Who Benefits from Sustainability-linked Loans?[*]

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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 reveals SLLs do not have lower initial loan spreads and finds only mixed evidence that borrower ESG performance improves post-SLL. However, we observe that SLL lenders attract higher deposits after issuance, supporting increased lending. 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.

JEL Classification Codes: G20, G21, M14

Keywords: ESG; sustainability-linked loans; loan spreads; bank deposits; relationship lending

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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 reveals SLLs do not have lower initial loan spreads and finds only mixed evidence that borrower ESG performance improves post-SLL. However, we observe that SLL lenders attract higher deposits after issuance, supporting increased lending. 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 could attract more deposits through ESG signaling. Our study is designed to empirically answer these questions.

In order to empirically investigate SLLs, we assemble a dataset comprising 1,606 SLL facilities and 921 deals, sourced from Thomson/Refinitiv LoanConnector Dealscan during the period from January 2017 to December 2021. The Dealscan database offers comprehensive information on corporate loans, including key performance indicators incorporated into SLL contracts, which are linked to sub-components of RepRisk, our primary ESG score. For the sake of robustness, we also obtain sustainability performance data from S&P Global and Thomson/Refinitiv ASSET4. By matching borrowers and lenders to companies covered in Compustat and Compustat Bank, we are able to obtain relevant borrower and lender characteristics for our analysis.

Our analysis begins by documenting fundamental patterns observed in SLLs. First, SLLs have gained increasing prominence over time, with the total issuance escalating from $2,258 million (representing 0.04% of total corporate loan issuance) in 2017 to $634,863 million (8.17%) in 2021. Consequently, the average proportion of SLLs within a lender's loan portfolio has grown from 0.06% in 2017 to 9.45% in 2021. 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 (24.65%) and Western Europe (57.39%).

We proceed to investigate whether SLLs offer economic incentives to borrowers and contribute to improvements in their ESG performance. In our loan pricing analysis, we compare loan spreads for the same borrower and lender within the same year. This identification strategy effectively accounts for the influence of potential unobservable borrower and lender characteristics

on yield spreads. We do not identify a significant difference in at-issue loan spreads between SLLs and matched non-SLLs. However, SLL contractual terms are subject to adjustment based on borrowers' ESG performance throughout the loan's duration. Consequently, a straightforward comparison of loan spreads at issuance does not capture the essential features of SLL contracts. To gain a deeper understanding of the pricing implications of SLLs, we manually gather data on sustainability rate adjustments from the DealScan database. Our findings suggest that potential discounts for ESG performance do not appear to provide sufficient economic incentives for SLL borrowers to pursue substantial changes in their ESG profiles. Specifically, the typical borrower could expect a maximum reduction of only four basis points on their interest rate.

To investigate whether SLLs help borrowers commit to a predetermined set of sustainability goals, we compare an SLL borrower's ESG performance before and after the loan's origination. We manually gather specific key performance indicators (KPIs) integrated into SLL contracts and subsequently match each KPI to a corresponding RepRisk subcomponent. By contrasting the ESG performance of an SLL borrower around the issuance of an SLL with that of its peers, we aim to assess the effectiveness of these loans in achieving their intended objectives. Contrary to the original purpose of SLLs, our findings reveal that SLL borrowers are, in fact, more likely to encounter negative ESG events following the loan's issuance. This suggests that the penalty side of SLLs is the focus of lenders concerned about potential spillover from negative ESG events at their borrowers.

The low correlation across different ESG ratings is a well-established fact (Berg, Koelbel, and Rigobon, 2022). So, as a robustness check, we compare the overall sustainability performance of SLL borrowers using various ESG ratings. To achieve this, we match each SLL borrower with non-SLL borrowers within the same country, industry, and year in the 12 months preceding the

loan issuance. This approach ensures that any subsequent differences in borrower characteristics between the SLL and non-SLL samples reflect the impact of the SLL. Consistent with our previous findings, we do not observe evidence of improved ESG performance for SLL borrowers relative to their non-SLL counterparts. Consequently, it appears that SLLs do not effectively incentivize borrowers to enhance their ESG profiles, according to rating agencies.

Gauging ESG performance improvement solely based on third-party ESG ratings may subject our inferences to potential biases in ESG data. To mitigate this concern, we utilize greenhouse gas (GHG) emissions data obtained from Trucost Environmental to study the *real* impact of SLLs on borrowers' green performance. We find that SLL borrowers are more likely to reduce their GHG emissions following the origination of SLLs compared to non-SLL borrowers. Overall, our analysis of borrower ESG performance yields mixed evidence: even though our analysis of the potential spread adjustments and the ESG ratings data suggest that potential loan spread discounts may not offer sufficient economic incentives for SLL borrowers to pursue ESG improvements, results using GHG emissions data indicate some real improvement in environmental commitments.[4]

Next, we shift the focus of our analysis to the lenders. Specifically, we examine two potential benefits for lenders: attracting more deposits from ESG-conscious customers and selecting less risky borrowers through SLLs. Our results show that SLL lenders are able to attract more deposits than matched non-SLL lenders, allowing them to engage in more lending. This

[4] With mixed evidence suggesting borrowers benefit from a loan spread discount or improved ESG performance, we explore alternative financial incentives that could be driving the emergence of such loans. We investigate whether borrowers experience a significant improvement in financial performance around the origination of SLLs. Employing market-to-book ratio and profitability (ROA) as proxies for financial performance, our analysis does not reveal any evidence of improvement on the part of borrowers.

finding supports the hypothesis that entering into SLL contracts makes lenders more attractive to ESG-conscious depositors, leading to lending growth.

Turning to lenders' risk management concerns, we hypothesize that SLL borrowers are less risky in terms of default and credit risk, which could be either because SLLs are issued to safer borrowers 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. 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. We then examine borrowers' credit risk using credit downgrades and default events between SLLs and matched non-SLLs. Again, we find no evidence to support the hypothesis that SLL borrowers are safer (or riskier, for that matter) than non-SLL borrowers. 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 in which 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 both 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 (2023) suggests that banks with lower ESG reputations may offer favorable rates to ESG-focused borrowers as a way 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 banking has been studied in recent research by Amiram, Gavious, Jin, and Li (2023) and Kim, Kumar, Lee, and Oh (2023). Amiram et al. (2023) investigate the impact of the Equator Principles, an environmental and social risk management framework adopted by several large US banks, on loan contracts for their borrowers. The study finds an increase in environmental protection provisions in loan contracts, and a reduction in loan

spreads, particularly among borrowers who borrow from early adopters and borrowers who switch to banks that adopted the framework.[5]

The only existing empirical research on the SLL market that we are aware of is a contemporaneous study conducted by Kim et al. (2023), which characterizes 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 in the model with firm fixed effects. Furthermore, they find no pricing difference between ESG-linked loans and non-ESG loans. In contrast, our paper focuses on the economic incentives of lenders in the SLL market and presents the first evidence demonstrating that SLL lenders are more likely to experience growth in deposits and loans following SLL issuance. Our paper also contributes to a deeper understanding of SLLs by conducting a manual analysis of specific KPIs incorporated in SLL contracts and loan pricing adjustments. Moreover, using GHG emissions data enables us to accurately evaluate the actual 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. Notably, our findings reveal a reduction in GHG intensity among borrowers who have obtained SLLs, as compared to their non-SLL counterparts. These results highlight the fact that even when utilizing multiple ESG datasets for the purpose of ensuring robustness, precise estimates may not always be attained, or significant aspects of a firm's ESG efforts may be overlooked. Therefore, our study complements the literature on the explicit use of ESG

[5] It is important to note that the type of ESG-related covenants examined by Amiram et al. (2023) differ from those in SLL contracts. The covenants studied by Amiram et al. do not include contingencies related to loan spreads, unlike those found in SLLs.

information in debt contracts, which supplements the existing literature on the use of financial information in debt covenants.

More broadly, our study is related to the growing literature on sustainable finance. While the majority of prior studies have examined sustainable equity investing, with a focus 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), our study specifically examines the explicit use of ESG information in debt contracts. Our findings contribute to the understanding of the effectiveness of SLLs in incentivizing borrowers to improve their ESG performance and the role of lenders in adopting these contracts. Our study adds to the literature on sustainable finance and highlights the importance of incorporating ESG considerations in debt contracts in addition to equity investments.

Other recent studies have focused on sustainable debt instruments. Larcker and Watts (2020) find no pricing difference between green and non-green bonds in the market for municipal bonds. Flammer (2021) finds that investors respond positively to the issuance of green bonds and that issuers of green bonds improve their environmental performance post-issuance while experiencing increased ownership by long-term and green investors. Baker, Bergstresser, Serafeim, and Wurgler (2022) show that green municipal bonds are issued at a premium to otherwise similar ordinary bonds and that green bonds, particularly small or essentially riskless ones, are more closely held than ordinary bonds. Berrada, Engelhardt, Gibson, and Krueger (2022) examine the mispricing of sustainability-linked bonds. Different from these debt instruments, ESG lending involves formal, written contracts between a group of lenders and a borrower, unlike green bonds with informal use-of-proceeds expectations that are traded among a large number of investors.

Therefore, different economic forces may be at play, and monitoring strength could differ substantially between the lending and bond setting.

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, which is 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, which were 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 through the use of 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 choose to 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 the original loan agreement of BlackRock are provided in Appendix A. In the revolving credit agreement, Annex B outlines the sustainability fee adjustment and sustainability rate adjustment. 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

One of the defining characteristics of SLLs is the potential for borrowers to access discounted loan rates while retaining flexibility in the use of funds. Our first hypothesis relates to whether SLLs offer a lower loan spread compared to other types of loans. On one hand, three factors may contribute to a lower spread at contract initiation. First, borrowers who opt for SLLs

may inherently be less risky. Second, lenders may initiate SLL lending relationships and offer favorable loan spreads as incentives for borrowers to enter into these loans. Third, borrowers may demand a lower spread at loan initiation as compensation for the risk of potential penalties for failing to meet sustainability targets.

On the other hand, there are reasons why spreads at issuance may not be lower. For example, SLL borrowers may not necessarily be financially safer or have stronger bargaining power than non-SLL borrowers. Additionally, while SLL borrowers are entitled to a subsequent discount if they meet specific sustainability targets, the initial spread may not be advantageous. Finally, banks may propose SLLs to manage tail risk from borrowers with inherently greater ESG risk profiles. Taking arguments on both sides into account, our first hypothesis can be stated as follows.

H1a: SLLs have lower initial loan spreads than comparable non-SLLs.

In addition to a potentially lower cost of debt, SLLs may also provide a mechanism for borrowers to improve their overall sustainability performance, demonstrate their sustainability commitments to stakeholders, and deepen relationships with lenders (Sustainalytics, 2021). Our second hypothesis is that SLL borrowers will improve their ESG performance. While there are arguments both for and against this hypothesis, SLLs provide a way for borrowers to signal their genuine commitment to improving their sustainability profile by committing to a pricing matrix that has both rewards and penalties based on sustainability performance. However, it is also possible that some borrowers may use SLLs for window-dressing or impression management, especially when the economic benefits are negligible. Prior research has documented instances of firms engaging in green-washing practices.

H1b: SLLs lead to an improvement in the ESG performance of borrowers.

Unlike other sustainability finance instruments, where the company raising funds interacts with a large number of capital providers, SLL loan terms arise from a negotiation between borrowers and lenders. As such, the benefits of SLLs accruing to lenders are critical to understand.

By issuing sustainable loans, banks can signal their commitment to ESG considerations. 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 and initiator of SLLs, banks have an interest in maintaining the credibility of the sustainability-linked loan segment.[6]

We next investigate two potential benefits for lenders in SLL arrangements: increased deposit attraction and loan volume, and improved credit risk management. Anecdotal evidence suggests that demand depositors may be attracted to banks with strong ESG commitments, and SLLs may serve as an ESG label, increasing the attractiveness of banks that offer sustainable loans. However, prior research has also found 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). Thus, it is uncertain whether SLL lenders are better positioned to attract deposits.

Banks rely on demand deposits to fund their lending activities, creating liquidity on their balance sheets by financing less liquid assets with more liquid liabilities (Diamond and Dybvig,

[6] 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.

1983; Berger and Bouwman, 2009). However, the additional deposits necessary to fund the lending growth will not materialize if SLLs are perceived as green-washing or SLL lenders discourage deposit growth through lower deposit interest rates. Our hypothesis, stated below, also includes a parallel prediction for the loans made by banks that issue SLLs.

H2a: SLL lenders attract more deposits and make more loans relative to comparable non-SLL lenders.

Finally, we examine whether SLL borrowers exhibit lower credit risk than other borrowers. It is possible that SLL-issuing lenders have better risk management practices due to their adherence to ESG principles, which could translate into lower credit risk for borrowers. 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, while 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. This finding is supported by Hoepner et al. (2021), who find that engagements on ESG issues can benefit shareholders by reducing firms' downside risks.

However, there are opposing arguments that SLL borrowers may not necessarily exhibit lower credit risk. Becchetti, Ciciretti, and Hasan (2015), among others, suggest that 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 exhibit lower default risk profiles than non-SLL borrowers.

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." Our primary sample consists of 1606 SLL facilities (921 deals) from 53 borrowing countries, spanning the period from January 2017 to December 2021.

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, S&P Global,

and Thomson/Refinitiv ASSET4. 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.[7] 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.

[Table 1]

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 (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.[8]

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

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

[8] 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.

(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 SLL's 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.

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. Additionally, 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 in which SLL facilities are domiciled. Except for Singapore, all the top 10 countries are located 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?

We begin by investigating whether borrowers derive any benefits from SLL. Specifically, we focus on two types of benefits: advantageous loan pricing (H1a) and improved ESG performance (H1b).

4.1. Loan pricing

For the loan pricing analysis, we compare the yield spreads charged by banks between SLLs and non-SLLs. To isolate the effects of SLL from factors that are related to borrower characteristics, we restrict our analysis to a sample of borrowers utilizing both SLL and non-SLL loans. Our identification strategy consists of two alternative specifications that differ in how we select comparable non-SLL loans as the control sample.

In the first specification (Model 1), we compare the loan spreads charged to SLLs of a borrower with those charged to non-SLLs of the same borrower for a given loan issuance year. In the second specification (Model 2), we further control for the impact of lender characteristics and

lending relationship on loan pricing by limiting the sample used in Model 1 to loan facilities in which the spreads are charged by the same lender. That is, we compare yield spreads charged to the same borrower by the same lender in the same year. Model 2 effectively controls for unobservable borrower and lender characteristics that affect the pricing of loans. We exclude financial firms from the borrowing population. The analysis is based on the following regression:

$$\text{Ln(Spread)}_{i,j,t} = \alpha + \beta \cdot \text{SLL}_{i,t} + \theta_t + \nu_i + \chi_j + Z_{i,j,t} + \varepsilon_{i,j,t} \quad (1)$$

The dependent variable, Ln(Spread), is the natural logarithm of the loan spread over the London Interbank Offered Rate (LIBOR). The independent variable of interest is SLL, which takes the value one for SLLs of a borrower and zero for non-SLLs of the same borrower. To control for time trends and unobservable time-invariant heterogeneities of a borrower and a lender, we include fixed effects for year (θ_t), borrower (ν_i), and lender (χ_j). Loan characteristics such as loan type, loan purpose, issuance amount, and loan maturity are included in the vector $Z_{i,j,t}$. Standard errors are clustered by borrower to account for possible correlation within a borrower's multiple loan facilities.

[Table 2]

Table 2 presents the results of our analysis. Model 1 (Column 1) compares yield spreads within the borrower-year, while Model 2 (Column 2) compares spreads within the borrower-lender-year. Both models yield negative coefficients, but neither is significant. This finding rejects the hypothesis that SLLs offer borrowers lower loan spreads compared to comparable non-SLLs.

However, it should be noted that 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 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. However, 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.

4.2. Borrower sustainability performance

A natural question that follows is whether the ESG performance of borrowers improves after SLL origination. To investigate this, 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 KPI details for 566 (340) facilities (deals), and we identify 1,171 KPIs

embedded in SLL contracts. On average, there are 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.[9]

[Table 3]

Panel A of Table 3 presents a summary of 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, a majority of the indicators are based on a borrower's environmental or social performance, although ESG sub-components are not mutually exclusive to one another. In some cases, counterparties agree to use third-party ESG scores (4.01%) instead of predetermined specific performance indicators.

To compare an SLL borrower's ESG performance 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. 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 estimate the following equation to examine the relationship between an SLL borrower's ESG performance and the issuance of an SLL facility:

$$\text{Neg\_ESG}_{i,t} = \alpha + \beta \cdot \text{Post}_t + \zeta_b + \text{I}_{\text{Ind}} + \theta_t + \nu_i + \varepsilon_{i,t} \quad (2)$$

Equation (2) represents a regression analyzing borrower ESG performance around SLL origination. The dependent variable is the borrower's sustainability, measured by RepRisk sub-

[9] 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.

scores that are aligned with the identified KPIs of each SLL contract. The variable Post takes a value of one during the time period following the origination of the SLL, and a value of zero otherwise. If the contractual details of SLLs provide borrowers with incentives to improve their ESG profiles, the coefficient of Post should be negative. 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. We find that the coefficients on Post are significantly positive across all model specifications. In contrast to what might be expected, borrowers' sustainability performance deteriorates rather than improves post-SLL. This finding, along with the loan pricing analysis, casts doubt on the purpose of ESG loans that claim to promote the ESG goals of borrowers by incentivizing and rewarding companies for making positive contributions to the environment and society. Instead, it appears that SLLs provide lenders with protection against downside ESG risks from their borrowers.

As a robustness test, we examine whether the results are sensitive to the choice of ESG ratings data by comparing a borrower's overall ESG performance around the issuance of SLLs using three different ESG ratings: RepRisk, S&P Global ESG, and Thomson/Refinitiv Asset4. 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.[10] The unit of observation is a unique borrower-year. Table 4 reports the results of the analysis based on overall ESG ratings based on the following model:

$$ESG_{i,t} = \alpha + \beta \cdot Post_t \times SLL_{i,t} + \gamma \cdot SLL_{i,t} + \delta \cdot Post_t + \zeta_b + I_{Ind} + \theta_t + \nu_i + \varepsilon_{i,t} \quad (3)$$

[10] As a further robustness check, we replicated the analyses in Table 4 with additional matching variables, including loan primary purpose and loan type. The untabulated results indicate that our conclusions hold for all ESG scores used, further supporting our main findings.

The dependent variable in each panel is a borrower's sustainability score, which is measured by different ESG ratings, including RepRisk (Columns 1 and 2), S&P Global (Columns 3 and 4), and Thomson/Refinitiv ASSET4 (Columns 5 through 8). It is important to note that these ESG datasets have opposite interpretations, where a higher RepRisk score indicates worse sustainability performance while higher S&P Global and ASSET4 ratings indicate better sustainability performance. The variable Post takes the value of one for ESG scores one (Panel A), two (Panel B), or three (Panel C) years after loan origination, and zero for those one year before origination. SLL is a dummy variable that takes the value of one for SLL borrowers and zero for matched non-SLL borrowers. 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.[11] We include borrowing country (ζ_b), , two-digit SIC industry (I_{Ind}), year (θ_t), and borrower (ν_i) fixed effects as control variables. Standard errors are clustered by borrower.

[Table 4]

The findings of Table 4 suggest that SLL borrowers do not improve their ESG performance regardless of the ESG rating used or the model specification employed. It is notable that the SLL dummy itself is often positive and significant, suggesting that firms that already have good scores seek out SLL loans, perhaps because they will meet the SLL KPI goal without having to make any additional investments. Together with the results from Tables 2 and 3, these findings raise doubts about the effectiveness of SLLs in achieving their intended objective of incentivizing borrowers to improve their sustainability performance.

[11] 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.

4.3. 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 may present 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 that have established business connections compared to 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 lack of transparency makes it difficult to assess the accuracy and reliability of the scores. In a related vein, the measurement of a company's ESG performance is inherently subjective. As a result, determining which aspects of ESG performance are considered positive, and the extent to which they have a social impact, frequently involves a matter of 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 ("green washing").

We address these potential limitations by utilizing GHG emissions data from Trucost Environmental. This allows 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 the following regression models:

$$\text{GHG Intensity}_{i,t} = \alpha + \beta \cdot \text{Post}_t \times \text{SLL}_{i,t} + \gamma \cdot \text{SLL}_{i,t} + \delta \cdot \text{Post}_t + \zeta_b + \text{I}_{\text{Ind}} + \theta_t + \varepsilon_{i,t} \quad (4)$$

The dependent variable in our analysis is GHG emissions, which is normalized by a firm's revenue (unit: tCO2e/$M where tCO2e refers to tons of carbon dioxide equivalent). The results for Scope

1 emissions 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), two (Panel B), or three (Panel C) years after SLL initiation, while zero represents the year prior to initiation. Our model includes fixed effects for borrowing country (ζ_b), two-digit SIC industry (I_{Ind}), and year (θ_t). We cluster the standard errors by borrower.[12]

[Table 5]

The results of Table 5 reveal several intriguing patterns. Notably, the coefficients on the interaction terms are significantly negative for Scope 1 emissions. In contrast to the findings regarding borrowers' ESG performance using ESG ratings, the results are notable: SLL borrowers are more likely to reduce GHG emissions following the origination of SLLs compared to non-SLL borrowers. Specifically, the estimates indicate that SLL borrowers exhibit a decrease in Scope 1 emissions ranging from 130.78 to 242.21 tCO2e/$M (equivalent to 1.24 million to 2.49 million tCO2e) per year after the issuance of SLLs (Scope 1 emissions are those most directly within the control of the borrower). These values have significant economic implications. Building upon the findings of Adrian, Bolton, and Kleinnijenhuis (2022), who calculated the net present value of coal phase-out by employing a social cost of carbon at $80 per ton of CO2, our assessments of the effects of SLLs on social costs can be converted into a range of $99.2 million to $199.2 million annually for each firm. Our findings provide new and compelling evidence of *actual* changes in borrowers' sustainability practices associated with the issuance of SLLs, which are not adequately

[12] The R-squared values of models also incorporating borrower fixed effects range from 0.89 to 0.99, with most values approaching 1 across various panels and GHG scopes. However, due to potential statistical concerns like overfitting and multicollinearity, among others, we have chosen not to include borrower fixed effects in the model.

captured by relying solely on ESG ratings provided by third parties. Unfortunately, there is no way to establish whether the SLLs caused the reduction, as opposed to the reduction already being planned by a borrower that seeks an SLL in anticipation. Nonetheless, given the potential to be rewarded for GHG reductions through loan pricing, there must be an impact on the margin, suggesting that SLLs can have a positive influence on corporate environmental practices and contribute to sustainability efforts. Our analysis also suggests that relying on ESG ratings data may not capture the full picture of the consequences of SLLs.

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: 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:

$$SLL_{j,t} = \alpha + \beta \cdot Y_{j,t-1} + \eta_l + \theta_t + \chi_j + \varepsilon_{j,t} \qquad (5)$$

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]

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 "green washing," 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:

$$\Delta\text{Deposit (or Loan)}_{j,t} = \alpha + \beta \cdot \text{Post}_t \times \text{SLL}_{j,t} + \gamma\text{SLL}_{j,t} + \eta_l + \theta_t + \chi_j + \varepsilon_{j,t} \qquad (6)$$

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 have relatively lower loan growth in the period immediately following SLL origination, but this difference 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.[13]

5.2. SLL borrower risk

Next, we test the hypothesis (H2b) that banks issue SLLs to safe borrowers in order to reduce their exposure to credit risk. To examine this, we compare the probability of default (PD) between SLL borrowers and their non-SLL peers. The PD measure estimates the likelihood of a borrower failing to meet its financial obligations over different time horizons, ranging from 6 to 60 months. The empirical analysis is based on the following regression:

$$SLL_{i,t} = \alpha + \beta \cdot PD_{i,t\,(or,t-3)} + \zeta_b + I_{Ind} + \theta_t + \nu_i + Z_{i,j,t} + \varepsilon_{i,t} \qquad (7)$$

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 measured over different periods before and after the SLL contract is initiated. We use the PD data from the National University of Singapore's Credit Research Institute.[14] With this specification, we assume that our PD is a proxy for the bank's assessment of the borrower's likelihood of default, and our hypothesis is that lower-risk borrowers are more likely to be offered SLLs. We include borrower country (ζ_b), two-digit SIC industry (I_{Ind}), year (θ_t), and borrower (ν_i) fixed effects in the regression. 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]

[13] The results remain robust when we restrict our sample to instances where the reference base rate is LIBOR.
[14] For details of the PD measure, see https://d.nuscri.org/static/pdf/Probability%20of%20Default%20White%20Paper.pdf.

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. As such, the results reject the hypothesis that banks use SLLs to reduce their exposure to borrowers' default risk.

To further investigate whether SLLs are issued to safe borrowers, we compare the frequency of SLL downgrades and defaults with that of non-SLL downgrades and defaults.

$$\text{Downgrade (or Default)}_{i,j,t} = \alpha + \beta \cdot \text{SLL}_{i,j,t} + \zeta_b + I_{Ind} + \theta_t + \nu_i + Z_{i,j,t} + \varepsilon_{i,j,t} \quad (8)$$

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 is defined as a borrower's S&P long-term credit rating being downgraded to 'D' or 'SD'. SLL is the main independent variable, with a value of one for SLLs and zero for comparable non-SLLs. We control for borrower country (ζ_b), two-digit SIC industry (I_{Ind}), year (θ_t), and borrower (ν_i) fixed effects in the regression. Loan characteristics are included in the vector $Z_{i,j,t}$, which contains loan type, purpose, amount, and maturity. Standard errors are clustered by borrower.

[Table 9]

The results of our analysis are presented in Table 9. The coefficients on the SLL variable are statistically insignificant (except in Column 2) for both downgrade and default measures, suggesting that SLLs are not more likely to be issued to low-risk borrowers. These findings support the conclusion that banks do not employ SLLs as a means to mitigate their exposure to credit risk

from borrowers. Overall, the results suggest that sustainable lending practices are not primarily driven by considerations of credit risk.

6. What Drives the Issuance of 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. 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). We estimate the following regression:

$$SLL_{j,t} = \alpha + \beta \cdot Y_{j,t} + \eta_l + \theta_t + \varepsilon_{j,t} \qquad (9)$$

The dependent variable in this analysis 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 takes the value of one if the bank is in a position to exert its influence, 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.[15] 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 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. Cumulative Loan Amount is the 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:

$$SLL_{i,j,t} = \alpha + \beta \cdot Y_{i,j,t} + \zeta_b + \eta_l + I_{Ind} + \theta_t + \varepsilon_{i,j,t} \qquad (10)$$

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

[15] While lenders benefit from issuing SLLs, it remains unclear why their possible preference for SLLs does not lead to lower spreads in equilibrium. Our findings in Tables 3 and 4 show a decline in SLL borrowers' ESG performance after issuance, suggesting the need for banks to establish pricing protection proactively to mitigate potential ESG risks. Moreover, as shown in Table 10, an SLL bank's market power may impact loan pricing and rate adjustments.

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 the 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 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.

7. Concluding Remarks

In this study, we examine the economic incentives for SLL borrowers and lenders. Our findings indicate that loan spreads are not lower for SLL contracts, and there is mixed evidence that borrower sustainability performance improves after SLL initiation. SLL lenders can attract more deposits post-origination and consequently increase their loan volume. We do not find evidence that SLL lenders issue sustainable loans to safer borrowers. The maximum economic benefit to borrowers (from lower spreads) is small, and even if the loans are associated with some evidence of positive externalities from reduced GHG emissions, borrowers do not benefit from improved ESG ratings. Overall, our results suggest that the economic incentives driving the growth of SLL contracts are likely centered on the lenders, who capture most of the benefits from such loans.

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Appendix A: Sustainability Fee Adjustment and Sustainability Rate Adjustment in the BlackRock Example

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
ESG	ESG total score	RepRisk / S&P Global / Asset4
CESG	The weighted average of the ESG scores and ESG controversies score per fiscal period	Asset4
Neg_ESG	Negative ESG events	RepRisk
Spread	Loan spread (all-in-drawn) over LIBOR	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	Statista

	worldwide, and zero otherwise. Appendix C provides the list of the largest banks worldwide.	
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: 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

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)

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 Pricing

Table 2 presents regression analyses comparing loan spreads for sustainability-linked loans (SLLs) and their counterparts. Column 1 compares yield spreads within the same borrower-year, while Column 2 further refines 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 takes into account 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)
Dependent Variable:	Ln(Spread)	Ln(Spread)
SLL	-0.108	-0.098
	(-1.624)	(-1.094)
Ln(Amount)	-0.041	-0.003
	(-1.066)	(-0.071)
Ln(Maturity)	0.365***	0.129
	(7.843)	(0.947)
Year FE	Y	Y
Borrower FE	Y	Y
Lender FE	Y	Y
Loan Purpose & Type	Y	Y
Clustering	Y	Y
Observations	723	177
R-squared	0.977	0.961

Table 3. KPIs and Borrower ESG Performance

Table 3 summarizes key performance indicators (KPIs) used in sustainability-linked loan (SLL) contracts and examines borrower ESG performance around the issuance of SLLs. Panel A presents 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 of interest, Post, takes the value of one for ESG ratings after issuance and zero for those before issuance. 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
Post	0.032*	0.033*	0.032*	0.033***
	(1.870)	(1.930)	(1.866)	(2.638)
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
Clustering	Y	Y	Robust	Robust
Observations	1,078	1,078	1,078	1,078
R-squared	0.414	0.731	0.414	0.731

Table 4. Borrower ESG Performance Using Different ESG Ratings

Table 4 presents regression analyses of borrower ESG performance surrounding the issuance of sustainability-linked loans (SLLs), with Columns 1 and 2 based on RepRisk, Columns 3 and 4 on S&P Global ESG, and Columns 5 through 8 on Thomson/Refinitiv Asset4. Post is an indicator variable that takes the value of one for observations before SLL issuance. The sample includes one year before and one year after (Panel A), two years before and two years after (Panel B), and three years before and three years after (Panel C) 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.

Panel A: ESG performance one year after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	RepRisk	RepRisk	S&P	S&P	Asset4	Asset4	Asset4	Asset4
Dependent Variable:	ESG	ESG	ESG	ESG	ESG	ESG	CESG	CESG
SLL x Post	1.653	2.028*	-0.244	-2.324*	-0.003	-0.016	0.003	-0.019
	(1.409)	(1.850)	(-0.109)	(-1.665)	(-0.167)	(-1.229)	(0.176)	(-1.121)
SLL	1.002	-0.369	11.464***	1.139	0.091***	0.000	0.088***	0.005
	(1.071)	(-0.505)	(6.308)	(1.144)	(6.047)	(0.062)	(6.216)	(0.641)
Post	-1.727***	-1.783***	-2.911***	2.363***	0.033***	0.046***	0.018**	0.031***
	(-3.485)	(-3.653)	(-3.743)	(3.881)	(5.334)	(10.073)	(2.364)	(4.573)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Borrower FE	N	Y	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,041	1,554	2,042	1,390	2,663	2,201	2,663	2,201
R-squared	0.29	0.819	0.243	0.948	0.204	0.952	0.183	0.894

Panel B: ESG performance two years after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	RepRisk	RepRisk	S&P	S&P	Asset4	Asset4	Asset4	Asset4
Dependent Variable:	ESG	ESG	ESG	ESG	ESG	ESG	CESG	CESG
SLL x Post	1.176	2.632*	-2.206	-3.240	0.028	-0.011	0.034	-0.014
	(0.743)	(1.686)	(-0.742)	(-1.445)	(1.366)	(-0.880)	(1.551)	(-0.763)
SLL	0.901	-0.945	11.693***	1.697*	0.091***	-0.003	0.088***	0.000
	(0.937)	(-0.910)	(6.412)	(1.729)	(5.982)	(-0.414)	(6.197)	(0.048)
Post	-2.282***	-2.484***	-5.155***	1.744*	0.050***	0.066***	0.027**	0.042***
	(-3.296)	(-3.574)	(-4.020)	(1.780)	(5.349)	(10.205)	(2.404)	(4.198)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Borrower FE	N	Y	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,809	1,240	1,760	1,028	2,316	1,824	2,316	1,824
R-squared	0.274	0.778	0.241	0.943	0.208	0.958	0.193	0.9

Panel C: ESG performance three years after SLL initiation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	RepRisk	RepRisk	S&P	S&P	Asset4	Asset4	Asset4	Asset4
Dependent Variable:	ESG	ESG	ESG	ESG	ESG	ESG	CESG	CESG
SLL x Post	4.248	6.712**	-3.648	-6.413	0.011	-0.008	0.013	-0.019
	(1.323)	(2.232)	(-0.765)	(-1.606)	(0.345)	(-0.354)	(0.441)	(-0.896)
SLL	1.069	-0.041	11.723***	2.447**	0.089***	-0.003	0.085***	0.002
	(1.095)	(-0.040)	(6.430)	(2.144)	(5.872)	(-0.347)	(5.963)	(0.226)
Post	-3.578***	-3.888***	-7.254***	-2.596*	0.072***	0.080***	0.047***	0.055***
	(-3.426)	(-3.753)	(-4.171)	(-1.720)	(4.620)	(6.933)	(2.648)	(3.453)
Borrower Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Borrower FE	N	Y	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,557	897	1,500	735	1,982	1,444	1,982	1,444
R-squared	0.291	0.806	0.259	0.947	0.208	0.963	0.194	0.919

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 that takes the value of one for observations before SLL issuance. The sample includes one year before and one year after (Panel A), two years before and two years after (Panel B), and three years before and three years after (Panel C) 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 industry-by-year 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 x Post	-130.775**	-131.554**	-0.376	0.737	15.003	15.442
	(-2.323)	(-2.233)	(-0.051)	(0.098)	(1.215)	(1.235)
SLL	-61.622	-62.373	-1.342	-0.613	23.698	23.673*
	(-0.982)	(-0.972)	(-0.168)	(-0.075)	(1.635)	(1.654)
SLL	14.452	14.640	-0.519	-0.993	-3.249	-3.393
	(1.170)	(1.106)	(-0.327)	(-0.618)	(-1.162)	(-1.199)
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
Industry x Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	2,633	2,632	2,633	2,632	2,633	2,632
R-squared	0.279	0.288	0.121	0.145	0.523	0.536

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 x Post	-242.214***	-218.383**	-0.981	-2.291	29.498	30.907
	(-2.971)	(-2.505)	(-0.079)	(-0.166)	(1.338)	(1.372)
SLL	-56.307	-63.526	-2.275	-1.559	24.810*	24.031*
	(-0.885)	(-0.975)	(-0.268)	(-0.184)	(1.679)	(1.659)
SLL	29.074*	21.491	-0.576	-0.048	-3.952	-4.272
	(1.740)	(1.212)	(-0.225)	(-0.017)	(-0.789)	(-0.840)
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
Industry x Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	2,281	2,281	2,281	2,281	2,281	2,281
R-squared	0.267	0.276	0.123	0.145	0.524	0.537

Panel C: GHG intensity three 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 x Post	-237.107	-260.958*	-49.190*	-49.052*	-17.774	-11.727
	(-1.620)	(-1.848)	(-1.946)	(-1.740)	(-0.445)	(-0.311)
SLL	-45.570	-48.968	-2.548	-1.804	24.232*	22.873
	(-0.726)	(-0.762)	(-0.292)	(-0.207)	(1.684)	(1.618)
SLL	29.190	34.027	9.303	8.875	6.721	5.238
	(0.770)	(0.910)	(1.646)	(1.397)	(0.691)	(0.548)
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
Industry x Year FE	N	Y	N	Y	N	Y
Clustering	Y	Y	Y	Y	Y	Y
Observations	1,959	1,959	1,959	1,959	1,959	1,959
R-squared	0.251	0.259	0.127	0.150	0.513	0.527

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