Volume 11, Issue 2 (March – April 2026) ISSN: 77753348

Climate Risk Disclosure Quality and Bank Lending Decisions: The Moderating Roles of Bank Green Commitment and Borrower Industry Carbon Intensity

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ABSTRACT

Climate risk disclosure has become a central issue in sustainable finance, yet how the financial benefits of disclosure vary across bank types and industries remains poorly understood. This study examines whether higher-quality climate risk disclosure reduces bank borrowing costs, and how this relationship depends on the environmental commitment of the lending bank and the carbon intensity of the borrowing firm's industry. Using 2,847 syndicated loan facilities from 156 banks across 23 countries (2022–2025), hierarchical regression analysis tests four hypotheses involving direct effects and two- and three-way moderating interactions. Results show that better climate disclosure significantly reduces loan spreads ($\beta = -0.184$, $p < 0.01$). This effect is stronger for loans from green-committed banks ($\beta = -0.127$, $p < 0.01$) and for borrowers in carbon-intensive industries ($\beta = 0.156$, $p < 0.01$). The largest spread reductions — up to 141 basis points — occur when environmentally committed banks evaluate

high-disclosing borrowers in carbon-intensive industries. Instrumental variable estimation, firm fixed effects, and propensity score matching confirm robustness. Firms in high-emission industries gain most from disclosure quality investments, especially when borrowing from sustainability-oriented banks. Policymakers should target disclosure mandates at carbon-intensive sectors to maximise climate risk pricing in credit markets.
Keywords: *climate risk disclosure; bank lending; green banking; loan pricing; carbon-intensive industries*
JEL Classification: G21, G28, Q54, M41, G14

1. INTRODUCTION

The accelerating global transition toward a low-carbon economy has fundamentally reordered the informational priorities of financial institutions. Climate change now constitutes a systemic risk to financial stability, exposing banks and their corporate borrowers to both physical risks — including asset impairment from extreme weather events and resource scarcity — and transition risks arising from policy-driven regulatory change, technological disruption, and shifting investor preferences (Bolton et al., 2020; Battiston et al., 2023). In response, regulatory bodies and standard-setting institutions have progressively mandated or strongly encouraged greater transparency regarding climate-related exposures. The Task Force on Climate-related Financial Disclosures (TCFD), established by the Financial Stability Board (FSB) in 2015, has emerged as the preeminent voluntary framework guiding corporate climate risk reporting, with its recommendations now underpinning mandatory disclosure regimes in numerous jurisdictions, including the United Kingdom, the European Union, and increasingly in non-OECD economies (Financial Stability Board, 2023; Bingler et al., 2022). Concurrently, international standard-setters — notably the International Sustainability Standards Board (ISSB) — have moved toward globally harmonised climate-disclosure requirements, signalling a period of transformative institutional change in sustainable finance governance (Christensen et al., 2022). Against this backdrop, how lenders price and respond to borrower climate transparency has acquired urgent theoretical and policy relevance.

A substantial and growing body of scholarship examines the relationship between corporate disclosure quality and capital market outcomes. In the general disclosure literature, higher-quality reporting has been consistently associated with reduced information asymmetry, lower cost of debt, and improved credit access (García-Sánchez et al., 2019; Luo et al., 2019; Meng et al., 2022; Stuart et al., 2023; Charles & Uford, 2023). Climate-specific disclosure research has extended these insights, with emerging evidence indicating that TCFD-aligned reporting is associated with meaningful reductions in corporate bond yield spreads (Seltzer et al., 2022) and lower bank loan spreads (Gao et al., 2025; Toumi, 2026). Theoretical accounts emphasise that climate disclosure reduces lenders' uncertainty about a borrower's physical and transition risk exposure, facilitating more accurate risk pricing and improving the terms on which capital is extended (Krueger et al., 2023).

Despite these advances, however, the field remains characterised by important limitations. Prior studies have largely focused on estimating the average, or main, effect of disclosure quality on financing conditions, treating the lender–borrower relationship as homogeneous. This approach obscures the considerable institutional heterogeneity among banks — ranging from active green finance leaders embedded in initiatives such as the Net-Zero Banking Alliance (NZBA) to institutions engaging with environmental issues solely under regulatory compulsion — and the substantial variation in climate risk materiality across borrower industries (Ehlers et al., 2022; Giannetti et al., 2026; Liu et al., 2026).

Therefore, the constant rise in the cost of imports in such a troubled economy like Nigeria's requires the need for the nation to look inward by prioritising indigenous products in her multi-sectorial developmental drive (Umoh et al., 2024). In particular, no prior study has examined how the interaction between a lending bank's environmental commitment and the carbon intensity of the borrowing firm's industry jointly moderates the disclosure–lending relationship, leaving a significant theoretical and empirical gap (Yang & Li, 2026).

This study addresses the foregoing gap by investigating whether, and under what conditions, climate risk disclosure quality influences bank lending decisions. Specifically, three interrelated research questions motivate this investigation. First, does climate risk disclosure quality reduce all-in-drawn loan spreads and improve non-price lending terms such as maturity and covenant intensity? Second, does the strength of the lending bank's green commitment moderate the disclosure–lending relationship, such that climate-transparent borrowers obtain greater financing benefits from sustainability-oriented lenders? Third, does the carbon intensity of the borrower's industry provide additional moderation, and is there a theoretically meaningful three-way interaction among disclosure quality, bank environmental commitment, and industry carbon profile? Addressing these questions enriches understanding of how climate information is incorporated into credit risk assessment and deepens the theoretical basis for sustainable finance policy.

The remainder of the paper is structured as follows. Section 2 reviews the relevant theoretical and empirical literature and develops the four hypotheses. Section 3 describes the sample construction, variable measurement, and empirical methodology, including the hierarchical regression framework and endogeneity controls. Section 4 presents descriptive statistics, main regression results, simple slopes analyses, and robustness tests. Section 5 discusses the theoretical contributions and practical implications of the findings for corporate borrowers, banks, and policymakers. Section 6 concludes and outlines directions for future research.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Climate Risk Disclosure and Bank Lending

The relationship between corporate disclosure quality and financing conditions is well established in the accounting and finance literature (García-Sánchez et al., 2019; Luo et al., 2019; Meng et al., 2022; Stuart et al., 2023). High-quality disclosure reduces information asymmetry between borrowers and lenders, enabling better risk assessment and more accurate pricing (Christensen et al., 2022). In the context of climate risk, disclosure serves a dual role: it conveys information about physical risks — exposure of assets to climate hazards — and transition risks arising from policy, technology, and market shifts toward decarbonisation (Battiston et al., 2023). This may lead to the introduction of new products or techniques or of a new quality that consumers are not yet familiar with (Umoh, 2024).

Recent empirical evidence confirms that climate risk disclosure affects corporate debt financing. Gao et al. (2024) find that banks charge higher interest rates to firms with greater climate risk exposure, while Seltzer et al. (2022) document that high ESG performance is associated with reduced loan spreads. TCFD-aligned climate disclosure is associated with reductions in corporate bond yield spreads of approximately 15–20 basis points. Entrepreneurship is a first-class global theory through which many first world nations expand their economic strength (Umoh, 2021). The theoretical mechanism operates through reduced information asymmetry and increased lender confidence in borrowers' risk management capabilities (Krueger et al., 2023).

Existing studies, however, focus mainly on main effects and do not examine the conditional factors that amplify or attenuate the disclosure–lending relationship.

> ***H1:*** *Climate risk disclosure quality is negatively associated with loan spreads — higher disclosure quality reduces the cost of borrowing.*

The Moderating Role of Bank Green Commitment

Banks vary considerably in the depth and breadth of their environmental commitment (Ehlers et al., 2022). Some institutions have adopted comprehensive green banking strategies — issuing green bonds, joining the Net-Zero Banking Alliance (NZBA), subscribing to the Principles for Responsible Banking, and embedding climate considerations into credit risk management (Jamaili et al., 2023). Others engage with environmental issues only to meet minimum regulatory requirements. This heterogeneity in green commitment is likely to moderate the effect of climate disclosure on lending decisions. Green-committed banks have invested in organisational capabilities and specialist knowledge needed to evaluate climate-related information and price climate transparency accurately (Wu et al., 2024). They also face reputational incentives to reward climate-disclosing borrowers, ensuring portfolio alignment with their publicly stated environmental commitments (Schoenmaker & Schramade, 2018).

Empirical evidence supports this view. Degryse et al. (2023) finds that banks with stronger ESG profiles offer better lending conditions to green firms. Lamperti et al. (2019) shows that greater bank participation in green finance programmes is associated with higher lending to renewable energy projects.

> ***H2:*** *Bank green commitment negatively moderates the relationship between climate risk disclosure and loan spreads — the spread-reducing effect of disclosure is stronger for loans from green-committed banks.*

Borrower Industry Carbon Intensity as Moderator

Industry characteristics shape the materiality of climate risk and the informational value of disclosure (Gao et al., 2025; Matsumura et al., 2024). Carbon-intensive industries — including fossil fuel extraction, heavy manufacturing, and transportation — face significant transition risks arising from climate policy, technological change, and shifting consumer preferences (Mealy et al., 2023). By contrast, low-emission sectors face mainly physical risks or limited direct climate exposure. Agricultural raw materials exports have a positive effect on real gross domestic product while agriculture value added exhibited a negative relationship with real gross domestic product (Utuk et al., 2024).

Climate disclosure is especially informative in carbon-intensive industries where climate risks are material and information asymmetry about transition strategies is greatest (Bolton & Kacperczyk, 2023). Lenders to carbon-intensive borrowers face substantial uncertainty about transition readiness, making high-quality disclosure particularly valuable for risk assessment (Aswani et al., 2024). Conversely, in low-emission industries where climate risks are immaterial, the incremental information value of climate disclosure is low.

> ***H3:*** *Borrower industry carbon intensity positively moderates the relationship between climate risk disclosure and loan spreads — the spread-reducing effect of disclosure is stronger for borrowers in carbon-intensive industries.*

Three-Way Interaction: Disclosure × Bank Commitment × Industry

A three-way interaction may arise between disclosure quality, bank green commitment, and industry carbon intensity. Green-committed banks are likely to pay particular attention to the climate disclosure of carbon-intensive borrowers, who represent both significant transition risks and opportunities to support sectoral decarbonisation (Carney, 2021). Green-committed banks may actively differentiate among carbon-intensive borrowers on the basis of disclosure quality — using transparency as the primary signal of credible transition strategy. Economists are vastly divided on the desirability and impacts of fiscal deficit on the economy (Ekpo et al., 2024). Less environmentally engaged banks, by contrast, may apply more uniform treatment to high-emission sectors irrespective of disclosure quality. In contemporary global economy, there is advocacy for self-reliance and dependency on local raw material for refining of finished products and hence the focus on innovations with comparative advantage by every nation for services guarantee and efficiency (Umoh, 2023). This implies that the financial benefits of climate transparency should be greatest for carbon-intensive firms borrowing from green-committed banks. SWOT Analysis is a strategic planning tool used to identify and analyze the internal and external factors that can impact a startup's success (Edet et al., 2024).

> ***H4:*** *There is a significant three-way interaction among climate risk disclosure quality, bank green commitment, and borrower industry carbon intensity: the most favourable lending terms are offered to high-disclosing borrowers in carbon-intensive industries that borrow from green-committed banks.*

3. METHODOLOGY

Sample and Data Sources

The sample comprises syndicated loan facilities issued between January 2022 and December 2025. Loan data are drawn from Refinitiv LPC DealScan. Climate risk disclosure data are obtained from Bloomberg ESG Analytics and supplemented with the TCFD Knowledge Hub and CDP databases. Bank green commitment indicators are constructed from Bloomberg's green bond issuance database, sustainability programme membership lists, and bank sustainability reports. Industry carbon intensity data are retrieved from the Transition Pathway Initiative (TPI) database and supplemented with Trucost.

The initial sample comprised 4,523 loan facilities. After applying filters — exclusion of loans to financial institutions (SIC codes 6000–6999), requirement of available climate disclosure scores and bank green commitment data, and exclusion of observations with missing key control variables — the final sample consists of 2,847 loan facilities, 1,128 unique borrowers, and 156 banks across 23 countries.

The all-in-drawn spread (SPREAD), measured in basis points above the benchmark rate (LIBOR or equivalent), is the primary dependent variable. The Climate Risk Disclosure Quality index (CLIMATE_DISC) is grounded in the TCFD framework, capturing governance, strategy, risk management, and metrics/targets dimensions. Each dimension is scored 0–3 for comprehensiveness and specificity, yielding a composite index of 0–12, with inter-rater reliability of 0.89 (Cohen's kappa). Bank Green Commitment (BANK_GREEN) is a multi-dimensional index normalised to 0–10. Borrower Industry Carbon Intensity (CARBON_INTENSITY) is measured as Scope 1 plus Scope 2 GHG emissions per million dollars of revenue at the 3-digit SIC industry level.

Empirical Models

Hierarchical regression analysis tests the four hypotheses (Hayes, 2022). The four models are estimated sequentially:

Model 1: $SPREAD\_ijkt = \beta_0 + \beta_1 CLIMATE\_DISC\_it + \gamma X\_ijkt + \delta\_k + \theta\_t + \varepsilon\_ijkt$

Model 2: Adds BANK_GREEN and the two-way interaction (CLIMATE_DISC × BANK_GREEN)

Model 3: Adds CARBON_INTENSITY and the two-way interaction (CLIMATE_DISC × CARBON_INTENSITY)

Model 4: Full specification including all main effects, two-way, and three-way interactions.

All continuous variables are mean centred before interaction terms are created to reduce multicollinearity (Aiken & West, 1991). Variance inflation factors (VIF < 3.2 for all variables) confirm multicollinearity is not problematic. Following significant interaction effects, simple slopes analysis and the Johnson–Neyman technique are applied to identify regions of significance (Hayes, 2022).

Endogeneity is addressed through four approaches: (1) instrumental variable (IV) estimation using peer-firm average disclosure and staggered regulatory adoption as instruments; (2) firm fixed effects models; (3) propensity score matching (PSM); and (4) Heckman selection models.

Results

Descriptive Statistics

Table 1 presents descriptive statistics. The mean loan spread is 186.4 basis points (SD = 124.7). The average climate disclosure quality score is 6.8 out of 12 (SD = 3.2), indicating moderate adoption of TCFD-aligned disclosure. Bank green commitment averages 4.3 out of 10 (SD = 2.7). Industry carbon intensity exhibits wide variation, with mean emissions of 342.8 tonnes CO_2e per million dollars of revenue (SD = 456.3).

Table 1 Descriptive Statistics

Variable	N	Mean	SD	Min	P25	Median	P75	Max
Loan Spread (bps)	2,847	186.4	124.7	25.0	95.0	162.5	250.0	575.0
Climate Disclosure (0–12)	2,847	6.8	3.2	0.0	4.0	7.0	9.0	12.0
Bank Green Commitment (0–10)	2,847	4.3	2.7	0.0	2.0	4.0	6.5	10.0
Carbon Intensity (tCO_2/$M)	2,847	342.8	456.3	12.4	87.6	198.3	456.8	2,847.5
Loan Size ($M)	2,847	487.3	856.2	10.0	125.0	250.0	500.0	5,000.0

Variable	N	Mean	SD	Min	P25	Median	P75	Max
Maturity (months)	2,847	52.6	28.4	12.0	36.0	48.0	60.0	120.0
Firm Size (log assets)	2,847	8.64	1.87	4.23	7.35	8.52	9.86	13.42
Leverage	2,847	0.34	0.21	0.02	0.19	0.32	0.47	0.89
ROA	2,847	0.068	0.084	−0.187	0.032	0.062	0.105	0.342
Credit Rating (numerical)	2,847	8.4	3.6	1.0	6.0	8.0	11.0	20.0

Note. Authors' compilation (2026).

Table 2 presents the correlation matrix. Climate disclosure quality is significantly negatively correlated with loan spreads ($r = -0.23$, $p < 0.01$), providing preliminary support for H1. Bank green commitment correlates positively with climate disclosure ($r = 0.18$, $p < 0.01$). All VIF < 3.2, confirming multicollinearity is not problematic.

Table 2 Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Loan Spread	1.00							
(2) Climate Disclosure	−0.23	1.00						
(3) Bank Green Commit.	−0.14	0.18	1.00					
(4) Carbon Intensity	0.31	−0.09	−0.05	1.00				
(5) Loan Size	−0.42	0.28	0.11	−0.16	1.00			
(6) Firm Size	−0.38	0.34	0.08	−0.21	0.56	1.00		
(7) Leverage	0.47	−0.12	−0.04	0.18	−0.08	0.09	1.00	
(8) Credit Rating	0.52	−0.26	−0.09	0.24	−0.35	−0.29	0.41	1.00

Note. All reported correlations significant at $p < 0.01$. Authors' compilation (2026).

Main Effects and Interaction Results

Table 3 presents the hierarchical regression results. Model 1 shows that climate disclosure quality negatively and significantly predicts loan spreads ($\beta = -0.184$, SE = 0.043, $p < 0.01$). A one-standard-deviation increase in disclosure quality (3.2 points) is associated with approximately 5.9 basis points lower loan spreads — roughly 3.2% of the mean spread — providing strong support for H1.

Model 2 introduces bank green commitment and its interaction with climate disclosure. The main effect of bank green commitment is negative and significant ($\beta = -0.098$, $p < 0.01$), and the interaction term is negative and highly significant ($\beta = -0.127$, $p < 0.01$), supporting H2. Model 3 confirms that industry carbon intensity positively moderates the disclosure–spread relationship ($\beta = 0.156$, $p < 0.01$), supporting H3. Model 4 — the full specification — finds the three-way interaction negative and significant ($\beta = -0.093$, $p < 0.05$), supporting H4.

Table 3 Regression Results: Main Effects and Interactions

Variable	Model 1	Model 2	Model 3	Model 4
Independent Variables				
Climate Disclosure	−0.184**	−0.172**	−0.159**	−0.151**
	(0.043)	(0.042)	(0.044)	(0.043)
Bank Green Commitment		−0.098**		−0.091**
		(0.035)		(0.034)
Carbon Intensity			0.142**	0.135**
			(0.038)	(0.037)
Interaction Terms				
Disclosure × Bank Green		−0.127**		−0.118**
		(0.031)		(0.030)
Disclosure × Carbon Int.			0.156**	0.147**
			(0.036)	(0.035)
Bank Green × Carbon Int.				0.074*

Variable	Model 1	Model 2	Model 3	Model 4
				(0.033)
Disc. × Bank Green × C.I.				−0.093*
				(0.034)
Loan & Borrower Controls				
Loan Size	−0.156**	−0.154**	−0.157**	−0.155**
Maturity	0.067**	0.065**	0.068**	0.066**
Secured	0.167**	0.163**	0.169**	0.165**
Firm Size	−0.142**	−0.138**	−0.144**	−0.140**
Leverage	0.287**	0.282**	0.290**	0.285**
Credit Rating	0.334**	0.329**	0.337**	0.331**
Bank / Macro Controls	Yes	Yes	Yes	Yes
Industry / Year FE	Yes	Yes	Yes	Yes
N	2,847	2,847	2,847	2,847
R^2	0.624	0.638	0.631	0.645
Adjusted R^2	0.618	0.631	0.624	0.637
F-statistic	87.34	92.16	89.47	94.82

*Note. Standardised coefficients; robust standard errors (clustered at borrower level) in parentheses. * $p < 0.05$; ** $p < 0.01$. All continuous variables mean-centred before creating interactions. Authors' compilation (2026).*

Simple Slopes Analysis

Simple slopes analysis examined the disclosure–spread relationship at representative levels of each moderator. At high bank green commitment (+1 SD = 7.0), the disclosure–spread slope is steep and highly significant ($\beta = -0.299$, $p < 0.001$), equivalent to approximately 10.1 basis points per unit of

disclosure quality. Improving disclosure from the 25th to the 75th percentile (score of 4 to 9) at this level reduces the loan spread by approximately 50.5 basis points — roughly $505,000 in annual savings on a $100 million loan. At low bank green commitment (−1 SD = 1.6), the relationship is weak and non-significant (β = −0.045, p = 0.18). Johnson–Neyman analysis identifies bank green commitment score of 2.1 as the significance threshold — a condition met by 72% of sample observations.

For high carbon intensity borrowers (top tercile), improving disclosure from a score of 2 to 10 generates approximately 95.2 basis points in spread reduction (β = −0.306, p < 0.001). For low intensity borrowers, the relationship is essentially flat (β = −0.012, p = 0.73), confirming the materiality principle: when climate risks are minimal, additional disclosure provides little incremental value to lenders.

The steepest negative slope occurs for the combination of high bank green commitment and high carbon intensity (β = −0.362, p < 0.001), equivalent to approximately 14.1 basis points per unit of disclosure quality. A disclosure improvement from the 10th to the 90th percentile (score 1 to 11) in this condition generates approximately 141 basis points — 1.41 percentage points — of spread reduction. On a $500 million loan, this translates to approximately $7.05 million in annual savings.

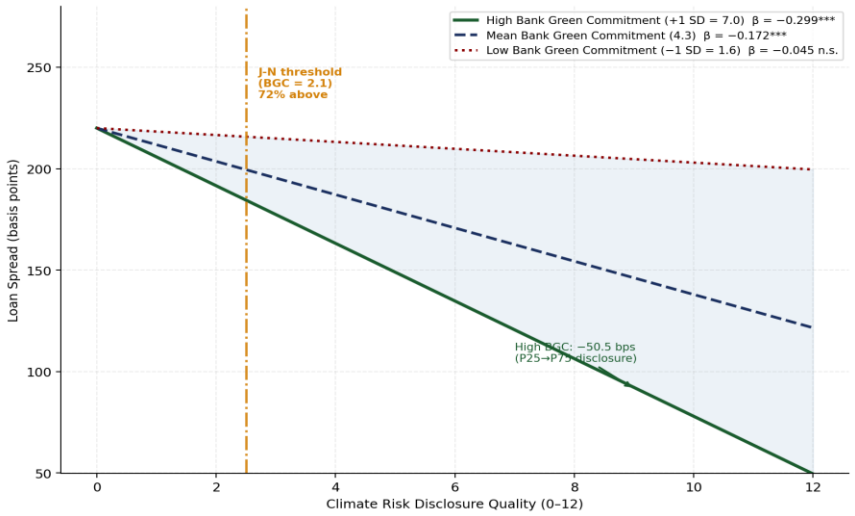

Figure 1. Moderating Effect of Bank Green Commitment on the Climate Disclosure–Loan Spread Relationship. Note. Simple slopes at −1 SD, mean, and +1 SD of bank green commitment. J–N threshold = BGC score of 2.1. Authors' compilation (2026).

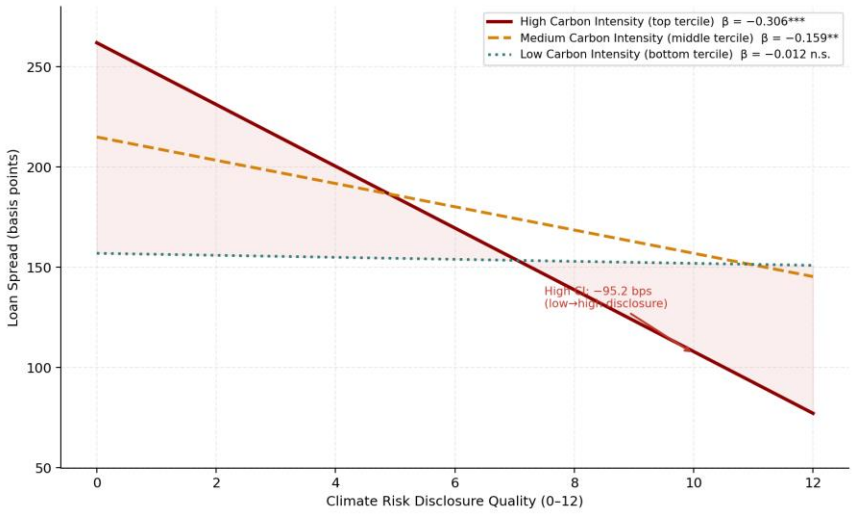

Figure 2. Moderating Effect of Industry Carbon Intensity on the Climate Disclosure–Loan Spread Relationship. Note. Simple slopes at high, medium, and low carbon intensity terciles. Authors' compilation (2026).

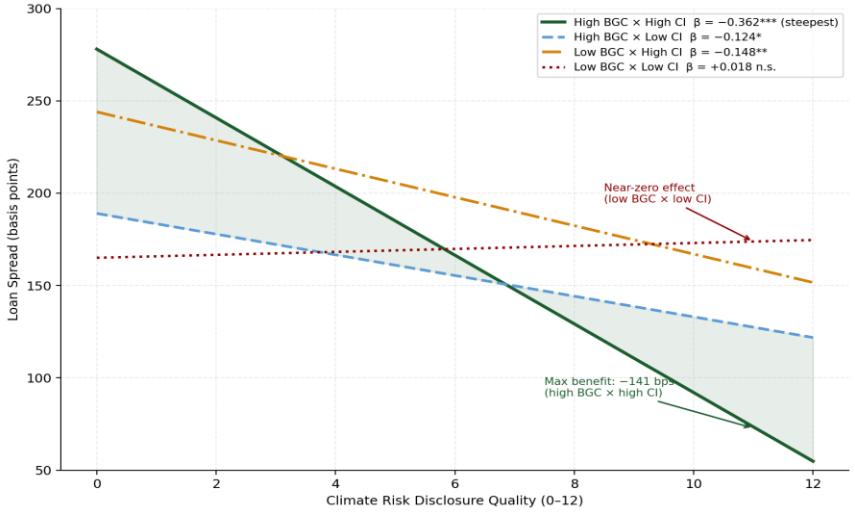

Figure 3. Three-Way Interaction: Climate Disclosure Quality × Bank Green Commitment × Carbon Intensity. Note. BGC = Bank Green Commitment; CI = Carbon Intensity. Steepest slope (High BGC × High CI, β = −0.362) confirms H4. Authors' compilation (2026).

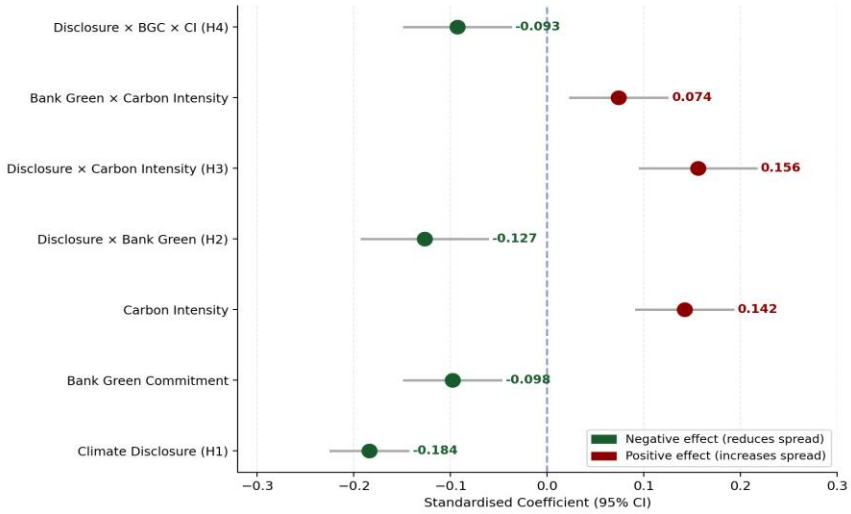

Figure 4. Coefficient Plot — Model 4 (Full Specification). Note. Points indicate standardised coefficients; horizontal lines indicate 95% confidence intervals. Green = negative effect (reduces spread); red = positive effect. Authors' compilation (2026).

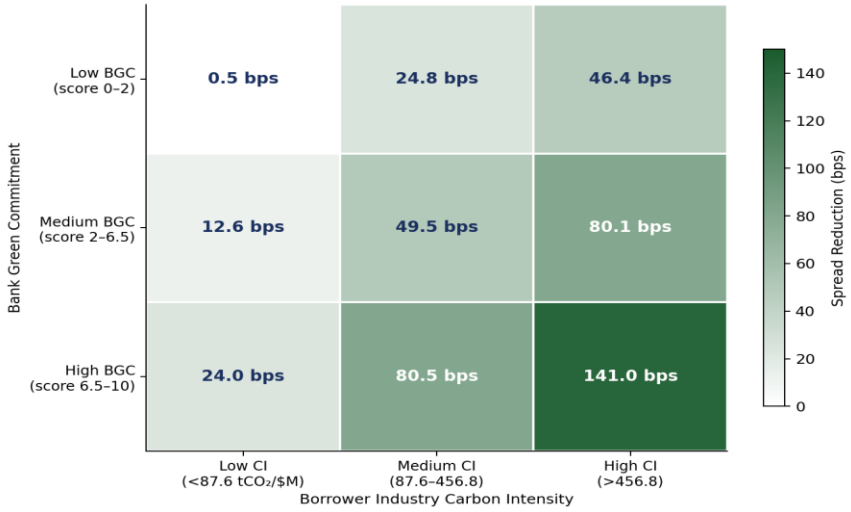

Figure 5. Loan Spread Reduction for P10 to P90 Disclosure Quality Improvement Across Bank Green Commitment and Carbon Intensity Combinations. Note. Values confirm the 141 bps maximum reduction (High BGC × High CI). Authors' compilation (2026).

Non-Price Loan Terms

Table 4 examines climate disclosure effects on non-price lending terms. Climate disclosure positively predicts loan maturity ($\beta = 0.112$, $p < 0.01$), indicating that more transparent borrowers receive longer-term financing. The bank green commitment interaction is positive and significant ($\beta = 0.087$, $p < 0.05$), confirming that this effect is amplified by bank environmental positioning. For covenant intensity, climate disclosure is negatively associated with restrictive covenants ($\beta = -0.094$, $p < 0.05$), indicating greater contract flexibility for disclosing firms.

Table 4 Climate Disclosure and Non-Price Loan Terms

Variable	Maturity	Covenant Intensity
Climate Disclosure	0.112**	−0.094*
	(0.041)	(0.046)
Bank Green Commitment	0.076*	−0.052
	(0.034)	(0.039)
Disclosure × Bank Green	0.087*	−0.043
	(0.038)	(0.042)
Carbon Intensity	−0.068*	0.105**
Controls + Fixed Effects	Yes	Yes
N	2,847	2,847
R^2	0.547	0.512

*Note. Standardised coefficients; robust standard errors in parentheses. * p < 0.05; ** p < 0.01. Authors' compilation (2026).*

Robustness Tests

Six robustness checks are conducted. First, IV estimation (2SLS) uses peer-firm average disclosure and staggered regulatory adoption as instruments. The first-stage F-statistic of 47.3 confirms instrument relevance, and the Hansen J-test (p = 0.34) confirms instrument validity; the disclosure effect remains significant in the second stage (β = −0.217, p < 0.01; Table 5). Second, firm fixed effects models confirm climate disclosure remains significant (β = −0.142, p < 0.01) and the bank green commitment interaction persists (β = −0.108, p < 0.05). Third, propensity score matching (caliper = 0.01) finds high-disclosure borrowers receive 22.3 basis points lower spreads (p < 0.01) in the matched sample (Table 6). Fourth, alternative disclosure measures — binary TCFD adoption, CDP climate score, and text-based disclosure quantity — all yield consistent results. Fifth, temporal split analysis (2022–2023 vs. 2024–2025) shows consistent interaction patterns. Sixth, regional subsamples all replicate the directional pattern, with the strongest effects in Europe.

Table 5 Instrumental Variable Estimation (2SLS)

	First Stage	Second Stage
Peer Average Disclosure (IV)	0.483***	

	First Stage	Second Stage
	(0.067)	
Regulatory Adoption (IV)	1.247***	
	(0.213)	
Climate Disclosure (instrumented)		−0.217**
		(0.079)
Bank Green Commitment		−0.104**
Disclosure × Bank Green		−0.139**
Controls + Fixed Effects	Yes	Yes
First Stage F-statistic	47.3	
Hansen J-test (p-value)		0.344
N	2,847	2,847

*Note. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

Table 6 Robustness Tests: Firm Fixed Effects and Propensity Score Matching

	Firm Fixed Effects	Propensity Score Matching
Climate Disclosure	−0.142**	−22.3 bps**
	(0.053)	(8.7)
Disclosure × Bank Green	−0.108*	
	(0.046)	
Controls	Yes	Matched

	Firm Fixed Effects	Propensity Score Matching
Fixed Effects	Firm, Year	—
N	2,847	1,624
R^2 (within)	0.412	—

*Note. Column 1: standardised coefficients. Column 2: average treatment effect in basis points. * p < 0.05; ** p < 0.01. Authors' compilation (2026).*

4. DISCUSSION

Theoretical Contributions

This study makes four contributions to sustainable finance theory. First, it extends disclosure theory to the climate risk domain by demonstrating that climate transparency generates measurable financial benefits in lending markets. The magnitude of the baseline effect — approximately 5.9 basis points per standard deviation of disclosure improvement — is economically meaningful and consistent with prior research on ESG disclosure benefits (Christensen et al., 2022).

Second, the study advances understanding of institutional heterogeneity in sustainable finance. The finding that bank green commitment strongly moderates disclosure value ($\beta = -0.127$) suggests that green-committed banks possess both greater analytical capacity for climate risk assessment and stronger incentives to reward climate-transparent borrowers. This contributes to emerging literature on green banking (Degryse et al., 2023; Weber & Scholz, 2024) by identifying specific mechanisms through which institutional sustainability commitments shape lending decisions.

Third, the study provides novel evidence on industry-level contingencies in climate finance. The finding that disclosure benefits concentrate in carbon-intensive industries ($\beta = 0.156$) is consistent with materiality-based disclosure theory: information value is highest where risks are greatest and uncertainty about transition readiness is most acute. This has direct implications for debates about universal versus sector-specific disclosure mandates.

Fourth, the three-way interaction ($\beta = -0.093$) contributes an integrative theoretical insight: climate disclosure value depends jointly on lender environmental commitment and borrower industry climate exposure. Green-committed banks use disclosure to differentiate among carbon-intensive borrowers, rewarding credible transition strategies while maintaining risk-appropriate pricing.

Practical Implications

For corporate borrowers, particularly those in carbon-intensive industries, climate disclosure represents a high-return investment in financial flexibility. Comprehensive TCFD-aligned disclosure — covering governance, strategy, risk management, and metrics — generates spread reductions of up to 141 basis points when combined with a green-committed lending relationship. Firms in high-emission industries should both invest in disclosure quality and cultivate banking relationships with sustainability-oriented institutions.

For banks, the findings suggest that building expertise in climate risk assessment enables more sophisticated pricing that rewards transparent borrowers while managing portfolio transition risk. Banks developing green finance capabilities should invest in analytical infrastructure for evaluating TCFD disclosure comprehensiveness and specificity.

For policymakers, the results provide evidence that market-based climate disclosure mechanisms influence capital allocation, but their effectiveness depends on bank environmental engagement and the materiality of borrower climate exposure. Mandatory, standardised disclosure requirements — particularly for carbon-intensive sectors — may be necessary to ensure consistent climate risk pricing. Policies supporting green banking development, such as preferential capital treatment for climate-aligned loans or central bank green refinancing facilities, would amplify disclosure benefits.

Limitations and Future Research

Several limitations warrant acknowledgment. First, the sample focuses on syndicated loans in predominantly developed markets, which may limit generalisability to bilateral lending or emerging economies with different institutional environments. Second, the manual coding of climate disclosure quality, while achieving high inter-rater reliability ($\kappa = 0.89$), involves interpretive judgement. Third, while IV and matching approaches support causal interpretation, quasi-experimental designs exploiting regulatory discontinuities would further strengthen causal claims.

Fourth, the study focuses on climate risk disclosure in isolation from other ESG dimensions. Future research should examine potential complementarities or substitution effects among environmental, social, and governance disclosures in lending contexts. Fifth, this analysis examines loan pricing and terms but not loan availability. Promising future directions include examining real investment effects of disclosure-driven financing benefits; studying bank learning curves in climate risk assessment over time; investigating the role of third-party assurance; and analysing the market impact of emerging mandatory disclosure standards such as ISSB and SEC climate rules.

CONCLUSION

This study examines how climate risk disclosure quality affects bank lending decisions, with attention to the moderating roles of bank green commitment and borrower industry carbon intensity. Analysing 2,847 syndicated loan facilities from 156 banks across 23 countries for 2022–2025, the findings confirm that higher-quality climate disclosure significantly reduces loan spreads and improves non-price lending terms. These effects are substantially moderated by bank environmental positioning and borrower industry carbon profile, with the largest benefits accruing when green-committed banks evaluate carbon-intensive borrowers with high-quality disclosure — a condition generating up to 141 basis points in spread reduction.

The findings advance sustainable finance theory by demonstrating that institutional characteristics and contextual factors jointly determine the financial value of climate transparency, moving beyond prior research focused on main effects alone. Practically, TCFD-aligned climate disclosure is a value-creating activity — particularly for carbon-intensive firms — with benefits extending to improved contract terms and longer maturities. For policymakers, the evidence indicates that disclosure-based climate regulation can redirect capital, though standardisation and green banking development policies are needed to maximise market-wide impact.

As climate risk becomes increasingly material to corporate risk profiles and financial system stability, understanding how climate transparency influences capital allocation grows in importance. This study provides evidence that market mechanisms can price climate risk when supported by credible, high-quality disclosure — offering insights relevant to the financial system's role in the transition to a low-carbon economy.

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