Financial Incentives for US Corporate Green Bonds

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Abstract

This study examines financial incentives for corporate issuers in the U.S. green bond market. A significant underwriting fee discount of 0.25% per issuance (approximately $1.6 million) for green bonds persists throughout the sample period. Green bond issuers initially enjoy lower borrowing costs, with an average green premium of 21 basis points; however, this advantage erodes over time and reverses into a green discount by 2023. Sustainability-linked bonds yield greater financial benefits than green bonds. Repeated issuers realize smaller green benefits, consistent with market concerns about potential greenwashing. By design, sustainability-linked bonds mitigate the manipulation risks of outcomes, allowing seasoned issuers to reap more benefits than debut issuers. This research deepens insight into the evolving financial dynamics and clarifies the mechanism determining the motivation of labeled security issuance.

Keywords: Climate Finance, Green Bonds, Greenwashing, Financial Intermediation, Underwriting Fee Discount
JEL Classification: G12, G30, Q54

1. Introduction

Financial markets are increasingly pivotal in addressing climatic challenges and promoting positive environmental decisions to all participants. Investors with sustainability preferences allocate capital to environmentally beneficial initiatives, firms behave in pro-environmental decision-making, and policymakers balance regulation and market accessibility, which are crucial for the long-term success of a sustainable society. To achieve climate targets in line with the Paris Climate Agreement by 2030, it's necessary to invest a minimum of $5 trillion annually.[1] The bond market is especially central to financing the necessary investment.

Green bonds are fixed-income securities that earmark proceeds for specific projects that have positive environmental and climate benefits. Examples include renewable energy, clean transportation, sustainable agriculture, and energy efficiency. They have become increasingly more prevalent in practice as a new financial instrument. The green bond market has grown exponentially in recent years, reaching a cumulative issuance volume of approximately $3 trillion as of September 2023[2] since the label made its debut back in 2007. Green bonds are the most popular and dominant financial instrument among ESG-related debt securities. Specifically, the banking sector is increasingly profiting from underwriting bonds linked to ESG, surpassing earnings from debt issuance for fossil fuel companies.[3]

It is counterintuitive for corporations to issue green bonds rather than traditional bonds. Green bonds require that proceeds be exclusively dedicated to environmentally focused projects ex-ante but do not mandate achieving green outcomes, binding a firm's investment flexibility. In contrast, sustainability-linked bonds tie the cost of debt to actual environ-

[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/3d313e4819de8d6bcb4238f253874b0f-0340012023/original/GSSS-Quarterly-Newsletter-Issue-No-5.pdf

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

mental performance ex-post while leaving the use of proceeds unrestricted. Despite the constraints inherent in security design, the financial incentives for issuing labeled bonds exceed those of conventional bonds, raising an intriguing empirical question regarding their true motivations. Building on the previous literature Flammer (2021) regarding the motivations for issuing green bonds, three primary rationales have been identified: signaling, greenwashing, and cost of capital. The true motivation behind green bond issuance remains debated, with several studies supporting each of these rationales. In this paper, I contribute to the discussion on the cost of capital argument by measuring financial incentives in two ways: the cost of debt, demonstrating lower financing costs, and underwriting fee discounts at issuance, a novel measure among the green premium literature. Additionally, the unique design of these securities implies a degree of greenwashing among heterogeneous issuer types.

A key contribution of this paper is highlighting a significant underwriting fee discount as a financial benefit for green bond issuers. The evidence indicates that corporate green bonds are priced at a premium compared to traditional bonds. In the absence of consensus on a green premium, I analyze how underwriters bear the cost of "greenness", which fluctuates with investor preferences. Furthermore, surprisingly, one-time issuers receive a higher discount than repeated issuers, contradicting the expectation that repeated issuers benefit from stronger reputations in credit markets. Unlike sustainability-linked bonds—where outcome commitments enhance reputational benefits—green bonds do not require demonstrable environmental performance, thereby increasing incentives for greenwashing and diminishing the green benefit for seasoned issuers.

The study examines 332 green bonds and 28,442 ordinary US corporate bonds issued from 2015 to 2024. Nearest neighbor matching on an extensive set of covariates ensured that the bonds were comparable except for their greenness. A key finding is a significant underwriting fee discount for green bond issuers, averaging 0.25%—approximately $1.6 million per note. The comparative analysis of their offering yields reveals a 21 basis points (bps) differ-

ence, which is statistically significant, marking an unexpected deviation from the previous literature. Conventionally, rigorous matching methods do not reveal a premium in the green bond market, yet the analysis identifies a notable premium in bond pricing corroborated by alternative methodologies. Moreover, the findings reveal the dynamic nature of the green premium, showing a decreasing trend over time and reversing to a discount in 2023.

Further analysis on the sustainability-linked bonds from 2019 to 2024 reveals significant financial benefits. Specifically, these bonds exhibit an underwriting fee discount of approximately 1.5% while offering yields reduced by 50 basis points—more than double the green premium. The study also finds that experienced sustainability-linked bond issuers secure greater underwriting discounts than newcomers. The substantial financial benefits stem from the lower perceived risk and mandated commitment to environmental outcomes, which makes them more appealing to underwriters. This contingent mitigates information asymmetry among borrowers, intermediaries, and lenders.

This study contributes to the empirical literature on corporate green bonds by examining their potential to lower the cost of capital. A substantial body of research has aimed to quantify the green premium—the additional return investors require to hold green bonds relative to similar conventional bonds. Findings are mixed across various markets, including supranational, sovereign, municipal, and corporate. Recent studies by Caramichael and Rapp (2022), Baker, Bergstresser, Serafeim, and Wurgler (2022), and Wang and Wu (2022) provide evidence of a green premium, while research by Larcker and Watts (2020), Flammer (2021), and Tang and Zhang (2020) finds no greenium, and Zerbib (2019) even reports a discount. A comprehensive review by MacAskill, Roca, Liu, Stewart, and Sahin (2021) indicates that a green premium is prevalent in many studies, particularly in primary and secondary markets for investment-grade government bonds and bonds that follow specific green bond governance and reporting standards.

The empirical results strongly support the theoretical framework proposed by Barbalau

and Zeni (2022) on optimal security design for financing green investments. Furthermore, when considering incentives for greenwashing, comparing security designs between green and sustainability-linked bonds provides valuable insights into the behavior of heterogeneous issuer types. As Holmstrom and Tirole (1997) demonstrates that firms with stronger reputational incentives are more likely to access bond markets. The paper presents empirical evidence that corroborates these theoretical perspectives in this context.

This paper contributes to the discussion on non-pecuniary motives in asset pricing by providing evidence that investors are willing to pay a green premium. The findings of Heinkel, Kraus, and Zechner (2001), Fama and French (2007), and Pastor, Stambaugh, and Taylor (2022) support a notable shift in investor preferences from traditional returns to green returns. Specifically, the increasing preference for ESG investments is highlighted by Krueger, Sautner, and Starks (2020) and Ilhan, Krueger, Sautner, and Starks (2023), given the willingness of investors to accept lower yields for pro-environmental projects. Consequently, this study reinforces the literature on non-financial motives driving investment decisions.

The remainder of this paper is organized as follows. Section 2 presents the background and institutional details of green and sustainability-linked bonds. Section 3 argues the research's mechanism and premise. Section 4 describes the data and presents an univariate analysis. Section 5 describes the methodology. Section 6 presents the primary results of pricing corporate green and sustainability-linked bonds. Section 7 supports the main result with different methodology. Finally, section 8 concludes.

2. Institutional Details

Sustainable credit markets are the finance segment that funds environmental or social objectives through debt instruments. This market has expanded rapidly over the past decade. For example, in 2021, the combined issuance of labeled sustainable debt (including green,

social, sustainability, and sustainability-linked bonds) reached about $1.1 trillion, nearly double the previous year. Green bonds dominate this space in terms of volume and remain the largest category of sustainable debt. Indeed, green bonds consistently account for roughly half or more of annual sustainable bond issuance (about 57% in 2024). In short, green bonds have established themselves as the mainstay of sustainable finance, and they set the stage for the innovations that followed in sustainable credit markets.

2.1. Green bonds

In 2008, the World Bank launched the first green bond, initiating the green bond market, which finances climate-related projects. Corporate participation began in 2013 with issuances from Bank of America and a Berkshire Hathaway solar subsidiary. The Green Bond Principles (GBP), established in 2014 by major investment banks, provided guidelines on using funds, project evaluation, and reporting. These banks played a crucial role in shaping the market, often leading green bond underwritings. The establishment accelerated market expansion, attracting diverse issuers and investors.

Third-party certification, including efforts by Moody's and Standard & Poor's, emerged to ensure environmental compliance, given the absence of mandatory green bond frameworks. Notably, there is a lack of public governance; issuance with green criteria relies instead on evolving market norms and voluntary standards. Green bonds are characterized by their commitment to funding green projects. However, they face a moral hazard as issuers may not fulfill their green promises post-funding. To mitigate this, the GBP, formulated by the International Capital Market Association(ICMA), provides guidelines emphasizing pre-issuance verification but does not guarantee project outcomes. Even the ex-ante green label certification from aligned providers can enhance issuer credibility and mitigate the information asymmetry between issuers and investors.

In this research, the initial assumption is that the motivation for issuers in the green

bond market lies in reducing the cost of capital. However, this dynamic could be altered by tax incentives for investors or interest payment subsidies for issuers, a scenario not currently applicable to corporate bonds but prevalent in municipal bonds. Key mechanisms include tax credit bonds, as seen in the U.S. federal government's Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs) programs, where bond issuers offer tax credits instead of interest payments, effectively reducing their financial burden. Additionally, direct subsidy bonds under the same programs allow issuers to receive government rebates to offset their interest expenses.

2.2. Sustainability-linked bonds

Sustainability-Linked Bonds (SLBs) are a more recent innovation in sustainable finance, designed to complement the use-of-proceeds model of green bonds. An SLB is any bond instrument for which the financial or structural characteristics can vary depending on whether the issuer achieves predefined sustainability targets. In other words, instead of dedicating the bond proceeds to specific green projects, the issuer commits to future sustainability performance goals (measured by Key Performance Indicators KPIs). The bond's terms, typically the coupon rate, will adjust ex-post if those targets are unsatisfied. This mechanism directly links the issuer's sustainability results to its cost of capital.

The first corporate SLB is widely credited to Enel S.p.A., an Italian energy company, which in September 2019 issued a $1.5 billion bond tied to its renewable energy goals. This landmark transaction demonstrated the viability of linking bond financing to broad sustainability outcomes and effectively marked the beginning of the SLB market. In June 2020, ICMA introduced the Sustainability-Linked Bond Principles (SLBP) to guide this nascent market. The SLBP is a voluntary framework analogous to the Green Bond Principles but tailored for performance-linked instruments.

With a framework in place and growing sustainability commitments by corporates, the

SLB market expanded rapidly. From only a handful of deals in 2019–2020, issuance surged in 2021, making SLBs one of the fastest-growing segments of sustainable finance. In 2021, companies issued roughly $118.8 billion worth of SLBs globally, a volume nearly 10 times (940%) higher than the SLB issuance in 2020. By integrating sustainability outcomes into the bond's financial structure, SLBs appeal to companies that may not have enough green assets to do a traditional green bond but still want to signal and incentivize their transition to more sustainable operations.

They have thus carved out a complementary role in the sustainable debt market: whereas green bonds fund specific environmental projects, SLBs fund general corporate purposes while driving issuer-level sustainability performance. Although SLB issuance volumes are still smaller than green bonds, they are expected to grow as more issuers and investors become comfortable with this innovative format. In sum, corporate SLBs have quickly become an important tool within sustainable finance, broadening the reach of the market by focusing on outcomes (sustainability performance) rather than strictly the use of funds.

In conclusion, while green and sustainability-linked bonds aim to channel capital toward sustainability, they do so via very different mechanisms. Green bonds focus on allocating funds to green projects, leaving the bond's financial terms unchanged. SLBs, in contrast, focus on incentivizing the issuer's sustainability performance by embedding targets into the bond contract aligning financing costs with sustainability outcomes. These differences in design and structure mean the two instruments can complement each other in a climate finance strategy: an issuer might use green bonds to fund specific projects and SLBs to drive company-wide improvements.

3. Mechanism

The paper contends that corporations' proliferation of green bonds is catalyzed by economic motivations that transcend pursuing a modest reputation. Such motivations encompass reductions in borrowing costs attributable to a "green premium" as an economic channel, such as the cost of capital. Nevertheless, it is projected that the magnitude of this premium wanes over time as the mechanics of market supply and demand reshape it. However, the relative advantage of this premium is predicted to decline as market dynamics gradually change. The observed decline in the US green bond index since 2021 suggests that not only the green premium diminish, but it may also invert, transitioning to a state of discount in the future.

Moreover, analyzing the underwriters' role in this nascent market is imperative. It is anticipated that a significant incidence of underwriting discounts is evident in the issuance of green bonds. This suggests that rather than investors, the underwriters predominantly absorb the economic advantages that corporations reaped through green bond issuance. Such a paradigm shift in the economic landscape of green finance accentuates the pivotal role that underwriters play in determining the marketability and pricing structures of green bonds.

Further investigation into how the green benefits vary with issuers' frequency of participation in the market is critical. It is hypothesized that issuers with an experience of repeated market participation accrue more significant financial benefits than newcomers. This difference is primarily due to information asymmetry; investors and underwriters are likely to have more confidence in seasoned issuers, who have a proven track record of successfully allocating funds per their green mandates. In contrast, new entrants may face skepticism regarding their potential for greenwashing or doubts about their ability to comply with green standards, particularly where the gap in underwriting discounts is pronounced. This suggests that the financial market differentiates between issuer types, impacting the cost benefits of green bond issuance.

4. Data and Univariate Analysis

The dataset was compiled from Bloomberg's fixed income database to empirically examine corporate green bonds, covering the universe of active U.S. corporate green bonds issued from January 2015 through June 2024. For comparison with ordinary bonds, data from the Mergent Fixed Income Securities Database (FISD) is utilized to capture primary credit market bond characteristics. The FISD, known for its comprehensive and granular details of U.S. corporate debt securities, is integrated with the green bond dataset via unique 9-digit CUSIP numbers, facilitating precise matching and identification of green bonds within the broader universe of ordinary corporate bonds. However, because FISD data coverage extends only through the second quarter of 2024, the sample period for analysis is accordingly limited from January 2015 to June 2024.

The analysis is restricted to bonds denominated in USD, while the domicile country is varied to maintain consistency and relevance to the U.S. market, including all corporate debt, MTNs and Yankee bonds. Bonds with a maturity of less than one year and those missing data on the offering yield are excluded—a critical variable for this study. As this is provided on fixed-rate issues, the universe of U.S. corporate bonds is confined to securities with fixed coupons. The computation of yield spread is the difference between the bond's yield to maturity and the corresponding point on the government bond yield curve, which has been linearly interpolated to match the bond's maturity and issuance date. The daily treasury yield curve rates utilized in this analysis are sourced from the United States Department of the Treasury.

Except for dummy variables, all variables are winsorized for statistical robustness at the 1st and 99th percentiles of their pooled distribution. This process of winsorization and filtering yields a comprehensive dataset representing the complete universe of U.S. Corporate Bonds. The final sample used for analysis comprises 332 green bonds and 28,442 ordinary bonds, offering a substantive basis for examining the specific characteristics and trends within

the U.S. green bond market.

Figure 1 presents an in-depth examination of U.S. corporate green bond issuance trends, distinguishing between green and non-green bond issuance in annual bond issuance amounts in billions. As shown in the bar plot, green bonds are only a tiny fraction of the corporate debt universe. The line graph within the figure provides a detailed representation of the proportion of green bonds relative to the total volume of bonds issued, with this proportion termed the "green bond share" and quantified on the right vertical axis. This depiction aligns with the global trend of green bond evolution, indicating that the U.S. market exhibits a comparable pattern. The data reveals a notable peak in the absolute issuance amount of green bonds in 2022. Data for 2024 includes projections for the second half of the year, shown by the shaded area. Furthermore, the graph illustrates a significant insight: the relative share of green bonds within the total bond market has not merely grown but has done so exponentially, showcasing the accelerating integration of environmentally focused financial instruments in the U.S.

Similarly to the green bond data, sustainability-linked bond data is collected using Bloomberg's indicator. The earliest sustainability-linked bond in the dataset was issued in 2019, so the sample period covers January 2019 through June 2024. Table 1 presents summary statistics for labeled bonds compared to the broader universe of ordinary corporate bonds available in FISD. Since sustainability-linked bonds were introduced recently, the dataset contains only 103 securities issued by 66 unique firms. Within the sample, bonds are exclusively tagged as green or sustainability-linked; no bond holds both labels simultaneously. However, seven issuers in the dataset have issued green and sustainability-linked bonds. Labeled bonds are more than 50% larger than ordinary ones. This difference likely arises from the greater funding requirements associated with green and sustainability projects compared to conventional ones. Consistent with expectations for long-term projects, labeled bonds also have longer maturities.

Regarding credit ratings, bonds often carry multiple ratings from agencies like Moody's, S&P, and Fitch. To standardize the ratings, the average of all available ratings at issuance is used; if a bond has only one available rating, that single rating is adopted. Initially, ratings are captured using a standard alphabetical scale, which is converted to a numerical scale ranging from 1 (lowest, C) to 21 (highest, AAA). The average credit rating in the sample is approximately 14, equivalent to BBB+ or Baa1, depending on the rating agency. Figure 2 illustrates the frequency distribution of credit ratings for green and ordinary (non-green) corporate bonds. Green bonds are predominantly clustered in higher credit rating categories, suggesting that issuers of these bonds typically possess higher creditworthiness. The highest concentration of green bonds is observed at the BBB+ rating, reflecting relatively low credit risk. In contrast, ordinary bonds show a broader spread across credit ratings, indicating a more diverse range of credit quality within that universe, including a notable proportion with moderate to high credit risk.

A simple univariate analysis is summarized in Table 2. Ordinary bonds in each panel exclude bonds labeled explicitly as green or sustainability-linked; thus, ordinary bonds in Panel A do not include any sustainability-linked bonds. Panel A shows that green bonds, on average, exhibit a 1.37% lower offering yield, incur higher underwriting fees, and have larger issuance sizes compared to ordinary bonds, suggesting potentially lower perceived risk. Consistent with previous findings by Baker et al. (2022), green bonds also have lower coupon rates and significantly longer maturities, with an average difference in maturity of 4.87 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-linked bonds demonstrate similar patterns to green bonds. Although sustainability-linked bonds exhibit slightly lower underwriting fees than ordinary bonds, this difference is not statistically significant. Notably, sustainability-linked bonds and ordinary 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. Methodology

The green premium is determined by calculating the difference in yield at issuance between a green bond and its non-green counterpart. The emphasis on offering yield is to reflect the borrowing cost accurately in the primary market, while the potential misrepresentation is for secondary market yields. However, future research to learn the dynamics of investors' demand is plausible to expand. In investigating the presence of green premiums within the primary market, arising from the non-randomized nature of the treatment, the study employs a robust statistical methodology known as matching.

This technique is pivotal in assessing the impact of a given treatment by contrasting the outcomes of treated units with those of control units within the framework of an observational study. Central to this analysis is utilizing the "green" indicator as the treatment variable, facilitating a comparative assessment of the yield to maturity between green and conventional bonds. The primary aim of the matching process is to mitigate bias in the estimated average treatment effect. This is achieved by adjusting for various covariates, thereby isolating the attribute of "greenness" as the sole determinant in estimating the offering yield. Such a methodological approach enables a more accurate and unbiased comparison of outcomes across the respective groups, thus enhancing the rigor and validity of the findings about green premiums.

Existing literature predominantly concentrates on pricing municipal green bonds, yet the corporate green bonds' domain remains relatively underexplored. Flammer (2021) pioneered the examination of the latter, although the analysis encountered limitations due to a constrained sample period extending until 2018 (only five years of analysis after green bond

issuance.) Additionally, employing a broader timeframe when choosing counterpart bonds, starting from 2010 despite the initial issuance of green bonds in 2013, introduced potential distortions in the matching process. This may have led to an incomplete representation of the green premium within the corporate bond market. Notably, only 152 matched pairs, according to 65 unique issuers, were utilized in the global dataset, potentially skewering the results due to the omission of controls for the denomination currency and issuance date.

In this study, I adopt the methodology established by Larcker and Watts (2020), enhancing and extending the methods originally introduced by Flammer (2021), explicitly focusing on corporate green bonds. The process is meticulously outlined as follows: From 332 corporate green bonds issued by publicly listed companies, all of which provide accessible data on the yield at issuance and are associated with 201 distinct issuers. In the subsequent step, I carefully incorporate only those ordinary bonds from these issuers for which the offering yield data is readily available. It is important to note that this study's dataset explicitly excludes bonds with specific labels, such as sustainability-linked or social bonds, to maintain a focused and uniform bond set. On average, this represents about 20 potential ordinary bond matches per issuer. Such a detailed and comprehensive approach to dataset compilation is designed to yield a robust and expansive foundation for the analysis.

This analysis utilizes the nearest-neighbor matching approach, with the Mahalanobis distance as the primary metric. In the context of identical issuers and acknowledging the considerable variation in variables outlined in Table 2, the term "distance" is used to describe the extent of similarity between two financial instruments. The selection of the nearest neighbor is conducted by evaluating five essential characteristics: (i) the logarithm of the issuance amount, (ii) the coupon rate, (iii) the maturity years, (iv) the credit rating, and (v) issuance date (year-month). After trying to exact match with the credit rating, I control it as the nearest neighbor matching criteria due to the divergence of the notches and too much data being dropped. Within the scope of the study, it was observed that 93% of the bonds

in the sample lacked value in the seniority data at the security level, according to the FISD. Consequently, seniority as a characteristic has been excluded from the control parameters in the analysis to maintain data integrity and relevance. Evaluating the quality of matched samples is important when using matching methods. Figure 3 presents graphical diagnostics illustrating the covariate balance achieved through the matching process. The balance plot reveals that the empirical distributions of covariates between the matched treatment and control groups are well-aligned, demonstrating common support. Using the matching procedure, I calculate the average treatment effect of security being green over various outcome variables as:

$$\hat{\tau} = \frac{1}{N} \sum_{i=1}^{N} (Y_i^G - Y_i^{NG}) \tag{1}$$

where N represents the total number of bonds in our sample, Y_i^G is the outcome variable for the green bond, and similarly, Y_i^{NG} the outcome variable for the associated non-green bond. From the matching, only one potential outcome is observed for each observation i; the observed outcome $Y_i = Y_i^G$ or Y_i^{NG} represents one potential outcome. The unobserved outcome is estimated by averaging the observed outcomes for the observations j of the opposite treatment group chosen as matches for i.

6. Findings

This study aims to quantify the financial benefits associated with green bond issuance by estimating the Average Treatment Effect (ATE), effectively capturing the magnitude of the green premium. The estimation employs a comprehensive matching procedure. The analysis aggregates these estimates annually, facilitating an in-depth examination of temporal trends in the green premium.

The primary objective of this research is to precisely determine the scale and direction of financial advantages, commonly known as the "greenium," which traditionally considers

only the yield differential at issuance. This paper expands upon conventional terminology by introducing the broader concept of "green benefit," encompassing yield reductions and underwriting fee discounts facilitated by financial intermediation. Furthermore, the study explores alternative issuer characteristics, such as distinguishing between seasoned and first-time issuers, to account for differential impacts.

6.1. Is there a green benefit?

The hypothesis of this study posits that green bond issuers are likely to incur a reduced cost of debt due to the characteristics afforded by the ex-ante disclosure of the use of proceeds in their prospectus. This transparency serves as a compensatory mechanism for providing such information. Consequently, investors perceive lower risks associated with green securities, primarily due to the clarified use of funds, and are, therefore, willing to accept lower returns to mitigate information asymmetry.

One standout result in table 3 is the underwriting fee discount for green bonds. This measure is relatively novel in green bond premium literature, as most prior studies focus on yield differences rather than the fees paid to intermediaries. The underwriting fee (%) in column (1) is a percentage of the offering amount gap between the price received by the issuer and the price paid by investors: the selling concession alongside the underwriting and management fees. This concept is akin to an underwriter's discount. The analysis finds that this fee is consistently lower for green bonds: about 0.25% lower on average, and in many sub-periods even more. This fee reduction equates to a substantial savings of approximately $1.6 million for issuers per note. For issuers, going green is a direct monetary benefit, boosting their net proceeds from the bond sale.

The calculated overall greenium reported in column (2), as indicated by the offering yield (%), shows -21 basis points (bps), consistent with prior literature. While Larcker and Watts (2020) found no greenium in the municipal green bond market, other papers

Caramichael and Rapp (2022), Baker et al. (2022), and Wang and Wu (2022) have reported slight variations, with findings of -8 bps, -6 bps, and -5 bps, respectively. These figures contrast the corporate bond market, where Flammer (2021) observed no significant greenium. The findings diverge from these, presenting a notable and statistically significant outcome. Relative to the average offering yield of the sample, negative twenty one basis points reflect a 3% decrease in the borrowing cost to the issuer. The results suggest that issuing green bonds not only serves as a positive signal for the issuers but also provides them with the advantage of lower borrowing costs. Furthermore, the study reveals a discernible upward trend in borrowing costs, indicating that the financial benefits for issuers from the green premium have diminished over time.

The yield spread, defined as the difference between the bond's yield at issuance and the corresponding benchmark treasury yield, showed only a small 0.04% lower difference on average, which was insignificant. This suggests that while the headline yield at issuance was meaningfully lower for green bonds (a benefit to issuers), the difference was muted once adjusted for the risk-free rate. This finding is consistent with Flammer (2021) findings of nearly identical pricing for green and counterpart bonds. Still, the main takeaway is that over the entire period, green bond issuers benefited from a reduced underwriting cost and a lower borrowing cost at issuance.

Figure 4 illustrates the evolution of the green benefit between green bonds and their conventional counterparts over time. The green dots reflect the greenium coefficient for each year. The green premium initially existed because ESG-preferred investors accepted lower returns to align with sustainability goals. However, this trend diminished and reversed by 2023, as data indicates the yield difference became positive—signifying a green bond discount. By 2022–2023, investors appeared less willing to sacrifice returns, likely due to a shift in investor preference for ESG, rising interest rates prompting a stronger emphasis on yield, or growing skepticism over potential greenwashing. Consequently, the direct financial

incentive for issuing green bonds significantly diminished, elevating the importance of underwriting fee discounts beginning in 2020 as one of the important financial advantages for green bond issuers.

Underwriters accepting lower fees ("discounts") for green bond issuances may seem counterintuitive, but strategic market incentives drive the reasons financial intermediation might bear this cost in the primary market. Banks may intentionally reduce fees to establish a market presence in the rapidly expanding green finance sector and secure reputation, market share, and future cross-selling opportunities. Strong investor demand for ESG investments further justifies lower fees, as oversubscribed green bonds require less marketing effort and pose reduced underwriting risk. Finally, heightened competition among banks for green mandates naturally pressures underwriting fees downward. These factors explain why underwriters voluntarily transfer value to issuers through reduced fees, effectively sharing the cost advantage of green bond issuance in the primary market.

6.2. Is there a sustainable benefit?

Sustainability-linked bonds (SLBs) provide issuers with much larger underwriting fee discounts than green bonds (GBs). In Table 4, on average, SLB issuers pay about 1.5% lower underwriting fees than equivalent conventional bonds—six times larger than the 0.25% reduction for GB issuers. Similarly, while both bond types exhibit lower initial yields relative to comparable conventional bonds, SLBs show a substantially greater yield advantage (approximately 50 basis points), highlighting a stronger "sustainability-linked" premium compared to GBs' more modest benefit (around 21 basis points). These results underscore significantly stronger financial incentives associated with SLBs relative to green bonds.

The cost advantages associated with green bonds have evolved over the past decade, while SLBs, introduced more recently, exhibit different trends. Whereas the green premium has steadily declined, SLBs continue offering substantial financial benefits through 2024.

Even in 2023—a year when green bonds lost their yield advantage—SLBs still maintained roughly a 47 basis-point yield reduction compared to non-SLBs. They retained significant underwriting fee discounts, highlighting ongoing investor favor toward the SLB structure. Green bonds also confer issuer benefits through reduced fees and yields, but these advantages are smaller and diminish as the market matures. Over time, the green premium has weakened, whereas the SLB premium remains robust, reflecting investor and intermediary responses to the stronger credibility built into SLB performance commitments.

6.3. Heterogeneous effects

In this study, I investigate the differential impact of issuer participation frequency on the financial benefits of green bonds. The analysis captures distinctive market behaviors within a self-regulatory environment by segmenting issuers based on their bond issuance frequency. Table 5 reports a comprehensive breakdown of the financial advantages of issuing green and sustainability-linked bonds, categorized by issuer type. In the sample, repeat issuers account for approximately 60% of both labeled bond markets, while around 40% are first-time issuers. Panel A displays surprising result that issuers entering the green bond market for the first time tend to receive greater financial incentives than those who have repeatedly tapped into this market.

One-time green bond issuers experience substantially larger underwriting fee discounts, averaging about 0.69 percentage points, compared to seasoned issuers who receive minimal discounts of around seven percentage points, indicating no meaningful reduction. Additionally, first-time issuers secure notably lower offering yields at issuance, approximately 23 basis points below comparable conventional bonds, whereas issuers that frequently issue green bonds see no significant yield advantage, facing yields slightly higher by about six basis points. Debut issuers benefit from a more significant premium than repeated issuers, opposite to the findings of Fatica, Panzica, and Rancan (2021). In other words, a company's

first green bond issuance tends to get a notable green benefit that largely disappears for subsequent green bonds.

A salient reason that green bonds favor first-time issuers is their structural design, which mandates only an ex-ante commitment to allocate funds to green projects without requiring subsequent verification of environmental outcomes. Because issuers are not obligated to demonstrate actual sustainability results after issuance, some might exploit the green label without genuinely contributing to environmental goals—greenwashing. Investors and underwriters, mindful of this risk, initially reward debut green bond issuers with significant underwriting fee discounts and lower yields, essentially providing the benefit of the doubt.

Investors inevitably become aware that market enthusiasm declines for issuers who repeatedly enter the green bond market without demonstrating verifiable environmental outcomes. Although some firms voluntarily publish annual sustainability reports to signal their credibility, concerns remain that issuers lacking verified results might exploit the green label. Over time, stakeholders grow cautious following initial issuances that fail to deliver proven environmental benefits, reducing financial incentives for later issuances. Consequently, the absence of accountability inherent in standard green bond structures weakens investor trust, causing financial benefits to become concentrated in the initial issuance and significantly diminished for repeat issuers perceived as having higher greenwashing risks.

The results presented in Table 5, Panel B strongly support this reasoning. In contrast, the pattern observed for SLBs is the reverse of green bonds. Unlike green bonds, SLBs include explicit performance targets, enabling repeated issuers to achieve greater financial advantages than first-time issuers in the primary market. Specifically, repeated SLB issuers obtain underwriting discounts averaging approximately 1.8 percentage points, notably higher than the 1.4 percentage points awarded to first-time SLB issuers. Although both types of issuers benefit from significant discounts, the magnitude is distinctly larger for repeat issuers. Repeated SLB issuers attain premiums averaging around 75 basis points to comparable

conventional bonds. In contrast, first-time SLB issuers experience a smaller yield advantage, averaging around –0.41%, which is both smaller in magnitude and statistically less robust.

This outcome indicates that issuing multiple SLBs builds investor confidence and leads to even better financing terms, unlike the green bond case, where the first strike is the strongest. The study finds that experienced SLB issuers obtain significantly greater underwriting discounts than newcomers, reflecting the market's trust in repeat issuers' commitments or reputations. The key reason for this SLB pattern is the outcome-linked structure of sustainability-linked bonds. SLBs tie financial terms to actual sustainability performance – for example, an issuer must meet specific carbon reduction or ESG targets by a set date or incur a penalty (such as a coupon step-up) if targets are missed. This built-in accountability reassures investors that the issuer cannot label the bond as "sustainable" and ignore the goals.

Because SLB issuers are obliged to show results ex-post, the risk of greenwashing is significantly reduced. Investors and underwriters consequently view SLBs as more reliable and credible, leading them to reward issuers with a proven track record of meeting sustainability targets. A company that successfully issues an SLB and delivers on its promises gains reputation; when it comes back to the market with another SLB, its credibility translates into larger discounts and better pricing. In essence, the performance-based design of SLBs aligns incentives with outcomes, so repeated issuers are seen as lower-risk, high-credibility borrowers and benefit even more than first-time SLB issuers.

Consequently, in the green bond market, seasoned issuers do not gain a larger advantage than one-time issuers. This dynamic suggests that the market may discount the "green" novelty for experienced issuers – possibly due to investor skepticism about companies that repeatedly issue green bonds without additional proof of impact or simply because the first green issuance attracts an extraordinary wave of demand that later issues cannot replicate. In contrast, the SLB market rewards repeated issuers. This indicates a reputational or

credibility effect in the SLB market: an issuer that successfully issues an SLB and meets its sustainability targets can strengthen investor trust for subsequent issues. Underwriters and investors likely view experienced SLB issuers as "high-type" entities with a proven commitment to sustainability goals and, thus, are willing to offer even better terms on follow-up SLB issuances. Green bond issuers, lacking mandatory performance follow-up, do not see the same reputational reinforcement – a repeat green issuer does not automatically get a better deal and, in some cases, might even face a more indifferent or demanding market the next time around. In summary, sustainability-linked bonds exhibit larger financial benefits than green bonds.

7. Robustness

In this section, I present a series of robustness checks designed to confirm the reliability and generalizability of the main findings. By demonstrating different methodologies, we can better understand the previous literature discussions and find meaningful effects supporting the primary results.

This study employs rigorous matching to ensure the accuracy of its findings. For the robustness of the analysis and support of the hypothesis that green benefits exist in the market, this research advances by regressing key outcome variables against indicators of green bonds and a set of control variables with fixed effects. In the empirical framework, the specification of the outcome variable Y_{it}, which is the offering yield or underwriting fee, is a function of a set of explanatory variables. The baseline model is formalized as follows:

$$Y_{it} = \alpha + \beta_1 \cdot Label + \beta_2 \cdot X_{it} + \eta_j + \eta_c \cdot \eta_m \cdot \eta_t + \epsilon_{it} \tag{2}$$

The binary variable *Label* indicates whether a bond is classified as green or sustainability-linked according to Bloomberg's tagging. Bond control variables are in X_{it}. Adhering to

the methodological approach by Baker et al. (2022), the study incorporates a range of fixed effects to adjust for varying maturities, credit ratings, and prevailing market conditions during bond issuance. The term η_j denotes the issuer fixed effect, while the interaction term $\eta_c \cdot \eta_m \cdot \eta_t$ represents the interaction of credit rating, maturity, and issuance year fixed effects. ϵ_{it} is the error term, assumed to be normally distributed and independent of the explanatory variables. Furthermore, the model is extended to include an interaction term of issuer type $Label \times Repeat$, which accounts for the differential effect of being a repeated issuer within the subset of labeled bonds. This interaction allows for investigating whether repeated issuers of labeled bonds experience a different pricing mechanism than new issuers.

Table 6 provides additional regression results that reveal two critical nuances. First, consistent with some prior literature, Panel A suggests that green bonds do not always exhibit a clear premium over conventional bonds. We can learn that the existence of the green premium may vary according to the different methodologies. It is important to use strict matching methods to display a clear green premium, but simple regression does not capture it. This provides one avenue of evidence to the literature on why there is no consensus on the greenium. Secondly, the "Green" indicator often shows a negative coefficient, indicating lower underwriting fees and green premium; even though they do not show any significance, the magnitude of the interaction with the repeated issuer is smaller than the one-time issuer, suggesting that for frequent issuers, any green bond benefit may be diminished or overshadowed by concerns about greenwashing which is consistent to the previous result.

Interestingly, SLB issuers benefit significantly from underwriting fee discounts but not from the premium of offering yield overall. However, the subsequent analysis by issuer type shows a different pattern. Panel B highlights that SLBs continue to demonstrate a robust cost advantage—repeated issuers, in particular, receive a significant premium (37 bps) and enjoy notable underwriting fee discounts of 1.6%. This indicates that the market trusts the verifiable performance commitments inherent in sustainability-linked bonds, especially

when issuers have an established track record. These results underscore how bond design and issuer reputation intersect, offering a more comprehensive picture of how investors price green versus sustainability-linked debt.

8. Conclusion

As climate change poses significant challenges, the green bond market has become a vital channel for various issuers—including governments, municipalities, financial institutions, and corporations—to secure funding for carbon emission reduction projects. This research focuses on green corporate bonds, building on the analysis of Flammer (2021). The findings reveal that green bonds trade at a premium, although this premium decreases over time. Remarkably, this paper introduces the novel finding that green bond issuers benefit from a significant discount on underwriting fees, which serves as their primary financial motivation in the debt market. This observation provides a complementary perspective to the findings presented by Hong and Kacperczyk (2009) in equity markets, where sin stocks are correlated with higher returns.

Interestingly, green bond favors one-time issuers, implying the market is concerned with greenwashing motives. Due to the difference in security design, the experienced sustainability-linked bond issuers benefit more. Given the result, we can understand how the market reacts to the commitment by words versus the actual performance. In summary, issuing green bonds offers economic benefits to issuers by allocating funds for environmentally friendly projects, demonstrating a commitment to sustainability. For policymakers, understanding the financial incentives between corporations and intermediaries could guide regulations or incentives that align with climate and sustainability goals. The expansion of the green bond market and its evolving dynamics present promising avenues for further study. In particular, mandating the disclosure of fund utilization and the environmental impact achieved would offer intriguing directions for future research.

Figure 1. **Trends in US corporate green bonds issuance (2015–2024)**
This figure presents annual corporate bond issuance in the U.S. debt market, measured in billions of U.S. dollars, from January 2015 through June 2024. The stacked bars distinguish green bonds (in green) from non-green corporate bonds (in gray). The red line plots the share of green bond issuance relative to total issuance on the right axis. The 2024 bar includes predicted issuance for the remainder of the year.

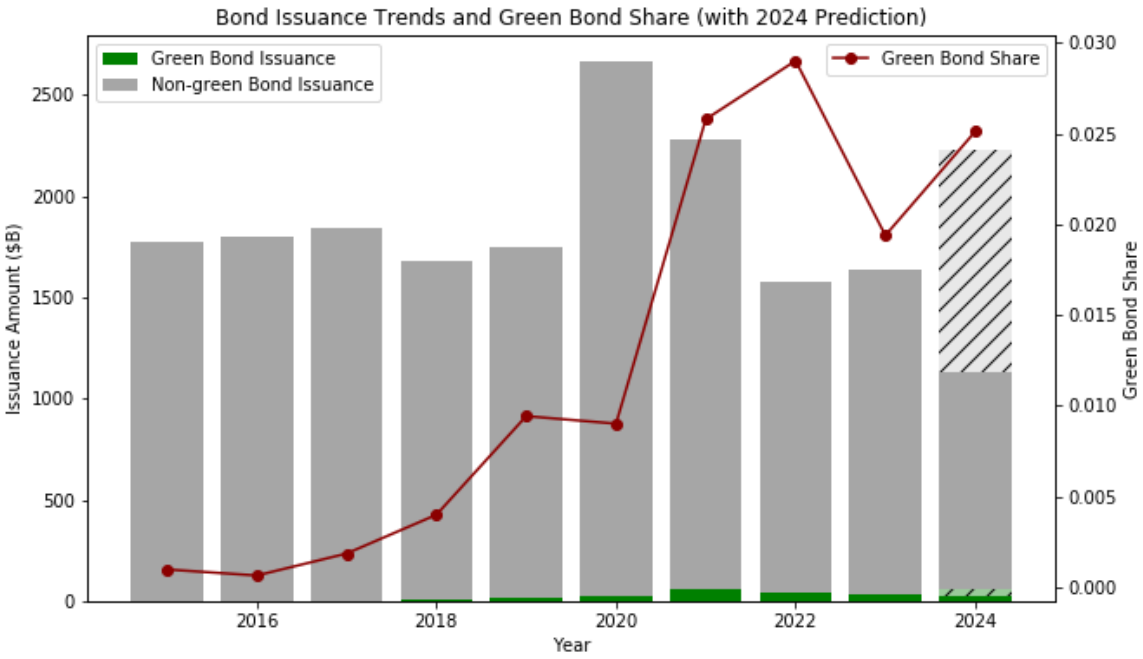


Figure 2. **Distribution of credit ratings for green and non-green bonds**
This figure shows the distribution of credit ratings for green and non-green corporate bonds from Mergent FISD (2015–2024). For each bond with multiple ratings from Moody's, S&P, and Fitch, the average of the available ratings is used; if only one rating is available, that rating is adopted. Frequencies are shown as the percentage of total issuance in each rating category.

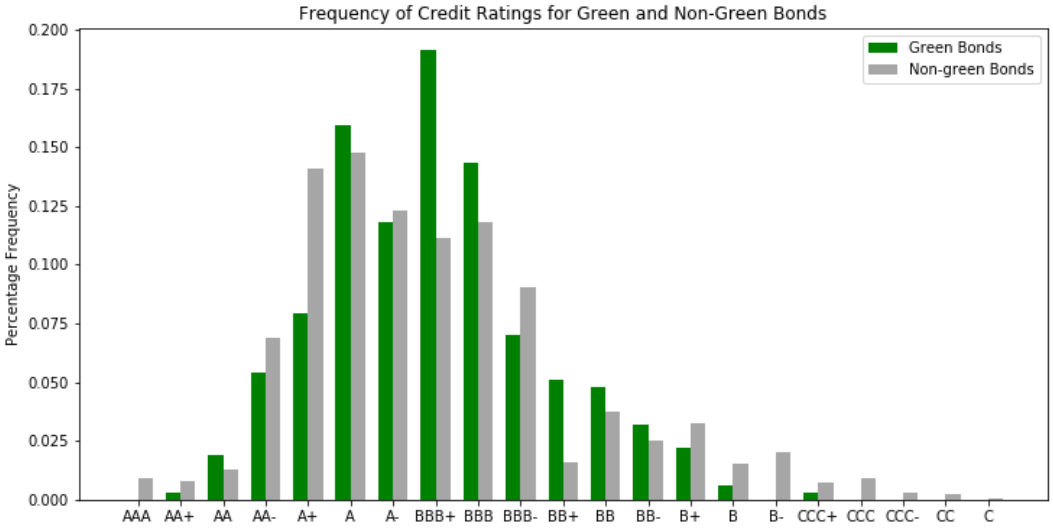


Figure 3. **Balance plot for matching diagnose**
The left panel ('Raw') illustrates the initial distribution of covariates for the variables used in the matching criteria before applying to match. The right panel ('Matched') presents the covariate distribution after implementing nearest-neighbor matching to enhance comparability between the control and treatment groups. The diminished interquartile range and the convergence of the median values for both groups demonstrate the post-matching enhancement in balance.

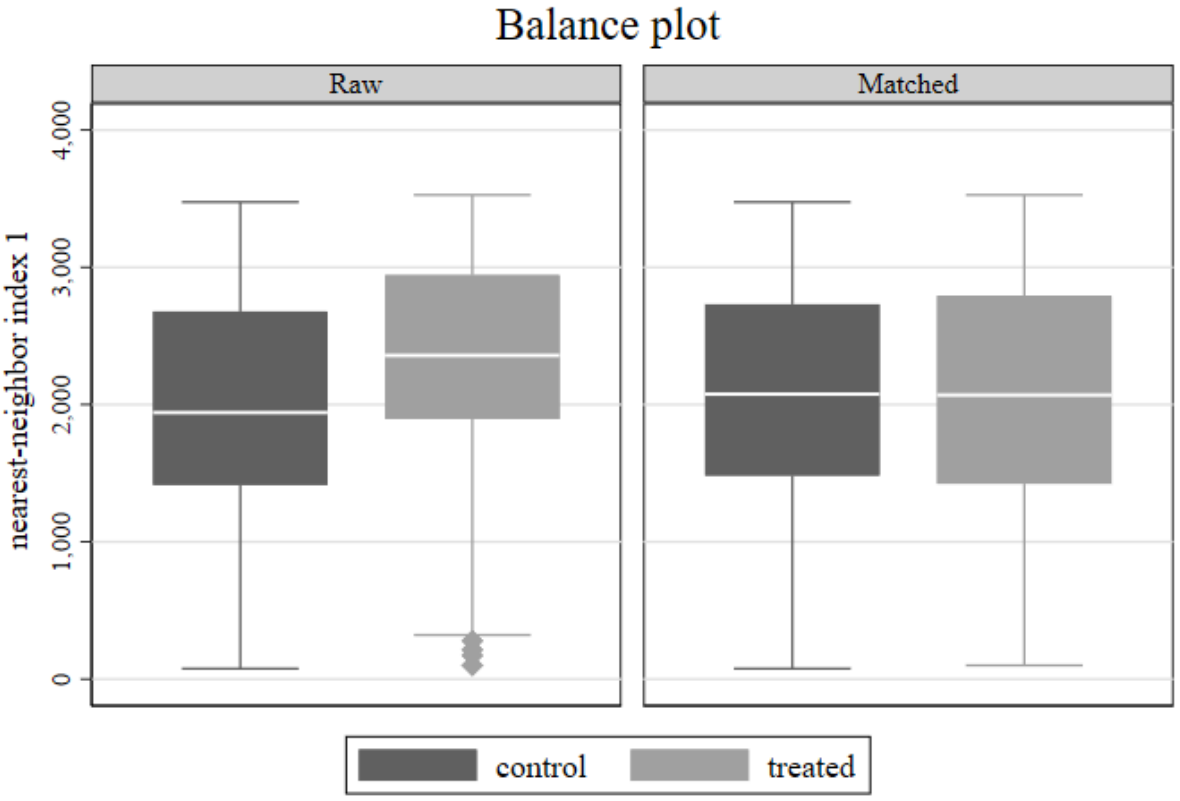


Figure 4. **Temporal trend of the green benefit**
This figure displays the annual evolution of the estimated green benefit based on the results in Table 3. The green benefit is measured by the offering yield difference (%) and the underwriting fee difference (%). Both measures are plotted on a single axis to allow for direct comparison over time.

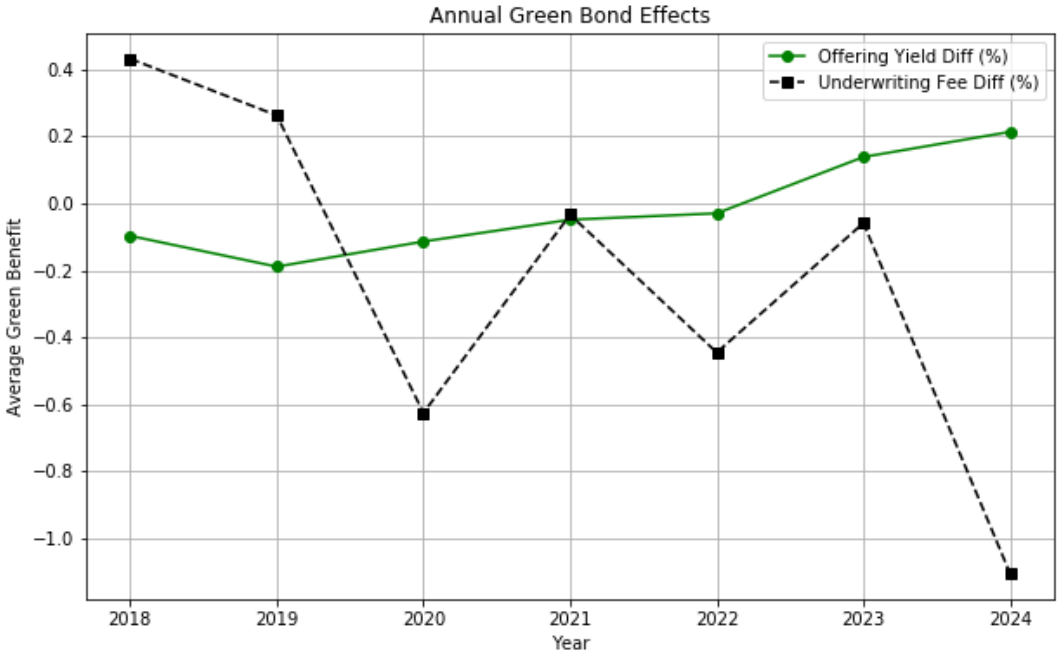


Table 1: **Summary statistics**
This table presents summary statistics for U.S. corporate bonds from January 2015 to June 2024. Column (1) reports the entire sample; column (2) contains green bonds; column (3) contains sustainability-linked bonds; column (4) combines green and sustainability-linked bonds; and column (5) reports ordinary bonds without any labels. The reported metrics include the total number of bond issues (*# Bonds*), 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.

Metric	All (1)	GBs (2)	SLBs (3)	GBs+SLBs (4)	Ordinary bonds (5)
# Bonds	28,877	332	103	435	28,442
# Bond issuers	4,191	201	66	260	4,133
Average amount (in $M)	422.14	628.31	637.91	630.58	418.90
	(493.14)	(307.27)	(383.50)	(326.48)	(494.60)
Coupon (%)	5.49	4.12	3.88	4.07	5.51
	(2.88)	(1.80)	(2.08)	(1.87)	(2.89)
Maturity (years)	7.25	12.05	10.37	11.65	7.17
	(7.15)	(8.78)	(8.43)	(8.72)	(7.10)
Credit rating (AAA = 21)	13.99	14.04	14.22	14.08	13.99
	(3.18)	(2.60)	(3.60)	(2.88)	(3.19)
Callable (1/0)	0.64	0.84	0.69	0.80	0.64
	(0.48)	(0.37)	(0.47)	(0.40)	(0.48)

Table 2: **Univariate analysis**
This table summarizes the characteristics of green, sustainability-linked, and ordinary corporate bonds issued between January 2015 and June 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 32 green bonds, 103 sustainability-linked bonds, and 28,442 ordinary bonds with complete data on these characteristics.

Panel A: Green Bonds

Variable	GBs		Ordinary bonds		Diff	
	Mean	SD	Mean	SD	Mean	p-value
Offering yield (%)	4.16	1.82	5.53	2.89	-1.37	0.0000
Yield spread (%)	1.70	1.18	3.23	2.98	-1.53	0.0000
Underwriting fee (bps)	6.44	1.89	6.13	3.50	0.31	0.2426
Amount (in $M)	628.31	307.27	418.90	494.60	209.41	0.0000
Coupon (%)	4.12	1.80	5.51	2.89	-1.39	0.0000
Maturity (years)	12.05	8.78	7.17	7.10	4.87	0.0000
Credit rating (AAA = 21)	14.04	2.60	13.99	3.19	0.05	0.7883
Callable (1/0)	0.84	0.37	0.64	0.48	0.19	0.0000

Panel B: Sustainability-linked Bonds

Variable	SLBs		Ordinary bonds		Diff	
	Mean	SD	Mean	SD	Mean	p-value
Offering yield (%)	3.95	2.10	5.67	2.95	-1.73	0.0000
Yield spread (%)	1.69	1.32	3.13	2.95	-1.43	0.0000
Underwriting fee (bps)	5.51	2.39	6.23	3.58	-0.71	0.1807
Amount (in $M)	639.26	385.14	374.10	472.18	265.16	0.0000
Coupon (%)	3.90	2.09	5.65	2.95	-1.75	0.0000
Maturity (years)	10.37	8.47	6.83	6.83	3.54	0.0000
Credit rating (AAA = 21)	14.22	3.62	14.17	3.18	0.05	0.8759
Callable (1/0)	0.69	0.47	0.68	0.47	0.01	0.8154

Table 3: **Is there a green benefit?**
This table examines average treatment effect estimates for green bonds and their matched nongreen 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 (%)	Offering Yield diff (%)	Yield Spread diff (%)
Overall Sample			
2015-2024	-0.248**	-0.213***	-0.039
	(0.115)	(0.056)	(0.054)
Sub-Periods			
2015-2023	-0.113	-0.214***	-0.116**
	(0.118)	(0.054)	(0.056)
2020-2022	-0.392**	-0.188***	-0.142**
	(0.177)	(0.070)	(0.069)
2023-2024	-0.580*	0.155***	0.221***
	(0.316)	(0.048)	(0.058)
Annual Breakdown			
2017	-0.170	0.110	0.021
	(2.317)	(0.484)	(0.533)
2018	0.431**	-0.097	-0.244
	(0.200)	(0.159)	(0.166)
2019	0.262	-0.189	-0.298*
	(0.202)	(0.143)	(0.161)
2020	-0.625**	-0.114	-0.100
	(0.299)	(0.162)	(0.171)
2021	-0.034	-0.049	-0.141*
	(0.197)	(0.091)	(0.083)
2022	-0.445	-0.030	0.139**
	(0.411)	(0.077)	(0.070)
2023	-0.059	0.138*	0.152
	(0.432)	(0.075)	(0.099)
2024	-1.104***	0.213**	0.261***
	(0.400)	(0.096)	(0.074)

Table 4: **Is there a sustainability-linked benefit?**
This table reports average treatment effect estimates for sustainability-linked bonds (SLBs) and their matched non-SLB 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 (%)	Offering Yield diff (%)	Yield Spread diff (%)
Overall Sample			
2019-2024	-1.492***	-0.501***	-0.060
	(0.538)	(0.203)	(0.100)
Annual Breakdown			
2020	-1.976***	-0.694**	-0.467*
	(0.729)	(0.278)	(0.256)
2021	-1.113	0.013	0.034
	(0.725)	(0.146)	(0.108)
2022	-1.057	-0.399*	-0.102
	(0.815)	(0.237)	(0.090)
2023	-3.573***	-0.472***	-0.130
	(0.674)	(0.179)	(0.191)

Table 5: **Comparison of GBs and SLBs benefits across issuer types**
This table demonstrates estimated differences in underwriting fees and offering yields for green bonds (GBs; Panel A) and sustainability-linked bonds (SLBs; Panel B) relative to matched ordinary bonds, segmented by issuer frequency. Columns (1) to (3) report underwriting fee differences (in percentage points), while columns (4) to (6) report offering yield differences (in percentage points). The "Base" columns present results for the overall sample as reported in Tables 3 and 4; "First issuer" columns focus on issuers debuting their first labeled bond; and "Repeated issuer" columns capture issuers with multiple labeled bonds. Standard errors appear in parentheses, followed by corresponding p-values. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Underwriting Fee diff (%)			Offering Yield diff (%)		
	Base	First issuer	Repeated issuer	Base	First issuer	Repeated issuer
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
GBs	-0.248**	-0.690**	-0.074	-0.213***	-0.230**	0.063
	(0.115)	(0.294)	(0.117)	(0.056)	(0.095)	(0.058)
Panel B						
SLBs	-1.492***	-1.435***	-1.831***	-0.501**	-0.411	-0.748***
	(0.538)	(0.484)	(0.680)	(0.203)	(0.274)	(0.156)
2020	-1.976***		-0.322	-0.694**	-0.503	-0.699**
	(0.729)		(0.980)	(0.278)	(0.565)	(0.342)
2021	-1.113	0.050	-2.133*	0.013	-0.073	0.175
	(0.725)	(0.735)	(1.161)	(0.146)	(0.160)	(0.216)
2022	-1.057	-1.424**	-1.916*	-0.399*	0.065	-0.545
	(0.815)	(0.695)	(1.105)	(0.237)	(0.390)	(0.518)
2023	-3.573***		-4.000***	-0.472***	0.259	-0.680***
	(0.674)		(0.758)	(0.179)	(1.240)	(0.110)

Table 6: **GBs and SLBs benefit: additional regressions**
This table captures the estimated benefit associated with the green and sustainability-linked indicators on underwriting fees and offering yields relative to ordinary bonds, using ordinary least squares regressions. Panel A reports results for green bonds and Panel B for sustainability-linked bonds, each identified via Bloomberg tags. Columns (1) to (3) report differences in underwriting fees (in percentage points), while Columns (4) to (6) present differences in offering yields (in percentage points). The third row in each panel captures the effect of repeated issuers. All specifications include maturity–rating–year interaction fixed effects. Standard errors, clustered by issuer, are reported in parentheses below the coefficient estimates, followed by p-values. 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						
Green	-0.387	-0.202	-0.446	-0.100	-0.090	-0.089
	(0.638)	(0.407)	(0.502)	(0.138)	(0.138)	(0.179)
Green × Repeated issuer			-0.070			-0.093
			(0.545)			(0.192)
Repeated issuer			0.160			-0.020
			(0.170)			(0.072)
Interaction FE	Y	Y	Y	Y	Y	Y
Issuer FE	N	Y	Y	N	Y	Y
Bond Control	N	Y	Y	N	Y	Y
Adjusted R-squared	0.813	0.854	0.854	0.918	0.918	0.918
Observations	7298	7188	7188	14689	14494	14494
Panel B						
Sustainability	-2.188**	-1.198	-0.664	-0.142	-0.128	0.193
	(1.006)	(0.812)	(1.254)	(0.197)	(0.200)	(0.301)
Sustainability × Repeated issuer			-1.569**			-0.372*
			(0.799)			(0.191)
Repeated issuer			0.265			0.0801
			(0.471)			(0.146)
Interaction FE	Y	Y	Y	Y	Y	Y
Firm FE	N	Y	Y	N	Y	Y
Bond Control	N	Y	Y	N	Y	Y
Adjusted R-squared	0.786	0.833	0.833	0.916	0.917	0.917
Observations	5469	5371	5371	11220	11050	11050

References

Baker, M., Bergstresser, D., Serafeim, G., Wurgler, J., 2022. The pricing and ownership of us green bonds. Annual Review of Financial Economics 14, 415–437.

Barbalau, A., Zeni, F., 2022. The optimal design of green securities Available at SSRN: https://ssrn.com/abstract=4155721.

Caramichael, J., Rapp, A. C., 2022. The green corporate bond issuance premium. Discussion paper, International Finance Discussion Paper No. 1346.

Fama, E. F., French, K. R., 2007. Disagreement, tastes, and asset prices. Journal of Financial Economics 83, 667–689.

Fatica, S., Panzica, R., Rancan, M., 2021. The pricing of green bonds: Are financial institutions special? Journal of Financial Stability 54, 100873.

Flammer, C., 2021. Corporate green bonds. Journal of Financial Economics 142, 499–516.

Heinkel, R., Kraus, A., Zechner, J., 2001. The effect of green investment on corporate behavior. The Journal of Financial and Quantitative Analysis 36, 431–449.

Holmstrom, B., Tirole, J., 1997. Financial intermediation, loanable funds, and the real sector. The Quarterly Journal of Economics .

Hong, H., Kacperczyk, M., 2009. The price of sin: The effects of social norms on markets. Journal of Financial Economics 93, 15–36.

Ilhan, E., Krueger, P., Sautner, Z., Starks, L. T., 2023. Climate risk disclosure and institutional investors. The Review of Financial Studies .

Krueger, P., Sautner, Z., Starks, L. T., 2020. The importance of climate risks for institutional investors. The Review of Financial Studies .

Larcker, D. F., Watts, E. M., 2020. Where's the greenium? Journal of Accounting and Economics 69, 101312.

MacAskill, S., Roca, E., Liu, B., Stewart, R., Sahin, O., 2021. Is there a green premium in the green bond market? systematic literature review revealing premium determinants. Journal of Cleaner Production 280, 124491.

Pastor, L., Stambaugh, R. F., Taylor, L. A., 2022. Dissecting green returns. Journal of Financial Economics .

Tang, D. Y., Zhang, Y., 2020. Do shareholders benefit from green bonds? Journal of Corporate Finance 61, 101427.

Wang, L., Wu, J. J., 2022. Deciphering greenium: the role of investor demand Available at SSRN: https://ssrn.com/abstract=4136605.

Zerbib, O. D., 2019. The effect of pro-environmental preferences on bond prices: Evidence from green bonds. Journal of Banking Finance 98, 39–60.