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Effects of ESG performance and sustainability disclosure on GSS bonds' yields and spreads: A global analysis

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ABSTRACT

This study investigates the effects of the issuer's environmental, social, and governance (ESG) performance on both the issue-specific yield and its spread vis-à-vis a sovereign comparable. A sample of 3,960 green, social, and sustainable (GSS) bonds issued in global capital markets was used for this purpose. The findings indicate a negative association between ESG performance and bond spreads, implying that a greater commitment to sustainable transition today is an effective strategy for a company to reduce the cost of debt for future projects. The study includes a two-stage procedure. First, the effect of "fundamentals" (e.g., credit rating) on issue pricing is determined; second, the residuals are regressed against the ESG performance. While the latter's risk-reducing power does not appear to differ based on the divide between advanced economies and emerging markets, we find that the real enabler of curbing the unexplained portion of risk is detailed disclosure of the use of proceeds. This is likely to minimize the likelihood of greenwashing.

1. Introduction

A substantial body of research has identified the advantages of social, environmental, and governance (ESG) practices on corporate financial performance (CFP). These practices facilitate accelerated top-line growth, reduce regulatory intervention and risk, enhance employee productivity, and may also be employed to optimize investment and capital expenses (Henisz et al., 2019). Additionally, they may be utilized to attract new customers, and thus increase sales or pricing power (Martin and Moser, 2016).

A commitment to ESG may affect CFP indirectly by reducing the cost of capital, thereby potentially improving access to finance (Flammer, 2021). A negative and significant relationship is typically observed between ESG and bond yields (Salvi et al., 2020; Barth et al., 2022; Zhou et al., 2016; Amiraslani et al., 2023; Ge and Liu, 2015). In a broader context, the strength of an entity's corporate social responsibility (CSR) is negatively associated with the yield spread (Ge and Liu, 2015; Salvi et al., 2020).

In recent years, credit rating agencies (CRAs) have incorporated CSR, or the broader ESG paradigm, into their assessment processes in response to investors' growing attention to ESG risks (Thompson, 2019). Incorporating these factors into the assessment process appears to be an efficient approach (Ge and Liu, 2015).

Non-financial disclosure (NFD) is beneficial because it reduces information asymmetry, thereby facilitating the efficient allocation of resources (Healy and Palepu, 2001). Voluntary publication of CSR documents is associated with a low cost of capital, high

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institutional investor ownership, and large analyst coverage (Dhaliwal et al., 2011). Additionally, a positive correlation has been identified between information asymmetry and credit spreads (Duffie and Lando, 2001; Zhou et al., 2014). The more bountiful the ESG information disclosed, the greater the trust placed in a company, which, in turn, leads to superior performance in bond markets (Amiraslani et al., 2023). However, firms with superior CSR practices are more transparent about their involvement as compared with poorly performing firms (Cheng et al., 2014; Matsumura et al., 2014).

2. Theoretical analysis and research hypotheses

This study investigates whether a superior corporate sustainability performance and effective communication thereof drive a lower cost of debt for companies that issue green, social, and sustainable (GSS) bonds, in either absolute or relative terms. This resonates with the studies that have investigated the existence and magnitude of an alleged “green premium” (in short, “greenium”) as of the yield spread between conventional and GSS bonds (Kozioł et al., 2022).

For each issuance, we examined the yield-to-maturity (YTM, or yield) and the spread vis-à-vis sovereign comparable issues (spread). Thus, we propose the following hypothesis.

(1) There is a negative association between the issuer’s sustainability performance and the yield or spread of a GSS bond relative to a comparable sovereign bond.

While NFD is a topic of growing interest for a wide array of subjects, the extant literature provides limited or unclear evidence on the relationship between sustainability reporting and financial performance (Benlemlih et al., 2018). Most of these studies examined the relationship between NFD and the cost of capital, with the majority of findings indicating a negative association (Dhaliwal et al., 2011; Orens et al., 2010).

However, as highlighted by MacLean and Rebernak (2007), the concept of CSR is potentially undermined by a possible discrepancy between a company’s actions and its stakeholders’ expectations. Furthermore, although NFDs are often accompanied by external assurance, fund allocations are rarely specified. Consequently, investors may be reassured of the credibility of the GSS issuer through the latter, which could reduce spreads. Therefore, we propose the following hypothesis.

(2) The issuer’s sustainability performance contributes more to reducing the GSS bond yield or its spread vis-à-vis a comparable sovereign bond if the allocation of funds is analytically disclosed.

The contributions of this study are multifaceted. We used a global sample to ascertain whether sustainability exerts differential impacts on the cost of debt across geopolitical and economic regions. We employed a two-step procedure to distinguish the impact of bond fundamentals such as credit ratings and proxying credit risk (Michalsky and Low, 2021) from the component of yields or spreads that are influenced by other variables such as sustainability and financial performance. Finally, we delved deeper into what is disclosed using the pursuit of specific United Nations’ Sustainable Development Goals (SDGs) as a possible determinant of yields and spreads, as an alternative to ESG performance.

2. Data and methodology

For this study, we obtained data on “plain vanilla” bonds¹, issued between 2008 and 2023Q1, from Bloomberg’s fixed-income module. Additionally, we also obtained a sample of 1,371 comparable sovereign instruments. The spread was computed by subtracting, from each YTM, the average one in a comparable group, based on the issuer’s country², the maturity upon issuance (“timespan”), and the amount issued³.

We implemented a two-stage procedure to conduct the empirical analysis. In the initial stage of the analysis, we isolated the direct determinants of GSS bond yields and spreads⁴.

$$Y_{bc\bar{t}} = \text{RATING}_{bc\bar{t}}\alpha + \delta \text{ISSUER_RATING}_{bc\bar{t}} + (\text{RATING} \times \text{ISSUER_RATING})_{bc\bar{t}}\pi + \gamma_b + \alpha_c + \nu_c + \tau_{\bar{t}} + \varepsilon_{bc\bar{t}} \quad (1)$$

where b indexes bonds, c represents issuing companies, and t quarters of issue; Y is the bond yield or spread, alternatively; RATING is a vector made of multiple dummy variables that take the value of 1 if bond b belongs to a certain rating class; ISSUER_RATING is a dummy variable that takes the value of 1 if the rating is attributed to the issuer; and γ are currency-fixed effects.

In the second step, the residuals of Eq. (1) ($\hat{\varepsilon}_{bc\bar{t}}$) are regressed on the issuer’s sustainability and financial performance as well as the disclosure variables related to the given security. Formally,

$$\begin{aligned} \hat{\varepsilon}_{bc\bar{t}} = & \text{ESG}_{b(\bar{t}-1)}\eta + (\text{ESG} \times \text{FUNDS_ALLOCATION})_{bc}\varphi + (\text{ESG} \times \text{EMERGING})_{bc}\mu \\ & + (\text{ESG} \times \text{FUNDS_ALLOCATION} \times \text{EMERGING})_{bc}\rho + \varphi \text{FUNDS_ALLOCATION}_b + \mu \text{EMERGING}_c \\ & + \rho(\text{FUNDS_ALLOCATION} \times \text{EMERGING})_{bc} + \text{CONTROLS}_{c(\bar{t}-1)}\gamma + \beta_b + \kappa_{bc\bar{t}} \end{aligned} \quad (2)$$

¹ In accordance with Salvi et al. (2020), we excluded convertible, floating rate, asset-backed securities, index-linked, hybrid and preferred bonds.

² If no comparable bonds could be obtained based on the country, we employed the geopolitical or economic area — namely, G20, Asia-Pacific (APAC), BRICS, and Latin America (LatAm) — or, if this led to no results, the advanced economy versus emerging market classification, as per the International Monetary Fund.

³ Below or above EUR 100 million.

⁴ These included credit ratings, the type of rating, country of issue, currency, and quarter of issue.

Table 1
Description of variables.

| Variable name | Unit of measurement | Source | Description |
|---|---------------------------------|---|--|
| Yield Spread | Basis points Basis points | Bloomberg Authors' computation from Bloomberg data | A bond's yield-to-maturity is computed upon issuance The difference between Yield and the yield-to-maturity of a comparable sovereign GSS bond, identified based on the procedure described in par. 4 |
| Rating class | Discrete, qualitative | Author's reclassification of Bloomberg data | The class to which the credit rating agency's synthetic judgement, expressed upon bond issuance, pertains. To each bond, the rating is attached based on this pecking order: (1) S&P bond rating; (2) S&P issuer rating; (3) Moody's bond rating; (4) Moody's issuer rating; (5) Fitch bond rating; (6) Fitch issuer rating. If none of the above is available, the observation is classified within the "unrated" class. For the way in which ratings from different agencies are reconciled into classes, see Table 3 |
| Issuer's rating, dummy | Either 0 or 1 | Bloomberg | Dichotomic variable that takes the value of 1 if the reported rating relates to the issuer, and 0 otherwise |
| Bond type | Either 0 or 1 for each variable | Bloomberg | Array of dichotomic variables; each one of them takes the value of 1 if the bond is of that specific type (i.e., green, social, sustainability-linked, transition, or generic), and 0 otherwise |
| Geopolitical and economic areas | Either 0 or 1 for each variable | International Monetary Fund (IMF) | Array of dichotomic variables; each of them takes the value of 1 if the issuer's country belongs to that specific area (i.e., G20, APAC, BRICS, or LatAm), and 0 otherwise |
| Country | Discrete, qualitative | Bloomberg | The country where the issuer is located |
| Currency | Discrete, qualitative | Bloomberg | The currency in which the bond is denominated |
| Quarter | Discrete, qualitative | Bloomberg | The exact quarter (e.g., 2023Q1) when the bond was issued |
| Emerging country, dummy | Either 0 or 1 | International Monetary Fund (IMF) | Dichotomic variable that takes the value of 1 if the issuer belongs to an emerging country based on the IMF classification, and 0 otherwise |
| Funds allocation declared, dummy | Either 0 or 1 | Bloomberg | Dichotomic variable that takes the value of 1 if the issue is accompanied by a precise declaration on the allocation of funds (i.e., the use of proceeds is a detailed one), and 0 otherwise |
| ESG score | 0–100 scale | Bloomberg | The issuer's comprehensive ESG score, expressed as the average of the three pillars (i.e., Environmental, Social, and Governance) |
| Environmental score | 0–100 scale | Bloomberg | The issuer's score relative to the Environmental pillar |
| Social score | 0–100 scale | Bloomberg | The issuer's score relative to the Social pillar |
| Governance score | 0–100 scale | Bloomberg | The issuer's score relative to the Governance pillar |
| SDG dummies | Either 0 or 1 for each variable | Bloomberg | Array of dichotomic variables; each one of them takes the value of 1 if the bond's proceeds are expected to be used to pursue that specific Sustainable Development Goal (SDG), and 0 otherwise |
| Amount issued, log | USD, log-transformed | Bloomberg | The volume of bond issued in monetary terms |
| Macaulay modified duration (% of timespan) | Percentage points | Authors' computation from Bloomberg data | The ratio between a bond's Macaulay modified duration (numerator) and maturity upon issuance (denominator) |
| Debt/Equity ratio (%) | Percentage points | Bloomberg | The ratio between the issuer's total financial debt (numerator) and common equity (denominator), both relative to the end of the year preceding the issuance |
| EBITDA margin (%) | Percentage points | Bloomberg | The ratio between the issuer's EBITDA (numerator) and revenues (denominator), both relative to the year preceding the issuance |
| Capital intensity (%) | Percentage points | Authors' computation from Bloomberg data | The ratio between the issuer's EBITDA (numerator) and revenues (denominator), both relative to the end of the year preceding the issuance |
| Total assets, log | USD, log-transformed | Bloomberg | The issuer's total assets, relative to the year preceding the issuance |

where ESG — which can be either a vector or a scalar — is alternatively *ESG score*, *Environmental score*, *Social score*, *Governance score*, or an array of dummy variables describing whether a given SDG is pursued or not; FUNDS_ALLOCATION is a dummy variable that takes the value of 1 if the issuer provides a detailed disclosure of the allocation of funds; EMERGING a dummy variable that takes the value of 1 if the issuer is located in an emerging country; CONTROLS is a vector of control variables; and β is a bond-type-fixed effect.

The sample compositions are listed in Table 1. Descriptions of the variables are provided in Table 2.

3. Empirical results

3.1. Summary statistics

China, Germany, and the US each account for approximately 18% of the volume issued; however, China issued more GSS bonds.

Table 2
Sample composition.

| (A) Issuer's country / area | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
|---------------------------------|--------------|----------------|----------------|-------------|-------------|
| China | 951 | 24.02% | 17.99% | 3.15 | 1.06 |
| Germany | 591 | 14.92% | 17.95% | 0.78 | -1.83 |
| United States | 492 | 12.42% | 18.08% | 3.48 | 1.18 |
| Japan | 337 | 8.51% | 6.55% | 0.52 | -1.96 |
| South Korea | 298 | 7.53% | 4.83% | 2.70 | 0.05 |
| Malaysia | 281 | 7.10% | 0.65% | 4.88 | 2.01 |
| United Kingdom | 132 | 3.33% | 4.75% | 3.66 | 1.56 |
| France | 129 | 3.26% | 8.46% | 2.83 | 0.67 |
| Thailand | 74 | 1.87% | 0.45% | 3.04 | -0.17 |
| Brazil | 70 | 1.77% | 0.95% | 6.72 | 4.52 |
| Other countries | 605 | 15.28% | 19.33% | 3.86 | 1.67 |
| G20 | 3,286 | 82.98% | 90.25% | 2.30 | -0.11 |
| APAC | 2,202 | 55.61% | 35.97% | 2.62 | 0.05 |
| BRICS | 1,067 | 26.94% | 20.59% | 3.94 | 1.85 |
| LatAm | 276 | 6.97% | 8.50% | 4.54 | 2.51 |
| Advanced economies | 3,286 | 82.98% | 73.84% | 2.22 | -0.21 |
| Emerging markets | 2,202 | 55.61% | 26.16% | 4.52 | 1.98 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |
| (B) Issuer's sector | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
| Controlled by local authorities | 856 | 21.62% | 11.10% | 1.22 | -1.35 |
| Controlled by the Government | 753 | 19.02% | 21.43% | 2.55 | 0.11 |
| Electricity | 656 | 16.57% | 15.16% | 4.08 | 1.65 |
| Capital goods | 302 | 7.63% | 4.09% | 3.40 | 0.75 |
| Consumer cyclical | 269 | 6.79% | 7.89% | 2.33 | -0.17 |
| Transportation | 179 | 4.52% | 3.13% | 2.47 | -0.19 |
| Basic industry | 131 | 3.31% | 4.34% | 3.01 | 0.69 |
| Consumer non-cyclical | 124 | 3.13% | 4.59% | 2.44 | 0.31 |
| Other | 690 | 17.42% | 28.28% | 2.66 | 0.33 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |
| (C) Issuer's rating | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
| Prime | 161 | 4.07% | 13.31% | 2.08 | -0.24 |
| High grade | 278 | 7.02% | 7.28% | 2.11 | -0.51 |
| Upper-medium grade | 700 | 17.68% | 34.48% | 2.19 | -0.02 |
| Lower-medium grade | 618 | 15.61% | 30.72% | 3.26 | 1.11 |
| Non-IG, speculative | 129 | 3.26% | 8.41% | 4.62 | 2.54 |
| Highly speculative | 99 | 2.50% | 5.80% | 5.89 | 3.74 |
| Near-default | 14 | 0.35% | 0.60% | 6.54 | 4.54 |
| Unrated | 1961 | 49.52% | 20.73% | 2.30 | -0.46 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |
| (D) Bond type | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
| Green | 2934 | 74.09% | 83.94% | 2.74 | 0.25 |
| Social | 255 | 6.44% | 6.76% | 1.05 | -1.56 |
| Sustainability-linked | 342 | 8.64% | 17.66% | 3.75 | 1.68 |
| Transition | 56 | 1.41% | 1.36% | 1.14 | -1.09 |
| Generic GSS | 373 | 9.42% | 11.61% | 3.04 | 0.63 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |
| (E) Currency | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
| US dollar | 916 | 23.13% | 37.02% | 3.77 | 1.58 |
| Chinese renminbi | 892 | 22.53% | 15.02% | 3.27 | 1.02 |
| Euro | 790 | 19.95% | 31.82% | 1.29 | -1.17 |
| Japanese yen | 326 | 8.23% | 5.32% | 0.42 | -2.08 |
| Malaysian ringgit | 279 | 7.05% | 0.56% | 4.88 | 2.01 |
| South Korean won | 223 | 5.63% | 1.59% | 2.71 | -0.09 |
| British pound sterling | 77 | 1.94% | 2.80% | 3.65 | 1.59 |
| Thai baht | 77 | 1.94% | 0.47% | 3.21 | 0.04 |
| Brazilian real | 60 | 1.52% | 0.36% | 12.25 | 10.25 |
| Canadian dollar | 54 | 1.36% | 1.45% | 4.15 | 2.03 |
| Other currencies | 266 | 1.94% | 3.57% | 2.57 | 0.07 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |
| (F) Year of issue | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
| 2008–2013 | 28 | 0.71% | 0.47% | 2.19 | -1.07 |
| 2014 | 21 | 0.53% | 0.45% | 3.52 | 1.16 |
| 2015 | 176 | 4.44% | 4.86% | 2.60 | 0.18 |
| 2016 | 58 | 1.46% | 1.22% | 3.07 | 0.46 |
| 2017 | 158 | 3.99% | 3.11% | 2.74 | -0.14 |
| 2018 | 190 | 4.80% | 4.33% | 2.29 | -0.46 |
| 2019 | 319 | 8.06% | 6.54% | 2.60 | -0.13 |
| 2020 | 477 | 12.05% | 10.79% | 2.57 | -0.01 |

(continued on next page)

Table 2 (continued)

| (A) Issuer's country / area | Obs. | Share (n) | Share (vol.) | Yield (%) | Spread (%) |
|-----------------------------|--------------|----------------|----------------|-------------|-------------|
| 2021 | 1224 | 30.91% | 32.89% | 2.71 | 0.32 |
| 2022 | 998 | 25.20% | 27.72% | 2.80 | 0.52 |
| 2023Q1 | 311 | 7.85% | 7.62% | 2.68 | 0.25 |
| Total | 3,960 | 100.00% | 100.00% | 2.69 | 0.23 |

Note. *Share (n)* and *Share (vol.)* denote the proportion of the sample constituted by observations pertaining to that given category (out of 3,960 GSS bonds) weighted either equally or by the amount issued, respectively. *Yield (%)* and *Spread (%)* are averages computed across observations for which these variables are available (i.e., 2,087 observations). The G20, APAC, BRICS, and LatAm are not mutually exclusive classifications; hence, the sum of their respective proportions is greater than 1. *Issuer's sector* is based on Bloomberg classification level 3. *Issuer's rating* class is based on the categories described in Table 3.

Table 3

Categorization of credit ratings from different agencies.

| Rating class | Synthetic judgement (S&P, Fitch) | Synthetic judgement (Moody's) |
|----------------------------------|----------------------------------|-------------------------------|
| Prime | AAA | Aaa |
| Upper-medium grade | A+ | A1 |
| | A | A2 |
| | A- | A3 |
| High grade | AA+ | Aa1 |
| | AA | Aa2 |
| | AA- | Aa3 |
| Lower-medium grade | BBB+ | Baa1 |
| | BBB | Baa2 |
| | BBB- | Baa3 |
| Non-investment-grade speculative | BB+ | - |
| | BB | - |
| | BB- | - |
| | B+ | B1 |
| Highly speculative | B | B2 |
| | B- | B3 |
| | B+ | Baa1 |
| | B- | Baa2 |
| | B- | Baa3 |
| Near-default | CCC+ | Caa3 |
| | CCC | - |
| | CCC- | - |
| Unrated | Missing rating | Missing rating |

Note. The second and third columns are based on the conversion table provided by the EU Credit Rating Agency Regulation No. 462/2013. Although S&P and Fitch use the same nomenclature, a given synthetic judgement may have different meanings across agencies. No judgement from an agency can be directly compared to others from a different agency, not even if it is lying in the same row in the table above. Judgements can only be compared if they are issued by the same agency.

Almost 83% of the observations (more than 90% in terms of volume) relate to G20 countries. In terms of the issuer sector, local government-controlled entities were the most common in our sample, but state-owned entities outnumbered the others in terms of the amount issued. While almost half of the observations consist of unrated securities, the majority with synthetic ratings belonged to the upper-medium grade category. Finally, green bonds significantly outnumbered the others.

Considering the average yields and spreads, the lowest (highest) values were found for Japanese (Brazilian) securities. While issues from the G20 and Asia-Pacific (APAC) countries showed very similar risk premiums, those from Brazil, Russia, India, China, South Africa (BRICS)⁵ and Latin America showed much higher values. Additionally, a significant difference is noted between advanced economies (average yield: 2.22 %, average spread: -21 bps) and emerging markets (4.52% and +198 bps, respectively). In terms of credit ratings, the riskier categories showed higher premia, but the relationship is not monotonic in terms of the average spread, which is lower for "high grade" bonds than for "prime" ones. Finally, social and transitional bonds appear to be significantly less risky than the others. Table 2 (panels A-F) summarizes these figures, including those related to the year of issuance. Table 4 reports the full summary statistics, and Table 5 shows the correlation matrix.

3.2. Results and discussion

The initial step in our methodology (Table 6) eliminates the influence of credit ratings on yields and spreads, of which they are the primary determinants. Our results align with the typical pattern observed in efficient bond markets, in which riskier securities exhibit higher yields and spreads. This could indicate that the GSS are not significantly distinct from other debt instruments. The rating

⁵ Actually, no observations in our sample pertained to either Russia or South Africa.

Table 4
Summary statistics.

| | N | Mean | SD | Min | p25 | Median | p75 | Max |
|----------------------------------|-------|---------|----------|------------|--------|---------|---------|----------|
| Spread (%) | 2,087 | 0.234 | 2.310 | -3.990 | -1.626 | 0.102 | 2.000 | 10.250 |
| Yield (%) | 2,087 | 2.686 | 2.093 | -0.780 | 0.579 | 2.482 | 4.314 | 12.250 |
| Amount issued (USD million) | 3,949 | 275.3 | 393.8 | 0.002 | 42.7 | 125.5 | 400 | 7,041 |
| Macaulay MD (% of timespan) | 1,966 | 90.585 | 8.176 | 26.360 | 87.786 | 92.896 | 96.436 | 98.79 |
| Funds allocation declared, dummy | 2,505 | 0.233 | 0.423 | 0 | 0 | 0 | 0 | 1 |
| Issuer rating, dummy | 3,960 | 0.12 | 0.326 | 0 | 0 | 0 | 0 | 1 |
| Emerging country, dummy | 3,960 | 0.396 | 0.489 | 0 | 0 | 0 | 1 | 1 |
| SDG 1, dummy | 1,494 | 0.075 | 0.263 | 0 | 0 | 0 | 0 | 1 |
| SDG 2, dummy | 1,494 | 0.048 | 0.213 | 0 | 0 | 0 | 0 | 1 |
| SDG 3, dummy | 1,494 | 0.153 | 0.360 | 0 | 0 | 0 | 0 | 1 |
| SDG 4, dummy | 1,494 | 0.106 | 0.308 | 0 | 0 | 0 | 0 | 1 |
| SDG 5, dummy | 1,494 | 0.037 | 0.188 | 0 | 0 | 0 | 0 | 1 |
| SDG 6, dummy | 1,494 | 0.22 | 0.414 | 0 | 0 | 0 | 0 | 1 |
| SDG 7, dummy | 1,494 | 0.746 | 0.435 | 0 | 0 | 1 | 1 | 1 |
| SDG 8, dummy | 1,494 | 0.188 | 0.391 | 0 | 0 | 0 | 0 | 1 |
| SDG 9, dummy | 1,494 | 0.418 | 0.493 | 0 | 0 | 0 | 1 | 1 |
| SDG 10, dummy | 1,494 | 0.115 | 0.319 | 0 | 0 | 0 | 0 | 1 |
| SDG 11, dummy | 1,494 | 0.634 | 0.482 | 0 | 0 | 1 | 1 | 1 |
| SDG 12, dummy | 1,494 | 0.319 | 0.466 | 0 | 0 | 0 | 1 | 1 |
| SDG 13, dummy | 1,494 | 0.633 | 0.482 | 0 | 0 | 1 | 1 | 1 |
| SDG 14, dummy | 1,494 | 0.054 | 0.227 | 0 | 0 | 0 | 0 | 1 |
| SDG 15, dummy | 1,494 | 0.144 | 0.351 | 0 | 0 | 0 | 0 | 1 |
| SDG 16, dummy | 1,494 | 0.021 | 0.145 | 0 | 0 | 0 | 0 | 1 |
| SDG 17, dummy | 1,494 | 0.037 | 0.190 | 0 | 0 | 0 | 0 | 1 |
| ESG score | 2,141 | 48.449 | 15.362 | 0.000 | 39.341 | 50.367 | 59.666 | 87.472 |
| Environmental score | 2,141 | 38.399 | 22.305 | 0.000 | 23.558 | 39.837 | 53.972 | 87.496 |
| Social score | 2,141 | 31.042 | 16.186 | 0.000 | 19.831 | 30.532 | 43.047 | 78.386 |
| Governance score | 2,141 | 75.905 | 18.801 | 0.000 | 65.924 | 81.457 | 89.855 | 100 |
| Debt/equity ratio (%) | 2,231 | 348.916 | 562.602 | 0.000 | 76.639 | 147.437 | 312.296 | 8119.167 |
| EBITDA margin (%) | 2,217 | -16.356 | 2242.166 | -105,531.5 | 9.890 | 20.255 | 48.923 | 201.135 |
| Capital intensity (%) | 2,223 | 39.485 | 29.232 | 0.000 | 11.337 | 37.654 | 64.961 | 94.42 |
| Total assets, USD million | 2,232 | 217 | 955 | 0.000 | 0.037 | 241 | 1,463 | 1,680 |

Note. The residuals of *Yield* and *Spread* from Eq. (1), as well as interactions and transformations, are not shown.

Table 5
Pairwise correlation matrix.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
|----------------------------------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Yield (%) | 1 | 1.00 | | | | | | | | | | | | | | |
| Spread (%) | 2 | 0.94 | 1.00 | | | | | | | | | | | | | |
| Amount issued (USD million) | 3 | 0.14 | 0.24 | 1.00 | | | | | | | | | | | | |
| Macaulay MD (% of timespan) | 4 | -0.64 | -0.43 | 0.19 | 1.00 | | | | | | | | | | | |
| Funds allocation declared, dummy | 5 | -0.03 | 0.03 | 0.25 | 0.12 | 1.00 | | | | | | | | | | |
| Issuer rating, dummy | 6 | 0.44 | 0.38 | -0.19 | -0.40 | 0.12 | 1.00 | | | | | | | | | |
| Emerging country, dummy | 7 | -0.13 | -0.16 | -0.04 | -0.03 | -0.02 | 0.07 | 1.00 | | | | | | | | |
| ESG score | 8 | 0.28 | 0.30 | 0.18 | -0.12 | 0.13 | -0.03 | 0.15 | 1.00 | | | | | | | |
| Environmental score | 9 | 0.13 | 0.15 | 0.15 | -0.03 | 0.05 | -0.13 | 0.20 | 0.90 | 1.00 | | | | | | |
| Social score | 10 | 0.26 | 0.28 | 0.19 | -0.14 | 0.09 | 0.03 | 0.08 | 0.80 | 0.70 | 1.00 | | | | | |
| Governance score | 11 | 0.32 | 0.32 | 0.10 | -0.15 | 0.17 | 0.04 | 0.07 | 0.70 | 0.41 | 0.26 | 1.00 | | | | |
| Debt/equity ratio (%) | 12 | -0.21 | -0.20 | 0.09 | 0.16 | -0.05 | -0.12 | -0.15 | -0.42 | -0.33 | -0.16 | -0.50 | 1.00 | | | |
| EBITDA margin (%) | 13 | -0.18 | -0.20 | 0.01 | 0.13 | -0.04 | 0.01 | 0.01 | -0.39 | -0.34 | -0.12 | -0.44 | 0.39 | 1.00 | | |
| Capital intensity (%) | 14 | 0.35 | 0.31 | -0.02 | -0.26 | 0.15 | 0.00 | -0.01 | 0.04 | 0.01 | 0.05 | 0.05 | -0.10 | -1.00 | 1.00 | |
| Total assets, USD million | 15 | 0.09 | 0.08 | -0.06 | -0.16 | -0.03 | 0.01 | 0.26 | 0.09 | 0.08 | 0.10 | 0.05 | -0.07 | 0.00 | -0.01 | 1.00 |

Note. We omit the SDG dummies for graphical clarity. The residuals of *Yield* and *Spread* from Eq. (1), as well as interactions and transformations, are not shown.

Table 6
First-stage regression: GSS bonds' yields and spreads versus credit ratings.

| | (A) Yield (%) | (B) Spread (%) |
|--|----------------------|----------------------|
| Near-default rating, dummy | 8.474*** (1.119) | 5.296*** (1.139) |
| Highly speculative rating, dummy | 7.331*** (0.622) | 3.990*** (0.670) |
| Non-investment-grade speculative, dummy | 6.183*** (0.620) | 2.938*** (0.672) |
| Non-investment-grade speculative, dummy × Issuer rating, dummy | -1.119*** (0.283) | -1.022*** (0.391) |
| Lower-medium grade rating, dummy | 4.927*** (0.601) | 1.687*** (0.653) |
| Lower-medium grade rating, dummy × Issuer rating, dummy | -1.339*** (0.264) | -1.651*** (0.330) |
| Upper-medium grade rating, dummy | 4.252*** (0.604) | 0.924 (0.654) |
| Upper-medium grade rating, dummy × Issuer rating, dummy | -0.257 (0.206) | -0.299 (0.258) |
| High grade rating, dummy | 3.555*** (0.590) | -0.0124 (0.646) |
| High grade rating, dummy × Issuer rating, dummy | 0.101 (0.215) | -0.00365 (0.268) |
| Prime rating, dummy | 3.760*** (0.697) | 0.475 (0.801) |
| BRICS country, dummy | -0.126 (0.224) | -0.110 (0.240) |
| LatAm country, dummy | -0.375 (0.244) | -0.255 (0.260) |
| G20 country, dummy | -0.728*** (0.237) | -0.729*** (0.255) |
| APAC country, dummy | -0.0404 (0.182) | 0.113 (0.197) |
| Quarter-fixed effects | YES | YES |
| Currency-fixed effects | YES | YES |
| Industry-fixed effects | YES | YES |
| Observations | 1,257 | 1,257 |
| R-squared | 0.887 | 0.673 |

Robust standard errors in parentheses

** $p < 0.05$, * $p < 0.1$

Note. The interactions between *Near-default rating* and *Highly speculative rating* with *Issuer rating dummy* were dropped when running the estimations.
*** $p < 0.01$,

assigned to the issuer, rather than the security, is perceived as a risk-mitigating factor. Except for the G20, no discernible differences emerged with respect to the other geopolitical and economic regions.

We used the residuals from Eq. (1) as dependent variables. It was observed that the effect of *ESG score* (Table 7) arises only with respect to *Core spread*, yet there is no discernible distinction when the issuer is located in an emerging market and no impact on *Core yield*.

By replacing the comprehensive score with *Environmental score* (Table 8), all previous results were retained, yet the interaction term between the focus explanatory variable and the *Funds allocation declared* dummy exhibited a nonzero coefficient relative to both dependent variables. Additionally, it can be posited that relatively capital-intensive companies are likely to spend more to finance themselves on debt capital markets.

When *Social score* was the focus explanatory variable (Table 9), the results were similar. While the score does not show any de-risking effect on a standalone basis, it does so when the use of proceeds is disclosed analytically. The *Emerging market* dummy has a negative and statistically significant effect on both the dependent variables. However, *Social score* appears to be a risk-accruing factor in the emerging markets.

Employing *Governance score* as the focus explanatory variable (Table 10), it can be observed that a precise statement on how funds will be allocated is a risk-accruing factor. However, in general, the *Funds allocation declared* dummy has an estimated negative and highly statistically significant coefficient⁶.

If we use all the Pillar Scores collectively (Table 11), *Environmental score* exerts a positive influence on *Core spread* (but not on *Core*

⁶ The results on control variables confirm the previously identified relationships; nevertheless, the natural logarithm of total assets is positively associated with *Core yield*. This suggests that, in addition to larger issues, larger issuers are also perceived as riskier when governance factors are considered.

Table 7
Second-stage regression: GSS bonds' yields and spreads versus the issuer's comprehensive ESG score.

| | (1) Core yield (bps) | (2) Core spread (bps) |
|--|-------------------------|--------------------------|
| ESG score | 0.402 (0.489) | 0.268 (0.563) |
| ESG score × Emerging country, dummy | 2.330 (2.474) | 2.686 (2.810) |
| ESG score × Funds allocation declared, dummy | -0.965 (0.698) | -1.418* (0.809) |
| ESG score × Emerging country, dummy × Funds allocation declared, dummy | -1.903 (3.106) | -1.376 (3.474) |
| Emerging country, dummy | -137.9 (133.9) | -156.5 (154.0) |
| Funds allocation declared, dummy | -40.43 (40.40) | -12.50 (46.92) |
| Emerging country, dummy × Funds allocation declared, dummy | 124.9 (163.3) | 91.52 (185.0) |
| Amount issued (USD), log | 26.15*** (3.807) | 14.98*** (4.795) |
| Macaulay modified duration (% of timespan) | -6.320*** (0.764) | -3.411*** (0.957) |
| Debt/equity ratio (%) | 0.00285 (0.00712) | -0.000548 (0.00773) |
| EBITDA margin (%) | 0.191 (0.204) | 0.0288 (0.229) |
| Capital intensity (%) | 0.450** (0.177) | 0.354* (0.204) |
| Total assets (USD), log | 1.817 (1.449) | -0.574 (1.700) |
| Bond-type-fixed effects | YES | YES |
| Observations | 607 | 607 |
| R-squared | 0.217 | 0.123 |

Robust standard errors in parentheses

- *** p<0.01,
** p<0.05,
* p<0.1

yield), highlighting that de-risking is pronounced and of greater magnitude when an analytical declaration about fund allocation is made. A higher *Social score* is a risk-accruing factor in emerging markets; conversely, on a stand-alone basis, *Governance score* is a de-risking factor. This effect is reversed if funds are precisely allocated, but not in emerging countries. In other words, the precise allocation of funds reduces the levels of both dependent variables.

In a specification with only the SDG dummies (Table 12), we find the following. Regarding *Core yield*, the pursuit of Goals 2 (*Zero hunger*) and 9 (*Industry, innovation and infrastructure*) is associated with a reduction in risk, whereas Goals 3 (*Good health and well-being*) and 12 (*Responsible consumption and production*) are risk-accruing. Regarding *Core spread*, Goal 5 (*Gender equality*), in addition to Goals 2 and 9, is negatively associated with a company's cost of debt net of the financial characteristics of the issue. The pursuit of Goals 12 and 8 (*Decent work and economic growth*) has the opposite effect, but this is not the case with Goal 3.

These results suggest a negative relationship between a company's sustainable performance and the yield and spread of GSS bonds, thereby supporting Hp. 1. These findings align with previous studies on the relationship between ESG commitment and access to financing (Ge and Liu, 2015; Flammer, 2021; Salvi et al., 2020).

However, our findings are somewhat contradictory when we disentangle the comprehensive ESG score into the three pillars, either individually or collectively. Our analysis revealed that the effects of these pillars on the dependent variable were statistically insignificant, except for the Environmental and Social pillars. However, we found that the detailed disclosure of proceeds could trigger stronger effects of these pillars on the dependent variable. These findings support Hp. 2. Furthermore, NFD acts as a de-risking factor both in conjunction with sustainability performance and on a standalone basis. This finding is consistent with the conclusions of Dhaliwal et al. (2011), Zhou et al. (2014), and Amiraslani et al. (2023). Conversely, while sound corporate governance is beneficial, detailed information on how funds should be used appears to exert a risk-accruing effect. This finding suggests that overly transparent firms can prompt investors to become suspicious of their financial soundness, particularly because of regulatory mandates (Vitale et al., 2023).

Socially oriented projects in developing countries, such as the preservation of local communities, are still perceived as an inherent source of risk as long as the private sector plays a more significant role in advancing the ESG framework in countries with higher levels of "institutional quality", such as European Union Member States (Tahmid et al., 2022; Bandeira Pinheiro et al., 2023).

Table 8
Second-stage regression: GSS bonds' yields and spreads versus the issuer's Environmental score.

| | (3) Core yield (bps) | (4) Core spread (bps) |
|--|-------------------------|--------------------------|
| Environmental score | 0.485 (0.309) | 0.496 (0.357) |
| Environmental score × Emerging country, dummy | 0.494 (0.950) | 0.697 (1.089) |
| Environmental score × Funds allocation declared, dummy | -1.147** (0.470) | -1.452*** (0.547) |
| Environmental score × Emerging country, dummy × Funds allocation declared, dummy | -0.149 (1.539) | -0.283 (1.635) |
| Emerging country, dummy | -30.85 (45.90) | -38.77 (53.35) |
| Funds allocation declared, dummy | -40.04 (24.50) | -23.41 (28.39) |
| Emerging country, dummy × Funds allocation declared, dummy | 23.32 (63.73) | 19.77 (70.40) |
| Amount issued (USD), log | 25.97** (3.611) | 14.42*** (4.567) |
| Macaulay modified duration (% of timespan) | -6.244*** (0.754) | -3.337*** (0.947) |
| Debt/equity ratio (%) | 0.00346 (0.00669) | 0.00130 (0.00734) |
| EBITDA margin (%) | 0.189 (0.202) | 0.0382 (0.226) |
| Capital intensity (%) | 0.476** (0.179) | 0.360* (0.206) |
| Total assets (USD), log | 1.439 (1.459) | -0.955 (1.723) |
| Bond-type-fixed effects | YES | YES |
| Observations | 607 | 607 |
| R-squared | 0.222 | 0.129 |

Robust standard errors in parentheses

*** p<0.01,

** p<0.05,

* p<0.1

4. Conclusions

This study employs a global sample of GSS bond issues to investigate the effects of ESG commitments and disclosures on the cost of debt at the corporate level. This study contributes to the existing literature by utilizing a broad, geographically diversified sample and discounting the effect of security fundamentals such as credit rating, country, currency, and timing of issues.

The empirical findings indicate that efforts towards sustainability can have a positive effect on a company's financial performance, thereby reducing its cost of debt. The results are strengthened by the pre-emptive exclusion of potential confounding factors that were included in the first step of the two-step procedure. While discrete credit ratings are nonlinear variables, further research would entail considering that "social responsibility" has already entered the credit rating process (Ge and Liu, 2015; Yang et al., 2023), as corporate performance might be boosted by the GSS bond issue (Liu and Li, 2024).

Our study also considers the potential impact of individual SDGs on issuers' risk and the cost of debt. This allows us to shed light on the relationship between the two areas of sustainability, which may be distinguished by their respective foci. On the one hand, the macro- and impact-oriented approach is reflected in the commitment to SDGs; on the other hand, the micro- approach, relative to improving a company's efficiency in dealing with resources and stakeholders, is reflected in ESG scores.

Finally, the results confirm the relevance of NFD in GSS bond issues, suggesting that analytically detailing the use of proceeds is akin to official green certifications (Li et al., 2022). As a potential means of greenwashing (Xu et al., 2022) and a driver of investor sentiment, NFD elicits risks and opportunities for companies. Although this study focuses on the issuer's perspective, the findings may also inform investors' portfolio strategy design. Notwithstanding the existence of notable discrepancies within both the ESG pillars and SDGs, the evidence collected indicates a trade-off between the disclosure of project-related information and financial returns. This is because a more comprehensive understanding of the use of proceeds can facilitate de-risking by enhancing sustainability. Considering these findings, it may be beneficial for investors to consider the depth of underlying information when assessing the "fairness" of a GSS bond price and making investment decisions.

The findings of Step 1 indicate that the financial characteristics of GSS bonds are not significantly different from those of their "brown" counterparts. However, a detailed breakdown of the use of proceeds may prove useful for managing financial stress, as it represents a channel through which an issuer's sustainability performance may influence investor returns. This is consistent with the existing literature, which suggests that green bonds may even contribute to the propagation of turbulence and, in isolation, are unlikely

Table 9
Second-stage regression: GSS bonds' yields and spreads versus. the issuer's Social score.

| | (5) Core yield (bps) | (6) Core spread (bps) |
|---|-------------------------|--------------------------|
| Social score | 0.706 (0.497) | 0.540 (0.588) |
| Social score × Emerging country, dummy | 2.239 (1.549) | 2.703* (1.615) |
| Social score × Funds allocation declared, dummy | -1.325* (0.711) | -1.691** (0.844) |
| Social score × Emerging country, dummy × Funds allocation declared, dummy | -0.740 (2.296) | -0.394 (2.460) |
| Emerging country, dummy | -104.2* (62.64) | -121.2* (67.31) |
| Funds allocation declared, dummy | -45.69 (28.81) | -29.72 (34.10) |
| Emerging country, dummy × Funds allocation declared, dummy | 61.36 (88.73) | 43.70 (96.25) |
| Amount issued (USD), log | 25.31*** (3.798) | 14.13*** (4.804) |
| Macaulay modified duration (% of timespan) | -6.193*** (0.769) | -3.307*** (0.964) |
| Debt/equity ratio (%) | 0.00279 (0.00677) | 0.000410 (0.00755) |
| EBITDA margin (%) | 0.140 (0.201) | -0.00388 (0.226) |
| Capital intensity (%) | 0.427** (0.176) | 0.320 (0.202) |
| Total assets (USD), log | 2.056 (1.412) | -0.338 (1.670) |
| Bond-type-fixed effects | YES | YES |
| Observations | 607 | 607 |
| R-squared | 0.222 | 0.127 |

Robust standard errors in parentheses

*** p<0.01,

** p<0.05,

* p<0.1

Table 10
Second-stage regression: GSS bonds' yields and spreads versus the issuer's Social score.

| | (7) Core yield (bps) | (8) Core spread (bps) |
|---|-------------------------|--------------------------|
| Governance score | -0.574 (0.423) | -0.759 (0.503) |
| Governance score × Emerging country, dummy | -0.374 (1.046) | -0.498 (1.154) |
| Governance score × Funds allocation declared, dummy | 0.896* (0.525) | 0.642 (0.620) |
| Governance score × Emerging country, dummy × Funds allocation declared, dummy | -0.347 (1.396) | 0.545 (1.513) |
| Emerging country, dummy | 8.540 (83.67) | 17.92 (92.82) |
| Funds allocation declared, dummy | -169.7*** (43.63) | -145.7*** (52.20) |
| Emerging country, dummy × Funds allocation declared, dummy | 59.61 (111.1) | -16.78 (120.8) |
| Amount issued (USD), log | 29.50*** (3.962) | 18.85*** (4.967) |
| Macaulay modified duration (% of timespan) | -6.364*** (0.776) | -3.461*** (0.971) |
| Debt/equity ratio (%) | 0.00133 (0.00883) | -0.00275 (0.00963) |
| EBITDA margin (%) | 0.0842 (0.206) | -0.104 (0.234) |
| Capital intensity (%) | 0.465** (0.183) | 0.363* (0.212) |
| Total assets (USD), log | 2.614* (1.470) | 0.153 (1.722) |
| Bond-type-fixed effects | YES | YES |
| Observations | 607 | 607 |
| R-squared | 0.217 | 0.122 |

Robust standard errors in parentheses

*** p<0.01,

** p<0.05,

* p<0.1

to stimulate growth in bond markets. Simultaneously, they can play a role in decarbonization and support the adoption of more environmentally friendly corporate policies (Tsagkanos et al., 2022).

This study reinforces the argument that policymakers should encourage greater transparency in corporate sustainability reporting while ensuring that the legitimate interests of companies in achieving positive financial outcomes, such as reduced cost of debt, are not undermined. However, it has some limitations, including the lack of ESG data and thus the limited number of observations processed in the empirical analysis, the lack of a time series dimension, and a cut-off date of 2023Q1 for bonds issued.

Further research could delve deeper into the relationship between GSS and “brown” bonds, possibly by considering time-varying characteristics (using panel data), and focusing on the occurrence of exogenous shocks. Moreover, following the idea developed by Tsagkanos et al. (2022), the link between bond yields and spreads to broader market indices should be investigated.

Additionally, by combining the cross-sectional and time-series dimensions, a Difference-in-Differences (DiD) approach could be used to look at the potentially disruptive effects of legislation that have been introduced in certain jurisdictions but not others, such as the NFD rules that recently entered into force in the European Economic Area (EEA) via the Corporate Sustainable Reporting Directive (No. 2022/464/EU, applied since January 5, 2023). This could be done under the assumption that, in the absence of that piece of legislation, issuing GSS bonds had similar effects relative to the cost of debt on EEA companies versus those established elsewhere, which seems to be in line with the findings of this study.

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Table 11
Second-stage regression: GSS bonds' yields and spreads versus the issuer's Pillar scores.

| | (9) Core yield (bps) | (10) Core spread (bps) |
|--|-------------------------|---------------------------|
| Environmental score | 0.634 (0.432) | 0.860* (0.511) |
| Environmental score × Emerging country, dummy | -1.149 (1.347) | -1.250 (1.455) |
| Environmental score × Funds allocation declared, dummy | -1.782** (0.699) | -2.021** (0.808) |
| Environmental score × Emerging country, dummy × Funds allocation declared, dummy | 0.142 (2.090) | -0.516 (2.229) |
| Social score | 0.401 (0.651) | 0.0819 (0.790) |
| Social score × Emerging country, dummy | 3.427 (2.387) | 3.617* (2.190) |
| Social score × Funds allocation declared, dummy | -0.102 (0.963) | -0.227 (1.135) |
| Social score × Emerging country, dummy × Funds allocation declared, dummy | -0.612 (3.162) | 0.456 (3.150) |
| Governance score | -1.075** (0.476) | -1.322** (0.564) |
| Governance score × Emerging country, dummy | 1.651 (1.489) | 1.745 (1.676) |
| Governance score × Funds allocation declared, dummy | 1.970*** (0.601) | 1.895*** (0.708) |
| Governance score × Emerging country, dummy × Funds allocation declared, dummy | -3.418** (1.740) | -2.954 (1.909) |
| Emerging country, dummy | -229.3 (172.3) | -236.5 (192.5) |
| Funds allocation declared, dummy | -170.8*** (47.07) | -145.6*** (56.03) |
| Emerging country, dummy × Funds allocation declared, dummy | 299.2 (185.3) | 235.7 (203.8) |
| Amount issued (USD), log | 28.41*** (4.031) | 18.13*** (5.053) |
| Macaulay modified duration (% of timespan) | -6.117*** (0.768) | -3.212*** (0.962) |
| Debt/equity ratio (%) | 0.00219 (0.00800) | -0.00171 (0.00864) |
| EBITDA margin (%) | 0.0874 (0.208) | -0.0758 (0.237) |
| Capital intensity (%) | 0.533*** (0.188) | 0.461** (0.219) |
| Total assets (USD), log | 1.898 (1.535) | -0.876 (1.829) |
| Observations | 607 | 607 |
| R-squared | 0.238 | 0.144 |

Robust standard errors in parentheses

- *** p<0.01,
** p<0.05,
* p<0.1

Table 12
Second-stage regression: GSS bonds' yields and spreads versus SDG dummies.

| | (11) Core Yield (bps) | (12) Core Spread (bps) |
|---|--------------------------|---------------------------|
| SDG 1 — <i>No poverty</i> , dummy | 16.36 (32.77) | 19.10 (38.67) |
| SDG 2 — <i>Zero hunger</i> , dummy | -70.00* (36.01) | -80.53** (36.99) |
| SDG 3 — <i>Good health and well-being</i> , dummy | 41.34* (23.19) | 40.33 (25.49) |
| SDG 4 — <i>Quality education</i> , dummy | -3.566 (24.90) | 2.194 (28.37) |
| SDG 5 — <i>Gender equality</i> , dummy | -41.61 (27.19) | -59.24* (32.25) |
| SDG 6 — <i>Clean water and sanitation</i> , dummy | 8.367 (15.83) | 3.175 (17.21) |
| SDG 7 — <i>Affordable and clean energy</i> , dummy | -5.892 (18.68) | -20.05 (20.80) |
| SDG 8 — <i>Decent work and economic growth</i> , dummy | 28.30 (19.81) | 41.44* (22.01) |
| SDG 9 — <i>Industry, innovation, and infrastructure</i> , dummy | -28.50** (13.56) | -33.39** (15.20) |
| SDG 10 — <i>Reduced inequalities</i> , dummy | 27.59 (24.84) | 22.60 (31.04) |
| SDG 11 — <i>Sustainable cities and communities</i> , dummy | -4.517 (14.27) | -8.212 (15.85) |
| SDG 12 — <i>Responsible consumption and production</i> , dummy | 28.77* (14.67) | 28.09* (16.10) |
| SDG 13 — <i>Climate action</i> , dummy | 18.89 (15.18) | 19.42 (16.79) |
| SDG 14 — <i>Life below water</i> , dummy | -20.48 (24.08) | -19.68 (25.82) |
| SDG 15 — <i>Life on land</i> , dummy | 0.330 (15.93) | 1.399 (17.38) |
| SDG 16 — <i>Peace, justice, and strong institutions</i> , dummy | -29.02 (43.14) | -8.182 (40.94) |
| SDG 17 — <i>Partnerships for the goals</i> , dummy | 23.70 (29.96) | -6.239 (32.54) |
| Emerging country, dummy | 4.571 (31.40) | 12.88 (31.15) |
| Funds allocation declared, dummy | -119.1*** (12.47) | -121.1*** (14.23) |
| Emerging country, dummy × Funds allocation declared, dummy | 22.71 (34.40) | 13.62 (34.10) |
| Amount issued (USD), log | 24.98*** (5.474) | 16.71** (7.003) |
| Macaulay modified duration (% of timespan) | -6.130*** (1.134) | -3.626** (1.424) |
| Debt/equity ratio (%) | 0.00711 (0.0111) | 0.00412 (0.0126) |
| EBITDA margin (%) | -0.00683 (0.293) | -0.186 (0.339) |
| Capital intensity (%) | 0.431* (0.247) | 0.281 (0.283) |
| Total assets (USD), log | 3.769* (2.003) | 1.690 (2.442) |
| Observations | 388 | 388 |
| R-squared | 0.289 | 0.223 |

Robust standard errors in parentheses

*** p<0.01,

** p<0.05,

* p<0.1

CRedit authorship contribution statement

Oliviero Roggi: Validation, Supervision, Resources, Project administration, Investigation, Data curation, Conceptualization. **Luca Bellardini:** Writing – review & editing, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sara Conticelli:** Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The authors do not have permission to share data.

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