Who Benefits from Sustainability-linked Loans?

Abstract

We study the economic motivations driving sustainability-linked loans (SLLs), a quickly growing loan segment, where the contract terms depend on the borrower's ESG performance.Our analysis suggests that SLLs do not offer advantageous loan terms and provides no evidence of improvement in borrowers' ESG performance following the issuance of SLLs. However, we observe that SLL lenders attract higher deposits after issuance, supporting lending growth. Further, we find no evidence that lenders offer SLL contracts predominantly to low-risk borrowers. With the lenders reaping the majority of benefits from such arrangements, these findings call into question the purported objectives of SLLs in promoting sustainable practices.

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1. Introduction

Sustainability-linked loans (SLLs) represent one of the most rapidly expanding segments within sustainable finance, aiming to encourage borrowers to meet pre-established sustainability performance targets.[1] In recent years, SLLs have experienced a surge in global popularity, with their issuance surpassing that of green bonds and loans, as reported by S&P Global (2021).[2] These loan agreements include covenants that offer borrowers reduced interest rates upon achieving certain sustainability objectives or impose higher rates if they fail to meet the specified goals. As a mechanism to incentivize borrowers to pursue ESG targets, SLLs provide banks with an alternative to restricted use-of-proceeds approaches typically found in green loans and bonds.[3]

Contrasting with pre-existing forms of sustainable finance (e.g., ESG funds or corporate green bonds), where ESG-linked financial instruments are traded among numerous market participants, SLLs (and the broader sustainability lending market) embody a significantly different institutional structure. Within this framework, ESG factors are integrated into legally enforceable contracts, generally involving a consortium of lenders and a single borrower. The negotiated nature of these agreements suggests that the driving forces behind SLLs likely stem from the economic motivations of both lending parties and borrowers.

Despite the attractive premise and growing popularity of SLLs, limited empirical research exists on the economic motivations of borrowers and lenders involved in these loan contracts. The economic incentives of the borrower—are initial spreads lower, do they receive meaningful subsequent reductions, do the loans represent a signal of ESG commitment—remain unexplored.

[1] In the context of this research, we employ the terms "sustainability" and "ESG" interchangeably throughout the study.
[2] See also, "U.S. Sustainability-Linked Loans Are 292% More Than All of 2020," Bloomberg, available at https://www.bloomberg.com/news/articles/2021-05-24/u-s-sustainability-linked-loans-are-292-more-than-all-of-2020.
[3] In this respect, SLLs differ from green loans, as the latter necessitates the allocation of loan proceeds specifically towards environmentally and socially responsible projects.

The economic motivations driving banks to issue these loans are also not established. For example, these loans could help banks manage their risk profile or attract more deposits through ESG signaling. Our study answers these questions empirically.

We first document several patterns in our sample. First, SLLs have become increasingly prominent over time, both in terms of total issuance and relative issuance. Second, SLLs are widespread in "hard-to-abate" industries, such as utilities, oil and gas, and chemicals. Third, in terms of total issuance, SLLs are predominantly concentrated in the United States and Western Europe.

Our analysis starts by examining whether SLLs provide economic incentives for borrowers to enhance their ESG performance. We compare loan spreads and non-loan pricing terms at issuance between SLLs and comparable non-SLLs, finding no significant differences in initial loan terms. Notably, however, the terms of SLLs are designed to be adjustable, contingent on the ESG performance of borrowers over the loan period. This highlights that a direct comparison of loan terms at issuance does not fully capture the nuanced dynamics of SLL contracts.

To more accurately capture the pricing implications embedded in SLL contracts, we conduct a manual examination of sustainability rate adjustments, based on detailed rate adjustment information from the DealScan database. Our findings indicate that the potential for rate reductions based on ESG performance, while present, does not seem to offer substantial economic incentives for borrowers. Specifically, our data show that the average borrower under an SLL arrangement might anticipate a maximum interest rate reduction of merely four basis points. This finding suggests that the financial benefits associated with ESG performance improvements under SLLs may not be significant enough to motivate borrowers to undertake considerable changes in their ESG profiles.

Next, to assess whether SLLs effectively encourage borrowers to adhere to pre-established sustainability goals, we analyze changes in the ESG performance of SLL borrowers after loan origination. We match each KPI embedded in SLL contracts to a specific RepRisk subcomponent for a comprehensive analysis. By comparing the ESG performance trajectories of SLL borrowers around the time of the SLL issuance with those of comparable non-SLL peers, we seek to evaluate the impact of these loans on achieving sustainability objectives. Contrary to the stated aim of SLLs, our empirical findings do not demonstrate a measurable improvement in the ESG performance of SLL borrowers post-origination. This outcome suggests that, despite their intended purpose, SLLs may not be as effective in fostering substantial enhancements in borrowers' sustainability practices as initially anticipated.

The low correlation among various ESG ratings, as documented by Berg, Koelbel, and Rigobon (2022), underscores the need to check the robustness of our analysis of SLLs. To this end, we compare ESG performance between SLL borrowers and their non-SLL counterparts using the S&P Global ESG scores. We first align each KPI identified in SLL contracts with corresponding sub-scores from S&P Global ESG. We then evaluate the ESG performance of SLL borrowers, as identified by these KPIs, against the relevant ESG sub-scores of comparable non-SLL borrowers.

In line with our initial findings, this additional analysis does not reveal any significant improvement in ESG performance among SLL borrowers compared to their non-SLL peers. This consistency in results leads to the inference that, according to assessments by ESG rating providers, SLLsdo not effectively motivate borrowers to enhance their ESG profiles. This finding adds to the growing body of evidence questioning the efficacy of SLLs in driving meaningful sustainability improvements.

Although our results demonstrate robustness across multiple ESG scores, relying exclusively on third-party ESG ratings to gauge improvements in ESG performance could potentially bias our conclusions. This concern arises because rating agencies frequently depend on self-reported data from companies, which might not always reflect their true ESG performance. Furthermore, the methodologies these agencies use are often complex and not entirely transparent, leading to the issue commonly referred to as the "black box" problem in ESG rating assessments.

To address this limitation, we also examine a more direct measure of environmental impact, based on the greenhouse gas (GHG) emissions data from Trucost Environmental. In line with our earlier findings derived from third-party ESG scores, our analysis reveals no significant evidence that SLL borrowers reduce their GHG emissions post-origination more than their non-SLL counterparts. This consistency in results across different metrics strengthens our inference: the potential for loan spread adjustments under SLL agreements is not a sufficiently compelling economic incentive for borrowers to pursue ESG improvements actively.[4]

Next, we shift the focus of our analysis to the lenders. We examine two potential benefits for lenders: attracting more deposits from ESG-conscious customers and reducing the risk profiles of loan portfolios through SLLs. Our results indicate that post-issuance, SLL lenders are able to attract more deposits compared to matched non-SLL lenders, enabling them to grow their lending. This finding supports the hypothesis that initiating SLL contracts makes lenders more attractive to ESG-conscious depositors, leading to lending growth.

[4] In light of our findings that borrowers neither benefit from reduced loan spreads nor demonstrate improved ESG performance associated with SLLs, we turn our attention to investigating other potential financial incentives driving the adoption of these loans. Specifically, we examine whether there is a significant enhancement in financial performance coinciding with the origination of SLLs. For this purpose, we utilize the market-to-book ratio and ROA as proxies to measure financial performance. However, our analysis does not uncover any evidence suggesting that borrowers experience an improvement in these financial metrics following the initiation of SLLs.

Turning to lenders' risk management concerns, we hypothesize that SLL borrowers are less risky in terms of default and credit risk, either because SLLs are issued to safer borrowers (selection effect) or because better sustainability practices reduce risk. To test this hypothesis, we first compare a borrower's probability of default over horizons of one month to 60 months between SLLs and matched non-SLLs before and upon the issuance of SLLs. We do not find any statistically significant differences in default risk between the two groups, rejecting the hypothesis that SLL borrowers represent reduced risks compared to non-SLL borrowers *ex ante*. We then assess borrowers' *ex-post* risk using credit downgrades and default events between SLLs and matched non-SLLs. Again, we find no evidence to support the hypothesis that SLL contracts reduce borrower risk after the issuance. Our analysis of the lender side potentially explains why SLLs are offered: lenders are able to extract benefits from SLLs by attracting more deposits and thus improving their performance, while not needing to offer better pricing or take on more risk.

We conclude our analysis by investigating the factors driving the initiation of SLL contracts. Given that lenders appear to capture the majority of benefits from SLLs, we hypothesize that SLLs are more likely to be initiated by banks with greater market power. Our findings support this conjecture. Additionally, our findings suggest that SLLs are more likely to be issued through relationship lending, highlighting the importance of the duration or strength of relationships between borrowers and lenders in the initiation of SLL contracts.

Our study is related to the growing literature on the role of ESG information in banking relationships and loan contracts. One way ESG information may affect these relationships is through implicit consideration of ESG factors in loan terms, while another way is through explicit inclusion of ESG criteria in loan contracts, as is the case with SLLs.

Prior research on the *implicit* use of ESG information has investigated the relationship between borrower corporate ESG ratings and loan terms. For instance, Goss and Roberts (2011) find that firms with social responsibility concerns pay higher interest rates than socially responsible firms. Chava (2014) reports that lenders charge higher interest rates on loans issued to firms with environmental concerns. According to Hasan, Hoi, Wu, and Zhang (2017), firms located in US counties with higher levels of social capital tend to secure loans with lower spreads and less strict non-price terms. Another strand of research highlights the relevance of ESG information in lending relationships, particularly in the loan origination process. Houston and Shan (2022) argue that lenders have financial and reputational incentives to focus on a borrower's ESG performance. They find that banks tend to match with borrowers with similar ESG ratings. Shin (2024) suggests that banks with lower ESG reputations may offer favorable rates to ESG-focused borrowers to improve their standing by aligning themselves with those borrowers. These studies shed light on the implicit use of ESG information in lending relationships and underscore the growing significance of sustainability considerations in the financial sector.

The *explicit* use of ESG information in loan covenants has been studied in several recent studies, which generally find that such ESG-based covenants facilitate the monitoring of borrowers' ESG risk (Amiram, Gavious, Jin, and Li, 2023; Choy, Jiang, Liao, and Wang, 2023; Wang, 2023). Amiram et al. (2023) find that after several large US banks adopt the Equator Principles (an environmental and social risk management framework), there is an increase in environmental protection provisions in loan contracts, and a reduction in loan spreads. Choy et al. (2023) document that lenders are more likely to use environmental covenants in the presence of higher environmental regulatory enforcement intensity. Wang (2023) shows that lenders adhering to ESG disclosure regulations tend to include more environmental action covenants in loan agreements.

Overall, this literature highlights the proactive role of banks in enacting ESG-conscious lending relationships. It is important to note that the type of ESG-related covenants examined in this literature does not include contingencies related to loan spreads thus differ from those found in SLLs.

Our study is part of a body of contemporaneous research examining SLLs, which offers mixed findings regarding whether SLLs significantly influence borrower sustainability performance/risk. Kim, Kumar, Lee, and Oh (2023) characterize the growth of ESG lending, including SLLs and green loans, globally. The authors report that SLLs are more likely to be initiated between borrowers and lenders with superior ESG profiles ex-ante and find evidence of ESG performance deterioration following loan origination. Furthermore, they find no pricing difference between ESG-linked loans and non-ESG loans. Dursun-de Neef, Ongena, and Tsonkova (2023) find ESG performance improves following SLL origination, while the findings from Kim et al. (2023) and Aleszczyk, Loumioti, and Serafeim (2023) are more consistent with greenwashing. Carrizosa and Ghosh (2023) find that some sustainability-linked loans are designed to incentivize borrowers to improve their sustainability performance, although there is also some evidence consistent with greenwashing concerns.

The primary distinction between our study and these studies is that we focus on the economic incentives of lenders in the SLL market. We present the first evidence demonstrating that SLL lenders are more likely to experience growth in deposits and loans following SLL issuance, which could be consistent with a greenwashing motive on the lender's side, coupled with evidence showing no improvement in borrower sustainability.

Our paper also contributes to a deeper understanding of SLLs by manually analyzing specific KPIs incorporated in SLL contracts and loan pricing adjustments. Moreover, using GHG

emissions data enables us to accurately evaluate the real impact of SLLs on borrowers' environmental performance, thereby addressing potential concerns associated with the subjective nature and lack of transparency in relying on ESG ratings provided by third parties. Overall, our study complements the literature on the explicit use of ESG information in debt contracts.

More broadly, our study contributes to the growing literature on sustainable finance. Most prior studies have examined sustainable equity investing, focusing on how investors use sustainable investments to achieve their performance goals and influence the ESG performance of investee firms (for a review, see Gillan, Koch, and Starks, 2021). Several recent studies have focused on sustainable debt instruments, such as green corporate and municipal bonds (Flammer, 2021; Larcker and Watts, 2020; Baker, Bergstresser, Serafeim, and Wurgler, 2022) and sustainability-linked bonds (Berrada, Engelhardt, Gibson, and Krueger, 2022). Unlike these debt instruments which are traded among many investors, ESG lending involves formal, written contracts between a group of lenders and a borrower. Our findings show that while strong economic motives exist for lenders in initiating SLL contracts, the average SLL contract does not sufficiently incentivize borrowers to improve their ESG performance.

The structure of the paper is as follows. Section 2 provides the institutional background and develops the hypotheses. Section 3 presents the data, sample, and descriptive statistics. Section 4 examines whether borrowers benefit from SLLs. Section 5 investigates whether lenders benefit from SLLs. Section 6 analyzes potential mechanisms. Finally, Section 7 provides concluding remarks.

2. Institutional Background and Hypothesis Development

2.1. Institutional background: sustainability-linked loans

Sustainability-linked loans are designed to incentivize borrowers to improve their sustainability practices by aligning loan terms with their sustainability performance, measured using one or more sustainability key performance indicators (KPIs) that can be either external or internal. The industry standards for SLLs are governed by the Sustainability-Linked Loan Principles, developed by a working group consisting of representatives from leading financial institutions involved in the global syndicated loan markets, including the Loan Market Association (LMA), Asia Pacific Loan Market Association (APLMA), and Loan Syndications and Trading Association (LSTA).

SLLs aim to incentivize positive changes in sustainability by using sustainability performance targets (SPTs) set against key performance indicators (KPIs). The calibration process for SPTs per KPI is essential to the structure of SLL contracts, as it expresses the level of targets that the borrower is willing to commit to. The SPTs should be set in good faith and remain relevant throughout the life of the loan. Examples of SPTs include reducing greenhouse gas emissions related to the borrower's products or manufacturing cycle and increasing the number of affordable housing units developed by the borrower. A borrower may work with one or more "Sustainability Coordinators" or "Sustainability Structuring Agents" to assist with arranging their SLL product. If appointed, these coordinators or agents will help negotiate the KPIs and calibrate the SPTs with the borrower.

To provide an example of how SLLs are structured, consider the SLL issued to BlackRock. The company entered into a financing agreement with a group of banks that ties its borrowing costs for a $4.4 billion credit facility to its ability to meet certain "sustainability targets." These targets include achieving goals for women in senior leadership positions and increasing the representation of Black and Hispanic employees in its workforce. The clauses for the sustainability

fee adjustment and sustainability rate adjustment from BlackRock's original loan agreement are provided in Appendix A. Annex B outlines the sustainability fee adjustment and sustainability rate adjustment in the revolving credit agreement. The agreement specifies that if, in a fiscal year, as reported in the SASB Aligned Report, (i) "two or more of the KPI Metrics are equal to or more than the applicable Sustainability Target set forth in the Sustainability Table," and (ii) "no KPI Metric is less than the applicable Sustainability Threshold set forth in the Sustainability Table," BlackRock will receive a Sustainability Fee Adjustment of -0.01% for the fiscal year.

2.2. Hypothesis development

2.2.1. Potential benefits for borrowers

As a form of performance-sensitive debt, SLLs are designed to incentivize borrowers to improve their sustainability performance. In this regard, SLLs are similar to loan contracts that link loan spreads to various borrower financial performance metrics, which have been extensively studied (e.g., Asquith, Betty, and Weber, 2005; Roberts and Sufi, 2009; Manso, Struloviei, and Tehistyi, 2010). A central tenet of performance-sensitive debt is that the introduction of performance metrics can be used to mitigate contract incompleteness and agency issues (e.g., Christensen, Nikolaev, and Wittenberg-Moerman, 2016). To the extent that ESG performance may also be associated with credit risk (Jiraporn, Jiraporn, Boeprasert, and Chang, 2014; Seltzer, Starks, and Zhu, 2022; Stellner, Klein, and Zwergel, 2015), banks would have an economic incentive to incorporate ESG performance in loan contracts as an attempt to address agency frictions resulting from incomplete contracts. Accordingly, borrowers with low ESG risks would want to use SLL as a signaling mechanism to show their genuine commitment to ESG performance.

Our first hypothesis examines whether SLLs offer a lower loan spread than other types of loans. On the one hand, two factors may contribute to a lower spread at contract initiation. First, borrowers who opt for SLLs may inherently be less risky. Second, borrowers may negotiate for a lower interest rate at the start of the loan to offset the risk of potential penalties for not meeting sustainability targets. These targets can be challenging, particularly when they require significant changes in business practices or operations, leading to difficulties in achieving them. External factors like shifts in market conditions, regulations, or stakeholder expectations can further hinder borrowers from meeting these targets. This risk is magnified because, unlike traditional loans that are based on financial metrics, SLLs rely on ESG metrics or third-party ratings, which are often difficult to define and measure precisely. This uncertainty, combined with spread penalties for missing the ESG targets would make borrowers reluctant to agree to this new type of financing, thus demanding lower initial spreads as compensation.

On the other hand, there are reasons why spreads at issuance would not be lower. First, SLL borrowers may not necessarily be financially safer. Ex-ante, there is no guarantee that SLL borrowers have high ESG profiles. Even with a strong sustainability performance, this does not necessarily imply low risk if corporate ESG practices result from agency issues or greenwashing. Additionally, since SLL borrowers are entitled to a subsequent discount if they meet specific sustainability targets, the negotiated initial spread may not be set lower. Finally, banks may use SLLs to manage tail risk from borrowers with inherently greater ESG risk. Considering arguments on both sides, our first hypothesis can be stated in null form as follows.

H1a: SLLs do not offer lower initial loan spreads than comparable non-SLLs.

The potential for borrowers to access discounted loan rates may not be evident in the initial loan spread at issuance. Instead, the spread differential between SLLs and non-SLLs could stem from the sustainability adjustments embedded in the loan terms. If the sustainability targets set in SLLs require substantial improvements in ESG performance, lenders may offer larger spread discounts to incentivize borrowers to meet the targets. This is especially plausible when SLLs are not used for greenwashing purposes. Similarly, if the adjustments required to meet sustainability targets in SLLs are costly, lenders may offer larger discounts to compensate for these costs. Moreover, some lenders may offer larger discounts to differentiate their SLL products from competitors, especially when banks have less market share in the corporate loan market.

However, there are reasons to expect otherwise. If SLLs are issued to borrowers with strong ESG profiles, there would be less room to enhance their ESG performance further. If so, the sustainability targets set in SLLs are weak or easily achievable.[5] As a result, the spread discounts offered may be relatively small. Furthermore, the bargaining power between borrowers and lenders can influence the size of spread discounts. If borrowers have limited bargaining power, lenders will offer smaller discounts. Our next hypothesis relates to the magnitude of sustainability spread adjustments.

H1b: SLLs do not offer sustainability adjustments that significantly affect (reduce) loan spreads.

Our next hypothesis examines whether SLL borrowers will improve their ESG performance post-SLLs. There are arguments both for and against this hypothesis. On the one hand, SLLs may provide a mechanism for borrowers to demonstrate their commitments to stakeholders and deepen relationships with lenders by enhancing their sustainability performance

[5]Consistent with this possibility, Aleszezyk et al. (2023) document that SLL pricing provisions typically include immaterial performance indicators and weak targets.

(Sustainalytics, 2021). On the other hand, it is also possible that some borrowers may use SLLs for window dressing or impression management, especially when the economic benefits are negligible.

H1c: SLLs do not lead to an improvement in the ESG performance of borrowers.

2.2.2. Potential benefits for lenders

SLL loan terms are the result of equilibrium contracting between borrowers and lenders. The preceeding hypotheses are motivated by the view that SLLs, as a form of performance-sensitive debt, may provide advantageous lending terms to borrowers which effectively incentivize actual ESG performance improvement. However, there is an alternative explanation for the emergence and increasing popularity of SLLs: banks can signal their commitment to ESG principles by issuing SLLs, enhancing their reputation as ESG-focused institutions and thus improving their performance.[6] If the benefits accruing to banks do not align with the enhancement in borrowers' ESG, however, this could be considered greenwashing or impression management by banks.

We focus on an important group of banks' stakeholders: depositors. A bank faces pressures from dispersed depositors whose collective decisions may significantly affect the bank's ability to attract liquid deposits.[7] Depositors may view ESG signals as correlated with the trustworthiness of bank, or pro-ESG depositors prefer banks with better sustainability practices. Prior research shows that depositors respond to information other than traditional metrics. For example,

[6] This signal is likely to be viewed as credible for two reasons. First, SLLs represent substantial long-term investments for banks, and come at an opportunity cost. Second, as the architect of SLLs, banks have an interest in maintaining the credibility of the sustainability-linked loan segment.

[7] In addition to depositors, prior research has also examined the role that other non-shareholder stakeholders play in corporate sustainability practice. For example, Dai, Liang, and Ng (2021) find that socially responsible corporate customers infuse similar socially responsible business behavior in companies.

Homanen (2018) shows that banks financing the controversial Dakota Access Pipeline experienced significant decreases in deposit growth. Similarly, Chen, Hung, and Wang (2023) document a decline in deposit growth following the release of negative bank social performance. By issuing sustainability-linked loans, banks can signal their sustainability commitment to depositors. If depositors respond positively to the issuance of SLLs, we should expect SLL-issuing banks to attract more deposits.

The inflow of demand deposits enables a bank to fund its lending activities, creating liquidity on its balance sheets by financing less liquid assets with more liquid liabilities (Diamond and Dybvig, 1983; Kashyap, Rajan, and Stein, 2002; Berger and Bouwman, 2009). Thus, we also predict a similar deposit-induced increase in the volume of loans made by the SLL-issuing banks.

It is worth noting that the impact of banks' sustainability commitments on deposits is not without tension. Some research finds a negative relationship between financial institutions' environmental policies and customers' deposits, as institutions that excel in managing carbon emissions and pursuing sustainable development tend to pay lower interest rates on customer deposits, discouraging deposit growth (Galletta, Mazzù, Naciti, and Vermiglio, 2021). Moreover, the additional deposits necessary to fund the lending growth will not materialize if depositors are sophisticated enough to see through SLLs perceived as greenwashing activities.

H2a: SLL lenders do not attract more deposits and make more loans relative to comparable non-SLL lenders.

Another potential benefit of the SLL contract to the lending bank is the lower credit risk of its loan portfolio. We thus also examine whether SLL borrowers exhibit lower credit risk than other borrowers. SLL engagements may help lenders improve their risk management practices due to their adherence to ESG principles, which could translate into lower credit risk for their loan

portfolio. To the extent that borrowers are incentivized to improve their ESG performance, we may also observe an impact on their credit risk.

Prior research has found a negative association between ESG performance and credit risk. For instance, Amiram et al. (2023) find that early adopters of the Equator Principles, a set of standards that improve ESG policies by certain borrowers and formalize their commitments to ESG goals in loan contracts, offer reductions in loan spreads. Other studies provide evidence that is consistent with this view. Ilhan, Sautner, and Vilkov (2021), for example, document that firms' downside risk increases with carbon intensity. Seltzer, Starks, and Zhu (2022) report that companies with poor environmental performance tend to have lower credit ratings. Furthermore, Jagannathan, Ravikumar, and Sammon (2018) show that ESG-related risks are non-diversifiable and associated with firms' downside risks. Similarly, Hoepner et al. (2021) find that engagements on ESG issues can benefit shareholders by reducing firms' downside risks.

However, opposing arguments exist that SLL borrowers may not necessarily exhibit lower credit risk. Becchetti, Ciciretti, and Hasan (2015), among others, suggest that an ESG/CSR focus increases firms' idiosyncratic risk. Additionally, if an SLL is used solely as a window-dressing tool, we should not expect to find any significant difference in the risk profile between SLL and non-SLL borrowers.

H2b: SLL borrowers do not exhibit lower default risk profiles than non-SLL borrowers.

Anecdotal evidence suggests that banks often act as the architects and initiators of SLLs.[8] When economic benefits primarily accrue to lenders, these loans are more likely to be issued by large banks with a significant advantage in the lending relationship. This proactive role in

[8] See ING's Position Paper "The credibility of the sustainability-linked loan and bond markets," https://www.ingwb.com/en/sustainable-finance/sustainability-linked-loans.

designing lending contracts has been well-documented, demonstrating that banks may be able to reap benefits through lending relationships that are not "arm's length" transactions (e.g., Boot and Thakor, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2007).[9] The dominance of large lenders is particularly pronounced for smaller borrowers and those in enduring lending relationships. Our final hypothesis examines the characteristics of lending relationships conducive to the emergence of SLLs, considering the proactive role of banks and the dynamics of asymmetric dominance in the lending market.

H2c: Lenders with greater negotiation power in the lending relationship are not more likely to issue SLLs.

3. Data, Sample, and Descriptive Statistics

3.1. Data and sample

Our data on SLLs and other types of loans are sourced from Thomson/Refinitiv LoanConnector Dealscan (formerly LPC Dealscan), which provides comprehensive coverage of the global commercial loan market. We consider a loan facility to be an SLL if it is classified under the market segment of "Environmental, Social & Governance/Sustainable Linked." Following the existing literature, we focus on lead arrangers. We identify the lead arranger(s) for each loan by classifying a bank as a lead bank if its name appears in the lead arranger field, or if the 'Primary Role' or 'Additional Roles' field indicates one of the following: admin agent, agent, arranger, bookrunner, coordinating arranger, lead arranger, lead bank, lead manager, mandated arranger, or mandated lead arranger. Our primary sample consists of 1606 SLL facilities (921 deals) from 53 borrowing countries, spanning the period from January 2017 to December 2021.

[9] Consistent with the view that banks dominate the lending relationship, Chava and Purnanandam (2011) finds that borrowers suffer from loss of the lending relationship.

We obtain data on financial statements for borrowers from Compustat (North America and Global) and financial data for lenders from Compustat Bank Fundamental. To match DealScan borrowers with Compustat companies, we use Michael Roberts's link table and supplement it with a manual comparison of borrower names not covered by the Roberts link table and company names in Compustat. For matching DealScan lenders with companies covered by Compustat Bank, we use Michael Schwert's (2018) link table and supplement it with a manual comparison of bank names. Finally, stock price data are obtained from CRSP.

To address potential concerns that our research findings may be influenced by the choice of ESG data sources (Berg, Koelbel, and Rigobon, 2022; Christensen, Serafeim, and Sikochi, 2022), we use ESG performance data from multiple providers, including RepRisk and S&P Global,. RepRisk is our primary sustainability rating provider, as it is based on negative ESG events that are reported by external sources, which reduces reliance on companies' self-reported disclosures. We also obtain greenhouse gas (GHG) emissions data from Trucost Environmental, which covers the period from January 2002 to December 2022. This dataset offers comprehensive information on GHG emissions, including Scope 3 upstream emissions, as well as Scope 1 and 2 emissions.[10] Thus, this dataset enables us to estimate the influence of SLL issuance on the indirect emissions that occur along the firm's value chain.

3.2. Descriptive statistics

Table 1 presents descriptive statistics for the sample of SLLs used in our analysis from January 2017 to December 2021. Panel A of Table 1 reports that the mean (median) issuance size of an SLL is $624.78 (269.56) million, with a standard deviation of $1.03 billion. The mean

[10] Data on Scope 3 downstream is not available.

(median) maturity of SLLs is 55.3 (60) months, with a standard deviation of 24.89 months. The mean (median) all-in-drawn spread is 154.19 (125) basis points.[11]

[Table 1]

Panel B of Table 1 presents summary statistics for three measures of lending relationship in the context of SLL issuance: relationship number, relationship length, and cumulative loan amount. Relationship number is the cumulative number of loan contracts between a borrower and a lender since they first initiated a loan contract. The mean (median) relationship number is 5.84 (3.50). Relationship length is defined as the number of years that have elapsed since the first loan between a borrower and a lender. The mean (median) length is 5.06 (3) years. Cumulative loan amount is the sum of all loan facility amounts initiated between the borrower-lender pair. The mean (median) cumulative loan amount for a pair is $6.96 (3.08) billion when an SLL is issued.

Panel C of Table 1 reports the total amount of SLL issuance by year. The SLL market started with a size of $2.26 billion in 2017 and has steadily grown since then. In 2021, the total annual issuance reached $634.86 billion. Additionally, Panel A provides information on the size of the SLL market relative to the entire corporate loan market. The total SLL issuance volume as a percentage of the total corporate loan issuance volume was only 0.04% in 2017, but by 2021, SLLs represent 8.17% of all loan issuance. The last column presents the average proportion of SLLs in a lender's loan portfolio, defined as a lender's total SLL issuance amount in a year divided by the lender's total corporate loan issuance amount in the year. The ratio grew from 0.06% in 2017 to 9.45% in 2021, as SLLs became an increasingly important segment of a lender's loan portfolio, indicative of the SLL market's remarkable growth in both absolute and relative terms.

[11] The number of observations for loan spreads is limited to 276, as this summary statistic only considers SLL contracts that use the London Interbank Offered Rate (LIBOR) as the base reference rate. Various other reference rates are utilized by different parties, such as Prime, SIBOR, HIBOR, and others. In certain loan agreements, data regarding the reference rate is not accessible.

Panel D of Table 1 reports the SLL issuance amount by industry, focusing on the top 10 industries as classified by LPC DealScan. Notably, several "hard-to-abate" industries, such as utilities (14.26% of all SLL loan volume), general manufacturing (6.98%), oil and gas (5.91%), chemicals, plastics & rubber (4.53%), and automotive (4.25%) are among the top borrowers of SLLs. This suggests that the flexibility of SLL contracts, which do not require funds to be spent solely on green projects, makes them particularly appealing to borrowers in traditionally high-emissions industries. The financial services sector ranks second in SLL loan volume, with $116.78 billion (11.68%).

Panel E of Table 1 presents the top 10 countries where SLL facilities are domiciled. Except for Singapore, all the top 10 countries are in North America or Western Europe. The United States is the largest market for SLLs, with a total issuance amount of $246.43 billion, accounting for 24.65% of the entire SLL market. France follows with $101.62 billion (10.17%).

Panel F of Table 1 shows the regional breakdown of the SLL market according to the DealScan classification. Western Europe dominates the SLL market, with $573.73 billion, accounting for 57.39% of the total SLL market. North America comes in second place, with $280.07 billion or 28.02%, followed by the Asia Pacific with $92.89 billion or 9.29%.

4. Do Borrowers Benefit from SLLs?

4.1. Loan spreads

To investigate whether borrowers derive any benefits from SLLs, we focus on advantageous loan terms (H1a and H1b) and improved ESG performance (H1c). We examine both pricing and non-pricing loan terms between borrowers of SLLs and comparable non-SLL borrowers. This includes an evaluation of loan spreads at issuance, collateral requirements,

financial covenants, and general covenants. For this analysis, we match each SLL borrower to non-SLL borrowers in the same country, two-digit SIC industry, and year. This matching procedure results in 293 SLL borrowers and 1,861 matched peers. The SLL group includes borrowers who use SLLs in a year, while the non-SLL group consists of borrowers who use only non-SLLs in the year.[12] Financial firms are excluded from the borrower sample. For this analysis, we estimate the following regression model:

$$Y_{i,j,t} = \alpha + \beta \cdot SLL_{i,t} + \zeta_b + I_{Ind} + \theta_t + \nu_i + Z_{i,j,t} + \varepsilon_{i,j,t} \quad (1)$$

In Table 2, Columns 1 and 2 assess loan spreads at issuance, with the dependent variable being the natural logarithm of these spreads over LIBOR. In Columns 3 and 4, we investigate collateral requirements, using a binary indicator for secured tranches as the dependent variable. The analysis in Columns 5 and 6 focuses on financial covenants, where the dependent variable reflects their presence, marked as one for elements like leverage ratios. Finally, Columns 7 and 8 compare overall covenants, employing a binary indicator as the dependent variable to signify the presence of general covenants, such as asset sales sweeps. Our model's key independent variable, *SLL*, is binary, indicating one for a borrower's SLLs and zero for non-SLLs of matched peers. We control for borrowing country (ζ_b), two-digit SIC industry (I_{Ind}), year (θ_t), and borrower-specific (ν_i) fixed effects. Loan characteristics, including type, purpose, issuance amount, and maturity, are included in the vector $Z_{i,j,t}$. To address potential correlations within a borrower's multiple loan facilities, standard errors are clustered by borrower.

[Table 2]

[12] SLL borrowers can also serve as matching firms during non-SLL periods, allowing for borrower fixed-effects. For instance, when ABC utilizes SLLs in 2019 and 2022, it is classified as an SLL borrower during those years, while DEF is classified as a matched non-SLL borrower. Conversely, if DEF utilizes SLLs in 2020 while ABC only utilizes non-SLL, then DEF becomes an SLL borrower and ABC becomes a matched non-SLL peer in 2020. This classification of SLL is applied consistently across all other tables.

Table 2 displays the results of our analysis. Negative coefficients on *SLL* in any column indicates less stringent loan terms for SLL borrowers. However, only one coefficient is marginally significant, and it is positive, so our findings do not support the hypothesis that SLLs offer more favorable loan terms compared to comparable non-SLLs (we fail to reject the null hypothesis of no difference in loan terms (H1a)).

In our loan pricing analysis, we conduct a robustness check by restricting our focus to borrowers with both SLLs and non-SLLs. This approach helps isolate the specific impact of SLLs, controlling for borrower-specific factors. We employ two distinct models for this analysis. The first specification compares the spreads of SLLs to non-SLLs for the same borrower within a given loan issuance year. Building on the first, the second specification also accounts for lender characteristics and lending relationships by only considering loans issued by the same lender to a given borrower in the same year. This model accounts for unobservable characteristics of both borrowers and lenders that influence loan pricing. Consistent with the findings of Table 2, we do not observe meaningful differences between SLLs and non-SLLs. Further details are provided in Appendix C.

4.2. Sustainabibility adjustments

Our comparison of loan spreads at initiation does not consider the subsequent adjustments to loan rates, which are a central feature of SLLs. To assess whether the potential reduction in loan spreads stipulated in SLL contracts could overturn the comparison between SLLs and non-SLLs, we formally consider the impact of the sustainability-linked adjustments. The DealScan database provides information on potential subsequent adjustments for some loans, but no data is available on realized discounts. We manually retrieve the details of 121 out of the 1,606 SLL facilities issued during the sample period (missing data fields limit our ability to collect most adjustment details).

We find that the potential maximum total discount ranges from 0.01% to 1%, with a mean (median) discount of 4.87 (4) basis points. Given the mean (median) SLL amount in our sample of $624.78 (269.56) million, the maximum discount that a typical borrower can earn over the life of the loan by achieving target KPIs is $0.3 (0.11) million per year in interest. Thus, our analysis suggests that this discount is not economically large enough to significantly lower the loan spreads of SLLs compared to non-SLLs. Therefore, the potential benefit to borrowers in terms of lower loan spreads is economically small, and consequently, the maximum penalty for poor sustainability performance is also economically small. This evidence suggests that the issuance of SLLs, even with potential subsequent adjustments, does not pose a substantial cost to lenders, establishing SLLs as attractive tools to lenders for greenwashing activities. Overall, our evidence that the loan spread adjustments in SLL contracts are immaterial does not lead us to reject our second hypothesis, H1b.

4.3. Borrower sustainability performance

The question of whether the ESG performance of borrowers improves after SLL origination (H1c) is also examined in several contemporaneous studies, which find mixed or no evidence (e.g., Kim et al., 2023; Aleszczyk et al., 2023). We conduct a comprehensive analysis using a battery of sustainability performance measures, including measures based on data aggregators and direct measures of real impact (i.e., carbon emissions).

We hand-collect all available information on Key Performance Indicators (KPIs) in SLL contracts from the DealScan database. Specifically, we use three variables (deal remark, tranche remark, or performance pricing remark) to gather detailed information on KPIs. Out of the 1,606 (921) SLL facilities (deals) during the sample period, we are able to extract the details for 1,171 KPIs embedded in 566 (340) facilities (deals), or an average of 2.07 KPIs per loan facility. We

then manually match each KPI to a particular subcategory of RepRisk, which is our primary source for ESG data.[13]

[Table 3]

Panel A of Table 3 summarizes the KPIs included in SLL contracts. The most commonly used metric among SLL contract counterparties is related to climate change and GHG emissions, accounting for 32.88% of all KPIs. This is followed by a KPI related to energy management, which accounts for 10.93% of all KPIs. As shown in the table, most of the performance indicators are based on a borrower's environmental or social performance, although ESG sub-components are not mutually exclusive. In some cases, counterparties agree to use third-party ESG scores (4.01%) instead of predetermined specific indicators.

4.3.1. ESG performance based on data aggregators

To assess the ESG performance of SLL borrowers relative to comparable peers around issuance, we first determine the length of the period after SLL initiation for each loan facility. We define this period as the difference (in days) between the tranche active date for each loan and December 31, 2021 (the last day of the sample period). To ensure comparability, we make the lengths of the pre-SLL periods the same as those of the post-SLL periods. For instance, if a tranche's active date is June 27, 2018, the number of days between that date and December 31, 2021, is 1,283. Therefore, the pre-SLL period for the loan runs from December 22, 2014, to the active date (a period of 1,283 days). We compare each SLL borrower's ESG performance, as indicated by their KPIs, with that of comparable non-SLL peers. This comparison assumes that the matched peers have identical SLL contracts (i.e., KPIs), and is conducted using the following equation:

[13] For the period spanning January 1, 2007 to December 31, 2021, RepRisk offers binary variables for subcategories of ESG risks, which are set to one (T) if a negative event occurs and zero (F) otherwise.

$$Neg\_ESG_{i,t} = \alpha + \beta \cdot Post_t \times SLL_{i,t} + \gamma \cdot SLL_{i,t} + \delta \cdot Post_t + \zeta_b + I_{Ind} + \theta_t + \nu_i + \varepsilon_{i,t} \quad (2)$$

In Equation (2), the dependent variable represents the borrower's sustainability, measured using RepRisk sub-scores that correspond to the KPIs in SLL contracts. *Neg_ESG* is a binary variable, set to one for firms experiencing negative ESG events that are pertinent to their SLL KPIs, and zero otherwise. The variable *Post* takes a value of one during the period following the origination of the SLL, and a value of zero otherwise. *SLL* is a binary variable, assigned a value of one for SLL borrowers and zero for their matched non-SLL counterparts. We predict that if SLL contracts effectively incentivize borrowers to enhance their ESG profiles, this would the interaction term will have a negative coefficient. The variables ζ_b, I_{Ind}, θ_t, and ν_i represent borrowing country, two-digit SIC industry, year, and borrower fixed effects, respectively. Standard errors are clustered by borrower.

Panel B of Table 3 presents the results. The analysis indicates that although the coefficients for the interaction terms are consistently negative across all model specifications, they are not statistically significant. In contrast to what might be expected, borrowers' sustainability performance shows no marked improvement following the SLL.

Moreover, the negative coefficients on *SLL* suggest that lenders extend these loans to sustainable borrowers, who have less room for further improvement in ESG. This finding, along with the loan pricing analysis, casts doubt on the purpose of SLLs that claim to promote the ESG goals of borrowers by incentivizing and rewarding companies for making positive contributions to the environment and society.

In light of the well-established low correlation among various ESG ratings (Berg et al., 2022; Christensen et al., 2022), we conduct a robustness test to determine if the choice of ESG

ratings data influences our results. For this analysis, we manually match each KPI used in SLL contracts with a subcategory of the S&P Global ESG data, and compare SLL borrowers' KPIs with those of their peers around the issuance of SLLs. A distinctive aspect of this data, compared to other ESG datasets, is that it provides information not only on the subcomponents that make up the total ESG score but also on the weights assigned to each item. Therefore, upon identifying the KPIs in each SLL contract, we calculate the weighted average of the corresponding S&P Global ESG sub-scores. This weighted-average score forms the dependent variable in our analysis.

Table 4 reports the results of the regression model that replaces the dependent variable of Equation (2) with S&P_ESG-based measures.[14] The variable *Post* takes the value of one for ESG profiles one (Columns 1 and 2) and two (Columns 3 and 4) years after loan origination, and zero for those one year before origination. If the SLL contract effectively enhances borrower sustainability, we would expect a positive coefficient for the interaction term.

[Table 4]

Table 4 reports the results. The interaction coefficients in Columns 1 and 2 are positive but only marginally significant. This marginal significance fades two years following the issuance of SLLs, as indicated in Columns 3 and 4, failing to provide robust evidence of ESG performance improvement among SLL borrowers. Additionally, the coefficient on *SLL* is positive yet insignificant, showing that the inference from Table 3 of SLL loans going to already-strong ESG firms is not robust. Together with the results from Tables 2 and 3, these findings raise doubts about

[14] It should be noted that RepRisk and S&P Global ESG scores have opposite interpretations. A higher RepRisk score signifies poorer sustainability performance, whereas a higher S&P ESG rating reflects better sustainability performance.

the effectiveness of SLLs in achieving their intended objective of incentivizing borrowers to improve their sustainability performance.[15]

4.3.2. Real impact: greenhouse gas (GHG) emissions

While third-party ESG ratings provide valuable insights into a firm's sustainable practices, relying solely on such ratings presents several challenges. First, there is a potential bias in ESG scores due to conflicts of interest arising from commercial relationships. Research indicates that ESG rating agencies are more likely to assign higher ratings to client firms with established business connections than non-client firms (Li, Lou, and Zhang, 2023). Second, the methodologies employed by ESG rating agencies are often complex and lack complete transparency, resulting in what is known as the "black box" problem. Consequently, the subjectivity and lack of transparency makes it difficult to assess the accuracy and reliability of the scores. As a result, determining which aspects of ESG performance are considered positive, and the extent to which they have a social impact, is often open to interpretation. Furthermore, rating agencies often rely on self-reported data from companies to calculate numeric scores, which may be prone to inaccuracies and potential manipulation, or greenwashing.

We address these potential limitations by utilizing GHG emissions data from Trucost Environmental, allowing us to investigate the real impact of SLLs on borrowers' green performance. Such analysis based on GHG emissions data is both relevant and economically significant, because key performance indicators most commonly included in SLL contracts are associated with climate change and GHG emissions.

The analysis, reported in Table 5, is conducted using a regression model that replaces the dependent variable of Equation (2) with *GHG Intensity*, measured as GHG emissions divided by

[15] We also compare the total ESG scores of SLL borrowers with those of their peers, employing both RepRisk and S&P Global ESG data. The results remain consistent. The results can be made available upon request.

a firm's revenue (unit: tCO2e/$M where tCO2e refers to tons of carbon dioxide equivalent emissions per million dollars of revenue).[16] The results for Scope 1 emissions (directly controlled by the borrower) are presented in Columns 1 and 2, Scope 2 emissions in Columns 3 and 4, and Scope 3 upstream emissions in Columns 5 and 6. As before, we utilize the *SLL* indicator variable, which takes a value of one for SLL borrowers and zero for matched peers. The *Post* variable takes the value of one, indicating a firm's GHG intensity one (Panel A) and two (Panel B) years after SLL initiation, while zero represents the year prior to initiation.

[Table 5]

Table 5 presents our findings. In Panel A, the coefficients for the interaction terms are statistically insignificant across all emissions scopes. This evidence suggests that SLL borrowers do not significantly reduce GHG emissions post-SLL origination compared to their non-SLL counterparts. This pattern aligns with the observations in Tables 3 and 4, which utilize third-party ESG ratings to assess borrowers' sustainability performance. These findings indicate the ineffectiveness of SLL contracts in enhancing borrowers' sustainability.

In Panel B, our analysis shows that SLL borrowers, compared to matched peers, exhibit a significant increase in Scope 1 emissions—over 110 tCO2e per million dollars of revenue annually—following SLL issuance. This

Overall, evidence consistently refutes the idea that SLLs can positively influence corporate environmental practices and contribute to sustainability efforts, leading us to fail to reject hypothesis H1c. This conclusion calls for a critical reassessment of the design and implementation of SLLs. It suggests the need for more robust frameworks and accountability mechanisms to ensure that these financial instruments drive environmental progress. Further research might explore

[16] The findings remain consistent when employing total GHG emissions as the dependent variable.

alternative structures or complementary measures that could enhance the environmental impact of SLLs, thereby aligning financial and sustainability objectives more effectively.[17]

5. Do Lenders Benefit from SLLs?

In this section, we explore the incentives for lenders to use SLLs, focusing on why and under what circumstances SLL contracts are initiated.

5.1. Lenders' performance after SLL issuance: deposits and loans

Before examining the consequences of SLLs for lenders, we investigate the determinants of a lender's decision to extend an SLL. Specifically, we examine the relationship between the likelihood of SLL issuance and lender characteristics, such as deposits and loans, measured prior to issuance. We match each SLL lender to non-SLL lenders in the same country and year, with each observation representing a unique bank-year. The empirical analysis is based on the following OLS regressions:

$$SLL_{j,t} = \alpha + \beta \cdot Y_{j,t-1} + \eta_l + \theta_t + \chi_j + \varepsilon_{j,t} \qquad (3)$$

The dependent variable is a binary indicator that takes the value of one for lenders offering SLLs in a year and zero for those offering only non-SLLs. The independent variable of interest ($Y_{j,t-1}$) is a lender's deposit and loan growth in the year prior to loan origination. To construct the variable, we calculate the percentage change in deposits and loans from the previous year for each lender. For example, if an SLL was issued in 2020, the growth variable is measured by (2020 value – 2019 value) / 2019 value. The model controls for lender country (η_l), year (θ_t), and lender (χ_j) fixed effects. Standard errors are clustered by lender.

[Table 6]

[17] We also conduct subsample analyses on firms with SLL KPIs specifically tied to GHG emissions. The results remain consistent and are available upon request.

Table 6 presents the regression results of the determinants of a lender's decision to offer an SLL, based on two panels: Panel A, which utilizes the full sample, and Panel B, which is restricted to loans with LIBOR as the reference rate. Columns 1 through 4 present the results of the regression model with the independent variable ($Y_{j,t-1}$) representing changes in deposit variables, including total domestic deposits (Compustat item: TDOMD), customer demand deposits (DPDC), customer savings deposits (DPSC), and customer total deposits (DPTC). In Columns 5 through 7, the main independent variable is one of the following loan variables: changes in commercial and industrial (domestic) loans (LCACLD), consumer loans (LCACRD), and loans net of unearned income (LG).

We find evidence suggesting that the coefficient estimates of most of the deposit and loan growth measures are significantly negative, indicating that, among a set of banks in a country in a given year, those with slower (or possibly negative) growth are more likely to initiate an SLL in the following year. These findings suggest that an SLL lender's decision to issue an SLL may be influenced by poor performance.

We further investigate whether the issuance of an SLL improves a lender's performance (H2a). SLL lenders may be more attractive to depositors who prioritize ESG commitments, leading to increased deposit growth. Additionally, the ability to offer sustainable loans could enhance lenders' reputation and relationships with clients, potentially increasing loan demand. However, it is possible that the issuance of an SLL is viewed as "greenwashing," or it may discourage deposit growth (Galletta et al., 2021). As in Table 6, we use deposit and loan variables as proxies for bank performance.

The empirical analysis, reported in Table 7, is based on the following regression equation:

$$\Delta Deposit\ (or\ Loan)_{j,t} = \alpha + \beta \cdot Post_t \times SLL_{j,t} + \gamma SLL_{j,t} + \eta_l + \theta_t + \chi_j + \varepsilon_{j,t} \qquad (4)$$

The dependent variable is the growth in either deposits (Columns 1 through 4) or loans (Columns 5 through 7). $Post_t$ is an indicator that takes the value of one for observations one (Panel A) or two (Panel B) years after SLL issuance, and zero for those one year before issuance. *SLL* takes the value of one for banks issuing SLLs and zero for their counterparts. To clarify, if an SLL is initiated in 2020, a post-issuance metric is defined as (2021 value – 2020 value) / 2020 value in Panel A and (2022 value – 2020 value) / 2020 value in Panel B. Similarly, a pre-issuance measure is defined as (2020 value – 2019 value) / 2019 value. We control for lender country, year, and lender fixed effects using η_l, θ_t, and χ_j, respectively. Standard errors are clustered by lender.

[Table 7]

The results of Table 7 suggest that the issuance of SLLs helps banks attract more deposits, indicating that depositors react to information about a bank beyond its traditional fundamentals. The effect is economically meaningful, with SLL banks experiencing increases in deposit growth of up to 19.6% relative to their peers in Panel A, Column 2. In contrast, SLL banks' poor loan growth (Table 6) continues in the year immediately following SLL origination, but the significance disappears two years after issuance. Overall, our findings suggest that SLLs are initiated by banks with weak performance, and these loans help improve a bank's performance post-issuance by attracting more deposits and allowing for increased lending. These results support our hypothesis that SLLs can provide a reputational benefit for banks and attract deposits from investors concerned about ESG commitments.[18] [19]

The validity of the DiD approach rests on the parallel trends assumption.

[18] The results remain robust when we restrict our sample to instances where the reference base rate is LIBOR.
[19] The following articles illustrate how banks communicate their issuance of SLLs through press releases and direct marketing efforts: https://www.businesswire.com/news/home/20210928005051/en/HSBC-Brings-First-of-its-Kind-Sustainable-Finance-Product-Suite-to-Canadian-Businesses and https://www.businesswire.com/news/home/20210928005051/en/HSBC-Brings-First-of-its-Kind-Sustainable-Finance-Product-Suite-to-Canadian-Businesses.

To investigate the validity of this assumption, we calculate the median deposit growth for each deposit variable for both SLL and non-SLL borrowers. Subsequently, we analyze the differences in these medians and compute the average of these differences. Figure 1 illustrates this comparison, highlighting the average deposit growth disparity between SLL and non-SLL borrowers.

[Figure 1]

Crucially, prior to the issuance of SLLs, the discrepancy in deposit growth between these two groups was negligible, suggesting parallel pre-intervention trends in outcomes. This observation supports the validity of the parallel trends assumption, implying that any post-intervention disparities in deposit growth can be attributed to the effect of SLLs. The divergent post-intervention outcomes between the groups reinforce this inference. Therefore, the parallel trends assumption appears to hold in our study, lending credibility to the estimated DiD coefficients as reliable measures of the impact of SLLs.

5.2. Loan portfolio risk

Next, we test hypothesis (H2b) that SLLs help banks reduce the credit risk of their loan portoflios. To examine this, we compare the probability of default between SLL borrowers and their non-SLL peers. The analysis is based on the following regression:

$$SLL_{i,t} = \alpha + \beta \cdot PD_{i,t\,(or,t-3)} + \zeta_b + I_{Ind} + \theta_t + \nu_i + Z_{i,j,t} + \varepsilon_{i,t} \qquad (5)$$

In the model, the dependent variable is *SLL*, which takes the value of one for SLL borrowers and zero for matched non-SLLs. The independent variable of interest is a borrower's default probability (*PD*) measured over different periods before and upon the initiation of the SLL contract. The *PD* measure is the likelihood of a borrower failing to meet its financial obligations

over different time horizons, ranging from 6 to 60 months.[20] This measure captures the bank's assessment of the borrower's likelihood of default. We include borrower country (ζ_b), two-digit SIC industry (I_{Ind}), year (θ_t), and borrower (ν_i) fixed effects. Loan characteristics, including loan type, purpose, amount, and maturity, are included in the model as a vector $Z_{i,j,t}$. Standard errors are clustered by borrower.

[Table 8]

Table 8 presents the results, with Panel A showing the results without controlling for borrower fixed effects and Panel B with them. The coefficients on the main covariates are statistically insignificant with mixed signs, indicating that we cannot detect any significant difference in default probabilities between SLL and non-SLL groups, whether before or after the SLL loan is initiated.[21] As such, the results reject the hypothesis that banks use SLLs to reduce their exposure to borrowers' default risk.

To further investigate whether SLLs reduce borrower risk post-issuance, we compare the frequency of downgrades and defaults between SLLs and non-SLLs..

$$Downgrade\ (or\ Default)_{i,j,t} = \alpha + \beta \cdot SLL_{i,j,t} + \zeta_b + I_{Ind} + \theta_t + \nu_i + Z_{i,j,t} + \varepsilon_{i,j,t} \quad (6)$$

Downgrade is a binary variable indicating whether a borrower's S&P credit rating has been downgraded during the loan period, while *Default* is a binary variable indicating whether a borrower has failed to meet its financial obligations during the loan period. Specifically, *Default*

[20] We obtain the *PD* measure from the National University of Singapore's Credit Research Institute. For details of the PD measure, see https://d.nuscri.org/static/pdf/Probability%20of%20Default%20White%20Paper.pdf.

[21] There is a debate about whether SLLs are issued to safe borrowers (selection effect) or if the contracts make them more ESG-focused. Results in Columns 1 to 5 of Table 8 reject the selection effect by showing that there are no differences in ex ante risk profiles between SLL and non-SLL borrowers.

is defined as a borrower's S&P long-term credit rating being downgraded to 'D' or 'SD'. The other variables and model specifications in Equation (6) are the same as those in Equation (5).

[Table 9]

The results are presented in Table 9. The coefficients on the *SLL* variable are statistically insignificant (except marginally positive in Column 2) for both downgrade and default measures, suggesting that SLLs do not effectively reduce banks' exposure to borrower risk. Overall, the results in Tables 8 and 9 indicate that sustainable lending practices are not driven by credit risk considerations: SLLs are not issued to safe borrowers ex ante and do not reduce borrower risk ex post.

6. Why Are Lenders able to Initiate SLLs?

6.1. Market power

In this section, we aim to identify the drivers of SLL issuance, with a specific focus on the impact of lender market power (H2c). Our previous findings suggest that lenders are the primary beneficiaries of SLLs. Therefore, we posit that sustainable loans are more likely to be issued when lenders possess greater market power vis-à-vis borrowers. To measure a lender's market power, we use market capitalization (as of December 2021) and corporate lending market share (as of 2021).[22] We estimate the following regression:

$$SLL_{j,t} = \alpha + \beta \cdot Y_{j,t} + \eta_l + \theta_t + \varepsilon_{j,t} \qquad (7)$$

The dependent variable in this analysis, *SLL*, is a binary indicator that takes the value of one for SLL banks and zero for matched peers. We use a set of proxies for a bank's market power ($Y_{j,t}$) as the main independent variables. Each measure of market power is a binary indicator that

[22] Appendix D shows the top 15 largest banks worldwide as of December 2021.

takes the value of one if the bank is in a strong market position, and zero otherwise. We control for lender country (η_l) and year (θ_t) fixed effects in the model, and standard errors are clustered by lender.

[Table 10]

Table 10 presents the results of our analysis. Columns 1-3 report the results based on market capitalization measures, while Columns 4-5 present the results based on market share measures. We find that all coefficients on proxies for banks' market power are positive and statistically significant at the 1% level, regardless of the model specifications. This finding suggests that sustainable loans are more likely to be issued by banks with greater market power, as measured by market capitalization and corporate loan market share. Combined with the results in Table 6, the overall picture of an SLL initiator is a mature, larger bank with high market share, but slowing growth.

6.2. Lending relationship

Finally, we investigate the potential role of lending relationships in driving the origination of SLL contracts. We construct three proxies for lending relationships: *Relationship Number*, *Relationship Length*, and *Ln(Cumulative Loan Amount)*. *Relationship Number* is the total number of loan contracts initiated between a borrower and a lender since the first loan between the pair. *Relationship Length* is the number of years since the first loan transaction between the borrower-lender pair. *Ln(Cumulative Loan Amount)* is the log of total amount a firm has borrowed from a bank since the first loan contract between the counterparties. We interpret a higher value of each metric as indicating a stronger and longer-lasting relationship between the borrower-lender pair. The empirical tests are based on the following regression equation:

$$SLL_{i,j,t} = \alpha + \beta \cdot Y_{i,j,t} + \zeta_b + \eta_l + I_{Ind} + \theta_t + \varepsilon_{i,j,t} \quad (8)$$

The dependent variable is an indicator that takes the value of one for SLLs and zero otherwise. The independent variables ($Y_{i,j,t}$) of interest are the proxies for lending relationships as defined above. We control for borrower country (ζ_b), lender country (η_l), two-digit SIC industry (I_{Ind}), and year (θ_t) fixed effects in the regression model. Standard errors are clustered by borrower and lender. A positive coefficient on $Y_{i,j,t}$ would suggest that sustainable loans are more likely to be initiated through relationship lending.

[Table 11]

Table 11 presents he results. Columns 1 and 2 report the results based on *Relationship Number*, Columns 3 and 4 are based on *Relationship Length*, and Columns 5 and 6 are based on *Ln(Cumulative Loan Amount)*. We find that the coefficients on proxies for lending relationships are significantly positive across different model specifications. These results suggest that a stronger or longer banking relationship is a potential mechanism through which SLL arrangements are initiated. Specifically, borrowers (potentially locked into long-term relationships with strong banks) end up with new loans with sustainability KPIs. The borrower, lacking bargaining power in these relationships, complies since the KPIs are neither particularly binding nor costly (as shown in Tables 3 - 5), allowing them to continue the lending relationship.

7. Concluding Remarks

This study examines the economic incentives for SLL borrowers and lenders. Our findings indicate that SLLs do not offer advantageous loan terms and show no evidence of improvement in borrowers' ESG performance following the issuance of SLLs. SLL lenders can attract more deposits post-origination and consequently increase their loan volume. However, we find no evidence that SLL lenders issue sustainable loans to safer borrowers (ex ante measure; selection

effect), nor do these contracts reduce borrower risk (ex post measure). . The maximum economic benefit to borrowers (from lower spreads) is small, and borrowers do not exhibit improved ESG ratings.

Overall, our results are most consistent with greenwashing; larger lenders facing slowing growth use their bargaining power to impose SLLs on existing borrowers. Those borrowers accept the SLLs because the KPIs are immaterial and do not map to economically meaningful spread adjustments. The result is no improvement in ESG outcomes, but greater loan growth for SLL-issuing banks as depositors react to their sustainability signal.

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Appendix A: Example of Sustainability Adjustments in Loan Contracts

Sustainability Fee Adjustment; Sustainability Rate Adjustment

This table determines if the applicable adjustments for the Sustainability Fee Adjustment and the Sustainability Rate Adjustment apply for any given Fiscal Year based on metrics set in the Sustainability Table in Schedule 4.17.

1. Sustainability Fee Adjustment = +0.01%, 0% or -0.01%, in each case for such Fiscal Year.

    a. As reported in the SASB Aligned Report, (I) are two or more of the KPI Metrics less than the applicable Sustainability Threshold set forth in the Sustainability Table and (II) no KPI Metric is equal to or more than the applicable Sustainability Target set forth in the Sustainability Table? Check one: ☐ YES ☐ NO

        i. If yes, a Sustainability Fee Adjustment of +0.01% applies for such Fiscal Year.

        ii. If no, a Sustainability Fee Adjustment of +0.01% does not apply for such Fiscal Year.

    b. As reported in the SASB Aligned Report, (I) are two or more of the KPI Metrics equal to or more than the applicable Sustainability Target set forth in the Sustainability Table and (II) no KPI Metric is less than the applicable Sustainability Threshold set forth in the Sustainability Table? Check one: ☐ YES ☐ NO

        i. If yes, a Sustainability Fee Adjustment of -0.01% applies for such Fiscal Year.

        ii. If no, a Sustainability Fee Adjustment of -0.01% does not apply for such Fiscal Year.

    c. If neither (a)(i) nor (b)(i) above applies, a Sustainability Fee Adjustment of 0% applies for such Fiscal Year.

    d. The Sustainability Fee Adjustment for Fiscal Year 20____ is _____%.

    e. As of the date hereof, after giving effect to the Sustainability Fee Adjustment, the Commitment Fee is _____%[12].

2. Sustainability Rate Adjustment = +0.05%, 0% or -0.05%, in each case for such Fiscal Year.

    a. As reported in the SASB Aligned Report, (I) are two or more of the KPI Metrics less than the applicable Sustainability Threshold set forth in the Sustainability Table and (II) no KPI Metric is equal to or more than the applicable Sustainability Target set forth in the Sustainability Table? Check one: ☐ YES ☐ NO

        i. If yes, the Sustainability Rate Adjustment of +0.05% applies for such Fiscal Year.

        ii. If no, the Sustainability Rate Adjustment of +0.05% does not apply for such Fiscal Year.

    b. As reported in the SASB Aligned Report, (I) are two or more of the KPI Metrics equal to or more than the applicable Sustainability Target set forth in the Sustainability Table and (II) no KPI Metric is less than the applicable Sustainability Threshold set forth in the Sustainability Table? Check one: ☐ YES ☐ NO

        i. If yes, the Sustainability Rate Adjustment of -0.05% applies for such Fiscal Year.

        ii. If no, the Sustainability Rate Adjustment of -0.05% does not apply for such Fiscal Year.

    c. If neither (a)(i) nor (b)(i) above applies, a Sustainability Rate Adjustment of 0% applies for such Fiscal Year.

    d. The Sustainability Rate Adjustment for Fiscal Year 20____ is _____%.

    e. As of the date hereof, after giving effect to the Sustainability Rate Adjustment, the Applicable Rate Percentage for each of the Base Rate, the Japanese Base Rate, the LIBOR Market Index Rate and the LIBOR Rate for purposes of Section 4.1(a) is as set forth below[13].

Source: BlackRock Form 8-K: Entry into a Material Definitive Agreement (filed as of 04/06/2021), Amendment No. 10 to Five-Year Revolving Credit Agreement (dated as of 03/31/2021), available at https://www.sec.gov/Archives/edgar/data/0001364742/000119312521107747/d113222dex101.htm.

Appendix B: Definitions of Variables

Variable	Definition	Data Source
S&P ESG	S&P Global ESG scores that correspond to each KPI in SLL contracts	S&P Global ESG
Neg_ESG	An indicator assigned a value of one if a firm experiences negative ESG events corresponding to KPIs in SLL contracts and zero otherwise.	RepRisk
Spread	Loan spread (all-in-drawn) over LIBOR	DealScan LPC Connector
Secured	Indication of whether or not the tranche is secured	DealScan LPC Connector
Covenants	Indication of whether or not financial covenants (e.g., leverage ratio) exist	DealScan LPC Connector
All Covenants	Indication of whether or not general covenants (e.g., asset sales sweep) exist	DealScan LPC Connector
Loan Purpose	Dummies for loan purpose (corporate purposes, takeover, and others)	DealScan LPC Connector
Loan Type	Dummies for loan type (term loan, revolver line of credit, and others)	DealScan LPC Connector
Loan Amount	Loan (facility) amount	DealScan LPC Connector
Loan Maturity	Number of months between facility start and end dates	DealScan LPC Connector
Relationship Number	Number of loan contracts since the first loan initiated between a borrower and a lender	DealScan LPC Connector
Relationship Length	Number of years passed since the first loan initiated between a borrower and a lender	DealScan LPC Connector
Cumulative Loan Amount	Total loan amount since the first loan initiated between a borrower and a lender	DealScan LPC Connector
TDOMD	Total domestic deposits	Compustat Bank
DPDC	Deposits - demand - customer	Compustat Bank
DPSC	Deposits - savings - customer	Compustat Bank
DPTC	Deposits - total - customer	Compustat Bank
LCACLD	Loans - commercial and industrial (domestic)	Compustat Bank
LCACRD	Loans - consumer	Compustat Bank
LG	Loans - net of unearned income loans	Compustat Bank
GHG Intensity (Scope 1)	Greenhouse gas (GHG) emissions from sources that are owned or controlled by the company (categorised by the Greenhouse Gas Protocol) divided by the company's revenue	Trucost Environmental
GHG Intensity (Scope 2)	GHG emissions from consumption of purchased electricity, heat or steam by the company (categorised by the Greenhouse Gas Protocol) divided by the company's revenue	Trucost Environmental
GHG Intensity (Scope 3 Upstream)	GHG emissions from other upstream activities not covered in Scope 2 (categorised by the Greenhouse Gas Protocol) divided by the company's revenue	Trucost Environmental
PD	Probability of Default based one Duan, Sun, and Wang (2012)	NUS Credit Research Initiative
High Mkt Cap (Top 5)	An indicator that takes a value of one if a bank's market capitalization, as of December 2021, ranks within the top 5 worldwide, and zero otherwise. Appendix C provides the list of the largest banks worldwide.	Statista

High Mkt Cap (Top 10)	An indicator that takes a value of one if a bank's market capitalization, as of December 2021, ranks within the top 10 worldwide, and zero otherwise. Appendix C provides the list of the largest banks worldwide.	Statista
High Mkt Cap (Top 15)	An indicator that takes a value of one if a bank's market capitalization, as of December 2021, ranks within the top 15 worldwide, and zero otherwise. Appendix C provides the list of the largest banks worldwide.	Statista
High Mkt Share (above Q50)	An indicator that takes a value of one if a bank's corporate loan market share in 2021 is higher than the annual median, and zero otherwise.	DealScan LPC Connector
High Mkt Share (above Q75)	An indicator that takes a value of one if a bank's corporate loan market share in 2021 is higher than the upper quartile, and zero otherwise.	DealScan LPC Connector

Appendix C: Analysis of Loan Pricing Using Alternative Methodologies

Appendix C presents regression analyses comparing loan spreads for sustainability-linked loans (SLLs) and their counterparts. Columns 1 and 2 compare yield spreads within the same borrower-year, while Columns 3 and 4 further refine the comparison by examining spreads within borrower-lender-year to fully account for lender characteristics and relationship lending. The dependent variable is the natural logarithm of the all-in-drawn loan spreads. The independent variable of interest is SLL, which takes the value of one for SLLs of a borrower and zero for non-SLLs of the same borrower. The model also controls loan characteristics such as facility amount, maturity, purpose, and type, along with year, borrower, and lender fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent Variable	Ln(Spread)	Ln(Spread)	Ln(Spread)	Ln(Spread)
SLL	0.030	-0.108	-0.076	-0.098
	(0.432)	(-1.628)	(-1.112)	(-1.247)
Ln(Amount)		-0.041		-0.003
		(-1.069)		(-0.080)
Ln(Maturity)		0.365***		0.129
		(7.863)		(1.078)
Borrower * Year FE	Y	Y	N	N
Lender FE	Y	Y	N	N
Borrower * Year * Lender FE	N	N	Y	Y
Clustering	Y	Y	Y	Y
Observations	723	723	171	171
R-squared	0.957	0.977	0.956	0.959

Appendix D: Largest Banks Worldwide as of December 2021

Banks	Market Capitalization ($ billion)
JPMorgan Chase	468.0
Bank of America	364.1
Industrial & Commercial Bank of China	245.5
China Merchants Bank	193.8
Wells Fargo	191.3
Morgan Stanley	176.1
China Construction Bank	175.4
Charles Schwab	159.0
Agricultural Bank of China	158.3
Royal Bank of Canada	151.3
Toronto-Dominion Bank	139.7
Goldman Sachs	127.6
Commonwealth Bank of Australia	125.1
HSBC	122.0
Citigroup	119.8

Source: Statista (https://www.statista.com/).

Figure 1. Parallel Trends Assumption

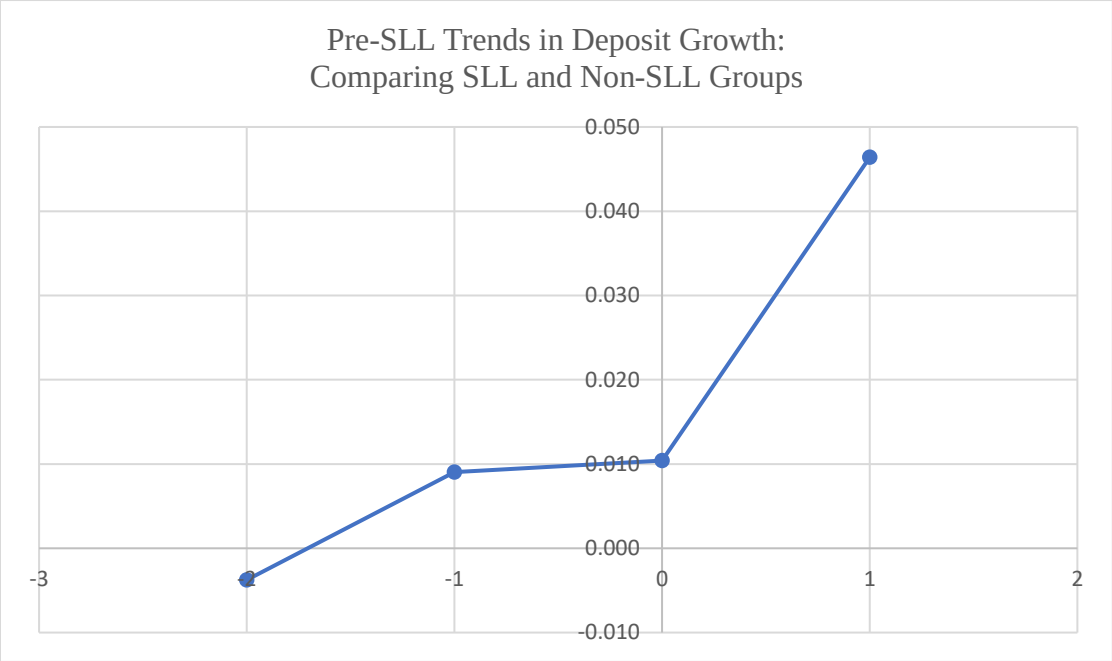

Figure 1 demonstrates the differences in average deposit growth between sustainability-linked loan (SLL) lenders and their non-SLL counterparts. The y-axis represents the differences in deposit growth, and the x-axis shows time in years, with '0' marking the year of SLL issuance.

Table 1. Descriptive Statistics

Table 1 presents the descriptive statistics of sustainability-linked loans (SLLs) between January 2017 and December 2021. Panel A reports the basic characteristics of SLLs; Panel B reports the summary statistics of SLL lending relationships; Panel C reports the total SLL issuance size by year and the average fraction of SLLs in a lender's loan portfolio; Panel D reports the total SLL issuance size by industry; Panel E reports the total SLL issuance size by country; Panel F reports the total SLL issuance size by region.

Panel A: Characteristics of SLLs

Variable	Mean	SD	Q1	Q2	Q3	Observations
Amount ($ million)	624.78	1029.60	89.58	269.56	715.90	1600
Maturity (months)	55.30	24.89	36.00	60.00	60.00	1554
Spread (bps)	154.19	84.87	100.00	125.00	187.50	276

Panel B: SLL lending relationship

Variable	Mean	SD	Q1	Q2	Q3	Observations
Relationship Number	5.84	6.71	2.00	3.50	7.00	1,748
Relationship Length (years)	5.06	5.57	0.00	3.00	8.00	1,748
Cumulative Loan Amount (million)	6960.34	12625.74	1307.32	3079.80	7479.97	1,747

Panel C: SLL by year

Year	SLL ($ million)	All ($ million)	Ratio to All Loans (%)	Avg % of Lender's Portfolio
2017	2258.36	6185254.19	0.04	0.06
2018	49253.58	6865374.89	0.72	0.78
2019	139630.22	6149078.18	2.27	2.48
2020	173644.18	5730642.12	3.03	3.65
2021	634863.37	7769918.67	8.17	9.45

Panel D: SLL by industry (top 10 industries)

Industry	SLL ($ million)	Ratio (%)
Utilities	142510.24	14.26
Financial Services	116780.25	11.68
REITS	75678.00	7.57
General Manufacturing	69737.46	6.98
Oil and Gas	59070.72	5.91
Beverage, Food, and Tobacco Processing	53130.65	5.31
Healthcare	46989.77	4.70
Chemicals, Plastics & Rubber	45240.37	4.53
Automotive	42480.49	4.25
Telecommunications	40390.61	4.04

Panel E: SLL by borrower country (top 10)

Country	SLL ($ million)	Ratio (%)
United States	246427.36	24.65
France	101619.04	10.17
Germany	85022.41	8.51
United Kingdom	69981.41	7.00
Italy	67020.27	6.70
Netherlands	63987.03	6.40
Spain	59744.62	5.98
Singapore	26451.12	2.65
Canada	25798.75	2.58
Switzerland	21537.91	2.15

Panel F: SLL by borrower region

Region	SLL	Ratio (%)
Western Europe	573733.32	57.39
USA/Canada	280066.01	28.02
Asia Pacific	92886.68	9.29
Latin America/Caribbean	22498.35	2.25
Eastern Europe/Russia	18608.71	1.86
Middle East	7589.62	0.76
Africa	4267.02	0.43

Table 2. Loan Terms

Table 2 presents a regression analysis that compares the terms of sustainability-linked loans (SLLs) with those of non-SLLs. The analysis is structured as follows: Columns 1 and 2 compare yield spreads; Columns 3 and 4 examine loan collateral requirements, distinguishing between secured and unsecured loan facilities; Columns 5 and 6 analyze financial covenants; and Columns 7 and 8 assess general covenants. The key independent variable is 'SLL', assigned a value of one for SLL borrowers and zero for matched non-SLL borrowers. The model incorporates various loan characteristics, including facility amount, maturity, purpose, and type. The model also accounts for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower and t-statistics are presented in parentheses. Statistical significance is indicated as follows: *, **, and *** represent significance levels at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Ln(Spread)	Ln(Spread)	Secured	Secured	Covenants	Covenants	All Covenants	All Covenants
SLL	0.077	0.123*	-0.182	-0.173	0.199	0.153	-0.168	-0.178
	(1.007)	(1.666)	(-1.343)	(-1.252)	(0.783)	(0.584)	(-1.023)	(-1.033)
Ln(Amount)	-0.042**	-0.035**	-0.001	0.002	0.003	0.002	0.009	0.009
	(-2.432)	(-2.224)	(-0.088)	(0.164)	(0.205)	(0.159)	(1.122)	(1.056)
Ln(Maturity)	0.165***	0.162***	0.027	0.025	0.019	0.017	0.074***	0.074**
	(5.389)	(5.174)	(1.179)	(1.128)	(0.397)	(0.356)	(2.601)	(2.570)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	N	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N	Y	N
Borrower FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry * Year FE	N	Y	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y
Observations	8,017	8,017	8,026	8,026	8,026	8,026	8,026	8,026
R-squared	0.901	0.912	0.915	0.918	0.843	0.844	0.890	0.890

Table 3. KPIs and Borrower ESG Performance (ESG Rating: RepRisk)

Table 3 reports comprehensive analyses of the key performance indicators (KPIs) utilized in sustainability-linked loan (SLL) contracts. Panel A provides the frequency of KPIs by topical category. Panel B presents regression analyses of borrower ESG performance surrounding SLL issuance. The dependent variable, 'Neg_ESG', is an indicator assigned a value of one if a firm experiences negative ESG events corresponding to KPIs in SLL contracts and zero otherwise. The independent variable 'SLL' is assigned a value of one for SLL borrowers and zero for their non-SLL counterparts. The variable 'Post' is assigned a value of one for ESG ratings post-issuance and zero for pre-issuance ratings. The model accounts for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

Panel A: Summary statistics of KPIs

KPIs	Frequency	Ratio (%)
Climate change, GHG emissions, and global pollution	385	32.88
Energy management	128	10.93
Other ESG issues	80	6.83
Water management	69	5.89
Gender inequality	65	5.55
Waste issues	64	5.47
ESG ratings	47	4.01
Supply chain issues	46	3.93
Economic impact	36	3.07
Salaries and benefits	29	2.48
Occupational health and safety issues	28	2.39
Discrimination in employment	27	2.31
Social discrimination	22	1.88
Impacts on communities	21	1.79
Epidemics/Pandemics	18	1.54
Products (health and environmental issues)	15	1.28
Plastics	14	1.20
Poor employment conditions	8	0.68
Health impact	6	0.51
Human rights abuses and corporate complicity	6	0.51
Airborne pollutants	5	0.43
Coal-fired power plants	5	0.43
Water scarcity	5	0.43
Agricultural commodity speculation	4	0.34
Animal mistreatment	4	0.34
Impacts on landscapes, ecosystems and biodiversity	4	0.34
Security services	4	0.34
Access to products and services	3	0.26

Corruption, bribery, extortion and money laundering	3	0.26
High conservation value forests	3	0.26
Land ecosystems	3	0.26
Local pollution	3	0.26
Overuse and wasting of resources	3	0.26
Soy	3	0.26
Land mines	2	0.17
Racism/Racial inequality	2	0.17
Marine/Coastal ecosystems	1	0.09

Panel B: Borrower ESG performance around the issuance of SLLs

	(1)	(2)	(3)	(4)
Dependent Variable	Neg_ESG	Neg_ESG	Neg_ESG	Neg_ESG
SLL * Post	-0.003	-0.003	-0.003	-0.003
	(-0.132)	(-0.131)	(-0.196)	(-0.196)
SLL	-0.096***	-0.121***	-0.096**	-0.121**
	(-2.765)	(-2.597)	(-1.967)	(-1.980)
Post	0.033***	0.033***	0.033***	0.033***
	(4.193)	(4.179)	(5.039)	(5.034)
Borrower Country FE	Y	Y	Y	Y
Industry FE	Y	N	Y	N
Year FE	Y	N	Y	N
Borrower FE	Y	Y	Y	Y
Industry * Year FE	N	Y	N	Y
Clustering	Borrower	Borrower	Robust	Robust
Observations	3,228	3,228	3,228	3,228
R-squared	0.750	0.750	0.750	0.750

Table 4. Borrower ESG Performance (ESG Rating: S&P Global ESG)

Table 4 shows regression analyses of borrower ESG performance post-issuance of sustainability-linked loans (SLLs), using S&P Global ESG data. 'Post' is an indicator variable set to one for observations at one year (Columns 1 and 2) and two years (Columns 3 and 4) after SLL issuance. 'SLL' is an indicator variable assigned a value of one for SLL borrowers and zero for matched non-SLL borrowers. The model accounts for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Post Variable	1 year	1 year	2 years	2 years
Dependent Variable	SP_ESG	SP_ESG	SP_ESG	SP_ESG
SLL * Post	0.613*	0.613*	0.296	0.296
	(1.674)	(1.663)	(0.640)	(0.629)
SLL	0.614	0.611	1.582	1.623
	(0.913)	(0.902)	(0.907)	(0.915)
Post	0.656***	0.656***	0.566	0.566
	(5.767)	(5.730)	(1.166)	(1.143)
Borrower Country FE	Y	Y	Y	Y
Industry FE	Y	N	Y	N
Year FE	Y	N	Y	N
Borrower FE	Y	Y	Y	Y
Industry * Year FE	N	Y	N	Y
Clustering	Y	Y	Y	Y
Observations	1,365	1,365	338	338
R-squared	0.398	0.401	0.519	0.543

Table 5. Real Effects of SLLs on Borrowers' Environmental Performance

Table 5 presents the regression analyses of borrowers' greenhouse gas (GHG) emissions surrounding the issuance of sustainability-linked loans (SLLs). Columns 1 and 2 focus on GHG Scope 1, Columns 3 and 4 on GHG Scope 2, and Columns 5 and 6 on GHG Scope 3 Upstream. The dependent variable is the company's GHG emissions scaled by its revenue (unit: tCO2e/$M where tCO2e refers to tons of carbon dioxide equivalent). 'Post' is an indicator variable set to one for observations at one year (Panel A) and two years (Panel B) after SLL issuance. 'SLL' is a dummy variable assigned a value of one for SLL borrowers and zero for matched non-SLL borrowers. The model accounts for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

Panel A: GHG intensity one year after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)
Scope	Scope 1	Scope 1	Scope 2	Scope 2	Scope 3 Upstream	Scope 3 Upstream
Dependent Variable	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity
SLL*Post	41.187	47.449	3.218	4.681	7.707	8.057
	(1.131)	(1.257)	(0.615)	(0.822)	(1.476)	(1.514)
SLL	-85.351**	-84.769**	-10.210	-11.496	-10.579***	-9.781**
	(-2.147)	(-2.129)	(-0.911)	(-0.989)	(-2.598)	(-2.427)
Post	-90.070***	-92.114***	-5.027	-4.988	-10.257***	-10.401***
	(-3.549)	(-3.538)	(-1.433)	(-1.411)	(-4.147)	(-4.121)
Borrower Country FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N
Borrower FE	Y	Y	Y	Y	Y	Y
Industry * Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	1,961	1,960	1,961	1,960	1,961	1,960
R-squared	0.951	0.951	0.856	0.860	0.980	0.980

Panel B: GHG intensity two years after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)
Scope	Scope 1	Scope 1	Scope 2	Scope 2	Scope 3 Upstream	Scope 3 Upstream
Dependent Variable	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity	GHG Intensity
SLL * Post	113.104***	111.831***	3.363	1.462	11.638	12.153
	(2.725)	(2.589)	(0.503)	(0.218)	(1.485)	(1.502)
SLL	-53.152	-52.890	-8.173	-9.457	-7.085*	-6.204
	(-1.494)	(-1.484)	(-0.763)	(-0.856)	(-1.852)	(-1.647)
Post	-164.442***	-165.607***	-14.129***	-13.819***	-18.324***	-18.367***
	(-3.810)	(-3.757)	(-2.795)	(-2.750)	(-4.379)	(-4.312)
Borrower Country FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N
Borrower FE	Y	Y	Y	Y	Y	Y
Industry * Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	1,450	1,445	1,450	1,445	1,450	1,445
R-squared	0.944	0.944	0.869	0.874	0.979	0.980

Table 6. Bank Performance Before the Issuance of SLLs

Table 6 examines lenders' deposit and loan growth before the issuance of sustainability-linked loans (SLLs), with the dependent variable SLL taking the value of one for SLL-issuing banks and zero for matched peers issuing non-SLLs. Panel A includes the full sample, while Panel B restricts the sample to cases where the base reference rate is LIBOR. The model controls for lender country, year, and lender fixed effects. Standard errors are clustered by lender, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively. Variable definitions are provided in Appendix B.

Panel A: Analysis with full sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable:	SLL	SLL	SLL	SLL	SLL	SLL	SLL
ΔTotal Domestic Deposits	0.033						
	(0.082)						
ΔCustomer Demand Deposits		-0.071					
		(-0.396)					
ΔCustomer Savings Deposits			-0.153***				
			(-4.916)				
ΔCustomer Total Deposits				-0.206*			
				(-1.938)			
ΔCommercial and Industrial Loans					0.015		
					(0.107)		
ΔConsumer Loans						-0.129*	
						(-1.752)	
ΔLoans Net of Unearned Income Loans							-0.172
							(-1.199)
Lender Country FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y
Observations	342	355	216	668	355	357	658
R-squared	0.179	0.188	0.242	0.215	0.188	0.196	0.212

Panel B: Analysis with LIBOR sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable:	SLL	SLL	SLL	SLL	SLL	SLL	SLL
ΔTotal Domestic Deposits	-0.191						
	(-0.872)						
ΔCustomer Demand Deposits		-0.268**					
		(-2.689)					
ΔCustomer Savings Deposits			-0.258***				
			(-3.737)				
ΔCustomer Total Deposits				-0.280***			
				(-3.907)			
ΔCommercial and Industrial Loans					-0.108		
					(-0.874)		
ΔConsumer Loans						-0.158***	
						(-6.131)	
ΔLoans Net of Unearned Income Loans							-0.272***
							(-2.910)
Lender Country FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y
Observations	177	186	119	342	186	192	339
R-squared	0.140	0.169	0.265	0.193	0.162	0.188	0.191

Table 7. Bank Performance Around the Issuance of SLLs

Table 7 presents regression analyses of lenders' deposit and loan growth surrounding the issuance of sustainability-linked loans (SLLs). In Panel A, the Post variable represents measures of deposits and loans one year after issuance (value of one) compared to one year before issuance (value of zero). In Panel B, the Post variable considers measures of deposits and loans two years after issuance compared to one year before issuance. SLL is a dummy variable assigned a value of one for SLL-issuing banks and zero for matched peers issuing only non-SLLs in a year. The model accounts for lender country, year, and lender fixed effects. Standard errors are clustered by lender, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively. Variable definitions are provided in Appendix B.

Panel A: Bank performance one year after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable:	ΔTotal Domestic Deposits	ΔCustomer Demand Deposits	ΔCustomer Savings Deposits	ΔCustomer Total Deposits	ΔCommercial and Industrial Loans	ΔConsumer Loans	ΔLoans Net of Unearned Income Loans
SLL x Post	0.073**	0.196***	0.026**	0.057***	-0.019	-0.051***	0.000
	(2.560)	(4.522)	(2.362)	(3.585)	(-0.915)	(-3.754)	(0.006)
SLL	-0.045**	-0.104***	-0.083***	-0.039***	-0.007	0.011	-0.008
	(-2.625)	(-4.413)	(-2.845)	(-3.150)	(-0.450)	(0.481)	(-0.911)
Lender Country FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y
Observations	680	702	427	1,322	702	706	1,306
R-squared	0.350	0.440	0.173	0.359	0.328	0.309	0.334

Panel B: Bank performance two years after SLL initiation

Dependent Variable:	(1) ΔTotal Domestic Deposits	(2) ΔCustomer Demand Deposits	(3) ΔCustomer Savings Deposits	(4) ΔCustomer Total Deposits	(5) ΔCommercial and Industrial Loans	(6) ΔConsumer Loans	(7) ΔLoans Net of Unearned Income Loans
SLL x Post	0.076*	0.199***	0.070*	0.071***	0.011	-0.033	0.023
	(1.980)	(6.034)	(1.850)	(3.616)	(0.269)	(-1.321)	(0.971)
SLL	-0.041**	-0.107***	-0.073*	-0.043***	0.026	0.017*	-0.012
	(-2.487)	(-7.053)	(-2.003)	(-4.872)	(1.440)	(1.900)	(-0.907)
Lender Country FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y
Observations	641	662	408	1,180	643	647	1,164
R-squared	0.294	0.260	0.181	0.278	0.260	0.329	0.268

Table 8. SLL Borrower Risk: Probability of Default

Table 8 examines the probability of default (PD) measured over different time horizons, comparing sustainability-linked loan (SLL) and matched non-SLL groups. The dependent variable is SLL, assigned a value of one for SLLs and zero for their counterparts. The independent variable of interest represents a borrower's default probability measured over various time horizons ranging from 1 to 60 months after the SLL contract is initiated. Loan characteristics include loan type, purpose, amount, and maturity. The model controls for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

Panel A: Regressions without borrower fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	3 Months Before SLL Initiation					After SLL Initiation				
Dependent Variable:	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL
PD_6M	0.500					0.109				
	(0.753)					(0.084)				
PD_12M		0.167					-0.255			
		(0.350)					(-0.287)			
PD_24M			-0.120					-0.550		
			(-0.308)					(-0.896)		
PD_36M				-0.253					-0.642	
				(-0.728)					(-1.343)	
PD_60M					-0.339					-0.647*
					(-1.184)					(-1.898)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower FE	N	N	N	N	N	N	N	N	N	N
Loan Characteristics	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,651	2,651	2,651	2,651	2,651	2,273	2,273	2,273	2,273	2,273
R-squared	0.235	0.235	0.235	0.235	0.235	0.235	0.235	0.236	0.236	0.237

Panel B: Regressions with borrower fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(5)	(6)	(7)
	3 Months Before SLL Initiation					After SLL Initiation				
Dependent Variable:	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL	SLL
PD_6M	3.495					4.031				
	(1.496)					(1.347)				
PD_12M		2.087					1.625			
		(1.589)					(1.036)			
PD_24M			1.432					0.393		
			(1.632)					(0.435)		
PD_36M				1.295*					0.036	
				(1.658)					(0.052)	
PD_60M					1.268					-0.064
					(1.615)					(-0.117)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Loan Characteristics	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,196	2,196	2,196	2,196	2,196	1,861	1,861	1,861	1,861	1,861
R-squared	0.870	0.870	0.871	0.871	0.871	0.864	0.864	0.864	0.864	0.864

Table 9. SLL Borrower Risk: Downgrade and Default

Table 9 presents regression analyses of borrower downgrades (Columns 1 and 2) and defaults (Columns 3 and 4) over the life of loans. The Downgrade indicator takes the value of one if a borrower's S&P credit rating is downgraded during the loan's life and zero otherwise, while the Default indicator takes the value of one if a borrower fails to meet its financial obligation during the loan period (S&P long-term credit rating downgraded to D or SD) and zero otherwise. The main independent variable, SLL, is assigned a value of one for SLLs and zero for non-SLLs. Loan characteristics include loan type, purpose, amount, and maturity. The model controls for borrower country, two-digit SIC industry, year, and borrower fixed effects. Standard errors are clustered by borrower, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent Variable:	Downgrade	Downgrade	Default	Default
SLL	-0.002	0.027*	-0.000	0.001
	(-0.250)	(1.843)	(-0.058)	(0.836)
Borrower Country FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Borrower FE	N	Y	N	Y
Loan Characteristics	Y	Y	Y	Y
Clustering	Y	Y	Y	Y
Observations	4,120	3,517	4,120	3,517
R-squared	0.084	0.759	0.006	0.127

Table 10. Market Power

Table 10 examines the relationship between the issuance of sustainability-linked loans (SLLs) and a lender's market power, as measured by market capitalization and corporate lending market share. SLL is a dummy variable assigned a value of one for SLL-issuing banks and zero for matched peers issuing only non-SLLs in a year. A series of covariates of interest are dummy variables representing banks with market power. The model controls for lender country and year fixed effects. Standard errors are clustered by lender, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	SLL	SLL	SLL	SLL	SLL
High Mkt Cap (Top 5)	0.185***				
	(3.381)				
High Mkt Cap (Top 10)		0.179***			
		(4.305)			
High Mkt Cap (Top 15)			0.163***		
			(5.997)		
High Mkt Share (above Q50)				0.207***	
				(5.704)	
High Mkt Share (above Q75)					0.265***
					(8.270)
Lender Country FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Clustering	Y	Y	Y	Y	Y
Observations	1,153	1,153	1,153	951	951
R-squared	0.153	0.157	0.165	0.184	0.23

Table 11. Lending Relationship

Table 11 examines the relationship between the issuance of sustainability-linked loans (SLLs) and lending relationships, measured by Relationship Number, Relationship Length, and Ln(Cumulative Loan Amount). Relationship Number is defined as the total number of loan contracts initiated between a borrower and a lender since their first loan, while Relationship Length represents the number of years passed since their first loan contract. Cumulative Loan Amount refers to the total amount a firm has borrowed from a bank since their first transaction. The model controls for borrower country, lender country, two-digit SIC industry, and year fixed effects. Standard errors are clustered by borrower and lender, with t-statistics reported in parentheses. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	SLL	SLL	SLL	SLL	SLL	SLL
Relationship Number	0.001***	0.001***				
	(6.490)	(5.840)				
Relationship Length			0.006***	0.005***		
			(15.362)	(15.382)		
Ln(Cumulative Loan Amount)					0.012***	0.011***
					(16.861)	(16.855)
Borrower Country FE	Y	Y	Y	Y	Y	Y
Lender Country FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N
Industry x Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	47,797	47,782	47,797	47,782	47,793	47,778
R-squared	0.389	0.458	0.4	0.466	0.397	0.465