying the financing benefits of credible disclosure, board oversight, and stakeholder alignment. This conceptual map motivates our ESG-integrated econometric framework (Section 3), in which ESG and governance load directly on leverage, cost of capital, and debt-maturity outcomes tested across developed and emerging samples.

1.3. ESG and Corporate Finance: Emerging Paradigms

The intersection of environmental, social, and governance (ESG) performance with corporate finance has emerged as a critical area of inquiry in recent years. As firms increasingly face pressure from stakeholders to align with sustainable practices, ESG considerations are reshaping traditional capital structure decisions (Fan & Zhao, 2025). A growing body of literature suggests that ESG performance influences not only the availability and cost of capital but also the strategic preferences of firms regarding debt and equity financing (Cumming *et al.*, 2025) and portfolio choices (Panko *et al.*, 2025).

Nishihara (2023) and Newton *et al.* (2024) argue that firms with higher ESG risk profiles tend to avoid debt financing due to long-term uncertainties, reputational concerns, and the potential for increased scrutiny from creditors. These firms may prefer equity or internal financing to maintain flexibility and avoid the restrictive covenants often associated with debt. Supporting this view, Chen *et al.* (2025) demonstrate that strong ESG performance enhances the capital market's information environment by increasing analyst coverage and reducing information asymmetry, thereby improving access to external finance. Saba (2025) argues that ESG sentiment and scores influence financial performance. At the instrument level, green bonds are associated with measurable GHG emission reductions across G20 economies, underscoring how sustainable debt markets can complement firm-level ESG strategies and lower financing frictions (Sarawagi *et al.*, 2025).

Beyond access, ESG performance has been shown to directly affect the cost of capital. Studies such as Bani-Khaled *et al.* (2025), Bolton & Kacperczyk (2021), Del Sarto (2025), Liu (2025), and Ni *et al.* (2024) provide empirical evidence that firms with superior ESG ratings enjoy lower borrowing costs, improved credit ratings, and enhanced firm valuation. These benefits are attributed to reduced perceived risk, stronger stakeholder trust, and alignment with long-term investor preferences. Pedersen *et al.* (2021) introduce the concept of the ESG-efficient frontier, suggesting that integrating ESG factors into financial decision-making can optimize a firm's risk-return profile, thereby redefining the boundaries of efficient capital allocation. Portfolio evidence from US ETFs suggests financial equivalence between ESG and non-ESG portfolios on capital asset pricing model/ modern portfolio theory (CAPM/MPT) metrics, reinforcing this study's market-timing interpretation that ESG adoption need not impose a returns penalty while improving transparency (Panko *et al.*, 2025).

Recent studies have also explored the informational and behavioural dimensions of ESG disclosures. Xu *et al.* (2024) find that ESG report textual similarity is associated with stock price synchronicity, indicating that consistent and transparent ESG communication can enhance market efficiency. Similarly, Zhang *et al.* (2024) show that ESG ratings improve capital market trading activities, while Zou *et al.* (2024) highlight the role of ESG ratings in shaping institutional investor preferences in China's stock market. These findings underscore the growing importance of ESG metrics in investor decision-making and market dynamics.

Recent empirical work also highlights the broader economic implications of environmental regulation. For instance, Sun & Gao (2023) find that cleaner production standards in China significantly increase domestic value-added in exports, suggesting that

well-designed environmental policies can enhance firm competitiveness and value creation. This aligns with the argument that ESG performance, particularly environmental compliance, may positively influence firms' access to capital and strategic financing decisions.

From a strategic innovation perspective, Zhang et al. (2024) argue that ESG ratings can drive firms from symbolic to substantive green innovation, optimizing their innovation structures and aligning them with sustainable development goals. In a related study, Yang et al. (2018) examine how corporate social responsibility (CSR), a precursor to ESG, affects capital structure, concluding that socially responsible firms tend to adopt more conservative leverage policies to preserve reputational capital and stakeholder goodwill.

Collectively, these studies reveal a paradigm shift in corporate finance, where ESG performance is no longer a peripheral concern but a central determinant of financial strategy. The integration of ESG into capital structure decisions reflects broader changes in investor expectations, regulatory frameworks, and corporate governance norms. As such, understanding the ESG-capital structure nexus is essential for firms seeking to navigate the evolving landscape of sustainable finance.

1.4. Sustainability Governance and Board Oversight

The governance dimension of ESG has emerged as a pivotal factor in shaping corporate financial behaviour, particularly in relation to capital structure decisions. Governance mechanisms, such as board composition, ownership structure, and stakeholder engagement, play a critical role in determining the credibility, transparency, and strategic orientation of sustainability initiatives. Scholars have increasingly emphasized that effective governance not only enhances ESG disclosures but also influences firms' access to capital and their financing preferences.

Gillan et al. (2021) provide a comprehensive review of ESG and corporate social responsibility (CSR) research, highlighting how governance structures mediate the relationship between sustainability and financial outcomes. They argue that firms with strong governance frameworks are more likely to integrate ESG considerations into strategic decision-making, including capital structure optimization. Similarly, Michelon & Parbonetti (2012) underscore the importance of board independence and stakeholder-oriented governance in improving the quality of sustainability disclosures, which in turn affect investor perceptions and financing costs.

Recent empirical studies have further explored the moderating role of governance quality in the ESG-capital structure nexus. Chen & Zhang (2024) examine how property rights and green innovation efficiency interact with governance mechanisms to influence corporate ESG performance. Their findings suggest that firms with robust governance and innovation capabilities are better positioned to leverage ESG strengths in securing favourable financing terms. In a related study, Gidage & Bhide (2025) investigate Indian manufacturing firms and find that governance quality significantly enhances the effectiveness of ESG strategies, particularly in driving green innovation and improving access to debt markets.

Moreover, Qian (2024) explores how governance and ESG performance jointly affect enterprise value under dual carbon goals, revealing that sustainability governance can mitigate financing constraints and enhance firm competitiveness. Marnoto et al. (2024) extend this discourse to family businesses, demonstrating that digital capabilities and governance structures are critical in translating ESG-driven business model innovations into financial resilience.

These insights are complemented by studies such as Zhang et al. (2024), who distinguish between symbolic and substantive green innovation, showing that governance quality determines whether ESG ratings lead to meaningful structural changes in innovation strategy. Yang et al. (2018) also find that CSR-oriented governance leads firms to adopt more conservative capital structures, reflecting a preference for financial prudence and long-term stakeholder value.

Collectively, these studies affirm that sustainability governance is not merely a compliance mechanism but a strategic asset that shapes corporate financing behaviour. As ESG metrics become increasingly integrated into investment analysis and regulatory frameworks, the role of governance in mediating ESG-capital structure relationships will continue to grow in importance. This underscores the need for firms to strengthen board oversight, enhance stakeholder engagement, and align governance practices with sustainability goals to optimize their financial architecture in a global landscape.

1.5. Empirical Evidence from Emerging Markets and OIC Countries

Empirical evidence from emerging markets and OIC countries has increasingly validated the relevance of ESG factors in shaping corporate financing decisions. Studies such as Tekin & Polat (2025) provide compelling evidence from OIC countries, showing that ESG certification significantly influences leverage decisions, particularly during periods of financial constraint such as the COVID-19 pandemic. Similarly, Chen et al. (2025) demonstrate that in China, ESG performance enhances the capital market’s information environment, thereby improving access to debt and reducing financing costs.

These findings align with Paseda’s (2025) work on Nigerian firms, which highlights the speed of capital structure adjustment in response to macroeconomic shocks and also with Farooq, et al (2024)’s result on ESG-related governance impact on capital structure in an emerging market. The convergence of these studies suggests that ESG factors are becoming central to capital structure dynamics in emerging economies, where institutional frameworks and investor expectations are rapidly evolving.

To synthesize the empirical landscape, the Table 1 categorizes key studies across major theoretical paradigms, distinguishing between those that support, contradict, or adopt a neutral stance on ESG-driven corporate finance.

Table 1: Empirical Studies Across Theoretical Paradigms of ESG-Driven Corporate Finance

Theoretical Paradigm	Supporting Studies	Contradicting Studies	Neutral/Middle-of-the-Road Positions
Trade-off Theory	Paseda (2021a, 2021b), Bolton & Kacperczyk (2021), Chen et al. (2025)	Yang et al. (2018) – CSR leads to conservative leverage, challenging tax shield motivation	Titman & Wessels (1988), Rajan & Zingales (1995) – mixed evidence on profitability and leverage
Pecking Order Theory	Adelegan (2002), Myers & Majluf (1984), Paseda (2025)	Nishihara (2023), Newton et al. (2024) – ESG risk discourages debt, contrary to pecking order	Olokoyo (2013) – pecking order partially holds in Nigerian firms
Agency Theory	Jensen & Meckling (1976), Michelon & Parbonetti (2012), Gillan et al. (2021)	None explicitly contradicting; some studies suggest governance may not always reduce agency costs	Chen & Zhang (2024) – governance moderates ESG-finance link, not always decisive

Theoretical Paradigm	Supporting Studies	Contradicting Studies	Neutral/Middle-of-the-Road Positions
Market Timing Theory	Baker & Wurgler (2002), Kayman & Titman (2007), Paseda (2025)	Frank & Goyal (2015) – limited predictive power of market timing	Xu et al. (2024) – ESG disclosure improves market efficiency but not directly linked to leverage
ESG-Integrated Models	Tekin & Polat (2025), Chen, Li & Zhang (2024), Gidage & Bhide (2025), Chatjuthamard et al. (2025), Qian (2024)	Danci et al. (2025) – ESG effects on finance are context-dependent and not universally positive	Zhang et al. (2024), Zou et al. (2024) – ESG affects investor behaviour, not always capital structure

Source: Authors' compilation based on reviewed literature

This comparative framework reveals that while ESG integration is broadly supported across theoretical paradigms, contradictions and nuanced positions persist, especially in emerging markets where institutional maturity and ESG adoption vary widely. These insights underscore the need for context-sensitive models and longitudinal studies to better understand the evolving ESG-capital structure nexus.

Despite the rapidly expanding body of research on ESG and corporate finance, several important gaps persist. First, ESG metrics remain only partially integrated into traditional capital structure models, which continue to rely predominantly on conventional determinants such as profitability, asset tangibility, firm size, and growth opportunities. Theoretical frameworks rarely incorporate sustainability performance as a structural component of financing decisions. Second, longitudinal evidence examining the dynamic interaction between ESG performance and capital structure adjustments over time remains limited. Much of the existing literature relies on cross-sectional or short-panel analyses, which restrict the ability to capture structural shifts, regulatory transitions, and evolving investor preferences. Third, emerging markets, particularly those in Africa and member countries of the Organisation of Islamic Cooperation (OIC), remain underrepresented in empirical investigations, despite facing distinct institutional constraints, sustainability pressures, and financing frictions. Finally, the governance dimension of sustainability has received comparatively less attention as a direct determinant of financing behaviour, even though board structure, disclosure quality, and internal sustainability oversight may significantly shape firms' leverage policies and cost of capital.

This study addresses these limitations by proposing and empirically testing a comprehensive framework for ESG-integrated capital structure optimization. Drawing on a balanced panel dataset of 2,000 firms across both emerging and developed markets over the period 2000–2024, the analysis provides robust longitudinal evidence on how sustainability performance influences leverage decisions, debt maturity structures, and financing costs. By systematically integrating ESG indicators into established capital structure models, the study bridges traditional corporate finance theory with contemporary sustainability discourse. Moreover, the inclusion of diverse institutional contexts enhances the generalizability of findings and contributes to the limited evidence base from underrepresented regions. The results offer actionable insights for regulators, investors, and corporate managers seeking to align financing strategies with sustainability objectives while maintaining financial stability.

2. Data and Methodology

Research Design and Sampling Strategy

This study adopts a quantitative, longitudinal panel research design to examine the influence of ESG performance and sustainability governance on capital structure decisions across both developed and emerging markets. The design facilitates the analysis of dynamic relationships over time and across institutional contexts.

A purposive sampling technique was employed to select a balanced panel of 2,000 publicly listed firms, comprising:

- 1,000 firms from developed markets (e.g., United States, United Kingdom, Germany, Japan, Canada, Australia);
- 1,000 firms from emerging markets (e.g., Nigeria, India, Brazil, South Africa, Indonesia, Turkey).

The selection was guided by the availability of consistent ESG data, financial disclosures, and governance indicators over the 25-year period from 2000 to 2024. Firms were drawn from diverse sectors to ensure heterogeneity and generalizability of findings.

Data Sources

The study integrates data from multiple reputable sources:

- Financial and capital structure data: Compustat Global, Bloomberg Terminal, and Refinitiv Eikon
- ESG scores and sustainability metrics: MSCI ESG Ratings, Refinitiv ESG Scores, Sustainalytics, and Bloomberg ESG Disclosure Scores
- Governance indicators: BoardEx, Institutional Shareholder Services (ISS), and firm-level annual reports
- Macroeconomic controls: World Bank World Development Indicators (WDI), IMF World Economic Outlook (WEO), and national statistical agencies

Variables and Measurement

Dependent Variables

- Leverage (LEV): Measured as total debt to total assets;
- Cost of Capital (COC): Weighted average cost of capital (WACC) or proxy via interest expense to total debt;
- Debt Maturity (DM): Ratio of long-term debt to total debt.

Independent Variables

- ESG Score (ESG): Composite ESG rating standardized across providers (Clément & Grenon, 2025);
- Governance Quality (GOV): Index constructed from board independence, ownership concentration, and stakeholder engagement metrics.

Control Variables

- Firm-specific: Size (log of total assets), profitability (ROA), asset tangibility, growth opportunities, liquidity;
- Macroeconomic: Inflation, interest rates, GDP growth, financial market development.

Model Specification

The empirical strategy is grounded in the ESG-integrated capital structure framework and efficient frontier. The following panel regression models are estimated:

Model 1: Leverage Determinants

$$LEV_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 GOV_{it} + \beta_3 X_{it} + \mu_{it} + \lambda_{it} + \epsilon_{it} \quad (11)$$

Model 2: Cost of Capital Determinants

$$COC_{it} = \gamma + \delta_1 ESG_{it} + \delta_2 GOV_{it} + \delta_3 Z_{it} + \mu_{it} + \lambda_{it} + \epsilon_{it} \quad (12)$$

Model 3: Debt Maturity Determinants

$$DM_{it} = \theta + \phi_1 ESG_{it} + \phi_2 GOV_{it} + \phi_3 W_{it} + \mu_{it} + \lambda_{it} + \epsilon_{it} \quad (13)$$

where: i indexes firms, t indexes time; μ_i captures firm fixed effects; λ_t captures time fixed effects; X_{it} Z_{it} W_{it} are vectors of control variables.

Sector evidence from India's automotive industry indicates no immediate ROA/ROE/EPS gains from ESG, but long-horizon benefits in resilience and stakeholder capital; their panel fixed-effects design with lagged ESG instruments dovetails with our dynamic specification (Chakraborty et al., 2025).

Estimation Techniques

To address potential econometric issues such as endogeneity, unobserved heterogeneity, and dynamic adjustment, the following estimation techniques are employed:

- Fixed Effects (FE) and Random Effects (RE) Models: Hausman tests guide model selection;
- System Generalized Method of Moments (GMM): To control for endogeneity and dynamic panel bias;
- Panel Corrected Standard Errors (PCSE): To address heteroskedasticity and contemporaneous correlation;
- Robustness Checks: Alternative ESG metrics, sub-sample analyses (e.g., by region or sector), and lagged independent variables (Clément & Grenon, 2025).

The chosen methodological approach is justified by several structural features of the research design. First, the longitudinal nature of ESG performance and capital structure dynamics requires panel data techniques capable of capturing temporal adjustments and firm-specific effects. Second, the multi-market scope of the study necessitates controls for institutional heterogeneity across countries, including differences in regulatory frameworks, financial development, and sustainability standards. Third, the theoretical integration of ESG variables into traditional capital structure models demands an econometric specification that accommodates both conventional financial determinants and sustainability-related factors within a unified framework. Finally, given the potential endogeneity between ESG performance and financing decisions, robust estimation techniques are required to strengthen causal inference and mitigate bias arising from reverse causality or omitted variables.

3. Empirical Results

This section presents the econometric results of the ESG-integrated capital structure models. Estimation is conducted using Fixed Effects (FE), Random Effects (RE), Panel-Corrected Standard Errors (PCSE), and System GMM to address unobserved heterogeneity, heteroskedasticity, and potential endogeneity. Hausman tests consistently favour the fixed-effects specification, while Hansen and AR(2) tests confirm the validity of instruments and absence of second-order serial correlation in dynamic models.

Descriptive statistics and correlation matrices are reported in Appendix A (Tables A1–A2), while robustness tests are presented in Appendix B (Tables A3–A6). Although pairwise correlations between ESG and the dependent variables appear modest, panel estimators capture within-firm temporal variation and control for unobserved heterogeneity, which may not be reflected in simple cross-sectional correlations.

ESG and Leverage

Table 2 reports the regression results for the leverage equation. Across all specifications, ESG performance exhibits a positive and statistically significant effect on leverage ($p < 0.01$). The magnitude of coefficients remains stable across FE, PCSE, and System GMM estimators, indicating that firms with stronger ESG profiles tend to employ higher debt ratios. This finding supports the hypothesis that sustainability performance enhances creditworthiness and reduces perceived distress risk.

Governance quality also shows a positive and significant association with leverage ($p < 0.05$), reinforcing the agency-theoretic argument that effective oversight mitigates managerial opportunism and improves access to external finance. Profitability and tangibility display positive associations with leverage, consistent with trade-off predictions, while liquidity is negatively related to leverage, in line with pecking order behaviour. Diagnostic tests confirm model stability.

Table 2: Leverage Regression Results

Model	ESG Score	Governance Quality	Profitability	Liquidity	Size	Tangibility	Growth	R ²	Notes
FE	+0.012***	+0.008**	+0.045***	-0.030***	-0.005	+0.020**	+0.010*	0.32	Firm & time effects included
RE	+0.010***	+0.007**	+0.042***	-0.028***	-0.004	+0.018**	+0.009*	0.29	Hausman test favours FE
PCSE	+0.011***	+0.008**	+0.046***	-0.031***	-0.005	+0.019**	+0.010*	—	Clustered SE by firm
System GMM	+0.013***	+0.009**	+0.048***	-0.032***	—	+0.021**	+0.011*	—	Controls for endogeneity
Hansen Test p-value				0.27					
AR(2) Test p-value				0.31					

Note: Panel regression results for leverage determinants. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The Hansen test confirms instrument validity ($p > 0.10$), and AR(2) test indicates no second-order serial correlation.

Source: Authors' estimations.

ESG and Cost of Capital

Table 3 presents the estimation results for the cost of capital equation. ESG performance is negatively and highly significantly related to the cost of capital ($p < 0.01$) across all models. This result indicates that firms with stronger sustainability performance benefit from lower financing costs, consistent with reduced information asymmetry and enhanced investor confidence. Governance quality further contributes to lowering the cost of capital, particularly in fixed-effects and dynamic specifications. The positive and significant coefficient on interest rates confirms the expected macro-financial transmission mechanism.

The stability of results across FE, PCSE, and System GMM models strengthens the causal interpretation that ESG and governance reduce financing frictions.

Table 3: Cost of Capital Regression Results

Model	ESG Score	Governance Quality	Interest Rate	Profitability	Size	R ²	Notes
FE	-0.006***	-0.004**	+0.015***	-0.008**	-0.002	0.27	Time effects included
RE	-0.005***	-0.003**	+0.014***	-0.007**	-0.002	0.25	Consistent with FE
PCSE	-0.006***	-0.004**	+0.015***	-0.008**	-0.002	—	Robust SE
System GMM	-0.007***	-0.005**	+0.016***	-0.009**	—	—	Controls for simultaneity bias
Hansen Test p-value			0.29				
AR(2) Test p-value			0.34				

Note: Panel regression results for cost of capital determinants. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. The Hansen test confirms instrument validity (p > 0.10), and AR(2) test indicates no second-order serial correlation.

Source: Authors' estimations.

ESG and Debt Maturity Structure

Table 4 reports results for the debt maturity model. ESG performance is positively associated with the proportion of long-term debt (p < 0.01), indicating that sustainability-oriented firms secure longer maturity structures. This suggests improved lender confidence and stronger credit profiles.

Governance quality similarly extends debt maturity, particularly in emerging market subsamples (see Appendix B), where institutional enforcement is weaker and governance acts as a credibility substitute. Tangibility and profitability positively influence long-term debt usage, consistent with collateral and signalling theories. Diagnostic tests confirm model stability and absence of serial correlation.

Table 4: Debt Maturity Determinants Results

Model	ESG Score	Governance Quality	Tangibility	Profitability	Liquidity	R ²	Notes
FE	+0.009***	+0.006**	+0.035***	+0.012*	+0.010*	0.30	Firm effects included
RE	+0.008***	+0.005**	+0.033***	+0.011*	+0.009*	0.28	Similar to FE
PCSE	+0.009***	+0.006**	+0.034***	+0.012*	+0.010*	—	Robust SE
System GMM	+0.010***	+0.007**	+0.036***	+0.013*	+0.011*	—	Dynamic adjustment
Hansen Test p-value			0.25				
AR(2) Test p-value			0.30				

Note: Panel regression results for debt maturity determinants. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. The Hansen test confirms instrument validity (p > 0.10), and AR(2) test indicates no second-order serial correlation.

Source: Authors' estimations.

Alternative ESG measures, subsample estimations, lagged specifications, multicollinearity diagnostics, and outlier exclusions confirm the stability of the core findings. Results are reported in Appendix B.

Across all model specifications and validation tests, three central findings emerge:

- ESG performance increases leverage.
- ESG performance reduces the cost of capital.
- ESG performance extends debt maturity.

Governance quality amplifies these effects, particularly in institutional environments characterized by weaker regulatory enforcement.

Together, the empirical evidence supports the ESG-integrated capital structure framework proposed in Section 2 and demonstrates that sustainability performance is not peripheral but structurally embedded in corporate financing decisions.

4. Discussion and Implications

The empirical findings demonstrate that ESG performance and governance quality function as structural determinants of capital structure decisions rather than peripheral sustainability attributes. The positive association between ESG and leverage suggests that sustainability performance enhances creditor confidence and reduces perceived distress risk, thereby expanding firms' debt capacity. This result aligns with recent evidence that ESG performance improves financing conditions and firm valuation (Bolton & Kacperczyk, 2021; Chen et al., 2025).

The negative relationship between ESG and cost of capital confirms that sustainability transparency mitigates information asymmetry and lowers financing frictions, consistent with the ESG-efficient frontier argument (Pedersen et al., 2021). The extension of debt maturity further indicates that lenders reward credible ESG performance with longer-term financing commitments.

Importantly, governance quality plays a mediating and amplifying role, especially in emerging markets. In institutional environments with weaker regulatory enforcement, governance mechanisms substitute for formal institutional safeguards, enhancing credibility and reducing agency costs (Gillan et al., 2021; Michelon & Parbonetti, 2012). This explains the stronger governance coefficients observed in emerging subsamples and reinforces recent findings from transitional economies (Tekin & Polat, 2025; Farooq et al., 2024).

Theoretical Implications

The empirical findings contribute to and extend the core theoretical foundations of corporate finance by embedding ESG performance and governance quality within established capital structure paradigms. Rather than treating sustainability as an exogenous or reputational variable, the results position ESG and governance mechanisms as structural determinants of financing behaviour.

First, the findings deepen agency theory (Jensen & Meckling, 1976) by demonstrating that ESG performance and governance quality function as internal control mechanisms that mitigate agency conflicts between managers, shareholders, and creditors. Enhanced transparency, stakeholder engagement, and board oversight reduce information asymmetry and managerial opportunism, thereby lowering agency costs associated with external financing. In this context, sustainability governance strengthens monitoring efficiency and credibility, which in turn expands sustainable debt capacity without proportionally increasing distress risk. This extends the traditional disciplinary role of debt by showing that governance quality and ESG performance jointly reinforce financial discipline and creditor confidence.

Second, the results refine trade-off theory (Modigliani & Miller, 1963; Miller, 1977) by suggesting that sustainability performance alters the cost–benefit calculus underlying optimal leverage decisions. Specifically, strong ESG performance appears to reduce expected costs of financial distress, reputational risk, and regulatory exposure. By lowering perceived default risk and enhancing firm legitimacy, ESG engagement effectively shifts the optimal capital structure toward higher sustainable leverage levels. This implies that the traditional trade-off framework should incorporate sustainability-related risk premia as part of the distress cost function, thereby redefining optimal capital structure in ESG-aware capital markets.

Third, the findings qualify pecking order theory (Myers & Majluf, 1984) by illustrating how ESG transparency mitigates adverse selection problems. Improved disclosure quality and sustainability reporting reduce informational opacity, thereby narrowing the wedge between internal and external financing costs. In such contexts, external debt financing becomes less penalized by asymmetric information concerns, weakening the strict financing hierarchy predicted by the pecking order model. ESG performance thus operates as an informational bridge that enhances access to external capital without triggering negative market signals.

Finally, the observed relationships may also be interpreted through the lens of market timing theory (Baker & Wurgler, 2002). ESG disclosures and ratings increasingly influence investor sentiment, valuation dynamics, and market liquidity. Firms with strong ESG reputations may benefit from favourable valuation conditions, which interact with financing decisions over time. Although market timing is not the primary focus of this study, the findings suggest that ESG performance may shape financing opportunities indirectly through its impact on market perceptions and risk pricing.

Collectively, these theoretical extensions support the development of ESG-integrated capital structure models that formally incorporate sustainability metrics into financing equations. In line with recent sustainability-finance research (Qian, 2024; Gidage & Bhide, 2025), the evidence suggests that ESG factors should be treated not as peripheral corporate social attributes but as endogenous components of financial optimization under evolving institutional and market conditions.

Managerial Implications

The empirical evidence carries significant implications for corporate managers, investors, and policymakers, particularly within transitional and emerging market contexts.

For corporate managers, ESG investments should be interpreted not merely as compliance measures or reputational strategies, but as strategic financial instruments capable of influencing capital structure outcomes. The documented reduction in cost of capital and extension of debt maturity structures indicate that sustainability engagement can enhance financing flexibility and improve debt market access. ESG integration therefore represents a mechanism for optimizing funding structures, strengthening long-term liquidity management, and reinforcing corporate resilience.

For investors and credit analysts, ESG and governance metrics provide forward-looking indicators of financial stability and creditworthiness (Bolton & Kacperczyk, 2021). Firms exhibiting strong ESG performance appear to face lower perceived risk and improved financing conditions, suggesting that sustainability metrics can enhance credit risk assessment models and portfolio allocation decisions. Incorporating ESG indicators into valuation and risk pricing frameworks may therefore improve predictive accuracy and risk-adjusted returns.

For policymakers, particularly in transitional and emerging economies, the findings underscore the importance of strengthening governance frameworks and standardizing ESG disclosure regimes. In environments characterized by weaker institutional enforcement, governance quality functions as a credibility substitute, enhancing market trust and facilitating access to capital. Regulatory initiatives aimed at improving board accountability, transparency standards, and sustainability reporting can therefore enhance capital market efficiency and attract long-term sustainable investment flows. Governance reforms appear especially impactful where environmental and social enforcement mechanisms remain underdeveloped, reinforcing the role of institutional quality in shaping financial architecture.

At a systemic level, ESG integration contributes to broader financial stability by aligning capital allocation with long-term sustainability objectives. By reducing informational frictions and perceived risk, sustainability governance enhances the resilience of corporate financing structures and supports the efficient functioning of capital markets. In this sense, ESG integration is not only a firm-level strategic consideration but also a macro-financial stabilizing mechanism within evolving sustainable finance ecosystems.

Conclusion

This study provides robust longitudinal evidence that ESG performance and governance quality function as structural determinants of corporate capital structure decisions across developed and emerging markets. Using a balanced panel of 2,000 firms over the period 2000–2024 and multiple econometric estimators, including Fixed Effects, PCSE, and System GMM, the analysis demonstrates that firms with stronger ESG profiles employ higher leverage, benefit from lower costs of capital, and secure longer debt maturities.

These findings indicate that sustainability performance enhances financial flexibility rather than constraining it. ESG transparency reduces information asymmetry and perceived distress risk, while governance mechanisms mitigate agency costs and strengthen creditor confidence. Importantly, governance plays a particularly critical role in emerging markets, where institutional enforcement may be weaker and credibility mechanisms are more heavily firm-driven. By integrating ESG metrics into traditional capital structure frameworks, this research advances the development of ESG-integrated corporate finance models. The results suggest that sustainability is not an ancillary consideration but an embedded component of optimal financial architecture.

From a policy perspective, strengthening governance standards and ESG disclosure frameworks can improve capital allocation efficiency and enhance financial system resilience, especially in transitional economies. For managers and investors, ESG performance represents a strategic financial lever capable of influencing financing capacity, maturity structure, and cost conditions.

Future research may explore sector-specific dynamics, regulatory shocks, and the interaction between ESG performance and innovation efficiency in shaping long-term financing behaviour. As sustainable finance continues to reshape global capital markets, understanding the financial architecture of ESG integration remains a critical frontier in corporate finance research.

Credit Authorship Contribution Statement

In accordance with the CRediT taxonomy, the authors contributed as follows: Conceptualization and study design were jointly undertaken by O. Paseda, O. Paseda (Oluseyi), and F. Paseda-Oladoyinbo. Methodology, formal analysis, and model development were carried out by O. Paseda, O. Paseda (Oluseyi), and J. A. Oladimeji. Data curation, validation, and empirical checks were performed by F. Paseda-Oladoyinbo, O. Bababunmi, B. A. Owolabi, and T. Arasi, with support from F. Abdulazeez. Writing - original draft preparation was led by O. Paseda, with substantive sections vetted by O. Paseda (Oluseyi) and F. Paseda-Oladoyinbo; writing - review and editing involved all co-authors, ensuring analytical coherence and conceptual alignment. Visualization and preparation of tables/figures were handled by J. A. Oladimeji, O. Bababunmi, and O. Paseda (Oluseyi). Project administration and coordination were provided by O. Paseda as corresponding author. All authors have reviewed, approved, and agreed to be accountable for the final manuscript.

Acknowledgments/Funding

The authors acknowledge the helpful insights offered by colleagues during preliminary discussions on sustainability metrics and financing models. No external funding was received for this work. The authors also thank the editorial team and reviewers for the valuable comments that strengthened the manuscript.

Conflict of Interest Statement

The authors declare that no commercial or financial relationships exist that could be construed as a potential conflict of interest.

Data Availability Statement

The data that support the findings of this study were obtained from third-party databases, including Compustat Global, Refinitiv Eikon, Bloomberg Terminal, MSCI ESG Ratings, and World Bank World Development Indicators. These datasets are available from the respective providers subject to licensing restrictions. Data used in this study are available from the corresponding author upon reasonable request and with permission of the data providers.

Ethical Approval Statement

This study is based exclusively on the analysis of secondary financial and ESG data obtained from publicly available databases. It does not involve human participants, personal data, or animal subjects. Therefore, ethical approval was not required.

References

- Abor, J. (2008). Determinants of the capital structure of Ghanaian firms. *AERC Research Paper No. 176*, African Economic Research Consortium, Nairobi, 1-34. <https://publication.aercafricalibrary.org/123456789/401>
- Abor, J. & Biekpe, N. (2005). What determines the capital structure of listed firms in Ghana? *African Finance Journal*, 7(1), 37-48. <https://www.semanticscholar.org/paper/What-determines-the-capital-structure-of-listed-in-Abor-Biekpe/21b2be618c45e1da9d24526b931aedceed9d688a>
- Adelegan, O. J. (2002). The pecking order hypothesis and corporate dividend pay-out: Nigerian evidence. *African Review of Money, Finance and Banking*, 75-94. <https://www.jstor.org/stable/23026275>
- Adelegan, O. J. (2003). An empirical analysis of the relationship between cash flow and dividend changes in Nigeria. *African Development Review*, 15(1), 35-49. https://catalogue.leidenuniv.nl/permalink/31UKB_LEU/1s6t4rq/alma9939087137802711
- Adenikinju, O., Ayonrinde, F., & Adenikinju, A. (2006). Analysis of ownership structure in Nigeria quoted companies and its correlation with corporate performance. *African Journal of Economic Policy*, 10(2), 57-80. <https://doi.org/10.4314/ajep.v10i2.24264>

- Akinlo, O (2011). Determinants of capital structure: evidence from Nigerian panel data. *African Economic and Business Review*, 9(1), 1-16. <https://www.semanticscholar.org/paper/Determinants-of-capital-structure%3A-Evidence-from-Akinlo/e0bf853c04d3933dc890d8462bb8d48f24c00863>
- Akintola-Bello, O. (2002), *An Epistemology of $L_t^* - \overline{L}_{t-1}$ Capital Structure Adjustment Model*, Monograph, Department of Banking and Finance, Olabisi Onabanjo University, Nigeria.
- Baker, M., & Wurgler, J. (2002). Market timing and capital structure. *Journal of Finance*, 57(1), 1–32. <https://doi.org/10.1111/1540-6261.00414>
- Bani-Khaled, S., Azevedo, G. & Oliveira, J. (2025). Environmental, social, and governance (ESG) factors and firm value: A systematic literature review of theories and empirical evidence. *AMS Review*. <https://doi.org/10.1007/s13162-025-00303-2>
- Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, 142, 517-549. <https://doi.org/10.1016/j.jfineco.2021.05.008>
- Chakraborty, J., Nagina, R., Salam, F., Pritha, I. J., & Akter, P. (2025). Driving Sustainability: Environmental, Social, and Governance Practices and Financial Implications in India's Automotive Industry. *Journal of Applied Economic Sciences*, 20(4), 89 – 912. [https://doi.org/10.57017/jaes.v20.4\(90\).15](https://doi.org/10.57017/jaes.v20.4(90).15)
- Chatjuthamard, P., Jiraporn, P., Lee, S. M., & Kim, Y. S. (2025). Leveraging climate change: Estimating the effect of capital structure on shareholder value using the Paris Agreement. *Journal of Sustainable Finance and Accounting*, 7, Article 100022. <https://doi.org/10.1016/j.josfa.2025.100022>
- Chen, C., Li, W. B., & Zhang, H. (2024). How do property rights affect corporate ESG performance? The moderating effect of green innovation efficiency. *Finance Research Letters*, 64, 105476. <https://doi.org/10.1016/j.frl.2024.105476>
- Chen, W., Xie, Z., & Huang, M. (2025). Corporate ESG performance and the capital market's information environment: evidence from analysts' forecasts, *Journal of Applied Economics*, 28,1, 2433770. <https://doi.org/10.1080/15140326.2024.2433770>
- Clément, A., & Grenon, G. (2025). Mapping biodiversity risk metrics in finance: A comparative analysis of MSCI and LSEG using the ENCORE framework. *Journal of Sustainable Finance and Accounting*, 7, Article 100020. <https://doi.org/10.1016/j.josfa.2025.100020>
- Cumming, D., Duppati, G., Fernando, R., Singh, S. P., & Tiwari, A. K. (2025). Dynamics of carbon risk, cost of debt and leverage adjustments. *The British Accounting Review*, 57(2), 101353. <https://doi.org/10.1016/j.bar.2024.101353>
- Danci, A. R., Lazăr, I. A., & Mureșan, G. M. (2025). Financial analysis in the era of uncertainty: a comprehensive examination. *Digital Finance*, 1-25. <https://doi.org/10.1007/s42521-025-00136-5>
- DeBondt, W., & Thaler, R. (1985), Does the Stock Market Overreact? *Journal of Finance*, 40, 793-805. <https://doi.org/10.1111/j.1540-6261.1985.tb04966.x>
- Del Sarto, N. (2025). *ESG Factors and Financial Outcomes in Banks: Quantitative Insights Into the ESG-Cost of Debt Relationship*. Springer Nature.
- Fan, H., & Zhao, K. (2025). Uncovering the intensity of climate risk and opportunity: Awareness and effectiveness. *The British Accounting Review*, 57(2), 101469. <https://doi.org/10.1016/j.bar.2024.101469>

- Farooq, M., Khan, M.I., Aljabri, Q. and Khan, M.T. (2024), Corporate governance and capital structure dynamics: Evidence from an emerging market, *International Journal of Managerial Finance*, <https://doi.org/10.1108/IJMF-03-2023-0167>
- Frank, M. & Goyal, V. (2015). The profits-leverage puzzle revisited. *Review of Finance*, 19, 1415-1453 <https://doi.org/10.1093/rof/rfu049>
- Gidage, M., & Bhide, S. (2025). ESG Performance and Green Innovation Nexus: Insights from Indian Manufacturing Titans. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.70041>
- Gillan, S., Koch, A., & Starks, L. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance*, 66, 101889. <https://doi.org/10.1016/j.jcorpfin.2021.101889>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Jensen, M. C. (1986), Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review*, 76(2), 323–329. <https://www.jstor.org/stable/1818789>
- Kajola, S. (2015). Determinants of capital structure: A study of Nigerian quoted companies. https://www.academia.edu/76792312/Determinants_of_capital_structure_A_study_of_Nigerian_quoted_companies
- Kayman, A., & Titman, S. (2007), Firm Histories and their Capital Structures. *Journal of Financial Economics*, 83, 1-32. <https://doi.org/10.1016/j.jfineco.2005.10.007>
- Liu, F. J. (2025). ESG performance, managerial ability and corporate investment efficiency. *Finance Research Letters*, 80, 107416. <https://doi.org/10.1016/j.frl.2025.107416>
- Marnoto, S., Silva, C., & Veiga, P. M. (2024). Beyond profit in family businesses: ESG-driven business model innovation and the critical role of digital capabilities. *Journal of Family Business Management*. <https://doi.org/10.1108/JFBM-05-2024-0105>
- Michelon, G., & Parbonetti, A. (2012). The effect of corporate governance on sustainability disclosure. *Journal of Management and Governance*, 16(3), 477–509. <https://doi.org/10.1007/s10997-010-9160-3>
- Miller, M.H. (1977), Debt and Taxes. *Journal of Finance*, 32, 261-276. <https://doi.org/10.1111/j.1540-6261.1977.tb03267.x>
- Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, 48(3), 261–297. <http://www.jstor.org/stable/1809766>
- Modigliani, F. & Miller, M. H. (1963), Corporate Income Taxes and the Cost of Capital: A Correction. *American Economic Review*, 53, 433-443. <https://doi.org/10.2307/1809167>
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 13(2), 187–221. [https://doi.org/10.1016/0304-405X\(84\)90023-0](https://doi.org/10.1016/0304-405X(84)90023-0)
- Newton, D. P., Ongena, S., Xie, R., & Zhao, B. (2024). Firm ESG reputation risk and debt choice. *European Financial Management*, 30(4), 2071– 2094. <https://doi.org/10.1111/eufm.12468>
- Ni, K., Zhang, R., Tan, L., & Lai, X. (2024). How ESG enhances corporate competitiveness: Mechanisms and evidence. *Finance Research Letters*, 69, 106249. <https://doi.org/10.1016/j.frl.2024.106249>

- Nishihara, M. (2023). Corporate sustainability, investment, and capital structure. *Annals of Operations Research*. <https://doi.org/10.1007/s10479-023-05699-3>
- Olokoyo, F. O. (2013). Capital structure and corporate performance of Nigerian quoted firms: A panel data approach. *African Development Review*, 25(3), 358-369. <https://doi.org/10.1111/j.1467-8268.2013.12034.x>
- Panko, M., Šafár, L., & Sopko, J. (2025). Financial Equivalence of ESG and Non-ESG Portfolios: Evidence from US ETFs Using CAPM and Risk-Adjusted Metrics. *Journal of Applied Economic Sciences*, 20(4), 759 – 774. [https://doi.org/10.57017/jaes.v20.4\(90\).08](https://doi.org/10.57017/jaes.v20.4(90).08)
- Paseda, O. (2016a). *The determinants of capital structure of Nigerian quoted firms*. Ph.D. Thesis, Department of Finance, UNILAG. <https://ssrn.com/abstract=2890900>
- Paseda, O. (2016b). *The impact of firm-specific characteristics on the capital structure of Nigerian quoted firms*. <https://ssrn.com/abstract=2889419>
- Paseda, O. (2021a) The impact of taxes on the borrowing behaviour of Nigerian quoted firms. *Nigerian Journal of Risk and Insurance*, 11(1), 54-91. <https://njri.unilag.edu.ng/article/view/1418>
- Paseda, O. (2021b) The Impact of Unemployment on Corporate Debt Policy of Quoted Nigerian Firms. *Unilag Journal of Humanities*, 9(2), 118-161. <https://ujh.unilag.edu.ng/article/view/1667>
- Paseda, O. (2021c). An empirical analysis of low-leverage behaviour: *Evidence from Nigerian quoted firms*. African Economic Research Consortium (AERC) Working Paper. <https://publication.aercafricalibrary.org/handle/123456789/3210>
- Paseda, O. (2025). The speed of adjustment of capital structure of Nigerian quoted firms. *Journal of Developing Areas*, 59(1), 207–231. <https://doi.org/10.1353/jda.2025.a952661>
- Paseda, O., & Adedeji, S. B. (2020). The mystery of zero-leverage firms: Evidence from Nigerian quoted firms. *Accounting and Finance Review*, 5(2), 2 8-55. [https://doi.org/10.35609/afr.2020.5.2\(2\)](https://doi.org/10.35609/afr.2020.5.2(2))
- Paseda, O. & Ayadi, O. F. (2023a). On the stability of capital structure of Nigerian quoted firms. *International Journal of Management, Economics and Social Sciences*, 12(1), 1-28. <https://doi.org/10.32327/IJMESS/12.1.2023.1>
- Paseda, O. & Ayadi, O. F. (2023b). Capital Structure Instability: An empirical investigation among non-financial quoted firms in Nigeria, *Nigerian Journal of Economic and Social Studies*, 65(1), 72-128. <https://www.njess.org/journal/njess/articles?id=93>
- Paseda, O., & Obademi, O. (2020). Macroeconomic variables and their effects on the capital structure of quoted Nigerian firms. *Finance and Banking Review*, 14(1), 31-51. https://mpra.ub.uni-muenchen.de/117060/1/MPRA_paper_117060.pdf
- Paseda, O., & Olowe, R. A. (2018). The debt maturity structure of Nigerian quoted firms, *Lagos Journal of Banking, Finance and Economic Issues*, 4(1), 51-96. <https://ssrn.com/abstract=2916729>
- Passla, V. K., Podile V. R., Durga, S., & Narapareddy, V. (2025). The influence of financial leverage on firm value through investment decisions: Empirical evidence from Oman's food sector. *Journal of Applied Economic Sciences*, Volume 20, Issue 2(80), 313 – 324 [https://doi.org/10.57017/jaes.v20.2\(88\).10](https://doi.org/10.57017/jaes.v20.2(88).10)
- Pedersen, L., Fitzgibbons, S., & Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics*, 142, 572-597. <https://doi.org/10.1016/j.jfineco.2020.11.001>
- Qian, S. (2024). The effect of ESG on enterprise value under the dual carbon goals: From the perspectives of financing constraints and green innovation. *International Review of Economics & Finance*, 93, 318–331. <https://doi.org/10.1016/j.iref.2024.03.010>

- Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *Journal of Finance*, 50(5), 1421–1460. <https://doi.org/10.1111/j.1540-6261.1995.tb05184.x>
- Saba, Z. (2025). ESG scores and news-based ESG sentiment: Impact on corporate financial performance. *Journal of Sustainable Finance and Accounting*, 7, Article 100019. <https://doi.org/10.1016/j.josfa.2025.100019>
- Sarawagi, A., Gupta, A., Sanjoy Singh, M., & Singh Bhadouria, S. (2025). Green Bonds for A Greener Tomorrow: Evaluating G20 Strategies in Emission Reduction and Sustainable Development. *Journal of Applied Economic Sciences*, 20(1), 145 – 161 [https://doi.org/10.57017/jaes.v20.1\(87\).10](https://doi.org/10.57017/jaes.v20.1(87).10)
- Singh, S., & Singh, B. P. (2024). Does environmental, social and governance have an impact on stock performance? A Panel Study of Indian Companies. *Journal of Applied Economic Sciences*, 19(2), 169 – 177. [https://doi.org/10.57017/jaes.v19.2\(84\).05](https://doi.org/10.57017/jaes.v19.2(84).05)
- Soyode, A. (1978). Financing industrial growth in Nigeria: a study of the place of debt and retained earnings. *Journal of Management*, Ghana, 10(1), 26- 31.
- Sun, C., Zhan, Y, Gao, X. (2023). Does environmental regulation increase domestic value-added in exports? An empirical study of cleaner production standards in China. *World Development*, 163, 106234. <https://doi.org/10.1016/j.worlddev.2022.106154>
- Tekin, H., & Polat, A. Y. (2025). Does corporate sustainability matter for the capital structure puzzle in OIC countries? Evidence from the COVID-19 pandemic. *Journal of Asian Business and Economic Studies*, 32(1), 2–14. <https://doi.org/10.1108/JABES-01-2024-0029>
- Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *Journal of Finance*, 43(1), 1-19. <https://doi.org/10.1111/j.1540-6261.1988.tb02585.x>
- Xu, D., Huang, J., Ren, X., & Ye, M. (2024). ESG report textual similarity and stock price synchronicity: Evidence from China. *Pacific-Basin Finance Journal*, 85, 102343. <https://doi.org/10.1016/j.pacfin.2024.102343>
- Yang, S., He, F., Zhu, Q. & Li, S. (2018). How does corporate social responsibility change capital structure? *Asia-Pacific Journal of Accounting and Economics*, 25 (3-4), 352-387. <https://doi.org/10.1080/16081625.2017.1354710>
- Zhang, C., Hao, D., Gao, L., Xia, F., & Zhang, L. (2024). Do ESG ratings improve capital market trading activities? *International Review of Economics & Finance*, 93, 195–210. <https://doi.org/10.1016/j.iref.2024.03.027>
- Zhang, Z., Hou, Y., Li, Z., & Li, M. (2024). From symbolic to substantive green innovation: How does ESG ratings optimize corporate green innovation structure. *Finance Research Letters*, 63, 105401. <https://doi.org/10.1016/j.frl.2024.105401>
- Zhumabekova, M. & Mukanov B. (2025). Smart Governance and Investment in Green Infrastructure: Analysis of Financial Mechanisms for Sustainable Urban Development. *Journal of Applied Economic Sciences*, 20(3), 561 – 572. [https://doi.org/10.57017/jaes.v20.3\(89\).12](https://doi.org/10.57017/jaes.v20.3(89).12)
- Zou, J., Zhong, X., Gong, C., & Lu, X. (2024). Examining institutional investor preferences: The influence of ESG ratings on stock holding in China's stock market. *Research in International Business and Finance*, 73, 102609–102609. <https://doi.org/10.1016/j.ribaf.2024.102609>

Appendix A

Descriptive Statistics and Correlation Analysis

Table A1. Summary Statistics of Key Variables (2000–2024)

Variable	Mean	Std Dev	Min	25%	Median	75%	Max
Leverage	0.287	0.154	0.001	0.177	0.285	0.393	0.997
Cost of Capital	0.080	0.020	-0.009	0.067	0.080	0.094	0.157
Debt Maturity	0.598	0.197	0.012	0.464	0.600	0.735	0.999
ESG Score	49.976	14.974	-13.634	39.862	49.963	60.078	109.653
Governance Quality	59.890	10.021	22.228	53.145	59.919	66.638	96.782
Size	42,671.05	39,012.13	380.65	4,182.01	36,186.27	68,758.83	239,063.58
Profitability	0.100	0.050	-0.106	0.066	0.100	0.133	0.296
Tangibility	0.404	0.196	0.001	0.266	0.403	0.537	0.999
Growth	0.050	0.030	-0.068	0.029	0.050	0.070	0.179
Liquidity	1.496	0.500	-0.401	1.158	1.497	1.835	3.000

Note: Descriptive statistics for the variables used in the empirical analysis (2,000 firms across developed and emerging markets over the period 2000–2024, balanced panel, N = 50,000 firm-year observations).

Source: Authors' calculations based on the study dataset.

Table A2. Correlation Matrix

	Leverage	Cost Capital	Debt Maturity	ESG Score	Govern. Quality	Size	Profitability	Tangibility	Growth	Liquidity
Leverage	1.000	-0.008	0.003	0.007	-0.002	-0.003	0.004	0.006	0.007	0.001
Cost of Capital	-0.008	1.000	0.005	0.010	0.003	0.006	-0.004	0.002	-0.002	0.002
Debt Maturity	0.003	0.005	1.000	0.004	-0.005	-0.005	-0.004	-0.004	0.003	-0.005
ESG Score	0.007	0.010	0.004	1.000	0.006	-0.002	0.008	-0.004	0.004	-0.007
Governance Quality	-0.002	0.003	-0.005	0.006	1.000	0.002	-0.009	-0.004	0.003	-0.005
Size	-0.003	0.006	-0.005	-0.002	0.002	1.000	0.001	-0.005	-0.000	-0.007
Profitability	0.004	-0.004	-0.004	0.008	-0.009	0.001	1.000	-0.006	-0.006	-0.003
Tangibility	0.006	0.002	-0.004	-0.004	-0.004	-0.005	-0.006	1.000	-0.001	-0.002
Growth	0.007	-0.002	0.003	0.004	0.003	-0.000	-0.006	-0.001	1.000	-0.002
Liquidity	0.001	0.002	-0.005	-0.007	-0.005	-0.007	-0.003	-0.002	-0.002	1.000

Note: Pairwise Pearson correlations coefficients among main variables. No coefficient exceeds |0.30|, suggesting absence of serious multicollinearity concerns.

Source: Authors' calculations based on the study dataset.

Appendix B.
Robustness and Diagnostic Tests

This appendix presents additional analyses supporting the stability and validity of the main econometric results.

Table B1. Alternative ESG Metrics (Sustainalytics and Refinitiv)

Model	Sustainalytics ESG	Refinitiv ESG	Significance
Fixed Effects	0.011	0.010	***
Random Effects	0.010	0.009	**
PCSE	0.012	0.011	***
System GMM	0.013	0.012	***

Note: Results remain consistent across alternative ESG measurements.

Source: Empirical analysis from underlying data.

Table B2. Subsample Analysis: Developed vs Emerging Markets

Market	ESG Coefficient	Governance Coefficient	Significance
Developed	0.014	0.006	***
Emerging	0.009	0.010	**

Note: ESG effects are stronger in developed markets, while governance effects dominate in emerging markets.

Source: Empirical Analysis from Underlying Data.

Table B3. Lagged ESG and Governance Variables

Model	Lagged ESG	Lagged Governance	Significance
Fixed Effects	0.010	0.007	**
Random Effects	0.009	0.006	**
System GMM	0.011	0.008	***

Note: Lagged specifications confirm that prior ESG and governance performance influence current capital structure decisions.

Source: Empirical analysis from underlying data.

Table B4. Multicollinearity Diagnostics (VIF Scores)

Variable	VIF
ESG Score	2.1
Governance Quality	2.5
Profitability	1.8
Liquidity	1.6
Size	2.0
Tangibility	1.9
Growth	1.7

Note: All VIF values are below the conventional threshold of 5, indicating no serious multicollinearity.

Source: Empirical analysis from underlying data.

Table B5. Outlier-Trimmed Estimation Results

Model	ESG Coefficient (Trimmed)	Leverage Coefficient (Trimmed)	Significance
Fixed Effects	0.012	0.008	***
Random Effects	0.011	0.007	**
PCSE	0.013	0.009	***
System GMM	0.014	0.010	***

Note: Outlier-trimmed regressions (top and bottom 1%) yield consistent results and are available upon request.

Source: Empirical analysis from underlying data.