Policy Research Working Paper 10200

Structural Loopholes in Sustainability-Linked Bonds

Imtiaz Ul Haq
Djeneba Doumbia

World Bank Group
International Finance Corporation
October 2022

Policy Research Working Paper 10200

Abstract

Sustainability-Linked Bonds—an innovative debt product that incorporates incentivized sustainability targets—are becoming increasingly popular to encourage issuers to improve their sustainability performance. However, existing Sustainability-Linked Bond structures allow issuers to weaken the link between sustainability and financial outcomes, rendering Sustainability-Linked Bonds less effective. This paper examines two potential structural loopholes on this front: late target dates and call options. The results show that Sustainability-Linked Bonds with coupon step-up penalties, which constitute the majority and benefit most from such features, are more likely to have later target dates and call options embedded. Larger penalties are associated with a greater likelihood of late target dates but not call options, which instead tend to be favored primarily by speculative grade issuers. The paper also provides evidence that issuers with high carbon dioxide emissions are more likely to resort to such structural loopholes. These findings suggest that Sustainability-Linked Bonds, despite incentivized targets, may be prone to greenwashing.

This paper is a product of the Economic Policy Research Department, International Finance Corporation: IFC. It is part of a larger effort by the World Bank Group to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at iulhaq@ifc.org.

Structural Loopholes in Sustainability-Linked Bonds

Imtiaz Ul Haq[1]*

International Finance Corporation

Djeneba Doumbia

World Bank

Keywords: Sustainability-linked bonds, ESG, Greenwashing

JEL Codes: G15, G23, Q56

[1] Imtiaz Ul Haq is an Economist at the Economic Research Unit at IFC. Djeneba Doumbia is an Economist at the Macroeconomics, Trade, and Investment Global Practice, World Bank. We would like to thank Denis Medvedev, Neil Gregory, Fiona Elizabeth Stewart, Frederica Zeni, and Otavio Augusto Fernandes Lopes for their valuable comments. Arsh Anand provided superb research assistance. The findings, interpretations, and conclusions expressed in this paper do not necessarily reflect the views of the World Bank Group, its Board of Directors, or member states. Please do not share or distribute without authors' permission.

*Corresponding author. Email: iulhaq@ifc.org

1. Introduction

Sustainability-Linked Bonds (SLBs) are an innovative instrument to channel capital towards environmental, social and governance (ESG) sustainability in the private sector. Their popularity has grown significantly since they were first launched in 2019, including in emerging markets. In 2021, annual SLB issuance reached $103 billion, an increase of 803 percent over 2020 figures (Orden & Calonje, 2022). SLBs were the fastest growing sustainable debt instrument in 2021 and have the potential to grow further due to increasing appetite from investors, supportive policy, and rising awareness about climate change risks (Giraldez and Fontana, 2021).

SLBs differ from existing green, social and sustainability bonds along three dimensions. First, a key feature is that SLBs are issued with pre-determined Sustainability Performance Targets (SPT) that the issuer aims to achieve before the maturity of the bond. Second, the achievement of these targets is linked to financial incentives (typically the coupon rate) for the issuer, with the objective that these will encourage the issuer to improve ESG performance and transparency around actual impact. The third difference is that SLB proceeds do not need to be project-specific and hence are fungible.

While the SLB structure allows flexibility in how such incentives are determined, an overwhelming majority of SLBs issued so far tend to have a coupon step-up, i.e., a pre-determined increase in the coupon rate that comes into effect if the issuer is unable to achieve the SPTs. Targets must be achieved by a certain date that is announced at time of issue and are typically verified externally. If targets are not hit by the target date, the increased coupon rate is paid by the issuer over the remainder of the bond's life. Achievement of targets subsequent to the target date have no impact on coupon payments. A minority of SLBs have forms of penalties other than a coupon step-up.

Existing SLB structures, however, raise a number of potential issues around incentives for issuers. In particular, the structure allows for the possibility for issuers to take advantage of easier access to potentially lower cost of capital without undertaking the expected corresponding improvement in ESG performance towards pre-set targets. This can be done primarily in three ways: (i) keeping penalties low; (ii) minimizing the impact of penalties by pushing target dates closer to maturity date; and (iii) calling an SLB before maturity to avoid or minimize the penalty. A separate but related issue is the setting of targets that are insufficiently ambitious, a topic that is outside the scope of this paper but warrants further research.

These three 'structural loopholes' weaken the effectiveness of incentivized sustainability targets in SLBs, a distinguishing feature and key reason for its growing popularity. Resulting concerns around actual sustainability impact from SLBs may threaten the pace of future growth of the market. This is especially true in the wake of greenwashing concerns that have dogged green, social and sustainability bonds. While there is an absence of studies examining these critical structural issues in SLBs, practitioners have recently begun to acknowledge them as reflected in the following statement:

"Does the date of the sustainable targets and potential financial incentive/penalty occur early enough in the bond's life to be material and before relevant call dates? If not, this could be a red flag as the issuer may, in reality, have no material financial incentive and/or could call the bonds before they are held accountable to hit the sustainability targets and avoid facing the financial penalty." (AEGON Asset Management, 2022).

This paper attempts to shed light on two of these structural loopholes and related issues. It does not analyze the first of the three potential structural loopholes. Kölbel and Lambillon (2022) examine this issue and find that the average SLB premium exceeds the average penalty, suggesting that penalties are set too low. Instead, our paper focuses on the remaining two structural aspects which have not been studied yet: setting of target dates and inclusion of call provisions. Setting a late target date is a simple way for an issuer to reduce the total number of higher coupon penalty payments arising from a failure to achieve sustainability targets. Similarly, calling a bond before maturity relieves the issuer from remaining coupon payments in the bond's life, allowing it to minimize or even completely avoid penalties.

Our sample includes all SLBs issued till the end of 2021, across all markets. Data is derived primarily from Thomson Reuters (Refinitiv) and BloombergNEF. To examine the setting of target dates, we hypothesize that in order to minimize penalties, SLBs with step-up penalties are likely to have later target dates while the opposite is true for step-down incentives (i.e., decrease in coupon rate if targets met). We find that step-up penalties are indeed associated with significantly later target dates, set on average at approximately 57.2 percent of the bond's tenor compared to step-downs for which it is set closer to the one-third (36 percent) mark. We further explore the relationship between target dates and step-up penalty amounts, as there is greater incentive to minimize penalties if the penalty payout is higher. We find a positive and significant relationship, with the target date being set later by 11 percent of the tenor period for a 25-basis point penalty increase.

To study the inclusion of call provisions, we make a distinction between call options with potential to minimize penalties and all others (such as clean-up calls and make-whole calls). We also consider potential penalties imposed on early call of an SLB. We find such penalties to be more lenient for SLBs with step-up penalties, averaging only 15.4 bps compared to the average penalty of 31.2 bps. These are substantially more stringent for SLBs with other types of penalties, making these less attractive for early call. This makes SLBs with step-up penalties a prime candidate for such call options. We present evidence that this is indeed the case and that such call options are typically structured to allow minimizing of total penalty payout by setting the call date close to the target date.

Additionally, the paper explores the type of issuers likely to resort to these two structural loopholes. In particular, we are interested in how an issuer's sustainability performance (proxied by past CO_2 emissions) is related to late target dates and penalty-minimizing call options. If past sustainability performance is a reflection of an issuer's motivation to pursue sustainability efforts, we expect high polluters to be more likely to exploit structural loopholes as an act of insurance against future failure to achieve pre-set SLB targets. We find this to be the case for setting of late target dates but not call provisions, which instead tend to be favored heavily by speculative grade issuers. Nevertheless, we find that speculative grade issuers are significantly higher polluters on average than their counterparts.

This paper makes three contributions to existing literature. First, we provide an overview of salient SLB features that may be used to minimize penalties and document their prevalence in the sector. While few studies investigate low penalties, none examine target dates or call provisions. Second, this paper provides evidence that such features are designed in a manner to allow for minimizing of the total penalty payout by issuers in case of failure to achieve pre-set targets. Third, our results show that certain types of issuers, particularly high polluters, are more likely to resort to these structural loopholes.

The remainder of the paper is structured as follows. Section 2 reviews the literature. Section 3 provides background on the SLB mechanism. Section 4 describes the data and provides descriptive statistics. Section 5 discusses methodology and empirical results. Section 6 provides concluding remarks.

2. Literature Review

The literature on SLBs is limited given these instruments are a recent innovation. The majority of the existing literature is qualitative, focusing on the potential of SLBs to overcome the limitations of green bonds and to attract capital toward sustainable finance projects. At the same time, rapid adoption of the instrument by the issuers globally has raised some concerns about the structure of the bonds, particularly around the quality of KPIs and issuer incentives to achieve SPTs. The majority of the concerns, however, are based on anecdotal evidence, and there is currently very limited in-depth empirical research testing the viability of these concerns.

The relevance, materiality, and robustness of Key Performance Indicators (KPIs) embedded in SLBs is a major concern. Vulturius, Maltaisa, and Forsbacka (2022) highlight the lack of definition of 'material' KPIs and 'ambitious' SPTs, which leaves room for greenwashing. They emphasize the need for clearly defined and aligned sector and context-specific material KPIs and SPTs. An article by Capital Monitor (2021) illustrates the issue via the example of Amedes, a German medical diagnostics company, which attempted to issue a sustainability-linked loan based on KPIs related to the percentage of electric vehicles in its fleet and employee accident rates. It also mentions Teva, an Israeli-US pharmaceutical company, as an example of a company that has been criticized for its unambitious KPIs attached to its US$5 billion bond.

There have only been a handful of studies that have attempted to analyze issuer incentinves in SLBs. Berrada, Engelhardt, Gibson, and Krueger (2022) explore incentives for issuers to issue SLBs via a theoretical framework and find that they are more likely to do so when the infrastructure cost to improve environmental performance is greater than the monetary benefit that investors associate with improved environmental performance, resulting in a higher cost to the investors. They also find that SLBs are overpriced in the primary market, resulting in wealth transfers from bondholders to shareholders. However, literature on pricing of SLB is nascent, with some studies (Barbalau and Zeni, 2021) finding lower SLB premiums.

A recent empirical study by Kölbel and Lambillon (2022) is closely related to our research. The study tests whether SLB penalties adequately penalize issuers in the event of failure to meet sustainability targets. They match 102 SLBs with counterpart conventional bonds from the same issuer and find that SLB issuers benefit from an average sustainability premium of 29.2 basis points, implying that issuers benefit from a lower cost of capital when issuing SLBs versus conventional bonds. Given that the average coupon step-up penalty is 26.6 basis points, issuers are better off even when it fails to achieve pre-set SPTs and the penalty comes into effect. However, the yield differential varied between bond pairs, where 65 percent of SLB issuers benefited from a sustainability premium. According to the authors, the average financial savings for issuers are more than 60 percent greater than potential coupon step-up penalties. Given the results, the authors argue that there is potential for greenwashing in this new sustainable bond market segment. Liberadzki, Jaworski, and Liberadzki (2021) find similar results through a case study approach that centers on a single SLB offering. Our paper goes beyond a comparison of SLB and conventional yields by expanding the discussion to other SLB features that pose concerns around effectiveness of incentivized sustainability targets in these instruments.

3. Sustainability-Linked Bond Mechanism

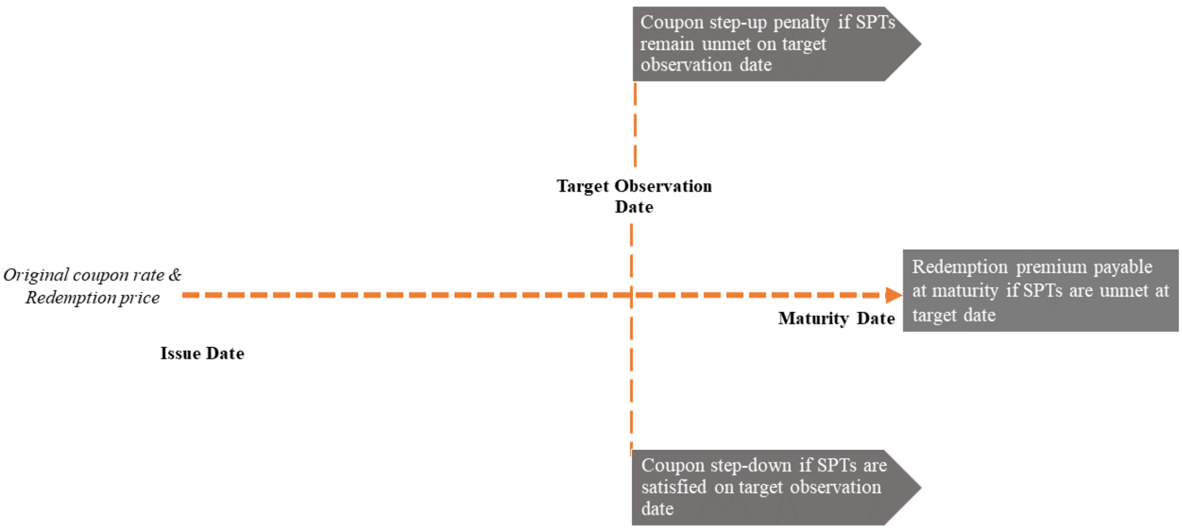
ICMA (2020) defines sustainability-linked bonds as "any type of bond instrument for which the financial and/or structural characteristics can vary depending on whether the issuer achieves predefined sustainability/ESG objectives." Unlike green bonds and other labeled bonds, the proceeds of SLBs are not restricted to a specific green project, but can be used for general purposes. Instead, issuers commit to meeting predefined goals within a set time frame. These goals do not have to be related to the environmental theme; rather, they can also be related to any type of sustainability, governance, or social issue. These goals are measured using predefined Key Performance Indicators (KPIs) and assessed against Sustainability Performance Targets (SPTs). ICMA (2020) provides voluntary process guidelines for issuing SLBs, including KPI selection, SPT calibration, bond characteristics, replication, and verification but not all issuers comply with these. Independent and external verifiers provide a second party opinion at the time of bond issuance to certify that the issued SLB adheres to the ICMA's Sustainability-Linked Bond Principles. In such cases, external verifiers also monitor the achievement of KPIs after they have been issued.

The change in the financial structure of SLBs over the bond's tenor is determined by whether or not the relevant KPIs are met. Figure 1 illustrates the payment mechanism of a basic SLB. The payment mechanism of the SLB is similar to that of any other bond until a certain point in time (the target observation date) such that the coupon payments are made in accordance with the coupon rate set at issuance. At the target observation date, the issuer is determined to have either achieved or failed to achieve the pre-set SPTs based on the predefined KPIs.

The SPT success or failure outcome determines if and how payments to investors are changed. Typically a penalty, such as a coupon step-up or redemption premium, is imposed on the issuer (at the benefit of the investor) if SPTs are unmet. In case of a coupon step-up, the issuer is liable to pay a higher coupon rate on the remaining coupon payments in the bond's life. On the other hand, the redemption premium is due entirely at maturity in the form of a higher redemption price. Other types of financial penalties are less common and outlined in Section 5.3. Occassionally, an incentive in the form of a coupon step-down is triggered if SPTs are met.

In this case, the issuer will pay a lower coupon rate on the remaining coupon payments. If the penalty or incentive is not triggered, payments to investors remain the same for the remaining tenor of the bond.

Figure 1: Payment mechanism of a sustainability-linked bond



4. Data

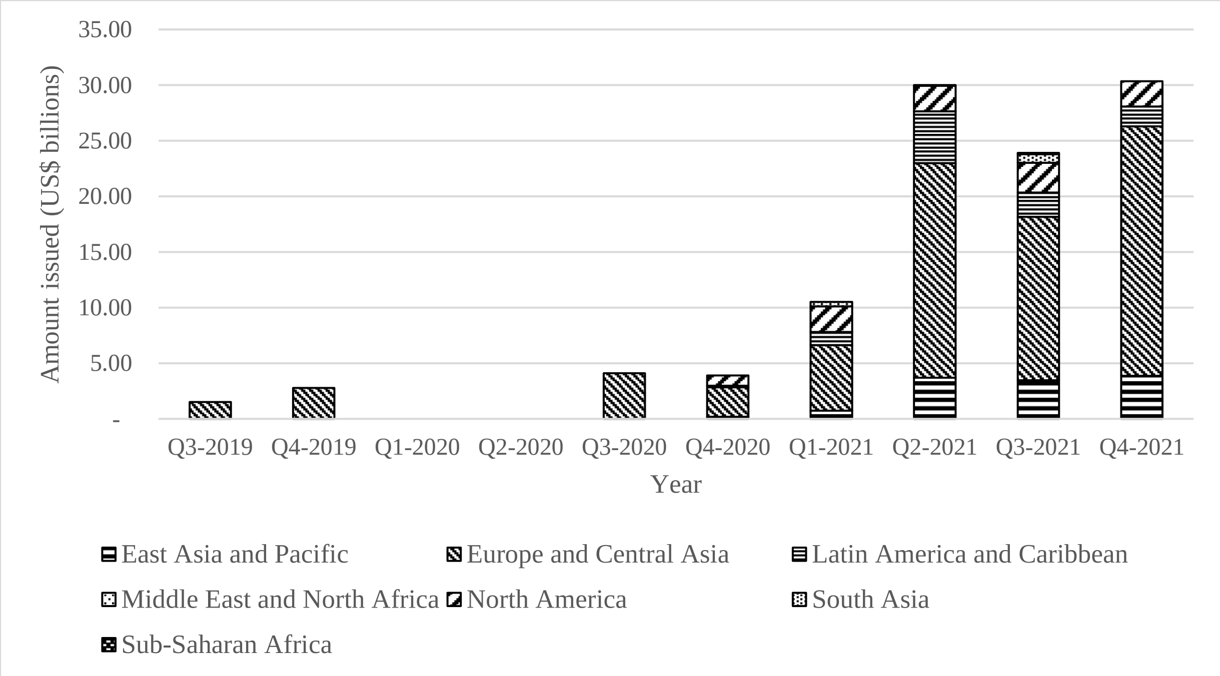
4.1. Sample

Data on SLBs is primarily sourced from Thomson Reuters (Refinitiv) and supplemented with BloombergNEF. We use two data sources to ensure that our data set reflects the entire universe of SLBs. Our sample is comparable to that reported by Environmental Finance in their most recent report, Sustainable Bonds Insight 2022 (Environmental Finance, 2022). Extraction from the data sources yields 228 SLBs issued as of December 31, 2021. We exclude 20 bonds for which data on sustainability targets and associated penalties was not available, resulting in a final data set of 208 bonds.

Figure 2 provides an overview of the issuance trends over time and geography. Europe and Central Asia leads SLB issuance by a wide margin compared to other regions. Growth over time has been impressive: 60 SLBs issues totaling approximately US$30 billion were issued in the fourth quarter of 2021, compared to only 11 SLBs raising about US$4 billion a year ago (Q4-2020).

For each bond, data is extracted from Refinitiv on standard bond characteristics (such as issue size, issue date, coupon rate, maturity, and bond rating) as well as information on the bond's callability features (i.e., if the bond is callable, first call date, and call price in the case of a callable bond). For specific SLB-related bond features such as KPIs, SPTs, incentive types (step-up, step-down, lumpsum, other), associated incentive/penalty amounts and target dates, we supplement data gathered from Refinitiv with other sources including bond prospectuses, company press releases, available investor relations materials, and second-party opinion reports. Annex A lists the SLB features on which data is collected and their definitions.

Figure 2: Sustainability-linked bond issuance (US$ Billions)

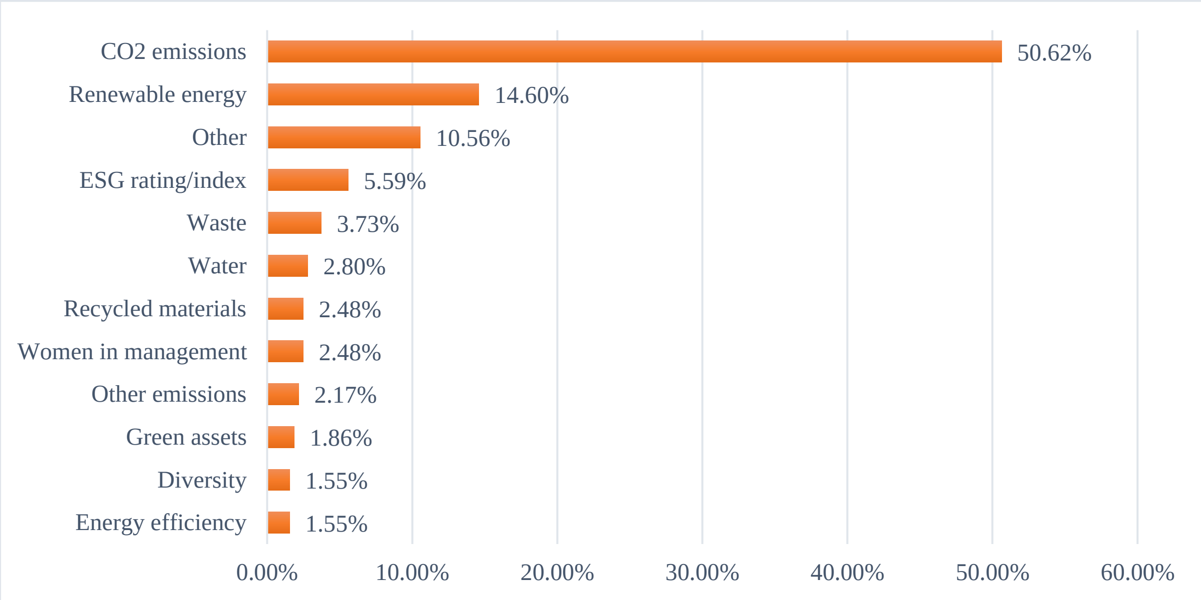


In addition to the bond level data, we extract firm level financial data from Refinitiv for each issuer for the calendar year of the year of bond issuance, to be used as issuer-level control variables in the regression analysis. These include total issuer assets (in US$ billions) to proxy for issuer size, firm leverage (defined as total outstanding debt as a fraction of total reported assets) and an indicator for public listing status. These controls are intended to capture variation in monitoring or disclosure across issuers. Previous studies show that public shareholders and creditors may engage in greater monitoring of firms and demand more disclosure around its activities (Fung, 2014; Tagesson, Blank, Broberg, and Collin, 2009; Villiers & Staden, 2010). Likewise, larger firms may also be subject to greater scrutiny (Gamble et al., 1996; Neu et al., 1998; Hasseldine, Salama, and Toms, 2005; Villiers, Low, and Samkin, 2014).

4.2. Descriptive Statistics

This section provides an overview of how KPIs and financial penalties are distributed in our sample. SLB proceeds, rather than being assigned to specific projects, are fungible so as to incentivize issuers to meet firm-level sustainability performance targets. Targets are set as measurable improvements in key performance indicators, which are quantifiable metrics that are pre-defined. A bond may have multiple KPIs, in which case each individual KPI has its own associated incentive/penalty. Our sample contains a total of 322 KPIs for 208 bonds. Figure 3 presents a breakdown of the KPIs in our sample. KPIs related to CO_2 emissions are by far the most popular. This is in line with what is observed in green bonds, which also tend to focus on CO_2 emissions reduction. Initial SLB offerings tended to focus more on ESG ratings, but this has become less favorable over time given concerns around transparency and accuracy of third-party ratings (Orden & Calonje, 2022). Environmental KPIs in general are popular; they account for eight of the ten most common KPIs in our sample.

Figure 3: Share of Key Performance Indicators (KPIs), as a percentage of 322 total KPIs



There are six different types of financial incentives associated with KPIs in our sample of SLBs. Table 1 defines each of these while Table 2 lists their frequency in our sample. The most common financial incentive associated with SLBs is a coupon step-up penalty. Some SLBs may have multiple financial penalties associated with a single target. For example, BCP V Modular Services Finance PLC, a special purpose entity for the Modulaire Group, issued a bond with multiple financial penalties tied to their single target of reducing GHG emissions. In this case, a coupon step-up is applicable after the target data if the issuer fails to meet the SPTs, along with a redemption premium that is paid at the time of maturity. Multiple penalties associated with a single target may or may not be of the same type. Occasionally, an SLB will have multiple sustainability targets, each with multiple financial incentives. For example, Fortress Reit Ltd, a JSE-listed real estate investment trust, issued an SLB with two sustainability targets, each associated with a coupon step-up and a coupon step-down incentive.

Table 1: Types of penalties

Types of financial penalties	Definition
Coupon step-up	A coupon step-up penalty means that if the issuer does not meet its pre-determined sustainability targets by the target observation date, subsequent interest payments will be increased by a pre-determined penalty amount (usually quoted in basis points).
Coupon step-down	A coupon step-down incentive means that if the issuer meets its pre-determined sustainability targets by the target observation date, subsequent interest payments will be decreased by a pre-determined amount (usually quoted in basis points).
Redemption premium	A redemption premium means that if the issuer does not meet its pre-determined sustainability targets by the target observation date, the issuer will have to pay a pre-determined premium on its redemption price at the time of redemption (usually quoted in percentage).

Donation	Donation means that if the issuer does not meet its pre-determined sustainability targets by the target observation date, an amount equal to a pre-determined percentage of the bond's issuance will be donated to a foundation or organization of the issuer's choice.
Early redemption	If the issuer does not meet its pre-determined sustainability targets by the target observation date, the bond will be redeemed early at a pre-determined redemption price.
Purchase carbon emission credits	If the issuer does not meet its pre-determined sustainability targets by the target observation date, the issuer will purchase carbon offsets for an amount equivalent to a pre-determined percentage of the aggregate principal amount of the bonds.

The first column in Table 2 reports penalty type at the bond level.[2] Of the 208 bonds in our sample, 131 bonds have a single financial incentive. About 75 percent of these (or 98 bonds) have a step-up penalty. Of the 77 bonds with multiple incentives, 55 bonds have multiple step-up penalties, often associated with multiple targets. Overall, about 74 percent of our sample (or 153 bonds) have only step-up penalties, whether single or multiple. Five bonds have step-up penalties in conjunction with other financial incentives, while 50 bonds (about 24 percent) have financial incentives other than step-up penalties. Of the remaining financial incentives, a redemption premium at maturity (about 20 percent of penalties) is most common followed by coupon step-down incentive (6 percent). Remaining types of financial incentives include a donation, purchase of carbon emission credits and early redemption, though their use is minimal in our sample.

Table 2: Bonds with single and multiple penalty structures

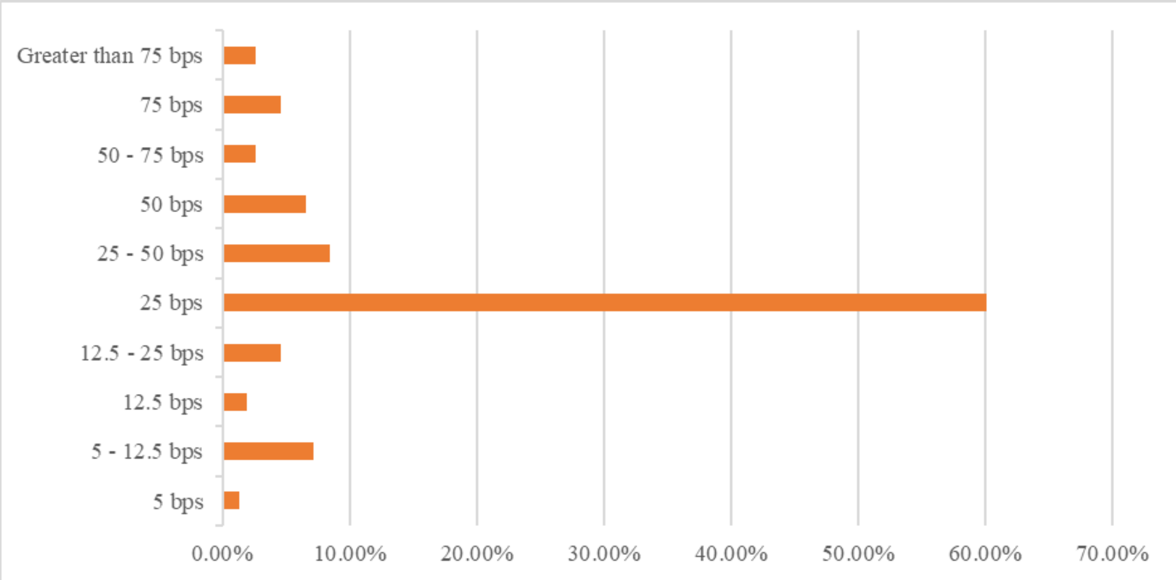
Penalty type	**Bonds[3]**	**Penalties**
Coupon step-up	153	229
Coupon step-down	3	19
Redemption premium at maturity	40	63
Donation	3	7
Purchase carbon emission credits	3	3
Early redemption	1	1
Total	**203**	**322**

Coupon step-up penalties warrant special attention given their extensive use as SLB financial penalties in the industry. An examination of the step-up coupon penalty amount reveals interesting trends. Figure 4 reports step-up coupon penalty levels at the bond level, i.e., multiple step-up penalties are aggregated for each bond. Step-up coupon penalties are highly clustered at 25 basis points (bps). About 60 percent of SLBs with only step-up penalties (whether single or multiple) have a step-up coupon penalty of exactly 25 bps (aggregated at bond level). The average step-up penalty is 31.2 bps, with about 75 percent of SLBs having penalties lower or

[2] Note that only bonds with the same penalty type across KPIs are included in the bond-level column. There are five SLBs for which different types of penalties are excluded from the total count.
[3] Excludes five SLBs for which there are different types of penalties associated.

equal to 25 bps. There is no clear rationale for the clustering at 25 bps, and this anomaly has been raised by industry stakeholders (Moody's ESG Solutions, 2021; Capital Monitor, 2021) as a source of concern reflecting the arbitrary nature of the setting of penalty amounts.

Figure 4: Share of total coupon step-up penalty amount at bond level, if bond has only step-up penalty



The average coupon rate for SLBs with step-up penalties is 261 bps. The average penalty, however, is only 31.2 bps, which is less than 12 percent of the coupon rate on average. The relatively low penalty amount may be inadequate as a financial incentive to persuade issuers to undertake serious sustainability efforts. Several industry articles (Capital Monitor, 2021; Reznick, Usson, and Demare, 2022; Webb, 2022; Liberatore, 2021) have called out the low penalty as a potential issue that raises greenwashing risks in SLBs.

On this front, it would be interesting to compare the step-up penalty to the 'premium' attracted by SLB bonds, if any.[4] If the penalty amount is below the SLB premium, then the issuer is able to lower their cost of capital simply by issuing an SLB even if it *fails* to achieve the pre-set targets. Theoretically, therefore, the lower bound for the step-up penalty should be equal to the SLB premium (both in present value terms).[5] Kölbel and Lambillon (2022) test for this by examining a sample of 102 matched bond pairs. They find that SLB issuers benefit from an average sustainability premium of 29.2 basis points, which, when compared to the average coupon step-up of 26.6 basis points, demonstrates that issuers are still better off even when a step-up penalty is applied.

5. Empirical Results

This section provides empirical evidence on the two structural loopholes that may be used to minimize total penalties: late target dates and callable bonds. Section 5.1 investigates whether

[4] The SLB premium in this case would be defined as the difference in yields between an SLB bond and a comparable conventional bond (ideally issued by the same issuer). For this comparison, it would be important to control for all factors (such as tenor, interest rates, etc.) that may influence bond yields.
[5] For a theoretical framework on this front, see Appendix 3 of Bouzidi and Papaioannou (2021).

step-up SLB target dates are set later and whether bonds with larger coupon step-up penalties are more likely to have later target dates. Section 5.2 explores whether step-up SLBs are more likely to be callable, whether the size of the penalty influences this likelihood, and how call dates are set with respect to target dates. Finally, Section 5.3 examines whether high polluters are more likely to exploit such structural loopholes.

5.1. Late Target Dates

Setting a late target cut-off date is a simple way to minimize the total step-up penalty payout an issuer faces if it fails to achieve the pre-set targets. However, this is only the case for SLBs with step-up penalties, as penalties are imposed only after the target date for remainder of the bond's tenor. With later target dates, fewer coupon payments need to be made at the higher coupon rate, reducing the total amount paid out in penalties over the life of the bond. The opposite is true for SLBs with step-down incentives, as there is greater incentive for the target cut-off date to be earlier to maximize financial benefits from achievement of targets. Therefore, issuers of SLBs with step-up penalties may have an incentive to set target dates later in the bond's life and those with step-down incentives earlier.

Figure 5: Distribution of target date to bond tenor for SLBs with step-ups and step-downs incentives

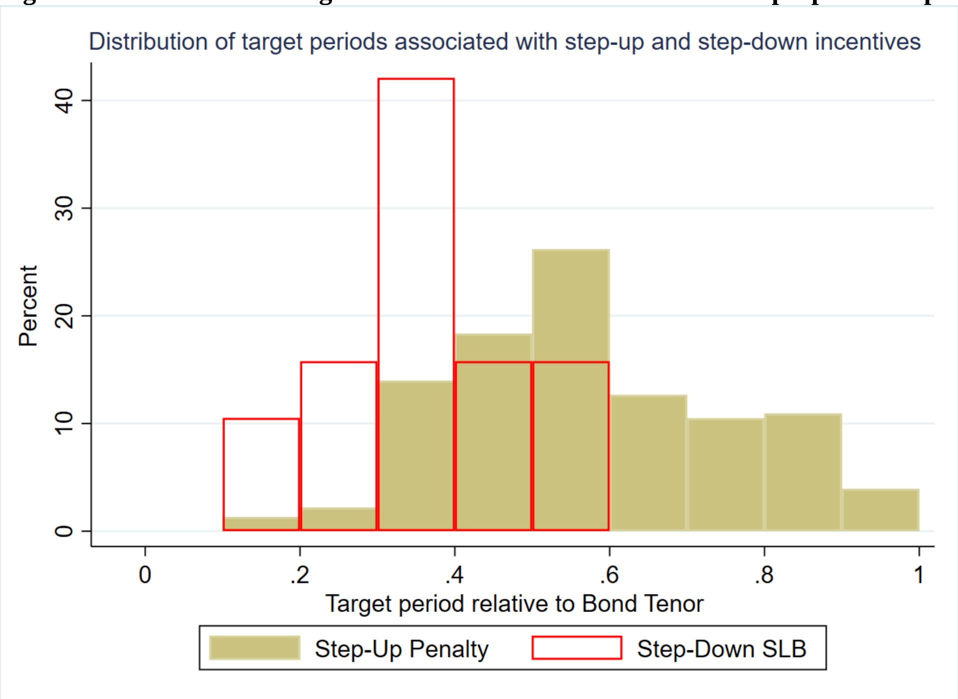


Figure 5 plots the distribution of target dates relative to total tenor of the bond (termed as target period), for both SLBs with step-up and step-down incentives. In line with expectations, step-up SLBs have later target dates, with a majority (57.2 percent) having target dates in the latter half of the bond's tenor. The paper tests for this formally by conducting a penalty-level regression as below:

$$TargetPeriod_i = \alpha + \beta . StepUp_i + Controls_i + \varepsilon_i \qquad [1]$$

Where $TargetPeriod_i$ refers to the time to target date from issue divided by the time to maturity from issue for penalty i; $StepUp_i$ is a dummy variable that equals 1 if the incentive type is a step-up coupon and 0 otherwise; $Controls_i$ refer to a set of control variables that include both instrument-level (investment grate, amount issued, tenor) and issuer-level (total firm assets, firm leverage, dummy for public listing status) characteristics. The regression is run at the penalty-level rather than the bond-level as both the target date and penalty type can vary by penalty within the same SLB. The regression sample includes both types of financial incentives (step-ups and step-downs) for which the payoff may be influenced by the target date. The chosen controls ensure that variation attributable to certain types of issuers and instruments is accounted for. The former is relevant as some firms may have greater monitoring or disclosure than others (such as larger firms, publicly listed firms and those with creditors), making them less likely to exploit such features for their benefit. The latter ensure the variation due to various bond characteristics other than those under study is controlled for.

Table 3 presents these results. Model 1 only includes our variable of interest, the dummy for a step-up penalty, for which the coefficient is positive and significant. The coefficient indicates that a step-up penalty is associated with a target date that is set later by a period of approximately 21 percent of the bond's tenor. The average target date for step-downs is set at about one-third (36 percent) of the bond's tenor. Comparatively, the average target date for step-ups is set significantly later at approximately 57.2 percent of the bond's tenor.

Table 3: Penalty-Level Regression Analysis for Target Period

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Coupon step-up penalty dummy	0.212***	0.235***	0.170***	0.134**
	(0.025)	(0.034)	(0.038)	(0.059)
Investment grade dummy		0.078***		0.099**
		(0.028)		(0.042)
Amount issued (US$ billions)		-0.027		0.123*
		(0.041)		(0.069)
Tenor (years)		-0.009**		-0.007
		(0.004)		(0.007)
Total assets (US$ billions)			0.0003	0.0006
			(0.001)	(0.001)
Leverage (%)			-0.318***	-0.124
			(0.088)	(0.139)
Public organization dummy			-0.146***	-0.075
			(0.048)	(0.058)
Constant	0.361***	0.386***	0.645***	0.506***
	(0.022)	(0.027)	(0.068)	(0.095)
Observations	248	158	138	80
Adjusted R-squared	0.093	0.053	0.162	0.112

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Model 2 includes instrument-level controls in the above specification. Results show that the coefficient associated with the dummy variable for step-up penalty continues to remain significant, with little change in the magnitude. Additionally, the paper finds that a bond that is investment grade is likely to have a later target date but an earlier one for bonds with longer maturities. Model 3 includes issuer-level controls. We find that public and leveraged firms tend to be less likely to set later target dates, in line with expectations that firms subject to greater monitoring may be less likely to exploit this loophole. Model 4 contains all controls; the regression sample decreases in size due to data limitations. Coefficients associated with step-up penalties continue to be positive and significant, though their magnitude is smaller, indicating that such penalties have target dates set later by a period of about 13.4 percent of the bond's tenor.

If issuers are indeed setting late target dates to minimize step-up penalties, we expect there to be a greater incentive to do so the higher the amount of the step-up penalty. Hence, the paper explores next the relationship between target dates and step-up penalty amounts. For a formal test, the below penalty-level regression model for only step-up penalties is estimated:

$$TargetPeriod_i = \alpha + \beta.StepUpPenalty_i + Controls_i + \varepsilon_i \qquad [2]$$

Where $StepUpPenalty_i$ refers to the amount of the penalty (in basis points) for step-up penalties and remaining variables are as described in specification [1] above. Table 4 presents the regression results.

Table 4: Penalty-Level Regression Analysis for Target Period with Step-up coupon penalty amount

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Coupon step-up penalty (bps)	0.004***	0.003***	0.005***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Investment grade dummy		0.068**		0.084**
		(0.026)		(0.039)
Amount issued (US$ billions)		-0.032		0.067
		(0.039)		(0.067)
Tenor (years)		-0.010**		-0.006
		(0.004)		(0.006)
Total assets (US$ billions)			0.0001	0.0002
			(0.001)	(0.001)
Leverage (%)			-0.247***	-0.084
			(0.083)	(0.124)
Public organization dummy			-0.115***	-0.088
			(0.043)	(0.057)
Constant	0.492***	0.562***	0.675***	0.565***
	(0.016)	(0.044)	(0.061)	(0.121)
Observations	229	155	125	79
Adjusted R-squared	0.125	0.138	0.229	0.237

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Results show a positive and significant relationship between target dates (relative to tenor) and the step-up coupon penalty amount in Model 1. The inclusion of instrument-level and issuer-level controls does not change the sign and significance of this coefficient. The magnitude also remains the same with the full model (Model 4). The coefficient suggests that a 25 bps penalty (the most common) leads to a target date set later by a period of approximately 11 percent of the bond’s tenor. Note that the average target date for the regression sample is high given that it includes only step-up penalties.

Our results above show that issuers choose to set later target dates for SLBs where the financial incentive is a step-up penalty. This is in line with prior expectations that issuers, at the time of issue, attempt to minimize potential penalties they may face in case of a failure to achieve target outcomes. The paper finds further support for this reasoning given that issuers set later target dates for SLBs when the step-up coupon penalty is higher. Higher potential penalties create greater incentives for issuers to tweak target dates in order to minimize payouts. Our results suggest that doing so can weaken the link between financial penalties and sustainability performance, therefore creating space for potential greenwashing by SLB issuers despite explicit sustainability targets.

5.2. Call Options

Another way for issuers to minimize or altogether avoid potential penalties is to call an SLB bond before maturity. Doing so means the issuer will be required to pay a pre-determined call price (typically based on par value) to the holder of the bond. As is the case with a conventional callable bond, the issuer is no longer liable for any remaining coupon payments after the call date. This makes a call option highly valuable to an SLB issuer as it can be used to evade potential penalties.

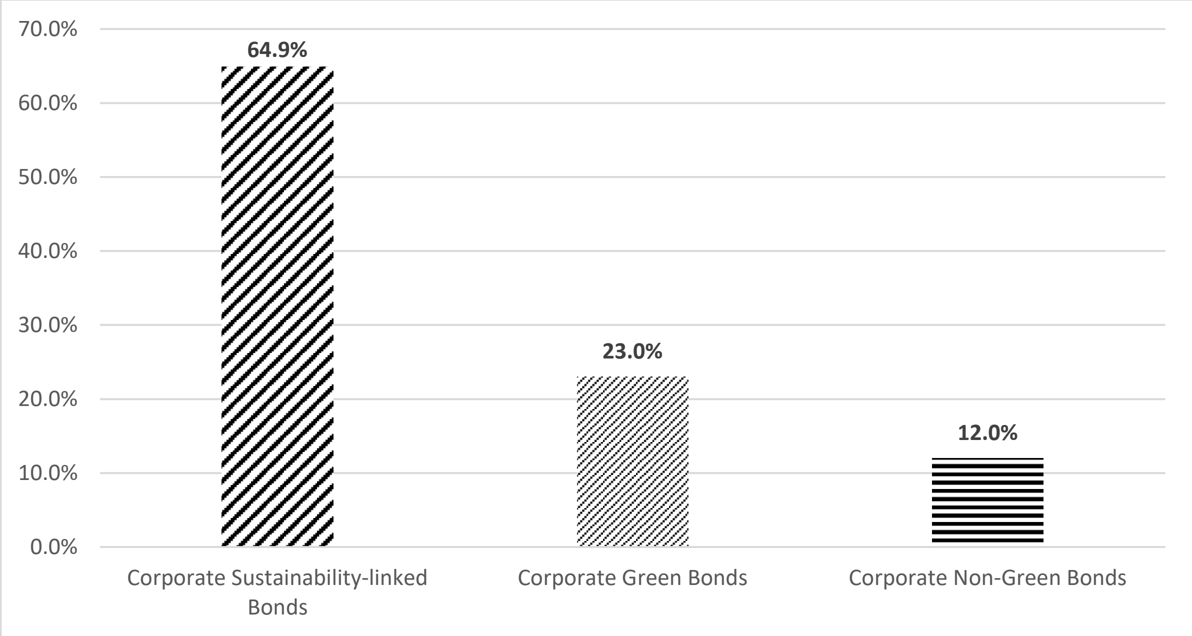
For SLBs with step-up penalties, a higher coupon rate (if targets are unmet) is only realized in the later part of the bond’s tenor. Exercising the call option before or close to the target date ensures that the higher coupon rate is never imposed, making it possible to avoid the penalty entirely. If exercised afterwards, the higher coupon payments apply only till the call date, effectively reducing the total potential penalty.

Similarly, for SLBs with redemption penalties at maturity, we posit that early call can potentially avoid penalties. For SLBs with step-down incentives, however, it is not beneficial for the issuer to call before the target date as potential benefits (i.e., the lower coupon rate if targets are met) may be realized later. However, it may still be beneficial to do so after the target date if targets are unmet as it limits the number of payments with a high coupon rate.

Given these incentives, we expect SLB issuers to be more likely to exercise call options embedded in bonds. However, given that SLBs have only been launched recently (the first SLB was issued in Q3 of 2019) and insufficient time has passed to observe events of early call of SLBs, the paper is unable to test this proposition. Therefore, our analysis focuses instead on the inclusion of the call provision in SLBs at the time of issue. Similar arguments apply in this case: we expect SLBs to be more likely to be callable bonds given the incentive to lower potential penalty payouts.

Figure 6 compares the frequency of callable bonds among SLBs, green (non-SLB) corporate bonds, and conventional corporate (non-thematic) bonds. A majority (65 percent) of the SLBs in our sample are callable. SLBs in general are about three times more likely to be callable than other types of corporate green bonds and more than five times as likely than conventional corporate bonds.

Figure 6: Portion of callable bonds among SLBs and green and conventional corporate and municipal bonds



Source: Figures on corporate non-green callable bonds from Dias (2021).

While the sheer difference in these proportions may suggest that call options are more valuable for issuers in SLBs than other bonds, it is important to note that not all call options are useful in avoiding penalties. In particular, we draw attention to two types of such call options: 'clean-up' call options and make-whole call options. The former refers to call options which can only be exercised within three months before maturity. These are typically used by issuers to reduce administrative expenses. These cannot be used to minimize the penalty amount (at least substantially) given they can only be exercised shortly before maturity.

Make-whole call options require the issuer to pay the bondholders not only the call price upon exercise but also the present value of all remaining coupon payments from call date to maturity. In essence, the issuer is responsible for its original liability, so the bondholder does not suffer a financial loss if the bond is redeemed early. Make-whole call options are rarely exercised in practice due to the high cost of doing so for the issuer. The high cost makes make-whole call options an inefficient tool to minimize penalty payouts. This is especially true as the make-whole premium the issuer has to pay the bondholder is typically higher if targets are unmet (as the higher coupon rate is used to determine future coupon payments), causing make-whole options for SLBs to be even costlier.

Hence, our analysis excludes both clean-up call options and make-whole call options when examining if SLB issuers exploit call option provisions to minimize potential penalties. This leaves only 40 (19 percent) of SLBs that have a call option that could be useful to potentially minimize step-up penalties; our subsequent analysis in this subsection focuses on these 'penalty-minimizing' call options. SLBs with such penalty-minimizing call options tend to be more likely to be speculative grade, shorter in maturity and have a smaller issue size than SLBs with other call option types. Issuers of penalty-minimizing call options also tend to be smaller, more leveraged and less likely to be publicly listed than their counterparts.

It is worth noting that some SLB issuers attempt to mitigate investor concerns that calling the bond early can be used to evade potential penalties if targets are not met. This is typically done by imposing a penalty on early call. For example, Braskem Idesa, a Mexican petrochemical company, issued an SLB that imposes a penalty of approximately 0.2 percent over the pre-determined call price if targets are unmet at time of call. Other issuers do not impose any penalty for early call. For example, Constellium SE, a global manufacturer of high value-added aluminum products and solutions, issued an SLB which does not impose any additional penalty at the time of call if sustainability targets are unmet.

Less than half (42.5 percent) of SLBs with step-up penalties and penalty-minimizing call options have a penalty attached to early call (henceforth referred to as call penalty) if targets are not met at time of call.[6] Call penalties are in the form of a higher redemption price instead of the original call price of the bond. Few step-up SLBs (7.5 percent) include call penalties on unmet targets if calling before target date. Instead, it is much more common for call penalties to be imposed if calling an SLB after the target date while targets remain unmet. A handful of step-up SLBs have stepwise call penalties that vary depending on number of targets achieved or time of call. Call penalties are low, with an average of only 15.4 bps (average step-up penalty is 31.2 bps) of the principal. Only one SLB has a call penalty that is higher than the step-up penalty coupon rate. Even in this case, calling an SLB early results in significantly lower total penalties as the call penalty is only paid once while the penalty coupon rate must be paid multiple times. These results show that call penalties are vastly inadequate in discouraging issuers from exploiting the call option to minimize potential penalties resulting from failure to achieve targets.

Call penalties are more significant for SLBs with redemption penalties. For all such SLBs in our sample, the value of the original redemption penalty is due when the bond is called if targets are unmet. This holds regardless of whether the bond is called before or after the target date, making it impossible to exploit the call option to minimize total penalty payout for such SLBs.

Interestingly, there are no SLBs with step-down incentives that are callable in our sample. This is in line with our expectations that call options are least valuable for step-down SLBs.

The aforementioned treatment of call penalties means that, in our sample, issuers are only able to exploit call provisions to minimize penalties for SLBs with step-up penalties. Therefore, we expect SLBs with step-up penalties in our sample to be more likely to include penalty-minimizing call provisions than other SLBs. Data show that 74 percent of such call options are indeed tied to SLBs with only step-up penalties. The paper tests this relationship formally by conducting a bond-level logistic regression as specified below:

$$Callable_i = \alpha + \beta . StepUp_i + Controls_i + \varepsilon_i \qquad [3]$$

Where $Callable_i$ is a dummy variable that equals 1 if bond i includes a penalty-minimizing call option (as defined above) and 0 otherwise; $StepUp_i$ is a dummy variable that equals 1 for

[6] Note that there are 12 step-up SLBs for which data on call penalties was not available.

bonds with only step-up coupon as the financial incentive and 0 otherwise; $Controls_i$ remain the same as specified in equation [1]. The regression is run at the bond-level as the decision for callability is made at the bond level, not penalty level. There are 5 SLBs in our sample that have step-up penalties along with other types of financial incentives (across multiple targets).[7] These are dropped from the analysis for simplification.

Table 5 presents the results from the logistic regression. Marginal effects at means are reported. Upon insertion of issuer-level controls in Model (3) and (4), we find that the SLBs with step-up penalties are significantly and positively related to the likelihood of penalty-minimizing call options, in line with our expectations. We also find that such options are strongly related to speculative grade SLBs. Such SLBs account for 75 percent of the penalty-minimizing call options. Almost half (45.9 percent) of such SLBs have such call options embedded in them. This varies substantially from investment grade bonds, of which only (11 percent) include such call options. Moreover, most (75.3 percent) speculative grade SLBs also have step-up penalties as their financial incentive.

Table 5: Bond-Level Regression Analysis for Call provisions

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Step-up SLB dummy	-0.004	-0.118	0.158**	0.109*
	(0.072)	(0.096)	(0.073)	(0.065)
Investment grade dummy		-0.349***		-0.158**
		(0.071)		(0.076)
Amount issued (US$ billions)		-0.010		0.044
		(0.079)		(0.058)
Tenor (years)		0.013		-0.002
		(0.012)		(0.008)
Total assets (US$ billions)			-0.006***	-0.002
			(0.002)	(0.002)
Leverage (%)			0.190	0.016
			(0.128)	(0.117)
Public organization dummy			-0.024	-0.075
			(0.064)	(0.075)
Observations	202	168	106	86
Pseudo R^2	0	0.152	0.191	0.378

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Within SLBs with step-up penalties, the paper tests whether the amount of the potential penalty an issuer faces influences the choice to embed a penalty-minimizing call option. We hypothesize that issuers will be more incentivized to act to minimize penalties if they face a higher potential penalty payoff. To test the relationship, the following logistic regression model at the bond level is estimated:

$$Callable_i = \alpha + \beta . TotalStepUpPenalty_i + Controls_i + \varepsilon_i \qquad [4]$$

[7] These represent only 3 percent of the total sample.

Where $Callable_i$ is a dummy variable that equals 1 if bond i has a penalty-minimizing call option and 0 otherwise; $TotalStepUpPenalty_i$ refers to the amount of the step-up penalty (in bps) imposed if targets are not met; $Controls_i$ refer to the same set of variables as specified in equation [1]. The regression is run at the bond-level and the regression sample restricted to SLBs which have only step-up penalty types. For simplification, SLBs with different types of financial penalties (5 SLBs) are removed from the analysis, leaving a total of 153 SLBs with only step-up penalties. We aggregate the step-up penalties at the bond-level for SLBs with multiple targets (and hence multiple step-up penalties).

Table 6 reports the estimates from the logistic regression. Results show that the coefficient for the step-up penalty amount is positive but not significant across most models, including the full model. This suggests that the likelihood of callability does not vary with the step-up penalty amount, counter to our expectations. As before, findings show that call options tend to be preferred by issuers of speculative grade SLBs.

Our results so far suggest that it is primarily issuers of speculative grade SLBs, especially those with step-up penalties, that include penalty-minimizing call provisions, regardless of the amount of the penalty. Do such issuers intend to exploit these call options to minimize penalties? While we are unable to test for this directly, the setting of the first call date provides some clues.

Issuers looking to minimize penalty payouts are best served by setting the first call date close to the target date. Given that step-up penalties are imposed only after the target date, there is little incentive to call an SLB before this point. However, the total penalty amount increases with the duration of time after the target date (assuming unmet targets). Therefore, an issuer interested in exploiting the call provision to minimize penalties is better served by calling the bond soon after the target date, and hence should set the first call date to reflect this.

Table 6: Bond-Level Regression Analysis for Call provisions with Step-up coupon penalty amount

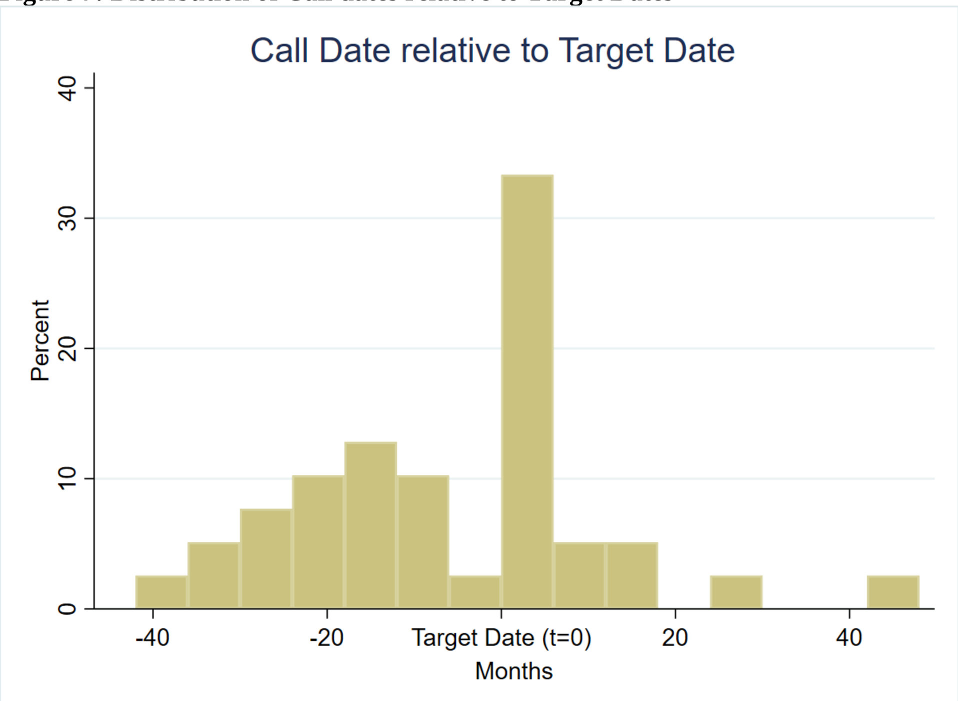
	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Coupon step-up penalty (bps)	0.001	0.002**	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.002)
Investment grade dummy		-0.424***		-0.223**
		(0.088)		(0.104)
Amount issued (US$ billions)		0.034		0.040
		(0.074)		(0.063)
Tenor (years)		0.022**		-0.002
		(0.009)		(0.008)
Total assets (US$ billions)			-0.009***	-0.002
			(0.002)	(0.002)
Leverage (%)			0.371*	0.105
			(0.205)	(0.132)
Public organization dummy			0.066	-0.016
			(0.079)	(0.066)
Observations	153	131	75	64
Pseudo R^2	0.001	0.358	0.18	0.454

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Figure 7 plots the distribution of the first call date relative to the target date. A value of less than 1 indicates the first call date is set before the target date and greater than 1 indicates it is set afterwards. Each bar represents six months (the typical frequency of coupon payments). In line with prior expectations, we find that about a third of all step-up SLBs with penalty-minimizing call options have the first call date in the six months subsequent to the target date, considerably more than any other six-month period. Only a small minority of such SLBs (17.5 percent) have a first call date after the six-month mark of the target date, lending credence to the proposition that call options are designed to potentially minimize penalties.

Figure 7: Distribution of Call dates relative to Target Dates [8]



Our results in this section show that the call provisions are more likely to be used in SLBs with step-ups, especially by issuers of speculative grade SLBs, regardless of the penalty amount. Where such a call provision is included, it is typically structured to allow minimizing of total penalty payout by setting the call date soon after the target date.

5.3. Relationship between CO_2 Emissions and Structural Loopholes

Target dates and call provisions are set at the time of issue and cannot be changed afterwards. These decisions, taken by issuers before it is known whether it will achieve the pre-set targets or not, act a sort of insurance in case of failure to achieve targets. It may be argued that issuers have more information on likelihood of achieving their targets than outsiders, even at the time of issue. At the very least, issuers have more information on the level of resources they plan to dedicate towards achievement of the targets. Therefore, we may expect certain issuers to self-

[8] For visualization purposes, the plot excludes one outlier value of call date at 122 months after the target date.

select into certain choices based on their initial internal expectations of likelihood of achievement of target.

In particular, we expect firms that are less motivated to undertake serious sustainability efforts (and hence more likely to fail to achieve pre-set targets) to be more likely to resort to measures such as setting later target dates or including penalty-minimizing call options. Such firms face a higher probability of penalty payouts, and hence have greater incentives to seek insurance against these payouts via structuring loopholes to minimize penalties. The existence of SLB premiums tends to attract more of these low-motivation firms to issue SLBs, which makes such decisions more relevant.

While it is not possible to gauge internal motivation of issuers to undertake sustainability efforts, we do have information on their past performance track on this front. Given that the majority 50.62 percent (Figure 3) of sustainability targets are related to reduction in CO_2 emissions intensity, the paper exploits past CO_2 emissions by the issuer as a proxy of their sustainability performance. Specifically, it examines if issuers with higher past CO_2 emissions are more likely to exploit structuring loopholes to minimize penalty payouts relative to issuers with lower past CO_2 emissions. We test formally for this relationship by conducting a bond-level regression for the following specifications:

$$TargetPeriod_i = \alpha + \beta . CO2Emissions_{i,t-1} + Controls_i + \varepsilon_i \quad [5]$$

$$Callable_i = \alpha + \beta . CO2Emissions_{i,t-1} + Controls_i + \varepsilon_i \quad [6]$$

Where $TargetPeriod_i$ refers to the time to target date from issue divided by the time to maturity from issue for bond i; $CO2Emissions_{i,t-1}$ refer to CO_2 emissions by the issuer in the year preceding the issue; $Callable_i$ is a dummy variable that equals 1 if the SLB has a penalty-minimizing call option and 0 otherwise; $Controls_i$ as the same as in equation [1]. Specification [5] is an OLS regression run only for SLBs with step-up penalties following specification [2]. Specification [6] is a logistic regression run for all SLBs for which CO_2 emission data is available.

Table 7: Bond-Level Regression Analysis for Target Period with CO_2 Emissions

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
CO_2 Emissions (tens of millions tonnes)	0.005***	0.007***	0.008***	0.013***
	(0.001)	(0.002)	(0.002)	(0.003)
Investment grade dummy		0.120**		0.163***
		(0.050)		(0.052)
Amount issued (US$ billions)		0.094		0.117
		(0.086)		(0.088)
Tenor (years)		-0.005		-0.001
		(0.008)		(0.007)
Total assets (US$ billions)			-0.001	-0.002***
			(0.001)	(0.001)
Leverage (%)			-0.221	-0.064
			(0.156)	(0.165)
Public organization dummy			-0.206**	-0.095

			(0.083)	(0.072)
Constant	0.587***	0.489***	0.877***	0.580***
	(0.024)	(0.091)	(0.099)	(0.167)
Observations	60	51	60	51
Adjusted R-squared	0.012	0.074	0.075	0.189

*Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1*

Table 7 presents the results for specification [5]. We find that CO_2 emissions in the year preceding the issue are significantly and positively related to later target dates. This holds across all models, suggesting that high polluters are more likely to set target dates later in a bond's life, possibly to reduce penalty payouts for unmet targets. As before, we find that investment grade SLBs are likely to have later target dates.

Table 8 reports estimates from specification [6]. We fail to find a robust significant relationship between CO_2 emissions and inclusion of a penalty-minimizing call option. As before, speculative grade bonds are more likely to include such call options. A closer inspection of the underlying data suggests that issuers of speculative SLBs tend to be significantly higher polluters on average. The average CO_2 emissions in year preceding SLB issue for speculative SLB issuers in our sample is 15.1 million tons, compared to only 3.6 million tones for investment grade SLB issuers.

Table 8: Bond-Level Regression Analysis on Callability with CO_2 Emissions

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
CO_2 Emissions (tens of millions tonnes)	-0.0002	-0.0004	0.010*	0.002
	(0.004)	(0.002)	(0.005)	(0.006)
Investment grade dummy		-0.179*		-0.150**
		(0.099)		(0.063)
Amount issued (US$ billions)		0.115*		0.122*
		(0.061)		(0.065)
Tenor (years)		0.005		0.005
		(0.008)		(0.006)
Total assets (US$ billions)			-0.006***	-0.001
			(0.002)	(0.003)
Leverage (%)			0.192	0.047
			(0.200)	(0.136)
Public organization dummy			-0.016	0.008
			(0.098)	(0.054)
Observations	88	67	88	67
Pseudo R^2	0	0.398	0.084	0.408

Robust standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

6. Conclusion

Our paper, motivated by rising practitioner concern about the effectiveness of SLBs in promoting sustainability, investigates the link between financial incentives and sustainability outcomes in these bonds. Using data from Thomson Reuters (Refinitiv) and BloombergNEF, we empirically examine two potential SLB structural loopholes that may be used to minimize potential penalties: setting of late target dates and inclusion of call options.

The paper presents evidence suggesting that both these features may be used by issuers to minimize penalties. Late target dates are particularly valuable for SLBs with step-up penalties, and we find that issuers issuing such SLBs tend to set later target dates. Specifically, a step-up penalty is associated with a target date that is set later by a period of about 21 percent of the bond's tenor. Findings also suggest that bonds with larger coupon step-up penalties are more likely to have later target dates, in line with expectations that issuers of such SLBs are more incentivized to minimize total penalties.

On call options, we limit our analysis to calls which can be exploited to potentially minimize penalties. We find evidence that SLBs with step-up penalties, the only type of SLBs in our sample for which early call can minimize penalties, tend to be more likely to include such call options. Where embedded within an SLB, it is designed in a manner to minimize potential penalties via setting of the first call date close to the target date.

This paper also explores the relationship between CO_2 emissions and the use of such structural loopholes. Using past CO_2 emissions as a proxy for sustainability performance, we find that high polluters are more likely to set later target dates. While we do not find the same results for the relationship will call options, we note that this loophole is primarily preferred by issuers of speculative grade SLBs, which are on average substantially higher polluters than their counterparts.

The SLB market is still in its early stages, particularly in emerging markets. The instrument has so far experienced impressive growth given its appealing structural design linking sustainability outcomes to financial incentives for issuers. However, our paper sheds light on issues with existing SLB bond structure that may potentially weaken this link. This threatens their credibility as an effective instrument to promote sustainability, an issue of particular concern in the industry given growing apprehensions about greenwashing among other sustainability instruments such as green bonds.

Greenwashing concerns may potentially prove to be an even bigger issue for SLBs given that issue proceeds are not restricted for specific uses and can instead be deployed as per general corporate needs instead of investments targeting firm sustainability. Hence, issuers may be tempted by SLB premiums to issue these instruments as an effective strategy to lower the overall cost of capital for the firm, with little thought towards sustainability.

Already such concerns are taking ground among SLB investors. Nuveen, an American asset management company, has declared SLBs unfit for their impact framework due to the ambiguity in the allocation of capital raised through SLBs, inability to track proceeds, unambitious targets and low penalties (Liberatore, 2021). Similarly, the French bank Naxitis notes that investors are growing wary of corporate SLBs, reflecting a lack of trust in the instrument (Capital Monitor, 2021).

This issue warrants greater attention from researchers and practitioners. SLBs have the potential to scale up sustainable financing and materially contribute to sustainability goals. In order to achieve their potential, however, more needs to be done to understand and address the weaknesses of the instrument. This paper contributes to this end, but further work is required to explore various structural aspects of SLBs, including the loopholes identified, and their impact on final sustainability outcomes.

Furthermore, little is known about investor response to penalty minimizing behavior by SLB issuers. There is some evidence (Attig, Ramahan, and Trabelsi, 2021; Barbalau and Zeni, 2021) that investors anticipate such behavior and impose higher costs to compensate for potential greenwashing, but further research is needed to document pricing response to various structural aspects of SLBs. From a policy perspective, a discussion of potential solutions to more accurately price greenwashing risk, such as expanding the role of third-party certifications to cover structural issues, would be highly relevant.

Advancing our understanding of these issues will be critical in improving transparency, ensuring alignment of sustainability and financial outcomes, and mitigating investor concerns in the SLB market. Doing so will enable SLBs to continue their impressive pace of growth into the future.

References

Attig, N., Rahaman, M. M., & Trabelsi, S. (2021). Greenwashing and Bank Loan Contracting: Does Environmental Disclosure Quality Matter to Creditors?. *Available at SSRN 3880113*.

Barbalau, A., & Zeni, F. (2022). The Optimal Design of Green Securities. *Available at SSRN 4155721*.

Berrada, T., Engelhardt, L., Gibson, R., & Krueger, P. (2022). The Economics of Sustainability Linked Bonds. *Swiss Finance Institute Research Paper No. 22-26, European Corporate Governance Institute – Finance Working Paper No. 820/2022*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4059299

Bouzidi, A., & Papaioannou, D. (2021). *Sovereign Sustainability-Linked Bonds - Opportunities, challenges and pricing considerations.* Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3919159

Dias, B. M. (2021). Working Paper: The relationship between Corporate Green Bond Yields and Firm Leverage. *Catolica Lisbon Business & Economics*. Retrieved from https://repositorio.ucp.pt/bitstream/10400.14/34137/1/Bernardo%20Miguel%20Vieira%20Rodrigues%20Dias.pdf

Environmental Finance. (2022). *Sustainable Bonds Insight 2022.* Retrieved from https://www.environmental-finance.com/assets/files/research/sustainable-bond-insight-2022.pdf

Fung, B. (2014). The Demand and Need for Transparency and Disclosure in Corporate Governance. *Universal Journal of Management, 2*(2), 72-80. doi: 10.13189/ujm.2014.020203

Furness, V. (2021, November 24). Banks flag greenwashing worries over sustainability-linked debt. *Capital Monitor*. Retrieved from https://capitalmonitor.ai/asset-class/fixed-income/banks-flag-greenwashing-worries-over-sustainability-linked-debt/

Gamble, G. O., Hsu, K., Jackson, C., & Tollerson, C. D. (1996). Environmental disclosures in annual reports: An international perspective. *The International Journal of Accounting, 31*(3), 293-331. doi:https://doi.org/10.1016/S0020-7063(96)90022-9

Ghosh, R., Nwanna, K., & Cliquet, B. (2021). *Credible targets and structures key to longterm growth of sustainability-linked bonds.* Moody's ESG Solutions. Retrieved from https://assets.website-files.com/5df9172583d7eec04960799a/60a1da152e1185ea3f5f7566_BX6396_MESG_SLBs_17May2021.pdf

Giráldez, J., & Fontana, S. (2021, April 19). *Sustainability-Linked Bonds: The Next Frontier in Sovereign Financing.* Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3829946

Hasseldine, J., Salama, A., & Toms, J. (2005). Quantity versus quality: the impact of environmental disclosures on the reputations of UK Plcs. *The British Accounting Review*, 231-248. doi:https://doi.org/10.1016/j.bar.2004.10.003

Huttumen, J., & Rich, J. (2022). *The state of the sustainability-linked bond market.* Retrieved from Aegon asset management: https://www.aegonam.com/en/aegon-insights/responsible-investing/the-state-of-the-sustainability-linked-bond-market/

Kölbel, J. F., & Lambillon, A.-P. (2022). *Who Pays for Sustainability? An Analysis of Sustainability-Linked Bonds.* Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4007629

Liberadzki, M., Jaworski, P., & Liberadzki, K. (2021). Spread Analysis of the Sustainability-Linked Bonds Tied to an Issuer's Greenhouse Gases Emissions Reduction Target. *Energies, 14*(23). doi:https://doi.org/10.3390/en14237918

Liberatore, S. M. (2021). *Sustainability-linked bonds do not fit our impact framework.* Retrieved from Nuveen: https://www.nuveen.com/en-us/insights/income-oriented-investing/sustainability-linked-bonds-do-not-fit-our-impact-framework

Neu, D., Warsame, H., & Pedwell, K. (1998). Managing Public Impressions: Environmental Disclosures in Annual Reports. *Accounting, Organizations and Society, 23*(3), 265-282. doi:https://doi.org/10.1016/S0361-3682(97)00008-1

Orden, R. d., & Calonje, I. d. (2022). *Sustainability-Linked Finance-Mobilizing Capital for Sustainability in Emerging Markets.* IFC. Retrieved from https://www.ifc.org/wps/wcm/connect/306c321d-ea77-448d-85c6-7ce3899136a5/EMCompass_Note+110_Sustainability-Linked+Finance_web.pdf?MOD=AJPERES&CVID=nVKABZX

Reznick, M., Usson, R., & Demare, S. (2022). *Do Sustainability linked bonds have a step-up problem?* Retrieved from https://www.hermes-investment.com/be/wp-content/uploads/2022/03/fhi_credit_take-note_sustainability-linked-bonds_march-2022-v2.pdf

Tagesson, T., Blank, V., Broberg, P., & Collin, S.-O. (2009). What Explains the Extent and Content of Social and Environmental Disclosures on Corporate Websites: A Study of Social and Environmental Reporting in Swedish Listed Corporations. *Corporate Social Responsibility and Environmental Management, 16*, 352-364. doi:10.1002/csr.194

The International Capital Market Association. (2020). *Sustainability-Linked Bond Principles: Voluntary Process Guidelines.* Retrieved from https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2020/Sustainability-Linked-Bond-Principles-June-2020-171120.pdf

Villiers, C., & Staden, C. J. (2010). Shareholders' requirements for corporate environmental disclosures: A cross country comparison. *The British Accounting Review, 42*(4), 227-240. doi:https://doi.org/10.1016/j.bar.2010.08.002

Villiers, C., Low, M., & Samkin, G. (2014). The institutionalisation of mining company sustainability disclosures. *Journal of Cleaner Production, 84*, 51-58. doi:https://doi.org/10.1016/j.jclepro.2014.01.089

Vulturius, G., Maltaisa, A., & Forsbacka, K. (2022). Sustainability-linked bonds – their potential to promote issuers' transition to net-zero emissions and future research directions. *Journal of Sustainable Finance & Investment*. Retrieved from https://doi.org/10.1080/20430795.2022.2040943

Webb, D. (2022). Half of sustainability-linked bond issuers see greenium larger than step-up, says study. *Responsible investor*. Retrieved from https://www.responsible-investor.com/half-of-sustainability-linked-bond-issuers-see-greenium-larger-than-step-up-says-study/

Annexures

Annex A

List of SLB features and their sources

Variables	**Definition**
Key Performance Indicators (KPIs)	Key Performance Indicators are quantifiable metrics used to measure the performance of selected indicators (ICMA, 2020).
Sustainability Performance Targets (SPTs)	Sustainability Performance Targets are measurable improvements in key performance indicators on to which issuers commit to a predefined timeline (ICMA, 2020).
Target Observation Date	The target observation date refers to the specific date at which the performance of each KPI(s) against each predefined SPT(s) is observed (ICMA, 2020).
Penalty Type	Type of financial incentive that comes into effect when a KPI has or has not achieved a predefined SPT at the observation data.
Penalty Amount	Amount of the financial incentive that is imposed. Depending on the type of financial incentive, this may be reported as an increase/decrease in coupon rate (in basis points) or a lumpsum amount (as percentage of the principal amount)