



What drives the Social Bond Premium? Evidence from certification and use of proceeds analysis[☆]

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ABSTRACT

The study investigates the Social Bond Premium (S-Premium), defined as the difference in Asset Swap Spreads (ASS) between Social Bonds (SBs) and comparable conventional bonds. Using a dataset of 163 SBs, the research employs Pooled OLS regressions with clustered standard errors to examine the determinants of the S-Premium. The findings show that ICMA Certifications and Second Party Opinions (SPOs) are associated with a more pronounced S-Premium, indicating that external validation enhances investor confidence. Additionally, the Use of Proceeds (UoP) categories influence the S-Premium, with bonds financing clearly defined social projects exhibiting stronger pricing effects. This study highlights how certifications, issuer characteristics, and the specificity of funded projects shape investor perceptions in the Social Bond market, contributing to the broader understanding of the motivation that drives the subscription of such instruments.

1. Introduction

The increasing relevance of sustainability in financial markets has expanded beyond environmental dimension to encompass social and governance concerns, to include all the dimensions summarized in the acronym ESG, Environmental, Social and Governance. Social sustainability, in particular, aims to enhance human well-being, reduce inequalities, and promote inclusive economic growth by ensuring access to essential services such as healthcare, education, and housing. These areas are central to the United Nations Sustainable Development Goals (SDGs) outlined in the 2030 Agenda, which emphasize the necessity of addressing socio-economic disparities to foster resilient and equitable communities. The COVID-19 pandemic further underscored the urgency of social sustainability, as it exacerbated existing inequalities and revealed the fragility of global social support systems (IMF, 2021).

In response to the challenges of sustainability, Social Bonds (SBs) have emerged as a key financial instrument for mobilizing capital toward projects that promote social inclusion, poverty alleviation, and equal access to essential services (ICMA SBP, 2021). These bonds have played a pivotal role in financing initiatives such as expanding healthcare infrastructure, supporting small businesses, and assisting communities affected by economic and humanitarian crises (Torricelli and Pellati, 2023). As investor interest in social finance has grown, regulatory advancements—such as the development of a social taxonomy at the European level—have further strengthened market confidence and contributed to the rapid expansion of SB issuance (Platform on Sustainable Finance, 2022). Despite this increasing market presence, however, the pricing dynamics of SBs remain underexplored compared to Green Bonds, which have been

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extensively studied in relation to the so-called Greenium (Alessi et al., 2021; Huang et al., 2023; Koziol et al., 2022)—the yield differential reflecting investor willingness to accept lower returns for green financial instruments. Building on this framework, this study investigates whether a Social Premium (S-Premium) exists, adopting the definition proposed by Zerbib (2019), which measures the premium as the difference between a sustainable bond—here, a Social Bond—and a comparable conventional bond that is identical in all characteristics except for its social sustainability designation. This gap in the literature raises our research question: does a S-Premium exist for SBs, and what factors drive its magnitude? Answering this research question is relevant for assessing how investors value social impact within fixed-income markets and whether specific bond characteristics—such as certifications, external opinions, and transparency in Use of Proceeds (UoP)—influence their valuation.

This study examines the existence and determinants of the S-Premium, defined as the differential in Asset Swap Spreads (ASS) between a SB and a comparable conventional bond issued by the same entity. This research builds on the methodology of Ferriani (2023), who employed ASS to assess risk differentials in the Green Bond market. The ASS metric is particularly suited for this analysis as it isolates credit risk compensation from confounding factors such as variations in bond coupon structures and term effects, which often distort traditional yield-based measures. A negative S-Premium indicates that SBs trade at a lower credit spread relative to conventional bonds, suggesting that investors assign additional value to their social impact. Furthermore, this study adopts the bond-matching framework of Zerbib (2019), directly comparing each Social Bond to a conventional bond issued by the same entity and selected to minimize differences in key financial characteristics such as maturity, coupon structure, and credit rating.

The empirical analysis is based on a dataset comprising 163 SBs issued between June 2022 and February 2025, each paired with a comparable conventional bond. The study utilizes daily ASS data across 716 trading days, ensuring that the observed credit spread differentials are not driven by short-term market fluctuations. On average, the ASS differential between SBs and their conventional counterparts is -2.32 basis points, indicating a systematic pricing effect. Further analysis highlights the significant role of credit rating and issuer type, particularly among agency issuers, in amplifying the S-Premium, suggesting that investors place considerable emphasis on the financial robustness and institutional credibility of Social Bond issuers.

A central contribution of this study is the examination of the impact of certifications, issuer characteristics, and Use of Proceeds (UoP) disclosures on the S-Premium. The findings indicate that the specificity and transparency of UoP disclosures play a crucial role in shaping the risk dynamics of Social Bonds. In particular, bonds financing high-impact social projects, such as affordable housing, industrial development, and socio-economic empowerment, exhibit the most pronounced effects. Social Bonds funding Housing & Infrastructure initiatives show the strongest reduction in the S-Premium, suggesting that investors attribute higher credibility and value to issuances addressing structural social needs. Similarly, bonds financing Health & Social Services projects display a weaker but still negative effect, indicating that investments in healthcare, pandemic response, and social employment programs may also contribute to improved pricing conditions, albeit to a lesser extent.

Conversely, the results suggest that not all UoP categories generate a distinct pricing effect. Bonds funding Environmental & Sustainability projects do not exhibit a statistically significant impact, indicating that investors may not systematically distinguish these issuances from broader sustainability-linked instruments, such as Green Bonds.

These results suggest that investors prioritize transparency and measurable social impact, underscoring the need for standardized reporting frameworks in the Social Bond market. From a policy perspective, the findings emphasize the importance of enhancing standardization and transparency in social impact metrics to foster investor confidence and encourage broader market participation. For issuers, aligning with international best practices and directing proceeds toward tangible, high-impact social projects can improve market perception and reduce financing costs. Academically, this study contributes to the sustainable finance literature by providing empirical evidence on SBs and identifying the key determinants of the S-Premium. Future research should investigate longitudinal trends in the S-Premium, the influence of impact disclosure quality, and the potential role of regulatory frameworks in shaping the market's evolution.

By addressing these aspects, SBs can play a more substantial role in financing global socio-economic challenges, reinforcing the broader sustainability agenda. This study not only bridges a relevant gap in the literature but also offers practical insights for issuers, investors, and policymakers, highlighting the significance of social sustainability in shaping the structure of financial markets.

In the rest of the paper, Section 2 draws a literature review focused on SBs and, at the end, specifies our testable hypotheses. Sections 3–5, respectively, report on our data, outline our empirical methodology, and present our main results. Finally, Section 6 discusses the main thrust of our analysis, stresses the implication of our results, and proposes new avenues for future research.

2. Literature review and hypothesis development

Recent studies show that the broader rise of social investments reflects a structural shift in financial markets, where sustainability considerations increasingly influence investment decisions due to growing awareness of their dual impact on corporate performance and social well-being (Sparkes and Cowton, 2004). Within this evolving landscape, SBs have become essential instruments for financing projects aimed at social development objectives (ICMA SBP, 2021). Unlike Green Bonds, which are exclusively linked to environmental projects, SBs focus on community welfare, targeting urgent socio-economic issues, such as enhancing healthcare access, promoting education, and reducing economic inequality (SBP, 2018). Their introduction to financial markets dates back to 2009, with the issuance of the first SB by the International Finance Facility for Immunization (IFFIm), aimed at improving vaccine coverage in developing countries (Hughes-McLure and Mawdsley, 2022). However, the COVID-19 pandemic acted as a major catalyst, revealing structural weaknesses in social support systems and exacerbating inequalities (IMF, 2021). In response, SBs gained further traction as tools for enhancing social resilience, mitigating economic disparities, and addressing the needs of vulnerable communities (Torricelli and Pellati, 2023).

To ensure transparency and credibility, the Social Bond Principles (SBP) were established in 2018, outlining four key components: Use of Proceeds, Project Evaluation and Selection, Management of Proceeds, and Reporting. These principles reduce information asymmetry between issuers and investors, mitigating risks of greenwashing and fostering confidence in social impact investments (Hyun et al., 2023). Given the complexities associated with measuring social outcomes—where standardized metrics are often lacking—the adherence to these guidelines plays a crucial role in market development.

Further advancing the standardization of social finance, the Social Taxonomy proposed by the Platform on Sustainable Finance (PSF, 2022) represents a significant milestone. Modeled after the Environmental Taxonomy, this framework defines criteria for socially sustainable investments, focusing on decent work, adequate living standards, and inclusive communities. By establishing clear classification criteria, it aims to enhance transparency, reduce social-washing risks, and strengthen investor protection, leading to more rigorous project selection (PSF, 2022). These regulatory efforts align with broader discussions linking regulatory clarity to financial performance, as increased investor confidence can improve issuer outcomes (Agoraki et al., 2023).

The motivation for this study stems from the increasing recognition of SBs as a distinct segment within sustainable finance and the growing investor interest in social sustainability. Unlike much of the existing research, which relies on qualitative assessments such as disclosure frameworks, impact reports, and regulatory compliance (Baffoe and Mutisya, 2015) this study adopts a quantitative approach to examine how financial markets incorporate social sustainability considerations into bond pricing.

The presence of a pricing differential for sustainable bonds has been widely observed in the Green Bond market, where the so-called Greenium reflects investors' tendency to accept reduced yields in order to support environmentally sustainable initiatives. This pattern aligns with insights from behavioral finance, which indicate that consumers of eco-friendly products are often inclined to pay a higher price to ensure their purchases reflect ethical and environmental commitments (Thompson et al., 2010). In financial markets, this behavior translates into investors being willing to forgo higher returns on conventional bonds in favor of Green Bonds, allowing them to align their portfolios with sustainability goals (Zerbib, 2019). A comparable mechanism applies to Social Bonds (SBs), where the concept of the S-Premium captures the extent to which investors integrate social impact into their valuation processes. This logic also extends to broader ESG bond portfolio behavior: recent evidence shows that investors tend to favor green bond portfolios, particularly under high climate policy uncertainty (Silva et al., 2024), over conventional bonds. A key dimension of this analysis concerns the role of certifications and external opinions in shaping the S-Premium. Sustainability certifications, such as compliance with the ICMA Social Bond Principles (SBP) and the presence of Second Party Opinions (SPOs), function as credibility-enhancing mechanisms that reduce information asymmetry and reinforce investor confidence (Allman and Lock, 2024). In the case of Green Bonds, previous research (Okafor et al., 2024; Zirek and Unsal, 2023; Ehlers and Packer, 2017) has demonstrated that certified bonds and those with higher rating (Chen et al., 2025) consistently exhibit lower credit spreads, as investors perceive them as more reliable and aligned with sustainability objectives). A similar effect is expected for SBs, where external validation enhances transparency and mitigates perceived risks. However, while certifications serve as quality signals, their quantitative impact on pricing remains an open question, as investor responses may vary depending on issuer characteristics, market conditions, and familiarity with certification standards. On this basis, our first hypothesis is:

H1. The S-Premium is significantly influenced by sustainability certification (ICMA SBP) and Second Party Opinions (SPOs), with certified bonds exhibiting a more relevant S-Premium.

Beyond certification effects, another fundamental determinant of the S-Premium is the specificity and transparency of Use of Proceeds (UoP) disclosures. In sustainable finance, investor confidence and risk assessment are strongly shaped by the clarity, granularity, and overall quality of Use of Proceeds (UoP) statements, as well as by the transparency of documents more broadly (Yao et al., 2024). Prior research on Green Bonds has highlighted that well-defined UoP disclosures are associated with lower credit spreads, as they reduce uncertainty and enhance credibility (Okafor et al., 2024). In the case of SBs, this study investigates whether bonds financing clearly defined social projects experience stronger pricing effects than those with more generic or ambiguous disclosures. Given that social investments often lack standardized impact metrics, investors may demand higher financial performance when UoP disclosures are vague or imprecise. Conversely, bonds that explicitly outline the projects financed, their expected social benefits, and alignment with broader social objectives may exhibit a more pronounced S-Premium, as investors gain greater confidence in the bond's impact (Aguilar and Vlosky, 2007; Dorfleitner et al., 2022; Hyun et al., 2020; Nanayakkara and Colombage, 2019).

Additionally, investor preferences may vary across different social projects categories. Certain sectors may attract stronger demand compared to others, while general-purpose financing or projects with less tangible impact metrics may attract fewer investors. This leads to the second hypothesis:

H2. The S-Premium is influenced by the specificity of Use of Proceeds (UoP), with clearer and more detailed UoP statements leading to more relevant S-Premium.

By examining ASS differentials between SBs and comparable conventional bonds, this study contributes to the broader discussion on how financial markets incorporate social impact considerations in the investment choices. The findings provide important insights for policymakers, institutional investors, and issuers, particularly in terms of how certification mechanisms, issuer credibility, and transparency affect S-Premium.

3. Data

The dataset construction follows a rigorous selection process to ensure the robustness and representativeness of the analyzed sample. The initial pool of SBs was identified based on the LSEG Workspace classification, selecting only bonds explicitly labeled as

SBs. As of the latest available market data, 2256 SBs have been issued globally. However, limiting the selection to bonds issued before 2022, which marks the beginning of the observation period for this study, reduces the available universe to 1100 SBs.

From this subset, we further refined the selection by focusing on the two dominant currencies in the Social Bond market—euro (EUR) and US dollar (USD). These two currencies collectively account for approximately 60 % of total Social Bond issuances, ensuring a high degree of liquidity and market relevance. The currency restriction also enhances the comparability of the sample, mitigating the influence of exchange rate fluctuations and monetary policy divergences across jurisdictions.

Following the currency-based selection, an additional filtering process was conducted to ensure the availability of a reliable comparable bond for each Social Bond. The comparables were identified using a structured matching approach, prioritizing conventional bonds issued by the same entity with similar maturity, coupon structure, and issuance characteristics. This step was crucial in isolating the effect of the social designation rather than broader issuer- or market-specific factors.

Once the Social Bond–Comparable Bond pairs were established, a final data validation step was performed. Bonds with incomplete or missing financial data were excluded to preserve the integrity of the analysis, leading to the final sample of 163 SBs and 163 comparable conventional bonds.

The dataset also integrates daily ASS data for each bond, spanning 716 trading days from June 2, 2022, to February 24, 2025. This time horizon allows for a high-frequency assessment of Social Bond pricing dynamics, ensuring that the observed spread differentials are not distorted by temporary market conditions. The use of ASS as the primary pricing metric ensures that the analysis captures the true cost of debt for SBs relative to their conventional counterparts, filtering out distortions arising from differences in coupon structures, liquidity conditions, or short-term volatility.

The sample is well-diversified in terms of issuance size, maturity, and credit rating (Table 1 and Fig. 1). On average, SBs have multi-billion-dollar issuances and medium-to-long-term maturities, though there is significant variation across bonds. The credit quality is predominantly high, with a large share of bonds rated AA and above, while a smaller fraction falls into lower investment-grade categories. However, a portion of bonds lacks a Fitch rating, an element controlled for in the analysis.

Regarding certifications, 60 % of SBs comply with the ICMA Social Bond Principles (SBP), and half of the sample has a Second Party Opinion (SPO). A substantial overlap exists between these two verification mechanisms, reflecting growing investor reliance on third-party validation.

In terms of Use of Proceeds (UoP) allocations, Basic and Essential Services dominate, absorbing half of total proceeds, while Affordable & Social Housing, Environmental Protection, and Education account for a meaningful share. Smaller allocations are observed in more specialized areas like Digital Education and Industrial Development.

These descriptive insights establish a representative foundation for analyzing the S-Premium and its key determinants, ensuring a structured and empirically sound approach.

4. Methodology

To assess the existence and magnitude of the S-Premium, this study starts from the analytical framework applied to Green Bonds by Ferriani (2023) and extends it to the Social Bond market. Specifically, the research leverages Asset Swap Spreads (ASS) as the primary pricing metric, as ASS effectively isolates credit risk compensation from confounding factors such as variations in coupon structures and residual maturity. This approach ensures that differences in pricing reflect investor preferences rather than structural bond disparities. A crucial element of the methodology is the selection of an appropriate benchmark for each SB. To achieve this, we employ a structured bond-matching procedure inspired by Zerbib (2019), which identifies a comparable conventional bond issued by the same entity with similar financial characteristics. The selection of the comparable bond is implemented through an algorithmic approach that systematically evaluates all available bonds from the same issuer and ranks them based on their proximity to the Social Bond along these dimensions. The selection process relies on a structured minimization procedure that iteratively computes the absolute differences between each candidate bond and the Social Bond across the three key characteristics—residual maturity, issuance date, and issuance amount—before selecting the bond that minimizes the weighted sum of these differences.

The matching process aims to identify a conventional bond that mirrors the Social Bond in issuer identity, currency denomination, and credit rating. These criteria ensure that both bonds are subject to similar risk perceptions, monetary conditions, and regulatory environments.

$$\Delta \text{Maturity}_{ij} = \left| \text{Maturity}_{SB_i} - \text{Maturity}_{CB_j} \right|$$

Table 1
Descriptive statistics of the sample.

	Mean	Median	Min	Max	Std. Dev.	5th Perc.	95th Perc.
Coupon	0.54	0.23	0.00	5.38	0.83	0.00	2.14
Maturity Residual (Days)	2468.90	1668.00	28.00	9639.00	2375.70	98.00	7982.00
Amount Issued (USD bln)	2.55	1.05	0.05	10.51	2.79	0.11	8.94

This table provides descriptive statistics for the key bond characteristics in the sample. Coupon represents the annualized interest rate paid by the bond. Maturity Residual (Days) indicates the number of days remaining until the bond's maturity, calculated from February 24, 2025. Amount Issued (USD bln) refers to the total nominal value of the bond issuance, expressed in billion US dollars.

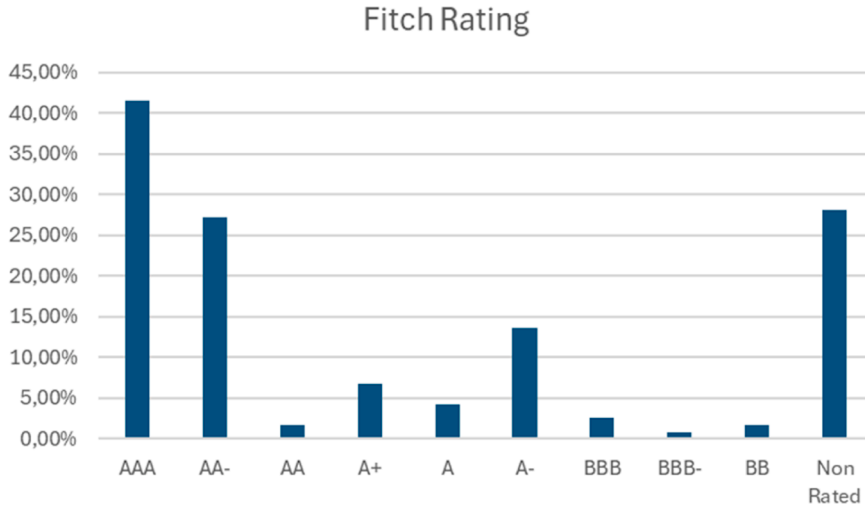


Fig. 1. Social bond allocation by fitch rating.

$$\Delta \text{IssueDate}_{i,j} = |\text{IssueDate}_{SB_i} - \text{IssueDate}_{CB_j}|$$

$$\Delta \text{AmountIssued}_{i,j} = |\text{AmountIssued}_{SB_i} - \text{AmountIssued}_{CB_j}|$$

The optimal comparable bond is selected by solving the following minimization problem:

$$CB^* = \underset{CB_j}{\operatorname{argmin}} \left(w_1 \cdot \Delta \text{Maturity}_{i,j} + w_2 \cdot \Delta \text{IssueDate}_{i,j} + w_3 \cdot \Delta \text{AmountIssued}_{i,j} \right)$$

where w_1 , w_2 , w_3 are weights that prioritize residual maturity over issuance date and amount issued. This structured approach ensures that the only material difference between the Social Bond and its comparable is the social label itself, enabling a clean estimation of the S- Premium.

Once the bond pairs are established, the S- Premium is calculated as the difference in ASS between the Social Bond and its matched conventional counterpart. The ASS represents the risk premium demanded by investors over the swap curve, providing a standardized measure of credit risk differentials across bonds. Unlike yield spreads driven by market liquidity, the ASS is derived from the daily market price of the bond and its scheduled coupon payments, ensuring that its valuation primarily reflects credit risk rather than transient liquidity shocks. Additionally, a key advantage of the ASS metric lies in its versatility, as it can be consistently applied across bonds issued by different entities. This makes it a widely applicable tool for analysing the Premium in the Social Bond market.

The S-Premium is formally defined as:

$$S - \text{Premium}_{i,t} = (ASS_{\text{Social},i,t} - ASS_{\text{Comparable},i,t})$$

To examine the determinants of the Social Premium, a Pooled OLS regression model with clustered standard errors at the bond level is employed. The model accounts for fundamental financial characteristics such as issuance size, credit rating, coupon, and residual maturity, along with certifications and disclosure levels associated with the bond. The estimated equation is:

$$S - \text{Premium}_{(i,t)} = \alpha + \beta_1 \log(\text{AmountIssued}_{(i,t)}) + \beta_2 \text{Coupon}_{i,t} + \beta_3 \text{FitchRating}_{i,t} + \beta_4 \log(\text{MaturityResidual}_{(i,t)}) + \gamma X_{(i,t)} + \epsilon_{(i,t)}$$

where $\log(\text{Amount Issued})$ controls for liquidity effects, as larger issuances tend to exhibit lower spreads due to increased market depth. Coupon is included to account for structural pricing differences, given that higher-coupon bonds generally display lower yields to maturity, which could otherwise distort the estimated premium. Fitch Rating, originally expressed in alphabetical format, has been converted into a numerical scale where higher ratings correspond to increasing values. This transformation ensures that variations in yield differentials are not merely driven by differences in default risk. Maturity Residual is incorporated to adjust for duration risk, as longer-term bonds typically exhibit higher spreads.

The term $X_{i,t}$ includes dummy variables capturing key certification and disclosure attributes. Specifically, compliance with the ICMA Social Bond Principles (SBP) assesses whether adherence to voluntary guidelines influences investor perception. The role of Second Party Opinions (SPOs), initially categorized based on the independent entity issuing the assessment, has been streamlined into a binary variable reflecting only the presence or absence of external verification.

For a more robust results we proceed in controlling for issuer type. Controlling for issuer type is crucial to ensure that the estimation of the Social Premium (S-Premium) is not confounded by structural differences in bond pricing that arise from the nature of the issuing entity. The risk perception, market positioning, and institutional backing of an issuer significantly influence credit spreads and, consequently, the pricing of its bonds. Government and agency issuers, for instance, often benefit from stronger investor confidence

due to perceived lower default risk and higher institutional credibility, leading to narrower credit spreads regardless of the social designation of the bond. In contrast, corporate issuers face greater variability in market perception, given differences in financial stability, business models, and sectoral risk exposure.

To account for these effects, the econometric model incorporates dummy variables representing different issuer types, ensuring that any observed S-Premium is not driven by issuer-specific characteristics. The regression equation is thus expanded to include these controls:

$$S\text{-Premium}_{(i,t)} = \alpha + \beta_1 \log(\text{AmountIssued}_{(i,t)}) + \beta_2 \text{Coupon}_{(i,t)} + \beta_3 \text{FitchRating}_{(i,t)} + \beta_4 \log(\text{MaturityResidual}_{(i,t)}) \\ + \sum_{j=1}^J \delta_j \text{IssuerType}_{(i,j)} + \gamma X_{(i,t)} + \epsilon_{(i,t)}$$

where the term $\sum_{j=1}^J \delta_j \text{IssuerType}_{(i,j)}$ represents a set of dummy variables that capture the specific effect of the issuer type, distinguishing between corporate, government, and agency issuers while designating one category as the reference group to avoid collinearity. The coefficient δ_j quantifies the expected variation in the S-Premium associated with each issuer type, providing insight into whether certain issuers systematically benefit from more favorable pricing conditions. All other regressors remain unchanged, ensuring that the analysis continues to focus on the key determinants of the premium while appropriately accounting for structural differences across issuers.

To address the second hypothesis, the study examines the impact of Use of Proceeds (UoP) categories on the S-Premium. This relationship is assessed through a bootstrap panel OLS regression with clustered standard errors, following the methodology of Díaz and Escribano (2021). The choice of the bootstrap approach is motivated by the heterogeneous frequency distribution of UoP categories, where some classifications are significantly overrepresented while others are underrepresented. Without adjustment, these disparities could introduce bias in the estimation, skewing the observed effects of specific UoP categories on bond pricing.

To correct for this imbalance and ensure a more robust statistical analysis, the study applies a resampling procedure with 1000 bootstrap iterations, generating balanced panel samples for each clustered UoP category. By equalizing the number of observations across groups in each iteration, the approach prevents any single category from exerting disproportionate influence on the regression results. This method also enhances the reliability of the estimated coefficients by constructing empirical confidence intervals that better capture the variability of the S-Premium across different UoP classifications.

Furthermore, to improve interpretability and minimize the risk of overestimating effects in underrepresented categories, UoP classifications were aggregated into five broader clusters based on their economic nature and investment purpose (Table 2). This clustering approach ensures that the estimated impact of social investments on bond pricing is not distorted by outliers or data sparsity while maintaining a meaningful economic distinction among different types of projects. The estimated model is :

$$S\text{-Premium}_{i,t}^{(b)} = \alpha^{(b)} + \beta_1^{(b)} \log(\text{AmountIssued}_{i,t}) + \beta_2^{(b)} \log(\text{MaturityResidual}_{i,t}) + \beta_3^{(b)} \text{Coupon}_{i,t} + \beta_4^{(b)} \text{FitchRating}_{i,t} + \sum_{k=1}^K \gamma_k^{(b)} \text{UoP}_{k,i,t} + \epsilon_{i,t}^{(b)}$$

where:

- $S\text{-Premium}_{i,t}^{(b)}$ represents the **Social Premium** for bond i at time t in bootstrap iteration b ,
- $\alpha^{(b)}$ is the intercept for bootstrap sample b ,
- $\beta_1^{(b)} \log(\text{AmountIssued}_{i,t}) + \beta_2^{(b)} \log(\text{MaturityResidual}_{i,t})$ capture the **size and duration effects** of the bond,
- $\beta_3^{(b)} \text{Coupon}_{i,t}$ control for social bond coupon,
- $\beta_4^{(b)} \text{FitchRating}_{i,t}$ controls for the credit rating of the social bond.
- $\sum_{k=1}^K \gamma_k^{(b)} \text{UoP}_{k,i,t}$ are **dummy variables for UoP clusters**, where each bond is assigned to one of the five predefined UoP categories,

Table 2

Use of proceeds cluster definition.

Use of proceeds cluster	Individual UoP categories
Education & Training	Compensatory Education, E-education Programs, Employment Training, Primary/Secondary Education, Other Education
Health & Social Services	Other Healthcare, Pandemic Response, Preventive Healthcare, Social Employment
Housing & Infrastructure	New Public Housing, Social Housing, Industrial Development, Socio-Economic Empowerment
Environment & Sustainability	Water Conservation, Clean Transport, Environmental Protection Projects
Essential Services & Finance	Essential Services, General Purpose, Refinancing, Eligible Social Expenditures

This table presents the classification of Use of Proceeds (UoP) categories into broader clusters based on their underlying economic and social objectives. The clustering was conducted following a logical grouping of UoP categories with similar purposes. Education & Training includes initiatives aimed at improving access to education and workforce skills development. Health & Social Services encompasses projects related to healthcare access, pandemic response, and employment support for social inclusion. Housing & Infrastructure groups investments in public and social housing, industrial development, and economic empowerment. Environment & Sustainability includes projects focused on ecological preservation, clean transportation, and water conservation. Finally, Essential Services & Finance covers broad-purpose funding, refinancing needs, and expenditures classified as essential social investments.

- $\varepsilon_{i,t}^{(b)}$ is the error term.

5. Results

The results of our study reported in this paragraph show the existence of an S-Premium in the sample of SBs and indicate the influence of certifications (H1) and use of proceeds (H2) on the size of the Premium.

First, the analysis provides empirical evidence on the existence of a negative S-Premium, measured as the difference in ASS between SBs and comparable conventional bonds. The findings indicate an average S-Premium of -2.32 and a median of -0.37 (Table 3). This result aligns with existing literature, which documents similar pricing patterns in Green Bonds (MacAskill et al., 2021). However, the observed range of values (-67.31 to 41.27) and the standard deviation of 1.24 suggest substantial heterogeneity in pricing mechanisms, highlighting the role of bond-specific features and investor perceptions.

Furthermore, while SBs exhibit a negative premium, its magnitude appears more moderate compared to the Greenium, suggesting that investors attribute a different financial value to social projects than to environmental ones. This discrepancy may stem from variations in market perception, transparency, and the quantifiability of impacts: whereas Green Bonds often finance projects with direct, measurable environmental benefits—such as carbon emission reductions or renewable energy infrastructure—SBs tend to support initiatives with broader, less immediately quantifiable social outcomes, such as affordable housing or education programs. As noted by Hyun et al. (2020), investors may be more inclined to accept lower yields on Green Bonds due to the stronger regulatory support and well-established environmental impact metrics, while SBs, despite their potential benefits, may face greater skepticism regarding their effectiveness and risk-adjusted returns. This distinction underscores the existence of differentiated valuation dynamics between social and environmental projects, reflecting varying levels of investor confidence and market standardization (Kozioł et al., 2022; MacAskill et al., 2021; Nanayakkara and Colombage, 2019).

A key element in understanding these Premium dynamics is the role of certifications and external validation mechanisms, as shown in Table 4. The negative correlation between ICMA SBP (Y) (-0.20) and the Premium indicates that ICMA-certified bonds exhibit a lower asset swap spread relative to non-certified counterparts, suggesting that the market perceives them as less risky or more attractive, leading to more favourable pricing conditions. A similar, though weaker, effect is observed for SPO (Y) (-0.16), implying that bonds with an external opinion also tend to have lower spreads. The correlation of ICMASBP x SPO (Y) (-0.20) with the Premium, identical to that of ICMASBP (Y) alone, suggests that the primary driver of this effect is the ICMA certification rather than the presence of an SPO.

Beyond certification effects, other financial and structural characteristics influence bond pricing. The amount issued (0.07) shows a weak positive correlation with the Premium, suggesting that larger bond issuances do not significantly affect the spread. Conversely, the Fitch Rating (-0.07) exhibits a negative correlation with the S-Premium, indicating that higher-rated bonds are associated with a more pronounced S-premium. This suggests that improved credit quality amplifies the S-Premium, as investors appear more willing to accept lower returns for SBs.

Secondly, the findings about the Certification effect (ICMA and SPO) on S-Premium support H1, confirming that certifications and external validation significantly affect the S-Premium. As shown in Table 5, SBs that comply with the ICMA Social Bond Principles (SBP) exhibit lower ASS (-0.21), supporting the idea that adherence to recognized sustainability standards reduces perceived risk and enhances market confidence (Colasante et al., 2024; Dorfleitner et al., 2022).

Similarly, bonds that obtain a Second Party Opinion (SPO) certification show a negative premium (-0.13), reinforcing the notion that external validation mitigates information asymmetry and strengthens investor trust. The strongest effect is observed when both ICMA SBP and SPO certifications are present (-0.25), confirming that combined verification mechanisms yield the most pronounced reductions in yield differentials (Hyun et al., 2020). These results align with Green Bond literature, where certified instruments benefit from greater market confidence and lower financing costs. However, variations in certification impact suggest that standardization remains necessary, as differences in issuer type and market conditions may influence the effectiveness of verification mechanisms.

Beyond certifications, issuer type plays a critical role in shaping the S-Premium. As presented in Table 6, government-issued SBs exhibit lower premium (-0.15), while agency bonds show an even stronger negative premium (-0.37). These results suggest that public-sector issuers benefit from stronger investor confidence, likely due to their lower perceived default risk and stronger institutional credibility. In contrast, corporate SBs reflects concerns over creditworthiness and the tangible impact of private-sector social investments. However, the effect of ICMA SBP and SPO certifications partially offsets this spread, albeit to a lesser extent than in public-sector bonds. This finding indicates that while certification enhances credibility across all issuer types, its influence is more pronounced in markets where baseline trust in the issuer is already high.

Overall, these findings highlight the interplay between certification, issuer characteristics, and investor confidence, underscoring the importance of both regulatory frameworks and market transparency in shaping Social Bond valuations. They further suggest that

Table 3
Descriptive statistics of S-premium.

	Mean	Median	Min	Max	Std. Dev.	5th Perc.	95th Perc.
S-Premium	-2.32	-0.37	-676.31	411.27	41.11	-52.51	37.37

This table reports the descriptive statistics for the S-Premium, defined as the difference in ASS between SBs and their comparable conventional counterparts.

Table 4
Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
S-Premium	1.00							
ICMA SBP (Y)	−0.20	1.00						
SPO(Y)	−0.16	−0.10	1.00					
ICMA SBP x SPO (Y)	−0.20	0.90	−0.10	1.00				
log (AmountIssued)	0.07	0.41	−0.10	0.41	1.00			
FitchRating	−0.07	0.37	−0.12	0.37	0.19	1.00		
Coupon	0.00	−0.27	0.06	−0.27	−0.19	−0.51	1.00	
Maturity Res	0.20	0.31	−0.21	0.31	0.29	0.23	−0.04	1.00

This table presents the correlation coefficients among the key variables in the analysis. ICMA SBP (Y) and SPO (Y) indicate whether a bond is certified under the ICMA Social Bond Principles or has a Second Party Opinion, respectively, while ICMA SBP x SPO (Y) captures their joint presence. log (AmountIssued) represents the logarithm of the bond's issuance size, and FitchRating denotes the bond's credit rating. Coupon refers to the annualized interest rate, and Maturity Res indicates the remaining time to maturity in days.

Table 5
Certifications effect on S-premium.

Dependent Variable	Premium					
Model	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.21 (0.91)	1.03 (0.91)	0.29 (0.72)	0.31 (0.72)	0.73 (0.81)	0.73 (0.81)
Log Amount Issued	−0.02 (0.04)	−0.01 (0.04)	0.01 (0.04)	0.01 (0.04)	−0.04 (0.04)	−0.04 (0.04)
Maturity Residual	0.07 (0.04) *	0.07 (0.04) *	0.08 (0.03) ***	0.08 (0.03) ***	0.07 (0.04)	0.07 (0.04) **
Coupon Social	−0.02 (0.03)	−0.01 (0.03)	−0.02 (0.03)	−0.02 (0.03)	0.00 (0.03)	0.00 (0.03)
Fitch Rating	−0.49 (0.26) *	−0.48 (0.26) **	−0.39 (0.24)	−0.37 (0.23)	−0.16 (0.28)	−0.48** (0.28)
ICMASBP (Y)	−0.21 (0.09) **	−0.21 (0.09) **				
SPO (Y)			−0.13 (0.07) *	−0.13 (0.07) *		
ICMA SBP x SPO (Y)					−0.25 (0.10) **	−0.21 (0.10) ***
Year FE	No	Yes	No	Yes	No	Yes
R ²	0.095	0.12	0.074	0.10	0.156	0.156
Adj. R ²	0.095	0.11	0.074	0.09	0.156	0.156
F-test	2.59 **	2.45***	2.31 *	7.52***	4.07 ***	4.07 ***

This table reports the regression results examining the impact of ICMA SBP certification, Second Party Opinions (SPO), and their interaction on the Social Premium (S-Premium), defined as the difference in asset swap spreads (ASS) between Social Bonds and comparable conventional bonds. The models control for key bond characteristics: log(Amount Issued), Maturity Residual, Coupon Social, and Fitch Rating. Columns (1) and (2) assess the effect of ICMA SBP certification, while columns (3) and (4) introduce SPO. Columns (5) and (6) include the interaction term ICMA SBP × SPO, capturing the joint effect of both certifications. Year fixed effects are included in models (2), (4), and (6). Standard errors are reported in parentheses. *, **, *** represent statistical significance at 10 %, 5 % and 1 %, respectively.

Table 6
Issuer type effect on S-Premium.

Dependent Variable	Premium		
Variable	(1)	(2)	(3)
Constant	0.73 (0.81)	−0.73 (0.90)	0.73 (0.90)
Log Amount Issued	−0.04 (0.04)	−0.004 (0.03)	−0.044 (0.04)
Maturity Residual	0.07 (0.04)	0.07 (0.03) **	0.07 (0.04) **
Coupon Social	0.00 (0.03)	0.00 (0.03)	0.01 (0.03)
Fitch Rating	−0.16 (0.28)	−0.13 (0.28) **	−0.16 (0.27)
ICMA SBP (Y)	−0.29 (0.07) ***		
SPO (Y)		−0.19 (0.10)**	
ICMA SBP x SPO (Y)			−0.28 (0.28)***
Issuer Type: Govern	−0.15 (0.10)	−0.21 (0.11)	−0.15 (0.10)
Issuer Type: Agency	−0.37 (0.11) ***	−0.28 (0.10) ***	−0.36 (0.10) ***
Year FE	Yes	Yes	Yes
R ²	0.156	0.12	0.12
Adj. R ²	0.156	0.12	0.12
F-test	4.07 ***	3.44 ***	3.44 ***

This table presents the regression results assessing the impact of ICMA SBP certification, Second Party Opinions (SPO), and their interaction on the Social Premium (S-Premium), while also examining differences across issuer types. The three models compare government and agency bonds against the baseline category of corporate issuers. Year fixed effects are included in all models. Standard errors are in parentheses. *, **, *** represent statistical significance at 10 %, 5 % and 1 %, respectively.

Table 7
Bootstrap regression analysis of use of proceeds on the social premium.

Variable	(1)
Const	−0.601 [−2.245, 1.029]
Maturity Res	0.038** [−0.024, 0.105]
Amount Issued (USD)	0.022 [−0.067, 0.101]
Coupon	−0.002 [−0.075, 0.073]
FitchRatingNum	−0.003*** [−0.42, −0.37]
Use of Proceeds Cluster: Environment & Sustainability	−0.116 [−0.422, 0.245]
Use of Proceeds Cluster: Essential Services & Finance	−0.067 [−0.520, 0.372]
Use of Proceeds Cluster: Health & Social Services	−0.028* [−0.391, 0.335]
Use of Proceeds Cluster: Housing & Infrastructure	−0.276*** [−0.653, 0.098]
Use of Proceeds Cluster: Education & Training	−0.114 [−0.466, 0.192]
R2	0.416 [0.157, 0.718]
F-test	4.067 [0.589, 19.175]

This table presents the results of the bootstrap regression examining the impact of Use of Proceeds (UoP) categories on the Social Premium (S-Premium), controlling for bond-specific characteristics. The model includes $\log(\text{Amount Issued})$ and Maturity Residual to capture size and duration effects, while Coupon and Fitch Rating account for bond-specific risk factors. UoP categories are included as dummy variables, with each bond assigned to one of five pre-defined clusters. Confidence intervals are reported in brackets. *, **, *** represent statistical significance at 10 %, 5 %, and 1 %, respectively.

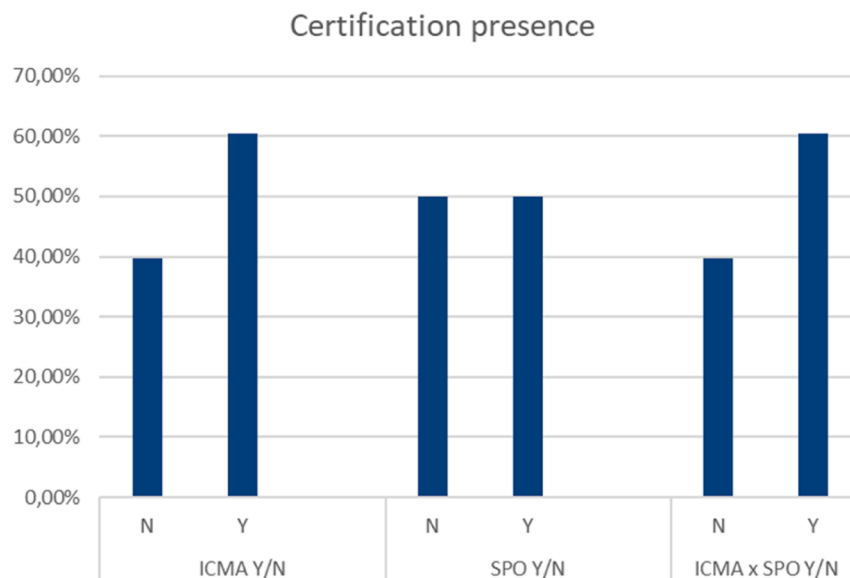


Fig. 2. Social bond allocation by the presence of certification (ICMA SBP and second party opinion).

while third-party verification mechanisms play a key role in reducing information asymmetry, issuer reputation and sectoral credibility remain fundamental in determining the S-Premium in the Social Bond market.

Thirdly, the results about Use of Proceeds (UoP) support H2, demonstrating that the specificity and transparency of UoP significantly impact the S-Premium.

As shown in Table 7 and Fig. 4, SBs financing high-impact social projects, such as affordable housing, industrial development, and

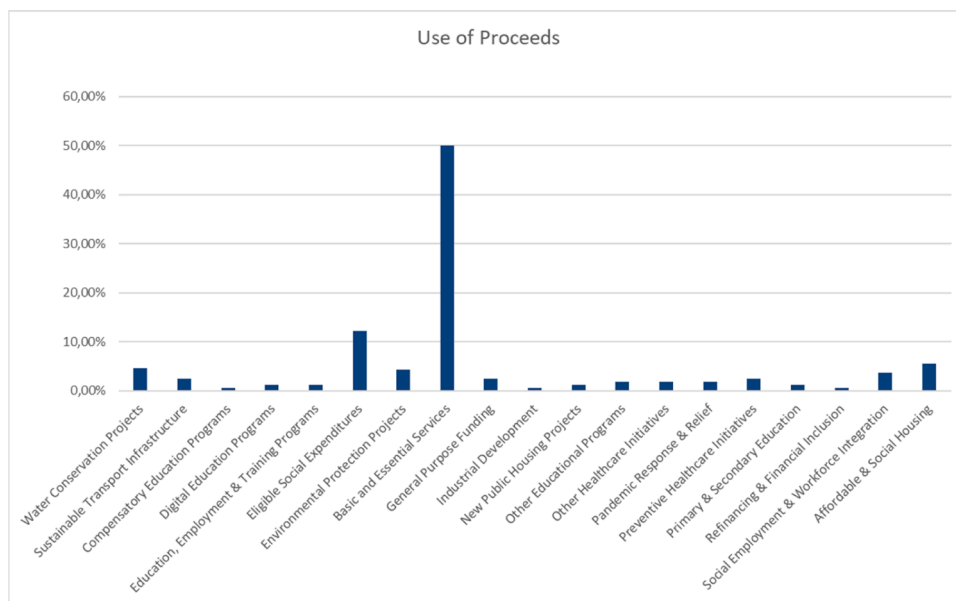


Fig. 3. Social Bond Use of Proceeds distribution in the sample.

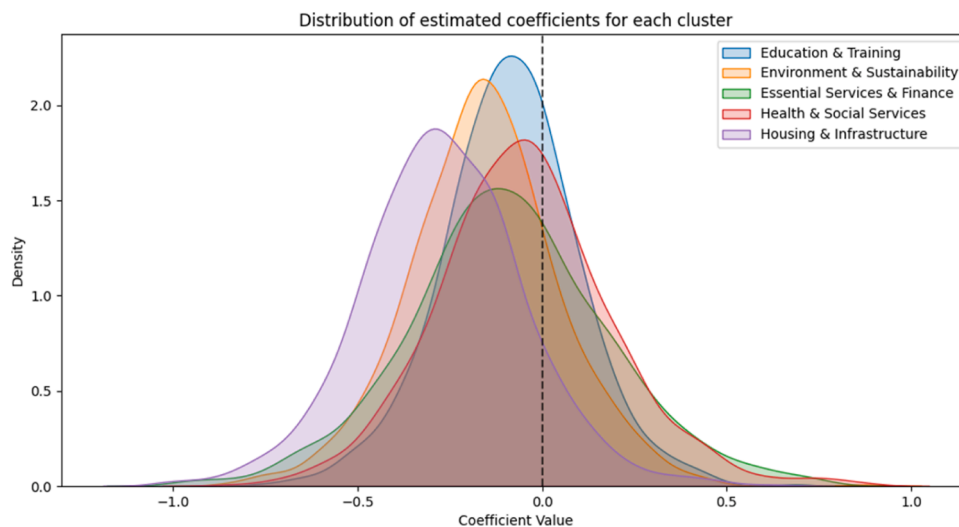


Fig. 4. Presents the distribution of estimated coefficients for each Use of Proceeds (UoP) cluster, obtained through the bootstrap regression. The density plot illustrates the variation in coefficient estimates across iterations, highlighting differences in the pricing impact of UoP categories on the S-Premium.

socio-economic empowerment, exhibit the most pronounced pricing effects. Specifically, bonds funding Housing & Infrastructure projects show the strongest negative premium (-0.276), suggesting that investors accept lower yields for issuances addressing structural social needs. This result underscores the perception that well-defined, tangible social investments—such as public housing and economic inclusion initiatives—are both credible and impactful, leading to more favorable pricing. Similarly, bonds financing Health & Social Services projects exhibit a weak but negative relationship with the S-Premium (-0.028), indicating that investments in healthcare, pandemic response, and social employment programs may also benefit from improved pricing, albeit to a lesser extent (Okafor et al., 2024) (Figs. 1-3).

Conversely, the results indicate that not all UoP categories generate a clear Premium. Bonds funding Environmental & Sustainability projects do not exhibit a statistically significant negative Premium (-0.116), with confidence intervals crossing zero. This suggests that investors may be skeptical about the credibility of environmental labels within the Social Bond market, as these issuances lack the explicit climate-related focus of Green Bonds. Similarly, bonds categorized under Essential Services & Finance projects (-0.067) do not show a consistent pricing effect, implying that general-purpose social expenditures and refinancing operations are not systematically valued by investors in the same way as targeted infrastructure and social welfare projects.

6. Discussion and conclusions

Our study provides empirical evidence on the existence and determinants of the S-Premium, showing that SBs systematically trade at lower ASS than comparable conventional bonds. The findings confirm that investors give value to the social impact of these instruments, though the magnitude of the S-Premium varies significantly depending on Certifications, issuer type, and Use of Proceeds (UoP) disclosure. Bonds adhering to the ICMA Social Bond Principles (SBP) and those with a Second Party Opinion (SPO) exhibit a more pronounced pricing effect, reinforcing the role of external validation in reducing perceived risk and enhancing market confidence. Similarly, issuers with higher institutional credibility, such as government and agency issuers, tend to secure more relevant Premium than corporate issuers unless supported by strong certification and disclosure mechanisms. The analysis also highlights that investors prioritize transparency and measurable social impact (Jankovic et al., 2022), with targeted housing, infrastructure, and social service projects exhibiting stronger premium effects compared to general-purpose or ambiguous social expenditures.

From a theoretical perspective, this study contributes to the literature on sustainable fixed-income instruments (MacAskill et al., 2021). While previous research has extensively examined the Greenium in Green Bonds, this study expands the scope of inquiry to SBs, revealing distinct valuation patterns and investor preferences. The findings support the argument that investor confidence is shaped by credibility signals, such as adherence to recognized sustainability frameworks and detailed impact disclosures, which mitigate information asymmetry and green/social-washing concerns.

From a policy perspective, the results underscore the need for greater standardization in the Social Bond market to enhance market efficiency and comparability. Establishing clearer certification requirements and improving impact reporting frameworks could help strengthen investor trust (Tang et al., 2023). Furthermore, regulatory initiatives aimed at improving transparency in UoP statements could contribute to more efficient capital allocation, ensuring that proceeds are directed toward high-impact social projects. These measures would facilitate a more integrated and transparent Social Bond market, making it a more attractive instrument for institutional investors.

From a practical perspective, issuers can leverage these findings to optimize their financing conditions. Bonds that comply with recognized certification standards and provide detailed UoP disclosures tend to benefit from Premium, demonstrating the financial value of credibility and transparency. By aligning with international best practices and structuring social finance frameworks around measurable and impactful projects, issuers can attract a broader investor base, enhance market liquidity, and reduce borrowing costs. Additionally, investors can use certification signals and UoP clarity as key factors in assessing SBs' quality, ensuring that capital is allocated to genuinely impactful projects.

Source of valuable contributions, this study presents limits and avenues for future research. First, expanding the dataset to include a larger and more diverse sample of SBs across different markets and time periods would improve the generalizability of the results. Second, a deeper investigation into the impact of international policy frameworks on Social Bond standardization—including regulatory initiatives such as EU Social Taxonomy and global ESG reporting standards—would provide valuable insights into the role of policy-driven incentives in shaping bond pricing dynamics. Lastly, further research should focus on analysing the relationship between SBs and broader ESG frameworks, exploring how different disclosure standards can impact measurement methodologies, and sustainability commitments can influence Premium and investor perceptions.

CRediT authorship contribution statement

Mariantonietta Intonti: Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Conceptualization. **Matteo De Leonardis:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Candida Bussoli:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization.

Data availability

Data will be made available on request.

References

- Agoraki, M.-E.K., Giaka, M., Konstantios, D., Patsika, V., 2023. Firms' sustainability, financial performance, and regulatory dynamics: evidence from European firms. *J. Int. Money Financ.* 131, 102785. <https://doi.org/10.1016/j.jimonfin.2022.102785>.
- Aguilar, F.X., Vlosky, R.P., 2007. Consumer willingness to pay price premiums for environmentally certified wood products in the U.S. *For. Policy Econ.* 9 (8). <https://doi.org/10.1016/j.forpol.2006.12.001>. Articolo 8.
- Alessi, L., Ossola, E., Panzica, R., 2021. What greenium matters in the stock market? The role of greenhouse gas emissions and environmental disclosures (Scopus). *J. Financ. Stab.* 54. <https://doi.org/10.1016/j.jfs.2021.100869>.
- Allman, E., Lock, B., 2024. External reviews and green bond credibility. *J. Clim. Financ.* 7, 100036. <https://doi.org/10.1016/j.jclimf.2024.100036>.
- Baffoe, G., Mutisya, E., 2015. Social sustainability: a review of indicators and empirical application. *Environ. Manag. Sustain. Dev.* 4 (2). <https://doi.org/10.5296/emsd.v4i2.8399>. Articolo 2.
- Chen, R., Wang, G., Jamil, N., Iqbal, N., 2025. The green premium of unconventional monetary policy: Evidence from the enlarged collateral framework by the People's Bank of China. *Res. Int. Bus. Financ.* 73, 102655. <https://doi.org/10.1016/j.ribaf.2024.102655>.
- Colasante, A., Morone, A., Morone, P., 2024. The importance of the Greenium: experimental evidence on the role of certifications. *Eurasia Econ. Rev.* 14 (1). <https://doi.org/10.1007/s40822-023-00258-4>. Articolo 1.
- Díaz, A., Escribano, A., 2021. Sustainability premium in energy bonds. *Energy Econ.* 95, 105113. <https://doi.org/10.1016/j.eneco.2021.105113>.
- Dorflleitner, G., Utz, S., Zhang, R., 2022. The pricing of green bonds: external reviews and the shades of green. *Rev. Manag. Sci.* 16 (3). <https://doi.org/10.1007/s11846-021-00458-9>. Articolo 3. Scopus.
- T. Ehlers & F. Packer, 2017. "Green bond finance and certification," BIS Quarterly Review, Bank for International Settlements, September.

- Ferriani, F., 2023. Issuing bonds during the Covid-19 pandemic: Was there an ESG premium? *Int. Rev. Financ. Anal.* 88, 102653. <https://doi.org/10.1016/j.irfa.2023.102653>.
- Huang, C.-Y., Dekker, D., Christopoulos, D., 2023. Rethinking greenium: a quadratic function of yield spread. *Financ. Res. Lett.* 54, 103710. <https://doi.org/10.1016/j.frl.2023.103710>.
- Hughes-McLure, S., Mawdsley, E., 2022. Innovative finance for development? Vaccine bonds and the hidden costs of financialization. *Econ. Geogr.* 98 (2). <https://doi.org/10.1080/00130095.2021.2020090>. Articolo 2.
- Hyun, S., Park, D., Tian, S., 2020. The price of going green: the role of greenness in green bond markets. *Account. Financ.* 60 (1). <https://doi.org/10.1111/acfi.12515>. Articolo 1.
- Hyun, S., Park, D., Tian, S., 2023. The price of frequent issuance: The value of information in the green bond market. *Econ. Change Restruct.* 56 (5). <https://doi.org/10.1007/s10644-022-09417-0>. Articolo 5.
- Jankovic, I., Vasic, V., Kovacevic, V., 2022. Does transparency matter? Evidence from panel analysis of the EU government green bonds. *Energy Econ.* 114, 106325. <https://doi.org/10.1016/j.eneco.2022.106325>.
- Kozioł, C., Proelss, J., Roßmann, P., Schweizer, D., 2022. The price of being green (Scopus). *Financ. Res. Lett.* 50. <https://doi.org/10.1016/j.frl.2022.103285>.
- MacAskill, S., Roca, E., Liu, B., Stewart, R.A., Sahin, O., 2021. Is there a green premium in the green bond market? Systematic literature review revealing premium determinants (Scopus). *J. Clean. Prod.* 280. <https://doi.org/10.1016/j.jclepro.2020.124491>.
- Nanayakkara, M., Colombage, S., 2019. Do investors in Green Bond market pay a premium? Global evidence. *Appl. Econ.* 51 (40). <https://doi.org/10.1080/00036846.2019.1591611>. Article 40.
- Okafor, A., Adusei, M., Edo, O.C., 2024. Effects of the utilization of green bonds proceeds on green bond premium. *J. Clean. Prod.* 469, 143131. <https://doi.org/10.1016/j.jclepro.2024.143131>.
- Silva, F., Ferreira, A., Cortez, M.C., 2024. The performance of green bond portfolios under climate uncertainty: a comparative analysis with conventional and black bond portfolios. *Res. Int. Bus. Financ.* 70, 102354. <https://doi.org/10.1016/j.ribaf.2024.102354>.
- Sparkes, R., Cowton, C.J., 2004. The maturing of socially responsible investment: a review of the developing link with corporate social responsibility. *J. Bus. Ethics* 52 (1), 45–57. <https://doi.org/10.1023/B:BUSI.0000033106.43260.99>.
- Tang, Y., Wang, B., Pan, N., Li, Z., 2023. The impact of environmental information disclosure on the cost of green bond: evidence from China. *Energy Econ.* 126, 107008. <https://doi.org/10.1016/j.eneco.2023.107008>.
- Thompson, D.W., Anderson, R.C., Hansen, E.N., Kahle, L.R., 2010. Green segmentation and environmental certification: insights from forest products. *Bus. Strategy Environ.* 19 (5). <https://doi.org/10.1002/bse.647>. Articolo 5.
- Torricelli, C., Pellati, E., 2023. Social bonds and the “social premium. *J. Econ. Financ.* 47 (3). <https://doi.org/10.1007/s12197-023-09620-3>. Article 3.
- Yao, Y., Wei, L., Jing, H., Chen, M., Li, Z., 2024. The impact of readability of risk disclosures in bond prospectuses on credit risk premium. *Res. Int. Bus. Financ.* 70, 102310. <https://doi.org/10.1016/j.ribaf.2024.102310>.
- Zerbib, O.D., 2019. The effect of pro-environmental preferences on bond prices: evidence from green bonds. *J. Bank. Financ.* 98, 39–60. <https://doi.org/10.1016/j.jbankfin.2018.10.012>.
- Zirek, D., Unsal, O., 2023. Green bonds: do investors benefit from third-party certification? *Glob. Financ. J.* 58, 100872. <https://doi.org/10.1016/j.gfj.2023.100872>.