From Premium to Penalty: Dynamic Intermediation Incentives in the ESG Bond Market

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Abstract

This study examines economic mechanisms driving the U.S. corporate ESG bond market, highlighting the pivotal role of financial intermediaries. We find that debut green and sustainability bond issuers receive a certification subsidy via significantly discounted underwriting fees. In response, issuers exhibit transient signaling behavior by increasing symbolic disclosure without substantive improvements in ESG performance. To mitigate moral hazard, investors exercise rational skepticism toward complex sustainability bonds, granting yield discounts only to seasoned issuers with verified performance. Finally, we document an intertemporal compensation mechanism: these labeled-debt issuers face a pronounced causal penalty—higher yields or fees—on subsequent conventional debt. The findings reveal an evolutionary lifecycle in sustainable finance, from initial intermediary certification to active market selection and reputational penalties.

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1. Introduction

Financial markets are increasingly pivotal in addressing climate challenges and promoting pro-environmental corporate decision-making. To achieve global climate targets, an estimated minimum of $5 trillion must be invested annually, positioning the corporate bond market as a central mechanism for financing this transition.[1] Over the past decade, this imperative has catalyzed the exponential growth of environmental, social, and governance (ESG) debt, primarily driven by use-of-proceeds instruments such as green and sustainability bonds, as illustrated in Figure 1. Following the 2013 debut of U.S. green bonds and the 2018 emergence of multi-thematic sustainability bonds, domestic issuance volumes surged from negligible levels to a peak of over $167 billion in 2024. These two instruments now constitute the core of the U.S. ESG fixed-income landscape, contributing to a global sustainable bond market that reached approximately $6.8 trillion in cumulative issuance as of December 2025.[2] Amidst this explosive market growth, the banking sector is increasingly profiting from these transactions, with earnings from underwriting ESG-linked bonds now surpassing those from debt issuance for fossil fuel companies.[3]

Despite this explosive market growth, the economic motivations for corporations to issue ESG bonds rather than traditional debt remain fiercely debated among academics and practitioners alike. Green and sustainability bonds inherently restrict a firm's operational and investment flexibility by mandating that proceeds be exclusively dedicated to specific environmental or social projects ex ante. However, crucially, these instruments operate within a voluntary framework that frequently lacks stringent, legally binding covenants or regulatory mechanisms to enforce the achievement of these sustainable outcomes ex post. From a classical corporate finance perspective, it is counterintuitive for profit-maximizing

[1] https://www.reuters.com/business/cop/world-needs-5-trillion-annual-climate-finance-by-2030-rapid-action-2021-10-28/

[2] https://thedocs.worldbank.org/en/doc/0cbf29fe7e18a8d8a64b67ad2d0a6a7c-0340012026/original/WBG-TRE-Labeled-Sustainable-Bonds-Market-Update-2025-Q4.pdf

[3] https://www.bloomberg.com/news/articles/2021-09-29/banks-are-really-cashing-in-on-esg-bond-underwriting-green-insight

corporations to voluntarily constrain their capital allocation mechanisms without extracting a commensurate reduction in their fundamental cost of capital. Consequently, a significant concern among investors and external stakeholders is whether these labeled bonds effectively alleviate structural information asymmetry and serve as credible commitment devices, or merely facilitate opportunistic greenwashing and post-issuance moral hazard.

While an extensive literature has sought to answer this question by estimating the "greenium"—the yield compression driven by investor demand—empirical findings remain mixed. Crucially, this uniformly investor-centric focus has largely overlooked the supply-side mechanics of the primary market, specifically the pivotal role of financial intermediaries in pricing these bonds, as well as the dynamic lifecycle of issuers as they transition from debut to seasoned market participants. In this paper, we provide the first comprehensive analysis of the intermediation incentives and reputational mechanisms driving the corporate ESG bond market, and evaluate their effectiveness in incentivizing genuine corporate commitment to sustainability while mitigating initial adverse selection.

Against this backdrop, we develop testable hypotheses to delineate the underlying incentives of issuers, underwriters, and investors by integrating Tirole (2006)'s contract theory with Diamond (1991)'s theory of reputation. Our first hypothesis, the "*intermediary certification subsidy*" hypothesis, posits that underwriters absorb economic costs to provide debut issuers with front-loaded fee discounts to overcome adverse selection, which incentivizes borrowers to engage in transient "lip service" (symbolic disclosure without substantive performance). Our second hypothesis, the "*probationary reputation*" hypothesis, posits that investors treat complex sustainability labels with rational skepticism, requiring a probationary track record of repeated issuances and actively rewarding only seasoned issuers with verified ESG performance. Finally, our "*intertemporal compensation and spillover*" hypothesis posits that primary market participants enforce a strict path dependency: if an issuer subsequently reverts to conventional debt, market participants effectively claw back

the initial subsidies, imposing a penalty on the firm's broader capital structure.

Our main empirical analyses aim to delineate these hypotheses using a comprehensive sample of U.S. corporate green and sustainability bonds issued between 2015 and 2024. To mitigate selection bias and isolate the pure financial impact of the ESG label, we first use a robust nearest-neighbor matching methodology that pairs each labeled bond with a conventional counterpart from the same issuer, confirming the existence of green and sustainability financial benefits. We further disentangle these effects using an ordinary least squares (OLS) regression with high-dimensional fixed effects, finding that debut green and sustainability bond issuers secure a significant certification subsidy, paying approximately 61 to 63 basis points less in underwriting fees. Finally, to corroborate the mechanism driving this initial market entry, we evaluate firm-level ESG outcomes using a matched difference-in-differences (DiD) framework. We document that this fee subsidy elicits transient signaling behavior: debut issuers exhibit a statistically significant 1.56-point increase in their ESG disclosure scores, but show no substantive improvement in actual ESG performance.

We further examine ex post pricing dynamics to assess how the market mitigates the initial moral hazard. We find a distinct divergence based on security design. Investors grant an immediate yield discount of 21.3 basis points to inaugural green bonds due to their maturity and technical verifiability. In contrast, investors exercise rational skepticism toward multi-thematic sustainability bonds, withholding financial rewards at debut. Instead, the market treats the inaugural issuance as a probationary period, granting a 33-basis-point yield reduction only upon repeated issuance. Crucially, we document an active selection mechanism among seasoned issuers: the market completely ignores purely symbolic disclosure and grants reputational yield discounts exclusively to firms demonstrating verified, substantive ESG performance improvements.

To evaluate the broader capital structure implications, we investigate whether ESG bond issuance generates causal spillovers on the pricing of a firm's subsequent ordinary

debt. Using a stacked DiD design to address biases inherent to staggered treatment timing, we find evidence of an intertemporal compensation mechanism. Sustainability bond issuers face a severe causal penalty, with their subsequent conventional bonds yielding 22 basis points more. Green bond issuers avoid this yield spillover but face a distinct underwriter fee clawback. These results suggest that market participants strictly ring-fence the financial benefits of ESG labeling to the specific instruments and aggressively price in the elevated monitoring risks associated with a firm exiting its sustainable commitments.

Our paper contributes to four main strands of literature by providing the first comprehensive analysis of intermediation incentives and intertemporal pricing dynamics in the corporate ESG bond market. First, we extend the empirical literature quantifying the "green premium" (e.g., Zerbib (2019); Larcker and Watts (2020); Baker et al. (2022b)) and the pricing of environmental risks in conventional bonds (e.g., Huynh and Xia (2021); Duan et al. (2025); Seltzer et al. (2022)). Because prior research focuses almost exclusively on investor-driven yield spreads, it has produced highly fragmented empirical results. We address this critical gap by introducing a novel supply-side measure: underwriting fee discounts at issuance. Following the foundational insight that researchers must not "ignore the fees" in corporate borrowing (Berg et al. (2016)), we demonstrate that the primary financial advantage of ESG bonds is frequently embedded in intermediary-negotiated gross spreads rather than solely in headline yield differentials.

Second, our findings advance the literature that disentangles substantive corporate sustainability from symbolic signaling and opportunistic "greenwashing" (e.g., Marquis et al., 2016; Krueger et al. (2020)). Recent empirical evidence highlights how firms strategically exploit sustainable frameworks, such as by divesting polluting assets to artificially improve ESG ratings without reducing aggregate industrial pollution (Duchin, Gao, and Xu, 2025), or by exhibiting ex-post ESG deterioration following the issuance of low-transparency sustainability-linked loans (Kim et al. (2025)). We extend this literature by documenting

that debut ESG bond issuers frequently engage in transient signaling behavior—inflating reporting disclosures to secure entry subsidies without executing substantive environmental improvements. In doing so, we refine the expanding literature on non-pecuniary motives in asset pricing (e.g., Heinkel et al. (2001); Fama and French (2007); Hartzmark and Sussman (2019); Pastor et al. (2022); Krueger et al. (2020); Bolton and Kacperczyk (2021); Ilhan et al. (2023)). We demonstrate that pro-environmental preferences do not equate to blind capital subsidization; instead, investors exhibit acute economic rationality, actively filtering out symbolic disclosures and granting reputational yield discounts exclusively for verified ESG performance improvements.

Third, we bridge the sustainable finance literature with classical theories of financial intermediation and reputation. Intermediaries alleviate adverse selection and moral hazard through delegated monitoring (Holmstrom and Tirole (1997); Tirole (2006)) and serve as crucial certifiers of firm value (**?**), mechanisms empirically supported in modern debt markets (e.g., Gustafson et al. (2021)). Simultaneously, borrowers must navigate a probationary period to establish reputational capital (Diamond (1991)). Applying these frameworks, we document the strategic role of underwriters in the sustainable debt market. We provide the first empirical evidence of an intermediary certification subsidy that facilitates debut market entry, demonstrating that ESG market expansion is driven as much by underwriter competition and supply-side gatekeeping as by non-pecuniary investor demand.

Finally, this paper contributes to the literature on capital structure path dependency and cross-market pricing spillovers. Although extensive prior research investigates information spillovers between equity and debt markets (Gebhardt et al. (2005); Choi and Kim (2018)), we provide the first evidence of an intertemporal compensation mechanism linking an issuer's ESG debt signaling to the pricing of its subsequent conventional debt. In doing so, we challenge the prevailing view—advanced by Flammer (2021) and Tang and Zhang (2020)—that green issuance confers generalized, firm-wide positive externalities. Instead, we

document that primary market participants effectively recoup their initial certification subsidies. This behavior is akin to the rent extraction dynamics in sequential debt relationships identified by Hale and Santos (2009). We show that exiting the sustainable debt framework imposes a multi-channel causal penalty, manifesting as pronounced yield premiums and elevated underwriting fees on subsequent conventional debt. This dynamic demonstrates that markets aggressively price the risks of transient sustainability commitments, strictly ring-fencing the benefits of ESG labeling to the instrument level rather than reducing the firm's aggregate cost of capital.

The remainder of this paper proceeds as follows. Section 2 outlines the institutional background of project-specific sustainable financing. Section 3 develops the theoretical mechanisms and hypotheses. Section 4 describes the data and sample characteristics. Section 5 presents the primary empirical results, and Section 6 concludes.

2. Institutional details

"Use-of-proceeds" instruments are fixed-income securities in which the issuer commits to using the proceeds exclusively to finance or refinance specific projects with environmental or social benefits. According to Bloomberg's methodology, these instruments—comprising green, social, and sustainability bonds—are identified using an indicator that determines whether the security meets evaluation criteria based on the issuer's public disclosures. For corporate and sovereign issuers, the primary requirement is that the offering documentation, such as a prospectus or term sheet, explicitly states that the net proceeds are dedicated entirely to projects with defined sustainable outcomes.

Unlike "sustainability-linked" bonds, which are general-purpose instruments where pricing terms (e.g., coupon step-ups) are tied to a firm's post-issuance ESG performance, use-of-proceeds bonds are strictly tied to the nature of the activities being funded. Within this project-specific universe, this study focuses on green bonds and sustainability bonds. We

exclude social bonds from the primary analysis because of their relatively small market share in the corporate sector and to maintain a focused examination of environmentally oriented projects.

The exclusion of social bonds is supported by the SIFMA Research (2023) quarterly report on fixed-income markets for the period spanning 2021 through 2023. While social bonds hold a 13.6% share globally, they account for a negligible 1.7% of the U.S. domestic labeled market. In practice, the classification and market integrity of these labeled instruments rely heavily on voluntary frameworks established by the International Capital Market Association (ICMA). Green bonds are specialized fixed-income securities where the issuer commits proceeds exclusively to projects with defined environmental benefits, such as renewable energy, pollution control, or biodiversity conservation. These issuances are expected to align with ICMA's Green Bond Principles (GBP), which provide guidelines for transparent reporting on environmental objectives and estimated impact. Detailed project categories are reported in Appendix Table A.1. Green bonds dominate the global landscape, accounting for approximately 70% of total labeled issuance.

In contrast, a sustainability bond acts as a hybrid instrument, funding a mixture of green and social projects. To mitigate greenwashing and maintain standardization, these issues typically follow ICMA's Sustainability Bond Guidelines (SBG), which are aligned comprehensively with both the GBP and the Social Bond Principles (SBP). These have emerged as a significant category in the U.S., representing 53% of domestic issuance. While a green bond focuses solely on environmental impact, a sustainability bond broadens its scope to address social objectives—such as affordable housing or access to essential services—alongside environmental goals. For the remainder of this paper, we collectively refer to this subset of green and sustainability bonds as ESG bonds.

3. Hypothesis development

The fundamental problem embedded within the corporate ESG bond market is a severe degree of structural information asymmetry. Because the U.S. market is governed largely by voluntary frameworks rather than strict regulatory mandates, this asymmetry manifests sequentially as acute adverse selection at market entry and pervasive moral hazard post-issuance. Specifically, it is difficult to distinguish a genuinely sustainable enterprise from an opportunistic entity seeking a primary market pricing premium through symbolic "cheap talk" without enacting costly operational changes.

To address these frictions, our theoretical framework shifts the focus to the pivotal role of financial intermediaries, a dimension frequently overlooked in the extant literature, which has primarily concentrated on investor-side pricing dynamics. By integrating Tirole (2006)'s contract theory—specifically addressing managerial agency problems, participation constraints, and hidden actions—with Diamond (1991)'s reputation theory, we develop a multi-stage framework tailored to the ESG debt market. This integrated approach generates testable predictions regarding how intermediation pricing subsidizes initial market entry, how market monitoring drives ex-post shifts in borrower-level ESG performance, and whether these reputational dynamics create causal spillover effects across a firm's broader capital structure.

The first hypothesis proposes that initial market entry is characterized by an acute adverse selection problem. In the absence of a track record, investors cannot readily distinguish between a genuinely high-quality ESG issuer and an opportunistic greenwasher seeking a primary market premium without committing to substantive operational changes. We posit that in this environment, underwriters—rather than investors—predominantly absorb the economic costs of issuance. By offering significant fee discounts, underwriters strategically compete for market share in this nascent asset class, acting as delegated monitors who provide a front-loaded subsidy to satisfy the issuer's participation constraint. However, because

primary market investors cannot immediately verify long-term outcomes, the incentive compatibility of this initial contract may lead to low-cost signaling rather than substantive action. Consequently, the "*intermediary certification subsidy*" hypothesis predicts that debut ESG bond issuers will receive significantly discounted underwriting fees and, in response, will exhibit a transient increase in symbolic ESG disclosure without executing costly, substantive improvements in ESG performance.

The second hypothesis posits that as initial information asymmetry is mitigated, the market's focus shifts to resolving ex-post moral hazard. We hypothesize that the financial benefits of issuance are not uniform but depend on the issuer's participation frequency and the perceived credibility of the instrument. Drawing on Diamond (1991), new borrowers lack reputational capital and must successfully navigate a probationary period before the market validates their long-term commitments. While debut issuers are incentivized with front-loaded fee discounts to enter the market, repeat issuers encounter rational skepticism regarding their motives. Reputational yield discounts are therefore not granted immediately; rather, they are earned selectively by seasoned issuers with a track record of repeated, verified performance. This "*probationary reputation*" mechanism suggests that the market differentiates between issuer types, penalizing those perceived as treating labeled bonds as a recurring arbitrage opportunity while rewarding seasoned entities that demonstrate substantive ESG performance improvements rather than mere symbolic disclosure.

The third hypothesis considers the path dependency and intertemporal pricing dynamics created by issuing sustainable debt. Rather than viewing a firm's return to the conventional corporate bond market strictly as a reputational exit, we posit an intertemporal compensation mechanism enforced by primary market participants. To facilitate initial market entry, underwriters and investors provide front-loaded financial rewards, such as certification fee subsidies and yield discounts. However, when issuers subsequently raise capital in the conventional (non-labeled) debt market, these participants effectively compensate themselves

for the initial financial benefits and ongoing monitoring costs. This creates a "reward first, penalty later" dynamic where initial benefits are clawed back across the firm's broader capital structure. Consequently, the "*intertemporal compensation and spillover*" hypothesis predicts a causal penalty on a firm's subsequent conventional debt issuances, manifesting as significantly higher borrowing costs and issuance fees for firms that have previously participated in the ESG bond market.

4. Data and sample

4.1. Bond-level data

The dataset is compiled from Bloomberg's fixed income database to examine the universe of active U.S. corporate green and sustainability bonds issued between January 2015 and December 2024. While green bonds span the full sample period, the earliest sustainability bond in the dataset appears in 2019. To provide a baseline for comparison, primary credit market characteristics for conventional debt are sourced from the Mergent Fixed Income Securities Database (FISD). The two datasets are integrated via unique nine-digit CUSIP numbers to ensure precise identification of labeled bonds within the broader corporate bond universe.

The analysis is restricted to USD-denominated corporate debt, including Medium-Term Notes (MTNs) and Yankee bonds. To ensure data consistency, we exclude bonds with maturities of less than one year or those with missing offering yield data, as the latter is a critical variable for estimating borrowing costs. Given that offering yields are typically reported for fixed-rate issues, the sample is confined to securities with fixed coupons. Yield spreads are calculated as the difference between a bond's yield to maturity and the corresponding point on the Treasury yield curve, linearly interpolated to match the bond's maturity and issuance date. Daily Treasury rates are sourced from the U.S. Department of the Treasury.

To ensure statistical robustness and mitigate the influence of outliers, all continuous variables are winsorized at the 1st and 99th percentiles of their pooled distribution. This filtering and cleaning process yields a final analytical sample comprising 400 green bonds, 127 sustainability bonds, and 33,238 conventional bonds. This comprehensive dataset represents the universe of active U.S. corporate ESG debt and provides the empirical basis for the subsequent analysis. Figure 3 illustrates the temporal evolution of U.S. corporate ESG bond issuance within this sample. While green and sustainability bonds constitute a small fraction of the total corporate debt universe, the data reveal an accelerating integration of labeled instruments. The ESG bond share—the proportion of labeled bonds relative to total issuance—grew exponentially through 2022, mirroring global trends in sustainable finance. Notably, while the green bond share shows steady growth, the sustainability bond share peaked in 2021. These patterns suggest that the U.S. market has transitioned from early adoption toward a more mature phase characterized by diversified ESG-labeled financing.

Table 1, Panel A presents summary statistics for these labeled bonds relative to the broader universe of ordinary corporate debt in the FISD. The combined ESG sample of 527 individual issues represents 449 unique issuer-years across 297 unique firms.[4] Within this sample, bonds are exclusively tagged as either green or sustainability; no instrument holds both labels simultaneously.[5] Regarding bond characteristics, labeled issues are significantly larger than conventional ones, with the average ESG bond size exceeding $620 million—more than 50% greater than the average size of ordinary bonds. This difference likely reflects the substantial funding requirements of environmental and sustainability projects relative to traditional corporate initiatives. Consistent with the long-term nature of such projects, labeled bonds also exhibit significantly longer maturities, averaging 10.6 years compared to 7.2 years for non-ESG debt.

[4]Specifically, *#Bond issuer-days* refers to the aggregate number of unique dates on which firms issued labeled debt; *#Bond issuer-years* represents the total unique calendar years in which firms participated in the labeled market; and *#Bond issuers* denotes the count of unique corporate entities.

[5]However, ten dual-label issuers are identified in Appendix Table A.2. These firms typically exhibit an issuance pattern that begins with the green label before transitioning to sustainability bonds.

To ensure a uniform measure of credit quality, we construct a composite rating by averaging available issuance-date ratings from Moody's, S&P, and Fitch. For bonds with only a single available rating, that specific assessment is adopted to avoid sample attrition. We convert these qualitative alphabetical scales into a numerical range from 1 (C) to 21 (AAA), yielding an average rating of approximately 14 (BBB+/Baa1) across all bond types. As illustrated in Figure 2, sustainability bonds are predominantly clustered in the upper "A" categories, while green bonds exhibit a peak at the BBB+ level. Notably, high-yield debt (rated below B-) remains significantly underrepresented in the green segment relative to the broader conventional universe. This distribution suggests that while the conventional market accommodates a wide range of credit risk, the green bond market remains primarily characterized by investment-grade issuers.

4.2. Firm-level data

Firm-level financial data are sourced from S&P Compustat, which provides standardized accounting metrics and industry identifiers for the issuers in our sample. To account for firm-level heterogeneity, we construct several key control variables, including *Size*, calculated as the natural logarithm of total assets, and *Return on assets* (ROA), defined as operating income before depreciation divided by total assets. We also include *Leverage*, which measures the ratio of total debt to total assets, and *Liquidity*, which captures the ratio of net current assets to total assets. To mitigate the influence of outliers, all continuous financial ratios are winsorized at the 1st and 99th percentiles of their empirical distribution.

ESG-related metrics are obtained from Bloomberg, which utilizes a systematic, bottom-up aggregation of over 2,000 industry-specific data fields sourced exclusively from public filings and sustainability reports. We primarily utilize the *ESG score* (on a 0 to 10 scale), which evaluates how effectively a firm manages financially material ESG risks relative to its industry peers. This scoring methodology prioritizes quantitative outcomes over qualitative policies and rates companies across three distinct pillars: environmental, social, and corpo-

rate governance. In the subsequent analysis, we utilize both the composite score and the individual pillar scores to examine how specific ESG dimensions correlate with bond pricing and underwriting incentives.

In addition to performance, we incorporate the *ESG disclosure score*, a metric that evaluates a company's reporting transparency and completeness on a scale of 0 to 100. Rather than measuring actual environmental or social impact, this score quantifies the volume of publicly disclosed data points across more than 120 categories, including greenhouse gas emissions, board diversity, and executive compensation. The disclosure score serves as a critical proxy for transparency, reflecting the extent to which a company provides ESG-related information to the market. To investigate the dynamic analysis of ESG performance and transparency, we construct a firm-year panel dataset that requires at least three years of overlapping observations for both metrics. This longitudinal approach reveals a robust positive relationship; the mean firm-level time-series Pearson correlation is 0.71, with the distribution of coefficients heavily skewed toward positive values. [6]

Table 1, Panel B, presents firm-level summary statistics for the 214 ESG bonds issued by public firms, which correspond to 179 unique firm-year observations.[7] All accounting variables are measured as of the fiscal year-end immediately preceding the bond issuance. To ensure a robust comparison, the control group is restricted to public firms identified in the Bloomberg database as active bond issuers that have not participated in the green or sustainability bond markets. For each characteristic, we compute the average across all firms in the comparison group within the same two-digit SIC (Standard Industrial Classification) industry and year. As shown in the table, ESG bond issuers are, on average, larger and more profitable (higher ROA) than their conventional bond-issuing peers.[8] Conversely, these

[6]While the high correlation indicates that improvements in ESG disclosure often coincide with enhanced risk management within the same firm, the metrics remain distinct; the Disclosure Score measures the volume of information, while the Performance Score evaluates the materiality of outcomes.

[7]Because Bloomberg primarily covers mid-to-large-cap public entities, ESG metrics are not available for all bond issuers in the primary sample.

[8]ESG issuers are defined as firms that have issued at least one green or sustainability bond.

issuers maintain more conservative capital structures, characterized by lower leverage and liquidity ratios. Consistent with their market positioning, ESG bond issuers also maintain significantly higher ESG disclosure and performance ratings across all analyzed metrics.

4.3. Univariate analysis

A simple univariate analysis is reported in Table 2. Non-ESG bonds in each panel exclude bonds labeled explicitly as green or sustainability; thus, ordinary bonds in Panel A do not include any sustainability bonds. Panel A shows that, on average, green bonds exhibit a 1.31% lower offering yield, incur similar underwriting fees, and have larger issuance sizes than ordinary bonds, suggesting potentially lower perceived risk. Consistent with previous findings by Baker et al. (2022b), green bonds also have lower coupon rates and significantly longer maturities, with an average maturity difference of 3.84 years. The analysis reveals statistically significant differences across all variables between green and ordinary bonds, except for underwriting fees and credit rating characteristics.

In Panel B, sustainability bonds exhibit patterns similar to those of green bonds. Although sustainability bonds exhibit slightly lower underwriting fees than ordinary bonds, this difference is not statistically significant. Notably, sustainability bonds and non-ESG bonds share comparable callable features. Interestingly, the key result of this paper—a significant underwriting fee discount after matching—is particularly remarkable given that the simple univariate analysis alone did not suggest such a difference.

5. Main results

The primary objective of this research is to understand the economic mechanisms driving the U.S. corporate ESG bond market. Moving beyond the traditional focus on yield spreads, this study evaluates a broader "green benefit" that accounts for both yield reductions and the critical role of financial intermediaries in providing underwriting fee discounts. The analysis

is structured to reveal an evolutionary lifecycle for ESG issuers, characterized by a shift from initial intermediary-led certification to active market selection based on verified operational substance. This lifecycle begins at market entry, where the study tests for a certification subsidy intended to incentivize first-time participation.

Furthermore, the results examine whether the financial impact of entering the ESG market extends to a firm's broader capital structure by evaluating causal spillovers on the pricing of subsequent ordinary, non-labeled debt. The framework specifically addresses the potential for a greenwashing penalty. Finally, the study explores how firm-level ESG information—specifically the divergence between symbolic transparency and tangible performance—functions as a monitoring and reputation mechanism for primary market participants.

5.1. Primary market incentives for ESG issuance

5.1.1. Matching methodology

The primary objective of this analysis is to identify the presence of a "green" or "sustainability" premium by calculating the difference in offering yields between a labeled bond and its most comparable conventional counterpart. Focusing on the offering yield at issuance ensures that borrowing costs are accurately reflected within the primary market. While the "green premium" is traditionally defined by this yield differential, this study expands the scope of financial incentives to include the underwriting fee, thereby capturing the pricing dynamics between issuers and financial intermediaries. Given the non-randomized nature of ESG bond issuance, a robust nearest-neighbor matching methodology is employed to mitigate selection bias and isolate "greenness" or "sustainability" as the primary determinant of these cost differentials.

Following the framework established by Larcker and Watts (2020) and extending the methodology of Flammer (2021), we restrict the control group to ordinary bonds issued by the

same firm to ensure identical issuer-level risk. The final sample consists of 400 green bonds from 233 unique issuers and 127 sustainability bonds from 75 unique issuers. To maintain a clean comparison, the matching pool for each labeled category strictly excludes other labeled instruments; for instance, sustainability-labeled bonds are not utilized as controls for green bonds. This process yields an average of 20 potential ordinary bond matches per issuer, providing a robust foundation for the empirical analysis.

The matching procedure utilizes the Mahalanobis distance metric to pair each labeled bond with a conventional bond from the same issuer based on five essential characteristics: (i) the logarithm of the issuance amount, (ii) the coupon rate, (iii) years to maturity, (iv) credit rating, and (v) issuance date (year-month). Although an exact match on credit ratings was initially attempted, it is ultimately included as a matching covariate to preserve sample size and account for diverging rating notches. Furthermore, as 93% of the sample lacks security-level seniority data in the Mergent FISD, seniority is excluded from the matching parameters to maintain data integrity.

Following the matching procedure, the average treatment effect is calculated to determine the impact of the ESG label across various outcome variables. For each bond in the sample, the observed outcome of a labeled bond is compared against the estimated counterfactual outcome of its matched non-labeled counterpart. This approach allows for a precise estimation of the financial incentives—or penalties—attributed specifically to the green or sustainability designation.

5.1.2. The green benefit

The central hypothesis of this study posits that green bond issuers incur a lower cost of debt driven by reduced information asymmetry associated with the ex-ante disclosure of the use of proceeds. This transparency mechanism is intended to lower the risk perception of green securities, inducing investors to accept lower returns in exchange for clarified capital allocation. Furthermore, this study identifies a critical role for financial intermediation in

shaping these incentives; rather than investors solely subsidizing issuers through lower yields, underwriters appear to absorb economic costs to facilitate strategic market entry.

Table 3 presents these results, highlighting a distinct financial advantage in the primary market: the underwriting fee discount. Unlike most prior literature, which focuses primarily on yield differentials, this analysis examines the direct compensation received by financial intermediaries. The underwriting fee—defined as the percentage difference between the price investors pay and the net proceeds the issuer receives—is consistently lower for green bonds. The first column indicates that green bond issuers pay, on average, 0.78% less in underwriting fees compared to conventional issuers. This reduction represents a direct monetary transfer to the issuer, effectively increasing the net proceeds from the bond sale.

Regarding the cost of borrowing, Column (2) reports an overall "greenium" of -20 basis points in offering yields, a result that is both statistically significant and economically meaningful. For the average note size, this reduction translates to approximately $1.3 million in interest savings. While Larcker and Watts (2020) documents no greenium in the municipal market, and Flammer (2021) finds no significant pricing difference in corporate bonds, this study aligns more closely with recent evidence from Caramichael and Rapp (2022) and Baker et al. (2022b), who report modest yield reductions ranging from 5 to 8 bps. The -20 bps effect observed here is notably larger, reflecting a 3% relative decrease in borrowing costs relative to the average sample yield. This suggests that the green label serves as a mechanism for tangible capital cost reduction rather than merely a reputational signal.

However, when adjusting for the risk-free rate, the yield spread—defined as the difference between the bond's issuance yield and the corresponding benchmark Treasury yield—shows only a statistically insignificant reduction of 0.05%. This discrepancy implies that while the absolute headline yield at issuance is lower for green bonds, the risk premium over the benchmark is not significantly compressed. This finding is consistent with Flammer (2021), suggesting that the primary advantage to issuers lies in the absolute cost of funds and fee

structures rather than a fundamental repricing of credit risk.

The temporal evolution of the green benefit, illustrated in Figure 4, reveals that the greenium has diminished significantly over time. While early periods reflect a willingness to pay by ESG-preferred investors, this trend reversed by 2023, when the yield differential turned positive. This shift is likely attributable to rising interest rates, changing investor preferences, and growing market skepticism regarding greenwashing. Interestingly, as the yield benefit erodes, the underwriting fee discount has become an increasingly critical component of the financial advantage, particularly after 2020. This persistence suggests strategic supply-side incentives, with financial intermediaries willing to accept lower margins to establish market presence and capture future cross-selling opportunities in the expanding green finance sector.

5.1.3. The sustainability benefit

Sustainability bonds provide issuers with significantly larger underwriting fee discounts than green bonds. As shown in Table 4, sustainability bond issuers pay, on average, a 2% lower underwriting fee than equivalent conventional bond issuers—a reduction three times larger than the 0.78% discount observed for green bonds. Similarly, while both bond types exhibit lower initial yields relative to comparable conventional debt, sustainability bonds show a substantially greater yield advantage of approximately 43 basis points. This highlights a sustainability premium that is more than double the benefit observed for green bonds. These results underscore the significantly stronger financial incentives associated with the sustainability label.

The cost advantages of green bonds have evolved differently from those of sustainability bonds over the past decade. Whereas the green premium has steadily declined as the market matures, sustainability bonds continue to offer substantial financial benefits through 2024. Even in 2023—a year when green bonds lost their yield advantage—sustainability bonds maintained a yield reduction of roughly 42 basis points compared to ordinary bonds. Fur-

thermore, they retained significant underwriting fee discounts, highlighting ongoing investor preference for the sustainability bond structure. While green bonds still confer some issuer benefits through lower fees and yields, these advantages are smaller and appear to diminish as market saturation increases. In sum, the green premium has weakened over time. In contrast, the sustainability premium remains robust, likely reflecting the relatively new nature of the sustainability bond market compared to the more mature green bond market.

5.2. Heterogeneous effects of debut and seasoned issuance

In this section, we examine whether the financial impacts of ESG issuance are constant or contingent upon the issuer's market experience. Theoretically, a firm's inaugural entry represents an adverse selection problem; underwriters, acting as reputational intermediaries, may offer a "*certification subsidy*" to satisfy the firm's participation constraint (Tirole, 2006). Once this initial information asymmetry is mitigated, the market's focus shifts to moral hazard, where pricing in subsequent issuances reflects the security's efficacy as a commitment device. To test this heterogeneity, we estimate the following specification at the bond level:

$$Y_{ib} = \alpha + \beta_1 \cdot First_b + \beta_2 \cdot Repeat_b + \gamma \cdot X_{ib} + \eta_i + \delta_{mrt} + \epsilon_{ib} \tag{1}$$

Y_{ib} represents the underwriting fee or offering yield. $First_b$ is an indicator for the issuer's inaugural sustainability or green bond, while $Repeat_b$ identifies all subsequent labeled issuances. The vector X_{ib} includes bond-level controls for size, callability, and seniority. To ensure robust identification, we employ issuer fixed effects (η_i) alongside maturity-rating-year interaction fixed effects (δ_{mrt}) following Baker et al. (2022b), thereby controlling for time-varying term structures and credit risk premiums. The coefficient β_1 captures the initial benefit of doubt relative to conventional bonds, while β_2 reflects the reputation-maintenance effect for seasoned ESG issuers.

Table 5 reports these results for sustainability bonds (Panel A) and green bonds (Panel

B). Consistent with our first hypothesis regarding the intermediary certification subsidy, Columns 1–3 show that $First_b$ is associated with a significant reduction in underwriting fees, consistent with an entry subsidy. Specifically, issuers receive a significant fee discount of approximately 61–63 bps upon market entry relative to conventional bonds. Conversely, the coefficient on $Repeat_b$ is smaller in magnitude and statistically insignificant. This suggests that the marginal informational value of ESG labeling diminishes as the market updates its priors, leading intermediaries to withdraw the certification subsidy for subsequent issuances.

Columns 4–6 reveal a distinct divergence in yield pricing between green and sustainability bonds. For green bonds, the market grants a significant yield discount of 21.3 basis points at the inaugural issuance, with no statistically significant effect for subsequent ones. Conversely, sustainability bonds receive no significant discount at debut, but experience a 33-basis-point reduction upon repeated issuance. This divergence likely stems from differences in maturity and transparency between the two markets. The green bond market benefits from over a decade of standardization and single-thematic project clarity, enabling immediate verification that mitigates adverse selection at entry. Conversely, the nascent sustainability bond market is characterized by multi-thematic, often vague goals, which heighten information uncertainty and rational skepticism (Diamond, 1989). Consistent with the second hypothesis, investors consequently treat inaugural sustainability issuances as a probationary period to monitor for potential moral hazard, withholding financial rewards until the issuer establishes a consistent track record. The eventual discount on repeated issuances signals that the firm has successfully transitioned from a state of uncertainty to a credible promise-keeping device, thereby earning the market's trust.

Collectively, these results indicate that the marginal financial benefit of ESG labeling is most pronounced at the point of market entry. Both bond types enjoy a significant certification subsidy in the form of reduced underwriting fees upon their debut, reflecting the intermediary's role in incentivizing initial participation. However, a corresponding yield dis-

count is unique to inaugural green bonds and functions strictly as an entry phenomenon, vanishing as the issuer establishes a repeat presence. These findings suggest that while underwriters provide a bridge for initial entry, primary market investors remain wary of repetition—likely due to persistent greenwashing concerns or the lack of mandatory ex post enforcement. This dynamic challenges traditional relationship-banking models; in the ESG market, where hidden actions are difficult to monitor, repeated issuance does not automatically yield a "reputational premium," but may instead expose the issuer to diminishing marginal returns on its sustainability signal.

5.3. Spillover effects of inaugural ESG bond issuance

Our results thus far indicate that issuers derive direct financial benefits from ESG labeling, primarily through lower borrowing costs than with conventional debt. However, these initial incentives may not exist in isolation. This section examines whether a firm's debut in the ESG debt market generates causal spillovers on the pricing of its subsequent ordinary (non-labeled) debt. We investigate whether the adoption of ESG bonds signals a credible, firm-wide commitment to sustainability that lowers overall borrowing costs across the capital structure—or, conversely, whether it triggers an intertemporal compensation mechanism. Specifically, this tests our third hypothesis regarding whether primary market participants effectively 'claw back' their initial entry subsidies by imposing a yield or fee penalty when issuers return to the ordinary debt market.

To isolate this causal effect, our empirical strategy must address the known econometric biases that emerge in staggered difference-in-differences (DiD) frameworks when treatment effects vary over time Goodman-Bacon (2021); Baker et al. (2022a). Because standard two-way fixed effects (TWFE) estimators can implicitly use previously treated units as controls, they risk yielding severely biased coefficients. We resolve this methodological challenge by employing a stacked DiD design at the bond level. Specifically, we create event-specific cohorts that pair each treated issuer with a clean control group of never-treated firms within

a five-year window ($t \in [-5, +5]$) surrounding the inaugural issuance. Appending these cohort datasets allows us to estimate the following specification:

$$Y_{ib} = \alpha + \beta_1 \cdot \text{Spillover}_{it} + \gamma \cdot X_{ib} + FE + \epsilon_{ib} \tag{2}$$

where Y_{ib} represents the offering yield or underwriting fee for an ordinary bond b issued by firm i. The variable of interest, $Spillover_{it}$, is an indicator equal to one for ordinary bonds issued by treated firms strictly after the offering date of their inaugural green or sustainability bond, and zero otherwise. Following the corporate bond literature, we utilize a five-year event window ($t \in [-5, +5]$) around the inaugural issuance to ensure a sufficient sample of subsequent ordinary debt issuances. The vector X_{ib} controls for bond-specific characteristics, including size, maturity, credit rating, callability, and seniority. To ensure robust identification, we include issuer-by-cohort and year-by-cohort fixed effects. This structure ensures that treated issuers are compared only against a clean control group of never-treated firms within the same temporal window, effectively eliminating contamination from previously treated units. The coefficient β_1 estimates the average treatment effect on the treated, specifically isolating the shift in pricing dynamics for conventional debt triggered by the firm's initial ESG market signal.

The results in Table 6 provide robust evidence of a significant yield penalty associated with entry into the sustainability debt market. Panel A reveals that issuing sustainability bonds imposes a statistically significant premium on subsequent conventional debt yields. Our most stringent specification (column 6) indicates a 22-basis-point increase in offering yields for ordinary bonds issued following a sustainability debut. For a benchmark issuance of \$500 million, this spillover effect translates to approximately \$1.1 million in additional annual interest expense. This substantial increase in the cost of capital suggests that the explicit performance commitments of sustainability bonds lead investors to subject the issuer's non-labeled debt to stricter scrutiny or higher monitoring costs. Notably, we find no

corresponding effect on underwriting fees for these issuers, suggesting this penalty is driven by investor demand rather than intermediary pricing.

In contrast, Panel B shows that green bond issuance generates no significant spillover effects on subsequent ordinary debt yields. However, we identify a distinct penalty imposed by financial intermediaries. While underwriters appear to provide a subsidy at market entry, they effectively claw back this discount by charging significantly higher fees when a green bond issuer returns to the conventional market. This suggests an intertemporal compensation mechanism on the part of underwriters rather than a shift in investor risk perception.

Consequently, rather than creating positive firm-wide spillovers, entering the ESG market imposes a multi-channel penalty: investors penalize the subsequent ordinary debt of sustainability bond issuers, while underwriters penalize green bond issuers. These findings are consistent with a market that aggressively prices in monitoring costs and strictly ring-fences the financial benefits of ESG labeling to the specific instruments themselves, rather than the issuing entity as a whole.

5.4. ESG bond issuance and firm-level ESG outcomes

In this section, we present supplementary evidence linking ESG bond issuance to broader firm-level ESG outcomes, thereby corroborating the mechanisms driving our primary pricing results. First, we examine how corporate ESG profiles—encompassing both substantive performance and reporting transparency—evolve following a firm's initial and repeated market entries. Second, we isolate the temporal dynamics of these dual ESG dimensions, specifically by following a firm's inaugural issuance and contrasting the post-entry trajectories of green and sustainability bond issuers. Finally, we test the reputation hypothesis by investigating whether an issuer's ex ante ESG track record yields financial incentives during seasoned bond offerings.

5.4.1. Data and methodology

Our primary outcome variables are the firm-level ESG score and the ESG disclosure score, both sourced from Bloomberg. The ESG score measures actual performance and risk management, evaluating how a company handles material ESG issues relative to peers through quantitative outcomes (e.g., emission reductions). In contrast, the ESG disclosure score measures transparency by quantifying the completeness of the company's ESG data. While these measures are highly correlated, analyzing them jointly reveals potential divergences between transparency in reporting and tangible outcomes. Specifically, this distinction tests whether issuers fulfill their use-of-proceeds commitments through substantive operational improvements or merely engage in symbolic signaling—"greenwashing"—by increasing reporting without executing real environmental action. Disentangling these two effects to evaluate the true efficacy of ESG bonds is a central focus of this analysis.

To empirically examine the causal impact of the first labeled bond issuance on these firm-level outcomes, we employ a matched difference-in-differences (DiD) framework. This approach is designed to mitigate endogeneity concerns related to the voluntary nature of labeled bond issuance, as issuers may differ systematically from non-issuers in observable ways. Specifically, for each of the 179 public firms in our sample that issued a labeled bond, we construct a matched control group of non-issuing firms in the same industry. Following Flammer (2021), we utilize nearest neighbor matching based on the Mahalanobis distance metric to pair each treated firm with a control firm in the year immediately preceding the bond issuance.

The propensity scores used for this matching are computed from a logistic regression predicting labeled bond issuer status based on 12 criteria: the baseline levels of ESG score, ESG disclosure score, firm size, leverage, return on assets (ROA), and liquidity, as well as the year-over-year growth in these six variables from $t-2$ to $t-1$. Including the baseline ESG metrics ensures both groups exhibit similar ex-ante ESG performance, while controlling

for their growth rates confirms their pre-issuance trajectories were strictly parallel. Figure 5 provides a covariate balance plot demonstrating the effectiveness of this matching procedure. Using this matched sample of treated and control firms, we estimate the aggregate treatment effect via a panel regression framework. We specify the following baseline difference-in-differences regression:

$$Y_{it} = \alpha + \beta_1 \cdot \text{Labeled Bond}_{it} + FE + \epsilon_{it} \tag{3}$$

where i indexes firms and t indexes years. Y_{it} is the outcome variable of interest (e.g., ESG score or ESG disclosure score). The variable $Labeled_Bond_{it}$ is an indicator equal to one if firm i has issued a labeled bond by year t, and zero otherwise. The specification includes firm and industry-by-year fixed effects. The coefficient of interest, β_1, measures the change in the outcome variable following the bond issuance relative to the matched control group. Standard errors are clustered at the two-digit SIC industry level.

To capture the heterogeneous effects of debut versus seasoned issuances, we adapt this baseline indicator into two separate variables: *ESG_bond_first*, which restricts the indicator to the firm's inaugural issuance year and all subsequent years, and *ESG_bond_repeat*, which activates in the year of the second labeled bond issuance to capture the incremental effect of repeated market entry.

Furthermore, to characterize the temporal dynamics of the treatment and formally test for pre-trends, we replace the single treatment dummy with a set of three specific time-varying indicators: i) *Labeled Bond (pre-issue)*, equal to one in the year strictly preceding the bond issuance; ii) *Labeled Bond (short-term)*, equal to one in the year immediately following the bond issuance; and iii) *Labeled Bond (long-term)*, equal to one in the subsequent years ($t \geq 2$). This dynamic specification allows us to distinguish between short- and long-term responses.

5.4.2. The certification mechanism: initial versus repeated issuance

We now turn to our main empirical analysis by examining firm-level ESG outcomes following initial and repeated ESG bond issuances. This analysis allows us to assess whether ESG bonds serve as effective commitment devices for tangible sustainability improvements or primarily facilitate symbolic signaling—often termed "lip service."

Building on the strategic underwriter pricing identified in previous sections, we hypothesize that the primary market faces an acute adverse selection problem at entry. Primary market participants cannot easily distinguish between a high-quality ESG firm and a greenwasher seeking a pricing premium without enacting substantive change. To overcome this initial market skepticism and buy the data necessary to certify the issuer, underwriters provide a certification subsidy, evidenced by the significant discounts on gross spreads for inaugural sustainability and green bonds. We hypothesize that debut issuers respond to this subsidy by increasing their ESG transparency to appease intermediaries, but do not necessarily commit to the costly operational changes required to improve actual ESG performance.

Table 7 provides clear empirical evidence supporting this certification hypothesis. Following an inaugural issuance (*ESG_bond_first*), firms significantly increase their reporting transparency. The coefficient indicates a statistically significant absolute increase of 1.6 points relative to the matched control group. Given the 100-point scale of the ESG disclosure score, this represents an economically meaningful expansion in reporting, equivalent to roughly 12.6% of a standard deviation. However, this surge in disclosure does not translate into real operational improvements. This divergence suggests that a lip-service signal dominates the initial certification phase: issuers eagerly provide data to mitigate ex-ante hidden information and secure the entry subsidy, but withhold substantive effort.

These dynamics shift drastically during repeated market entries, where the focus transitions from adverse selection to moral hazard. Subsequent issuances (*ESG_bond_repeat*) are

associated with a significant deterioration in both transparency and performance. The ESG disclosure score falls by a highly significant 2.5 points. More interestingly, the actual ESG performance score declines by 0.17 points, an economically significant deterioration representing approximately 13.1% of a standard deviation. This sharp reversal indicates a high prevalence of opportunistic greenwashing among serial issuers. Once the initial certification hurdle is cleared, low-quality issuers reduce their costly signaling efforts and expose their lack of substantive commitment. This dynamic underscores the necessity for market participants to transition from relying on initial certification subsidies to demanding rigorous, performance-based verification for seasoned issuers.

5.4.3. Post-issuance dynamics of ESG outcomes

To further unpack the initial lip service effect, we decompose the temporal dynamics of firm-level ESG outcomes surrounding the inaugural issuance of labeled bonds. Table 8 reports dynamic difference-in-differences estimates for sustainability bonds (Panel A) and green bonds (Panel B), allowing us to isolate short-term reactions from long-term structural changes.

Column 1 demonstrates that companies markedly improve their ESG transparency following the inaugural issuance of both bond types. This aligns with the certification argument, suggesting that debut issuers signal compliance to underwriters in exchange for the initial entry subsidy. However, this increased disclosure does not coincide with any meaningful improvement in actual ESG performance.

Column 2 shows that this surge in reporting transparency is a strictly short-term phenomenon. In the first year post-issuance, the ESG disclosure score exhibits a salient increase of 3.3 points for sustainability issuers and 1.6 points for green bond issuers. Yet, this transparency is highly transient; the long-term coefficients (2+ years) lose statistical significance, indicating that firms abandon their enhanced reporting practices once the initial certification period concludes. Concurrently, the dynamic analysis confirms a persistent lack of

substantive operational improvement, as actual ESG performance remains unchanged across all temporal windows.

In aggregate, these trends strongly corroborate our certification argument: debut issuers temporarily inflate disclosures to secure the initial underwriting subsidy but completely fail to translate this short-term signaling into durable ESG performance. Given this transient commitment, the critical question is whether primary market participants recognize and price this behavior in subsequent seasoned offerings.

5.4.4. The selection mechanism and reputational reward

Given the prevalence of opportunistic lip service in repeated issuances, we next examine whether the market successfully rewards genuinely high-quality firms. Consistent with the reputation hypothesis, we posit that once an issuer's "probationary period" ends, the market transitions from certification subsidies to active selection. Table 9 reports the relationship between prior-year ESG outcomes and the pricing of seasoned ESG bond issuances. By restricting the sample to repeat-labeled bonds, we isolate how the primary market prices ex ante issuer quality. We evaluate both the lagged ESG performance score and the lagged ESG disclosure score to determine whether investors reward substantive operational outcomes, symbolic transparency, or both.

The results provide pronounced evidence for the active selection mechanism. In Column 3, we document a highly significant negative relationship between a firm's lagged ESG score and its current offering yield. This confirms that primary market investors grant a substantial reputational reward—a steep yield discount—specifically to seasoned issuers demonstrating tangible sustainability improvements. Conversely, the market does not compensate for purely symbolic signaling. While initial transparency was crucial for overcoming ex ante adverse selection, seasoned investors no longer reward issuers solely for providing more data. Furthermore, underwriting fees are not significantly influenced by prior-year performance or disclosure, indicating the intermediary's certification subsidy does not persist for seasoned

issuers.

Taken together, these findings demonstrate that the market successfully mitigates moral hazard through a sophisticated monitoring framework. Once the probationary period concludes, seasoned investors actively filter issuers by decisively shifting their pricing focus from symbolic transparency to verified operational substance.

6. Conclusion

This paper investigates the economic mechanisms driving the U.S. corporate ESG bond market—a setting characterized by voluntary frameworks rather than the strict regulatory mandates seen in Europe. We document a distinct evolutionary lifecycle of ESG issuers defined by a transition from initial intermediary certification to active market selection. Our analysis yields three central takeaways.

First, as a novel contribution to the sustainable finance literature, we provide the first empirical evidence on the role of intermediation pricing in the ESG corporate bond market. We demonstrate that underwriters provide a certification fee subsidy to debut issuers, who respond with transient lip service—a short-term spike in reporting transparency with no substantive operational improvements. Second, these initial ESG commitments do not generate a positive firm-wide halo effect; rather, they attract heightened investor scrutiny, resulting in a yield penalty on the issuer's subsequent conventional debt. Third, despite the prevalence of opportunistic greenwashing among repeat issuers, the market efficiently mitigates moral hazard ex post, with seasoned investors ignoring symbolic disclosure and granting reputational yield discounts exclusively for verified operational performance.

These findings highlight critical implications for the architecture of U.S. sustainable finance. While capital market participants effectively act as quasi-regulators—efficiently pricing ex post moral hazard—the prevalence of cheap talk observed at market entry exposes

the limitations of relying exclusively on private market discipline. To mitigate this early-stage adverse selection, the market requires either standardized disclosure mandates from policymakers or structural innovations in security design, such as performance-committed sustainability-linked bonds (SLBs). Future research should therefore pivot from estimating primary market premiums to evaluating how these evolving contract designs and intermediation incentives impact real-world sustainability outcomes.

Figure 1. **Global and US ESG bond issuance volume (2013–2024)**
This figure illustrates annual issuance volumes, measured in billions of U.S. dollars ($B), based on Dealogic and SIFMA estimates. Data are presented on a fiscal year basis. Issuances are categorized by use of proceeds: green (environmental projects), social (socially beneficial projects), and sustainability (combined green and social objectives). For a granular breakdown of project eligibility and classification criteria, refer to Appendix Table A.1.

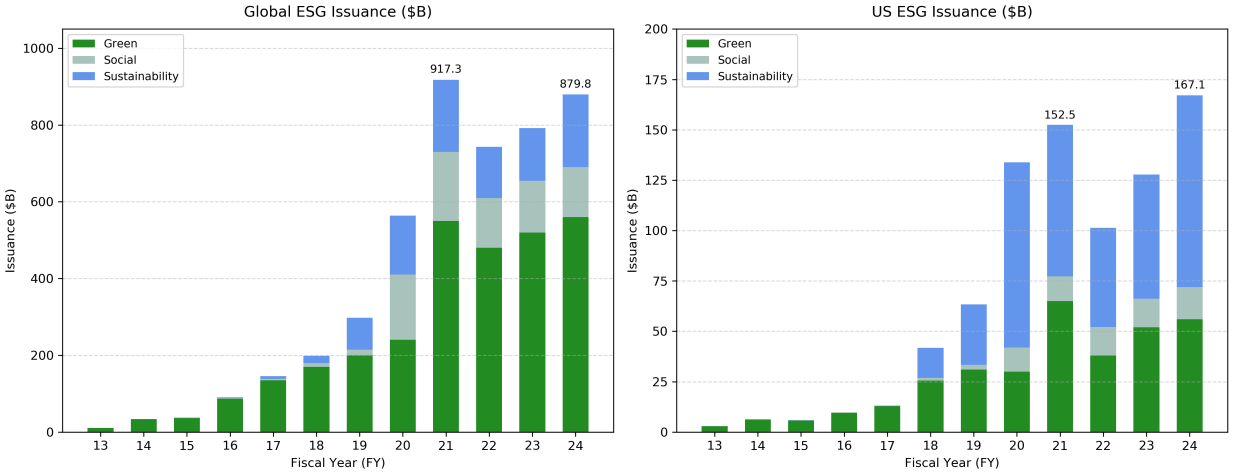


Figure 2. **US corporate bond issuance trends (2015–2024)**
This figure depicts annual U.S. corporate bond issuance volumes from 2015 through 2024. The stacked bars represent total annual issuance measured in billions of U.S. dollars on the left axis. These bars differentiate between green bond and sustainability bond volumes and traditional non-ESG bond issuance, which is shown in gray. The line plots correspond to the right axis and indicate the percentage market share relative to total corporate issuance, where the solid line denotes green bond issuance, and the dashed line denotes sustainability bond issuance.

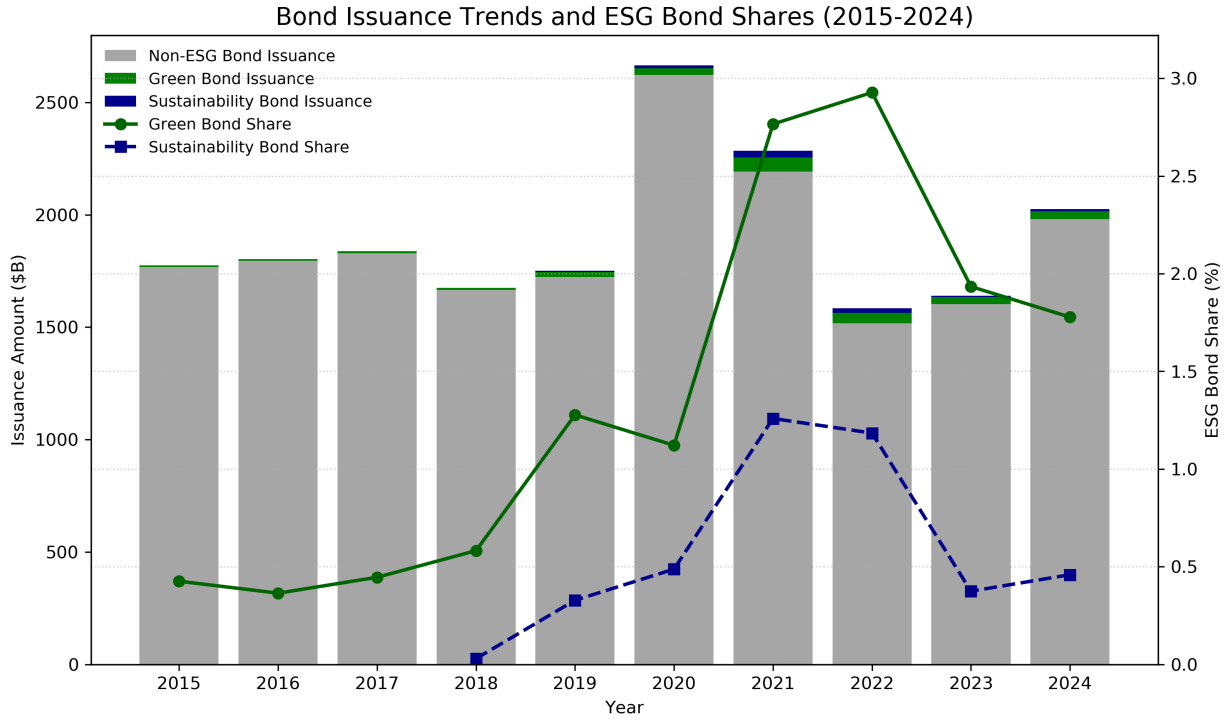


Figure 3. **Distribution of credit ratings by bond type**
This figure presents the credit rating distributions for green, sustainability, and non-ESG corporate bonds sourced from Mergent FISD. Non-ESG bonds are defined as issues categorized as neither green nor sustainability bonds. For each security, a composite credit rating is calculated as the numerical average of available ratings from Moody's, S&P, and Fitch. To ensure visual clarity across the full distribution, all ratings below B− are aggregated into a single "Below B−" category. Frequencies are normalized to represent the percentage of total issuance within each respective bond category.

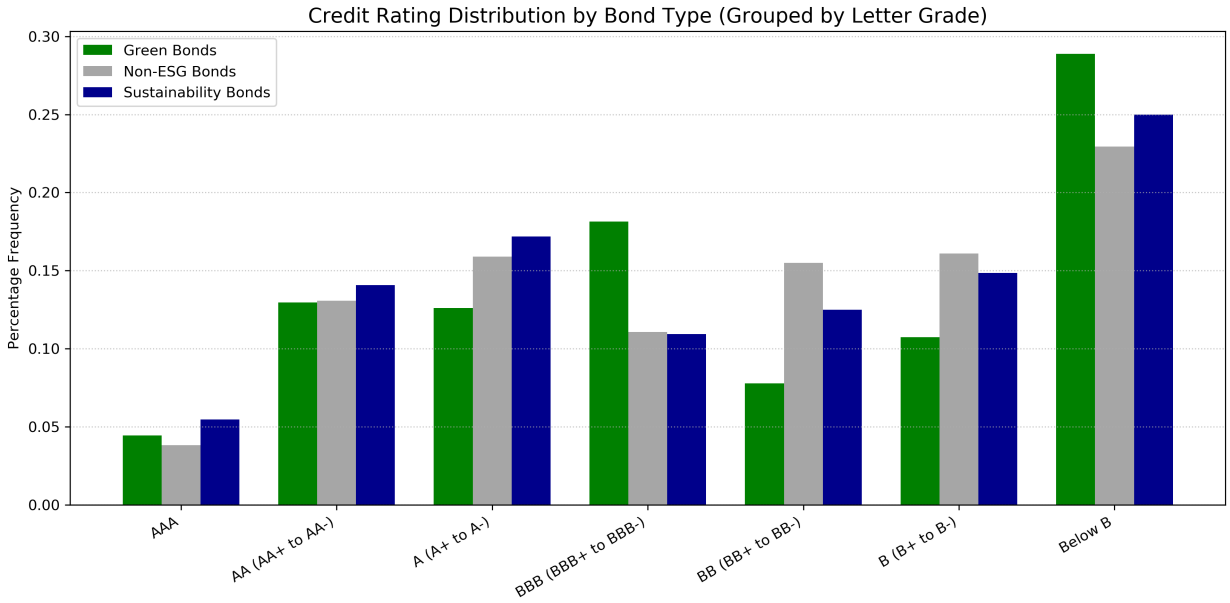


Figure 4. **Temporal trend of the green benefit**
This figure examines the annual evolution of the estimated green benefit, derived from the coefficients reported in Table 3. The green benefit is quantified using two primary metrics: the difference in offering yields, measured in percentage points, and the difference in underwriting fees, also expressed as a percentage of total proceeds. Both measures are plotted on a single axis to facilitate a direct comparison of the cost-of-capital advantages over time. Points represent the annual point estimates. This time-series visualization highlights the convergence or divergence of the "greenium" and issuance costs across the sample period.

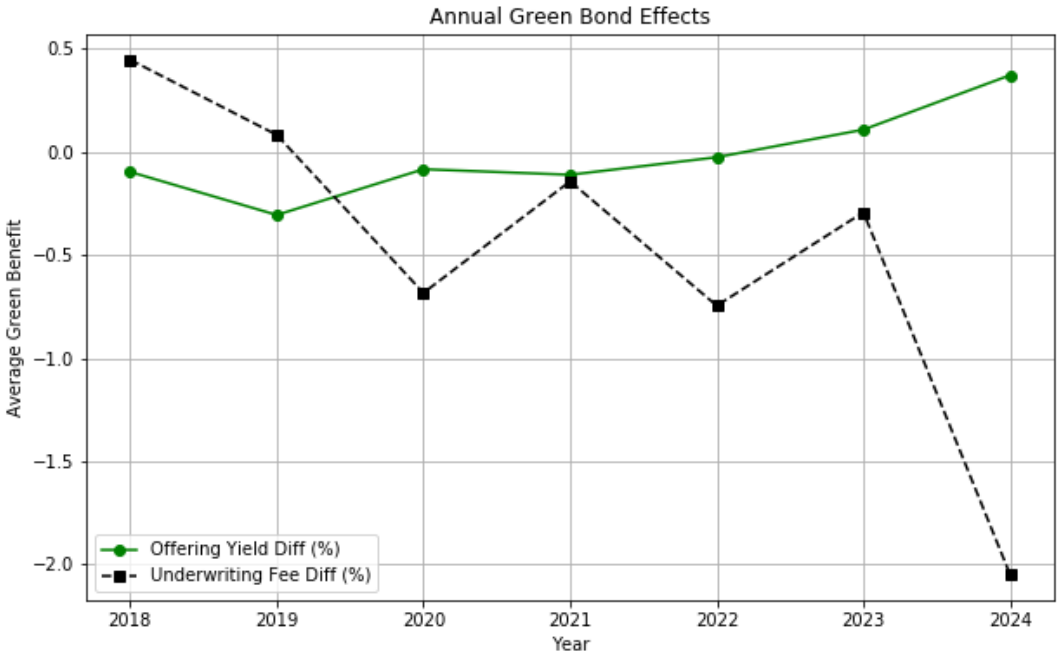


Figure 5. **Covariate balance of matched samples**
This figure compares the distributions of key firm characteristics between the treatment group, comprising firms issuing green or sustainability bonds, and the matched control group. The matched sample is constructed via 1:1 nearest-neighbor matching based on the Mahalanobis distance to ensure cross-group comparability. The covariates analyzed include size (log of total assets), leverage (total debt to total assets), return on assets (net income to total assets), liquidity, ESG score, and ESG disclosure score. Within each plot, the central horizontal line denotes the median, the shaded box indicates the interquartile range from the 25th to 75th percentiles, and the whiskers extend to the most extreme values within 1.5 times the interquartile range. The alignment of these distributions across the treated and control groups suggests that the matching procedure successfully balanced the observable covariates.

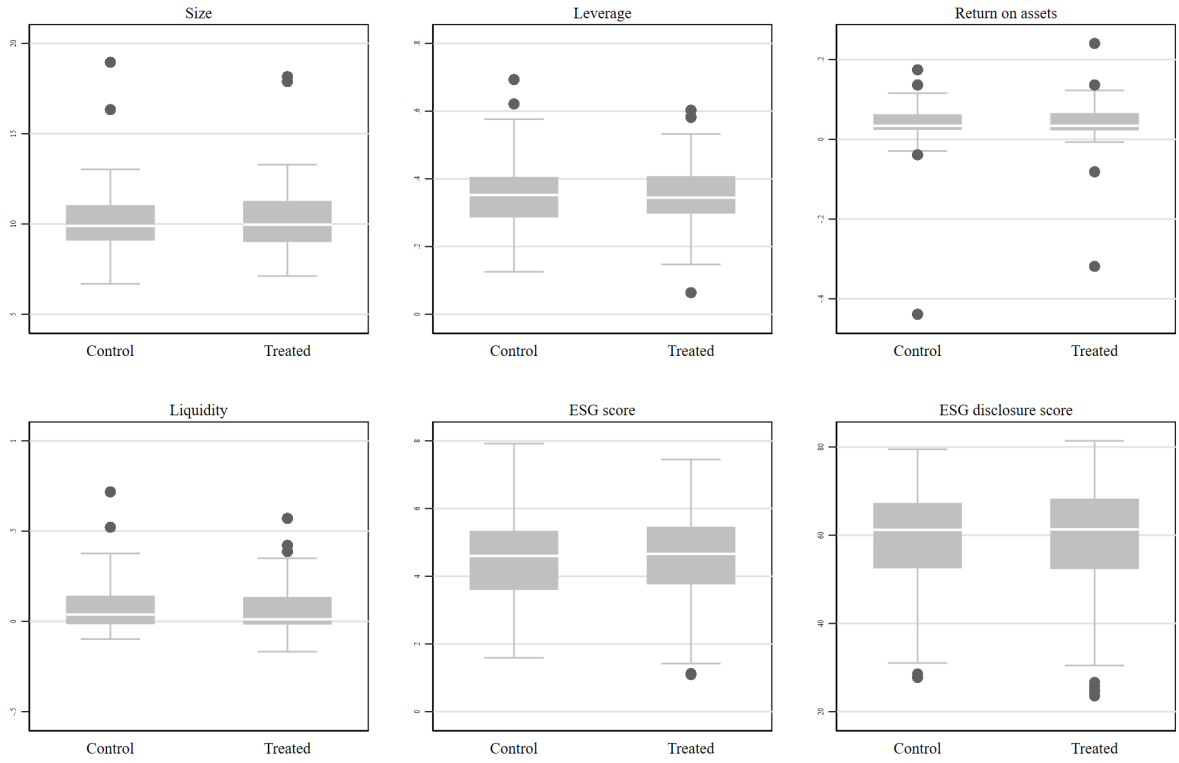


Table 1: **Summary statistics**

This table summarizes key bond-level and firm-level characteristics for U.S. corporate bond issuances between January 2015 and December 2024. Panel A reports bond-level characteristics. column (1) reports the entire sample; column (2) contains green bonds; column (3) contains sustainability bonds; column (4) combines green and sustainability bonds; and column (5) reports ordinary bonds without any labels. The reported metrics include the total number of bond issues (*# Bonds*), the total count of unique firm-issuance days summed across all firms (*# Bond issuer-days*), the total count of unique firm-issuance years summed across all firms (*# Bond issuer-years*), the number of unique issuing firms (*# Bond issuers*), the average issuance amount in millions of U.S. dollars (*Average amount*), the average time to maturity in years (*Maturity*), the average coupon rate (*Coupon (%)*), and the *Credit rating* on a numeric scale. Ratings range numerically from 1 (C) to 21 (AAA). For each bond with multiple ratings from Moody's, S&P, and Fitch, the average of the available ratings is used; if only one rating is available, that rating is adopted. *Callable* is a dummy variable equal to one if the bond is callable. All statistics are reported as mean values with standard deviations in parentheses. Panel B presents firm-level characteristics for the sample of publicly traded ESG issuers in the fiscal year preceding their inaugural issuance. *Log(assets)* is the natural logarithm of the book value of total assets. *Return on assets* is the ratio of operating income to the book value of total assets. *Leverage* is the ratio of total debt to the book value of total assets. *Liquidity ratio* is the ratio of current assets to current liabilities. All financial variables are obtained from Compustat. *ESG disclosure score*, *ESG score*, *Environmental score*, *Social score*, and *Governance score* are the Bloomberg-sourced ESG ratings. All continuous variables are winsorized at the 1% and 99% levels. For each group, the table reports the number of observations (N), sample mean, standard deviation (in parentheses), 25th percentile, median, and 75th percentile. The final column reports the p-value of the difference in means test: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A: Bond-level summary statistics

Metric	All	Green bonds	Sustainability bonds	ESG bonds	non-ESG bonds
	(1)	(2)	(3)	(4)	(5)
# Bonds	33,765	400	127	527	33,238
# Bond issuer-days	21,495	356	106	462	21,105
# Bond issuer-years	10,534	346	103	449	10,231
# Bond issuers	4,411	233	75	297	4,326
Average amount (in $M)	398.87	617.36	628.39	620.02	395.32
	(484.90)	(298.16)	(369.22)	(316.40)	(486.31)
Coupon (%)	5.59	4.30	4.14	4.26	5.61
	(2.79)	(1.95)	(2.12)	(1.99)	(2.80)
Maturity (years)	7.29	11.07	9.28	10.63	7.23
	(7.02)	(8.42)	(7.93)	(8.33)	(6.98)
Credit rating (AAA = 21)	14.17	13.95	14.12	14.00	14.17
	(3.08)	(2.66)	(3.43)	(2.87)	(3.09)
Callable (1/0)	0.66	0.82	0.67	0.78	0.66
	(0.47)	(0.39)	(0.47)	(0.41)	(0.48)

Table 1 – *Continued*

Panel B: Issuer-level summary statistics

Variable	ESG bond issuers					non-ESG bond issuers in same industry and year					
	N	Mean (SD)	P25	Med	P75	N	Mean (SD)	P25	Med	P75	*p*-value
Size	179	10.989(2.479)	9.46	10.32	12.11	5,811	9.339 (2.040)	7.97	9.11	10.43	0.000***
Return on assets	179	0.027 (0.072)	0.01	0.03	0.04	5,811	0.011 (0.106)	0.00	0.02	0.06	0.003***
Leverage	179	0.339 (0.136)	0.27	0.33	0.41	5,724	0.369 (0.197)	0.24	0.35	0.48	0.004***
Liquidity	134	0.060 (0.173)	-0.03	0.00	0.07	4,494	0.130 (0.187)	-0.01	0.07	0.22	0.000***
ESG disclosure score	152	58.422 (12.393)	51.39	59.96	68.38	2,901	49.432 (13.738)	36.29	50.11	60.59	0.000***
ESG score	146	4.588 (1.261)	3.89	4.90	5.63	2,649	3.746 (1.432)	2.50	3.80	4.85	0.000***
Environmental score	146	3.626 (1.798)	2.49	3.79	4.85	2,649	2.664 (2.121)	0.40	2.73	4.26	0.000***
Social score	146	4.236 (1.939)	2.59	4.25	5.86	2,649	2.920 (1.920)	1.44	2.48	4.24	0.000***
Governance score	148	7.069 (1.168)	6.65	7.24	7.93	2,735	6.985 (1.018)	6.55	7.17	7.68	0.390

Table 2: **Univariate analysis**
This table documents the characteristics of green, sustainability, and ordinary corporate bonds issued between January 2015 and December 2024. *Offering yield (%)* is the yield to maturity at issuance. *Yield spread (%)* is the difference between the offering yield and the corresponding point on the treasury yield curve, which is linearly interpolated to match the bond's maturity and issuance date. *Underwriting fee* is a percentage of the offering amount, expressed in basis points (bps). *Amount* represents the par value of each bond in millions of U.S. dollars. *Coupon* is the coupon rate for fixed-rate bonds. *Maturity* is expressed in years. *Credit rating* is reported numerically (AAA = 21, C = 1), averaged across Moody's, S&P, and Fitch ratings when multiple ratings are available. *Callable* is a dummy variable equal to 1 if the bond is callable. The final column reports the p-value from tests of differences in means. The sample comprises 345 green bonds, 110 sustainability bonds, and 33,310 ordinary bonds with complete data on these characteristics.

Panel A: Green bonds

Variable	Green bonds		non-ESG bonds		Diff	
	Mean	SD	Mean	SD	Mean	p-value
Offering yield (%)	4.33	1.96	5.64	2.81	-1.31	0.0000
Yield spread (%)	1.84	1.38	3.15	2.94	-1.31	0.0000
Underwriting fee (bps)	6.26	2.00	6.47	4.02	-0.22	0.4499
Amount (in $M)	617.36	298.16	395.32	486.31	222.04	0.0000
Coupon (%)	4.30	1.95	5.61	2.80	-1.31	0.0000
Maturity (years)	11.07	8.42	7.23	6.98	3.84	0.0000
Credit rating (AAA = 21)	13.95	2.66	14.17	3.09	-0.22	0.2046
Callable (1/0)	0.81	0.39	0.66	0.48	0.16	0.0000

Panel B: Sustainability bonds

Variable	Sustainability bonds		non-ESG bonds		Diff	
	Mean	SD	Mean	SD	Mean	p-value
Offering yield (%)	4.15	2.18	5.79	2.82	-1.64	0.0000
Yield spread (%)	1.72	1.39	3.02	2.89	-1.30	0.0000
Underwriting fee (bps)	5.61	3.78	6.64	4.16	-1.03	0.0815
Amount (in $M)	630.44	371.82	350.71	462.20	279.73	0.0000
Coupon (%)	4.16	2.13	5.76	2.80	-1.60	0.0000
Maturity (years)	9.30	7.99	6.97	6.72	2.33	0.0001
Credit rating (AAA = 21)	14.12	3.45	14.32	3.06	-0.20	0.4922
Callable (1/0)	0.67	0.47	0.69	0.46	-0.02	0.7074

Table 3: **Is there a green benefit?**
This table presents average treatment effect estimates for green bonds and their matched non-green counterparts issued by the same firm. The underwriting fee, offering yield and yield spread are expressed in percentage points (%). The first row shows the overall sample (2015–2024), followed by sub-periods and annual estimates to capture specific effects and temporal trends. Standard errors are shown in parentheses, followed by the corresponding p-values. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Underwriting fee diff (%) (1)	Offering yield diff (%) (2)	Yield spread diff (%) (3)
Overall sample			
2015-2024	-0.779***	-0.204***	-0.053
	(0.187)	(0.040)	(0.048)
Sub-periods			
2015-2023	-0.228*	-0.189***	-0.195***
	(0.123)	(0.058)	(0.053)
2020-2022	-0.520***	-0.189**	-0.201***
	(0.180)	(0.074)	(0.066)
2023-2024	-1.452***	0.263***	0.245***
	(0.313)	(0.039)	(0.051)
Annual breakdown			
2017	-0.148	0.106	0.020
	(2.285)	(0.483)	(0.531)
2018	0.448**	-0.096	-0.242*
	(0.188)	(0.141)	(0.144)
2019	0.0834	-0.305**	-0.458***
	(0.208)	(0.134)	(0.156)
2020	-0.683**	-0.083	-0.074
	(0.305)	(0.149)	(0.155)
2021	-0.142	-0.110	-0.184**
	(0.198)	(0.098)	(0.086)
2022	-0.745*	-0.025	0.020
	(0.423)	(0.083)	(0.066)
2023	-0.292	0.109	0.097
	(0.424)	(0.082)	(0.110)
2024	-2.049***	0.373***	0.296***
	(0.335)	(0.047)	(0.054)

Table 4: **Is there a sustainability benefit?**
This table reports average treatment effect estimates for sustainability bonds and their matched non-sustainability counterparts, covering 2019 to 2024. The first row shows the overall sample and annual estimates to capture temporal trends. The underwriting fee, offering yield and yield spread are expressed in percentage points (%). Standard errors are in parentheses, along with corresponding p-values. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Underwriting fee diff (%) (1)	Offering yield diff (%) (2)	Yield spread diff (%) (3)
Overall sample			
2019-2024	-2.053***	-0.432***	0.054
	(0.450)	(0.100)	(0.083)
Annual breakdown			
2020	-2.228***	-0.774**	-0.592**
	(0.722)	(0.335)	(0.266)
2021	-1.437***	0.0001	0.040
	(0.466)	(0.152)	(0.112)
2022	-1.116	-0.398**	-0.088
	(0.830)	(0.201)	(0.087)
2023	-3.938***	-0.419***	-0.137
	(0.716)	(0.132)	(0.159)

Table 5: **Pricing of initial vs. repeated ESG bond issuance**
This table presents ordinary least squares (OLS) regression results examining the financial impact of a firm's entry and continued participation in the sustainable bond market. The analysis compares sustainability-linked and green bonds to a baseline of the issuer's own conventional (non-ESG) bonds. The variable *First* is a dummy indicator identifying all bonds of a specific ESG type issued on the issuer's debut date for that category. The variable *Repeat* is a dummy indicator for all subsequent issuances of that same type occurring strictly after the initial debut date. Columns (1)-(3) employ underwriting fee as the dependent variable, and columns (4)-(6) employ offering yield as the dependent variable. Bond-level controls include: *Bond size* (log of issuance amount); *Callable* (dummy variable); and *Security level*, an ordinal scale (1–6) where a higher value indicates higher seniority. All specifications include maturity-rating-year interaction fixed effects, but issuer fixed effects vary. Standard errors, clustered by issuer, are reported in parentheses below the coefficient estimates. The symbols $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Underwriting fee (%)			Offering yield (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Sustainability bonds						
First	-1.548^{***}	-0.784^{**}	-0.634^{*}	-0.221	-0.141	-0.186
	(0.543)	(0.358)	(0.341)	(0.165)	(0.190)	(0.193)
Repeat	-2.897^{***}	-0.799	-0.627	-0.513^{***}	-0.205	-0.330^{*}
	(0.679)	(1.096)	(1.052)	(0.117)	(0.195)	(0.199)
Bond size			-0.168			0.049^{***}
			(0.176)			(0.017)
Callable			-0.003			0.368^{***}
			(0.788)			(0.078)
Security level			0.033			0.126^{***}
			(0.107)			(0.046)
Issuer FE	N	Y	Y	N	Y	Y
Interaction FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.571	0.625	0.623	0.805	0.874	0.877
Observations	4430	3961	3876	10050	8472	8323

Table 5 – *Continued*

	Underwriting fee (%)			Offering yield (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Green bonds						
First	−0.370	−0.534	−0.607*	−0.111	−0.191**	−0.213**
	(0.385)	(0.364)	(0.348)	(0.101)	(0.086)	(0.086)
Repeat	−0.872	−0.454	−0.472	0.077	0.036	0.040
	(0.946)	(0.371)	(0.300)	(0.161)	(0.148)	(0.146)
Bond size			−0.472***			0.036***
			(0.107)			(0.014)
Callable			0.387			0.508***
			(0.303)			(0.100)
Security level			0.168			0.130***
			(0.196)			(0.041)
Issuer FE	N	Y	Y	N	Y	Y
Interaction FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.570	0.611	0.617	0.805	0.861	0.866
Observations	4430	4025	3939	10050	8603	8449

Table 6: **Causal spillover effects of ESG bond issuance experience**
This table reports the causal spillover effect of a firm's inaugural sustainability or green bond issuance on the financing costs of its subsequent non-labeled (ordinary) corporate bonds. To ensure clean identification and mitigate potential biases arising from staggered treatment timing, the analysis employs a stacked difference-in-differences model using a five-year event window ($t \in [-5, +5]$) centered on the inaugural issuance. Each stack pairs treated firms with a control group of never-treated issuers that only issue conventional debt during the sample period. The variable of interest, *Spillover*, is an indicator that equals one for ordinary bonds issued by firm i strictly following the offering date of its inaugural ESG-labeled bond, and zero otherwise. Columns (1) to (3) use the underwriting fee as the dependent variable, while columns (4) to (6) use the offering yield. All specifications include issuer-by-cohort and year-by-cohort fixed effects. In addition to the reported coefficients for maturity, credit rating, and bond size, the models include bond-level controls for contractual characteristics, specifically a callable dummy and the seniority level. Because never-treated control units are included in multiple event cohorts, the stacked dataset yields a substantially larger number of total observations. Standard errors presented in parentheses are clustered by issuer to adjust for this repeated sampling, and significance is indicated by the symbols $*$, $**$, and $***$ denoting statistical significance at the 10%, 5%, and 1% levels, respectively.

	Underwriting fee (%)			Offering yield (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Sustainability bonds						
Spillover	−0.712	−1.174	−1.173	−0.373	0.215***	0.222***
	(0.751)	(1.093)	(1.054)	(0.835)	(0.083)	(0.083)
Maturity		0.201***	0.201***		0.042***	0.041***
		(0.018)	(0.018)		(0.001)	(0.001)
Credit rating		−0.225	−0.244		−0.224***	−0.214***
		(0.260)	(0.274)		(0.034)	(0.031)
Bond size		−0.659***	−0.626***		0.011	0.022
		(0.122)	(0.121)		(0.017)	(0.014)
Bond controls	N	N	Y	N	N	Y
Issuer × Cohort FE	Y	Y	Y	Y	Y	Y
Year × Cohort FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.438	0.592	0.592	0.442	0.814	0.817
Observations	70,105	50,765	50,705	199,609	94,669	94,542

Table 6 – *Continued*

	Underwriting fee (%)			Offering yield (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Green bonds						
Spillover	0.594**	0.388**	0.285**	−0.008	−0.046	−0.068
	(0.282)	(0.169)	(0.135)	(0.256)	(0.074)	(0.069)
Maturity		0.209***	0.209***		0.044***	0.043***
		(0.020)	(0.020)		(0.001)	(0.001)
Credit rating		−0.054	−0.115		−0.213***	−0.206***
		(0.228)	(0.248)		(0.032)	(0.031)
Bond size		−0.672***	−0.638***		0.022	0.025*
		(0.112)	(0.116)		(0.017)	(0.014)
Bond controls	N	N	Y	N	N	Y
Issuer × Cohort FE	Y	Y	Y	Y	Y	Y
Year × Cohort FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.433	0.551	0.553	0.466	0.809	0.812
Observations	75,272	54,355	54,298	214,481	103,381	103,261

Table 7: **Firm-level ESG outcomes of initial vs. repeated issuance**
This table presents difference-in-differences estimates of ESG performance surrounding the inaugural and subsequent issuances of ESG bonds (including green and sustainability bonds). The sample includes ESG bond issuers and matched control firms from 2013 to 2024. *ESG bond_first* is an indicator for the firm's first issuance year and all subsequent years. *ESG bond_repeat* is an indicator that starts in the year of the second labeled bond issuance and captures the incremental effect of repeated market entry. The dependent variables are the ESG disclosure score, ESG score, environmental score, social score, and governance score. All specifications include firm and industry-year fixed effects. Standard errors (in parentheses) are clustered at the industry level. The symbols $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ESG disclosure score (1)	ESG score (2)	Environmental score (3)	Social score (4)	Governance score (5)
ESG bond_first	1.566^{**}	-0.073	-0.042	-0.248	0.017
	(0.586)	(0.126)	(0.079)	(0.223)	(0.097)
ESG bond_repeat	-2.548^{**}	-0.166^{*}	0.010	-0.339^{**}	-0.268^{***}
	(1.065)	(0.078)	(0.151)	(0.115)	(0.074)
Firm FE	Y	Y	Y	Y	Y
Industry-year FE	Y	Y	Y	Y	Y
Adjusted R^2	0.883	0.784	0.775	0.710	0.879
Observations	971	953	953	953	953

Table 8: **Dynamic ESG outcomes following ESG bond issuance**
This table analyzes the dynamic impact on ESG performance associated with a firm's inaugural labeled bond issuance, using a difference-in-differences specification. Results are divided into Panel A for sustainability bonds and Panel B for green bonds. The treatment indicators, *SB* and *GB*, represent post-issuance periods for their respective bond categories. *SB/GB (pre-issue year)* identifies the fiscal year immediately preceding the issuance. *SB/GB (short-term, 1 year)* and *SB/GB (long-term, 2+ year)* are indicator variables capturing the incremental effects in the first year following issuance and all subsequent years, respectively. The dependent variables are the ESG disclosure score and the ESG score. The sample includes first-time issuers and matched control firms from 2013–2024. All specifications incorporate firm and industry-year fixed effects to account for time-invariant heterogeneity and sector-specific shocks. Standard errors, clustered at the issuer level, are reported in parentheses. The symbols $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ESG disclosure score		ESG score	
	(1)	(2)	(3)	(4)
Panel A: Sustainability bonds				
SB	2.880*		−0.055	
	(1.266)		(0.144)	
SB (pre-issue year)		−0.042		−0.142
		(1.100)		(0.121)
SB (short-term, 1 year)		3.334**		−0.070
		(1.125)		(0.075)
SB (long-term, 2+ year)		2.226		0.031
		(1.521)		(0.144)
Firm FE	Y	Y	Y	Y
Industry-year FE	Y	Y	Y	Y
Adjusted R^2	0.890	0.887	0.805	0.802
Observations	229	229	227	227

Table 8 – *Continued*

	ESG disclosure score		ESG score	
	(1)	(2)	(3)	(4)
Panel B: Green bonds				
GB	1.611***		−0.075	
	(0.510)		(0.096)	
GB (pre-issue year)		−0.156		0.051
		(0.446)		(0.066)
GB (short-term, 1 year)		1.594***		−0.003
		(0.349)		(0.107)
GB (long-term, 2+ year)		1.562*		−0.178
		(0.839)		(0.106)
Firm FE	Y	Y	Y	Y
Industry-year FE	Y	Y	Y	Y
Adjusted R^2	0.880	0.879	0.779	0.779
Observations	739	739	717	717

Table 9: **The selection mechanism and reputational reward**
This table reports the relationship between prior-year ESG performance and the pricing of seasoned ESG bond issuances. The sample is restricted to repeat green and sustainability bonds. The primary variables of interest are *ESG score* $_{t-1}$ and *ESG disclosure score* $_{t-1}$, both lagged by one year. Columns (1)–(2) utilize the underwriting fee as the dependent variable, while columns (3)–(4) utilize the offering yield. All specifications incorporate bond-level controls (maturity, size, rating), firm fixed effects, and industry-year fixed effects to account for time-invariant heterogeneity and sector-specific shocks. Standard errors, clustered at the issuer level, are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

	Underwriting fee (%)		Offering yield (%)	
	(1)	(2)	(3)	(4)
ESG score $_{t-1}$	0.514		-0.955^{***}	
	(0.712)		(0.291)	
ESG disclosure score $_{t-1}$		0.055		-0.064
		(0.066)		(0.050)
Bond controls	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-year FE	Y	Y	Y	Y
Adjusted R^2	0.821	0.759	0.858	0.849
Observations	60	67	91	99

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Appendix A.

A.1. Supplementary data

tabularx multirow array

Table A.1: **Eligible green and social project categories**
Reproduced from the Bloomberg fixed income green social sustainability bond index methodology. The green and sustainability bond indicator is given based on the project category stated in the use of proceeds.

Type	**Category**
Green	Renewable energy
	Energy efficiency
	Green buildings
	Clean transportation
	Sustainable water
	Pollution control
	Biodiversity
	Agriculture forestry
	Climate change adaptation
	Eco-efficient technology
Social	Affordable basic infrastructure
	Access to essential services
	Affordable housing
	Employment generation
	Food security
	Socioeconomic (advancement and empowerment)

Table A.2: **Sample of Dual Issuers**
This table presents a sample of issuers that have issued both Green Bonds (GB) and Sustainability Bonds (SB). There are 10 unique issuers in the full sample with dual-issuer experience. The *SB Count* and *GB Count* are the total number of bonds issued by the entity of that type. *First SB Date* and *First GB Date* refer to the first issuance date of the respective bond type by that issuer. The *First Bond Type* describes the chronological order of issuance (GB First, SB First, or Simultaneous) based on comparing the *First SB Date* and *First GB Date*.

Issuer CUSIP	Issuer Name	SB Count	GB Count	First SB Date	First GB Date	First Bond Type
373334	Georgia Power Co.	2	1	2021-02-22	2016-03-02	GB
82460C	Shinhan Bank America	1	1	2019-04-15	2022-04-05	SB
06051G	Bank of America Corp.	1	2	2022-11-07	2015-05-07	GB
59217G	MetLife Inc.	1	1	2022-06-27	2020-06-29	GB
5006EP	Korea East-West Power Co., Ltd.	1	1	2018-07-12	2022-04-28	SB
26442C	Duke Energy Carolinas, LLC	2	2	2022-03-01	2018-11-05	GB
68233J	Oncor Electric Delivery Co., LLC	1	1	2020-09-23	2022-05-17	SB
05464X	Axis Bank Ltd. Singapore Branch	1	1	2021-09-01	2016-06-01	GB
26442U	Duke Energy Progress, Inc.	2	2	2022-03-14	2019-03-04	GB
26444H	Duke Energy Florida, LLC	2	1	2021-11-29	2019-11-21	GB