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No. 712

Isabelle Cathérine Hinsche and  
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# **Mirror, Mirror on the Wall, Who Is Transitioning Amongst Them All?**

An Analysis of the Sustainability-Linked Bond Market's Efficiency in Attracting the Most Crucial Companies for a Successful Sustainability Transition

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## **Abstract**

In order to reach climate neutrality by 2050, the European Union is taking action in the form of extensive sustainability regulations with the aim to push the private sector towards sustainable economic activities. In this context, a new instrument to finance a company's sustainability transition has been developed: the sustainability-linked bond (SLB). This paper analyzes the SLB market's efficiency in attracting those companies that are most crucial for a successful sustainability transition, namely carbon-intensive companies and companies that are lagging behind in their sustainability transition, defined as ESG laggards. By developing a conceptual framework for the SLB market and running a probit and logit regression estimation, this paper shows that the SLB market efficiently attracts carbon-intensive companies, but fails to attract ESG laggards. Moreover, the paper identifies four success factors for the SLB market to improve its future accessibility and credibility.

JEL Classification: C25, G10, G14, G18, G38, Q01, Q58

Keywords: Sustainable Finance, Sustainability-Linked Bonds, Transition Financing, Sustainable Investing, ESG, Market Efficiency

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## 1. Introduction

The nations of the world are confronted with the challenge of climate change, as well as its ecological and societal consequences. They therefore increasingly make use of policy tools that try to achieve a transition towards more sustainable economic activities. The development of public policies to address climate change is known in the United States as the Green New Deal, whilst the European Union (EU) has adopted the European Green Deal. The latter, with a total promised budget of €600 billion, has set the political goal to reduce greenhouse gas emissions drastically and to become climate neutral by 2050 (European Commission, 2023a). However, public sector investments alone are insufficient to reach this target. The sustainable transition investment gap, in Europe alone, is estimated to be up to €290 billion annually (European Commission, 2020a).

Consequently, the EU introduced the European Green Deal Investment Plan, which incorporates three extensive legislations regarding the classification of sustainable activities, as well as transparent sustainability reporting and benchmarks. These regulatory requirements increase the pressure on the private sector to transition towards sustainable economic activities, thereby acquiring the necessary investments for a successful sustainability transition. The financial sector plays a key role in the implementation of these regulations. It has, on the one hand, incorporated sustainability criteria into investment and credit assessments to push investments towards sustainable activities and, on the other hand, developed specific financial instruments to finance particularly the sustainability transition.

Transition financing can be divided into two main groups, use-of-proceeds and sustainability-linked instruments. Use-of-proceeds instruments are restricted to financing or refinancing a classified sustainable project and can be issued independently of the issuer's sustainability (ICMA, 2021). One of the most commonly used instruments is a green bond, which assigns the proceeds to a green investment project. In contrast, sustainability-linked instruments take a company-level sustainability perspective and allow for proceeds to be used flexibly according to a company's investment strategy (ICMA, 2020). Moreover, the company needs to set overall sustainability targets in line with their economic activities and pays a financial penalty in the case of failure to achieve these targets, for instance in the form of a coupon step-up.

So far, research has focused on the pricing and credibility of sustainability-linked instruments. The sustainability-linked bond (SLB) is an attractive instrument for issuers to communicate

their transition strategy. It might even present an opportunity for issuers to receive a lower yield, a so-called premium, than they would have received for a comparable conventional bond (Berrada et al., 2022; Kölbel & Lambillon, 2022). Consequently, the SLB market has been growing rapidly in the last few years. Nevertheless, investors also show concern regarding the credibility and greenwashing potential of SLBs, especially in regard to the ambitiousness and materiality of sustainability targets and transition pathways (Vulturius, 2022; Liberadzki et al., 2021). However, the existing literature has not yet considered the efficiency of the SLB market in attracting those companies that are most crucial for a successful sustainability transition.

For a successful sustainability transition, carbon-intensive industries are imperative, as they promise the potential of high overall carbon emission reductions. Moreover, within the carbon-intensive industries, companies vary greatly in their progress to decarbonize and to transition their economic activities towards sustainability. Refinitiv sustainability ratings represent a company's relative sustainability performance respective to the industry level and thereby allow to differentiate between ESG leaders and ESG laggards, the latter defining companies which are lagging behind in their sustainability transition. Consequently, in order to ensure an economy-wide successful sustainability transition, the SLB market should attract particularly carbon-intensive industries and ESG laggards. But does the SLB market efficiently attract this target group?

This paper answers the question by developing a conceptual framework of the SLB market and subsequently testing the SLB market structures and accessibility to the relevant target groups. Based on the increasing pressure for transformation due to the implementation of sustainable finance regulations and the assumption of an efficient SLB market, carbon-intensive industries and ESG laggards should have a higher probability to issue a SLB. Moreover, the framework defines eight market, company and financial characteristics that could potentially influence a company's probability to issue a SLB through the established SLB market structures. One criterion is the issuer home market, which could influence the probability to issue a SLB apart from a company's industry and relative sustainability performance. The level of sustainability regulations adaptation differs even between EU countries and consequently leads to varying supportive environments, which could affect the attractiveness of the SLB market for issuers. Moreover, any potential effects of the issuer market are likely to become stronger for a more mature market, defining the second criterion, market maturity. Furthermore, the regulatory pressure of the sustainable finance regulations can vary depending on a company's size and

can thereby affect its probability to issue a SLB. Additional company characteristics, which could also have an influence on the probability to issue a SLB, are a company's credit rating and sustainable finance experience. Lastly, financial characteristics could also play an influential role, namely the financial instrument's issue size, maturity and currency, defining the sixth, seventh and eight criterion.

Based on the conceptual framework, the paper estimates the significance of the different influential variables on the probability to issue a SLB, using a probit choice model. Moreover, the estimations' robustness is tested using a logit choice model and the risk ratios for the respective significant variables are calculated. The regression analysis is run on a data sample that focuses on the European bond market and the sustainability transition of the real economy, thus omitting bond issues by financial and governmental institutions. The probit regression is run for a final sample consisting of 2,138 bonds, including normal, green, sustainability, social and (green) sustainability-linked bonds, which were issued by a total of 823 companies in the period September 2019 to November 2022.

The results show that the SLB market does indeed efficiently attract carbon-intensive industries. Being a company from the carbon-intensive materials or utilities sector more than triples the probability to issue a SLB. However, the SLB market does not efficiently attract ESG laggards. In fact, companies that have a below-average sustainability performance within their respective industry, and are thus considered ESG laggards, have an 80% decrease in the probability to issue a SLB.

Regarding the eight estimated market, company and financial characteristic effects, the results show that the first criterion, the issuer market, has a significant effect on the probability to issue a SLB, with a similar magnitude for the included EU countries. This indicates that the EU regulations create a comparable conducive investment environment. Secondly, the probability to issue a SLB increases with market maturity, implying further growth potential. Thirdly, the analysis shows that a company's size, measured in terms of both revenue and employee size, does not have a significant effect. Moreover, a company's sustainable finance experience, the fourth criterion, is insignificant. However, a company's credit rating at the time of the bond issuance, the fifth criterion, is significant, as companies with a lower credit rating are more likely to issue a SLB than companies with an upper investment grade credit rating. Regarding the financial characteristics, a bond's currency, the sixth criterion, does not have a significant

effect. But, the estimation results demonstrate a significant impact for bond issue size, the seventh criterion, as having a bond issue size larger than 1,250 million USD almost triples the probability to issue a SLB. Finally, for the eighth criterion, a bond's maturity, the analysis finds that a bond issuance with a maturity of five to ten years increases the probability to issue a SLB by 45%.

The paper contributes to the existing literature by analyzing the efficiency of the SLB market and by identifying four success factors for the SLB market to improve its accessibility for potential SLB issuers and credibility amongst sustainable investors. For a successful sustainability transition, the SLB market needs to attract those companies that are most crucial for advancing the economy's transition. This means that the SLB market needs to ensure the accessibility and market structures to particularly attract carbon-intensive industries and ESG laggards. This research paper shows that the SLB market efficiently attracts carbon-intensive companies, but fails to engage companies that are lagging behind in their sustainability transformation. These ESG laggards need to be particularly targeted, as they should have a substantially high incentive to transition their economic activities, based on the pressure for transformation through sustainable finance regulations. Consequently, the findings of this paper imply the need for sustainability policies, market structures and instruments that are especially adapted for ESG laggards.

The paper is structured as follows: section 2 gives an introduction to transformation policy measures and financing instruments, as well as the sustainability-linked bond market, and relates it to the relevant literature on sustainability-linked bonds. Section 3 develops the conceptual framework for the SLB market structures and potentially influential factors. Based on this framework, Section 4 first defines and subsequently gives a summary of the chosen data sample. Moreover, the empirical methodology is explained and the regression estimations and variables are outlined. Section 5 presents the findings of the regression analysis in regard to the SLB market's efficiency, as well as the impact of the market, company and financial characteristics. Finally, section 6 identifies four success factors for a further improvement of the SLB market and concludes by suggesting areas for future SLB market research.



## 2. Literature Review

### 2.1 The European Green Deal Investment Plan

In December 2019, the European Commission presented the European Green Deal, with the aim to transform the European Union (EU) into a modern, resource-efficient and competitive economy (European Commission, 2023a). One of the biggest goals is to reduce greenhouse gas emissions by at least 55% by 2030 and to be climate-neutral by 2050. In order to achieve these targets, Europe requires between €175 and €290 billion in annual sustainability transition investments for the upcoming decades (European Commission, 2020a). The EU has committed to contribute €600 billion for the sustainability transition through the EU budget and the Next Generation EU Recovery Plan, but this public sector contribution is far from closing the green finance gap (European Commission, 2023a). Consequently, the EU developed a European Green Deal Investment Plan, which was published in January 2020 and plans to mobilize at least €1 trillion of sustainable investments over the next decade, primarily through the private sector (European Commission, 2020a). The investment plan entails three main legislations, which are supposed to incentivize and channel private sector investment into a green and sustainable transformation.

The first key legislation is the EU Taxonomy, which is a unified classification of economic activities in regard to their sustainability contributions (European Commission, 2021). This is supplemented by several disclosure legislations, such as the Sustainable Finance Disclosure Regulation (SFDR) and the Non-Financial Reporting Directive (NFRD), which will soon be replaced by the Corporate Sustainability Reporting Directive (CSRD)<sup>1</sup>. These legislations ensure improved transparency concerning non-financial information, which is necessary for investors to make informed sustainable investment decisions (European Commission, 2021). Finally, the EU has developed several tools to aid companies and financial intermediaries in setting ambitious sustainability goals and preventing greenwashing. This includes the EU Climate Benchmark Regulation, which consists of the EU climate transition and Paris-aligned benchmarks<sup>2</sup>.

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<sup>1</sup> The SFDR defines sustainability disclosure obligations for financial institutions and financial advisors. The NFRD requires companies to report on both, how climate change affects their business and how their business impacts the climate. On January 5<sup>th</sup> 2023, the NFRD was replaced by the CSRD, strengthening the reporting rules and expanding the mandatory corporate sustainability reporting to a larger set of companies (European Commission, 2023b).

<sup>2</sup> The EU climate transition benchmark (EU CTB) and the EU Paris-aligned benchmark (EU PAB) aim to improve ESG transparency and comparability among benchmarks, as well as to provide minimum technical requirements to avoid greenwashing (European Commission, 2023b).

## 2.2 Transition Financing

Through the three key legislations, the EU Green Deal Investment Plan increases transparency and improves the disclosure of non-financial information, thereby pushing the private sector towards more sustainable economic activities (Schütze & Stede, 2021). For the successful implementation of these legislations, the financial sector is being actively involved to adopt the regulatory requirements in the form of adjusted financing instruments and revised risk assessment methods that incorporate sustainability criteria, among others. Moreover, financial institutions are expected to ensure the climate-alignment<sup>3</sup> of their portfolios and are thereby driven to increase low-carbon investments and to support the transition of carbon-intensive sectors (Platform on Sustainable Finance, 2021). Among the most prominent tools to advance the economy's sustainability transition are sustainable finance instruments. In order to ensure a real economic impact, the instruments need to encourage Paris-aligned economic activities, which means activities in line with the goals of the Paris Agreement, such as limiting global warming to well-below 2°C, and to enable issuers to manage their climate-related risks (Caldecott, 2020). For instance, sustainable finance instruments can incentivize companies to align their practices to a zero-emission future by reducing the cost of capital for Paris-compatible activities (Caldecott, 2020).

One of the most influential levers for a company's sustainability transition is debt financing, which led to the growing market of transition financing. Transition financing can be divided into two major categories, use of proceeds instruments and sustainability-linked instruments<sup>4</sup>. Use of proceeds instruments are characterized by the restrictive allocation of proceeds to classified environmental or socially beneficial projects (CBI, 2022a). The most common use of proceeds instrument is a green bond, which allocates all proceeds to a predetermined climate or environmentally valuable project (Hinsche, 2021). In contrast, sustainability-linked instruments allow for proceeds to be used for general purposes, thereby taking a company-level sustainability perspective, rather than a project focus (ICMA, 2020). One prominent example of this category is the sustainability-linked bond.

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<sup>3</sup> A climate-aligned portfolio takes into account the necessary emission reductions to reach the 1.5°C target.

<sup>4</sup> In some cases, the two instruments are combined, leading to a green sustainability-linked bond, for example.

### 2.3 Sustainability-Linked Bonds

According to the Sustainability-Linked Bond Principles (SLBP), a SLB is a financial instrument, which defines company-level sustainability targets and demands a penalty, for example in form of a coupon step-up, if the company should fail to meet its targets (ICMA, 2020). In advance of the issuance, the company defines Key Performance Indicators (KPIs) that measure the respective sustainability targets, as well as Sustainability Performance Indicators (SPTs), which indicate the desired level of the KPIs<sup>5</sup>. Both, KPIs and SPTs, are reported in the SLB Framework, as well as the timeline for the achievement of the KPIs. Moreover, the issuer decides which bond characteristic they would like to tie to the fulfillment of the KPIs and what the penalty scenario should be. The most commonly used bond adjustment in case of failure to reach the sustainability targets is a coupon step-up (Vulturius, Maltais & Forsbacka, 2022). The International Capital Markets Association (2020) recommends that the SLB Framework is verified through an external and independent party in form of a Second Party Opinion, certifying that the SLB issuance is in line with the SLBP.

### 2.4 Sustainability-Linked Bond Market

Sustainability-linked instrument issuances have increased rapidly in the last three years, with sustainability-linked bonds being the fastest-growing segment of the sustainability bond market (Vulturius et al., 2022). SLBs make up 11% of total sustainable finance debt issuances in the first half of 2022, even though the first SLB was issued only in December 2018 (CBI, 2022a). The growth is likely driven by the fact that SLBs can be used by a broader range of issuers compared to green bonds. For instance, companies that would not be able to issue a green bond, due to insufficiently large capital expenditures connected to a potential sustainability project, can issue a SLB (CBI, 2022a). Moreover, companies can use existing company-level sustainability performance indicators and reporting structures to set KPIs and SPTs, instead of setting up project-level tracking and reporting practices. This is especially attractive for smaller issuers, as it lowers issuance costs. Furthermore, SLBs offer companies the opportunity to signal their sustainability strategy and give them more flexibility in how to use the proceeds to achieve their successful sustainability transition (Liberadzki, Jaworski & Liberadzki, 2021). This is crucial, especially for carbon-intensive industries, because financial

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<sup>5</sup> KPIs can consist of environmental, social, as well as governance criteria and can either be measured by an external ESG rating or predefined metrics, for example greenhouse gas (GHG) emission intensity. SPTs set the desired level of achievement, which in the case of a greenhouse gas emission (GHG) intensity metric would be measured in gCO<sub>2</sub>/kWh.

institutions are increasingly incorporating sustainability indicators in their risk assessments and credit analysis (BaFin, 2019). Consequently, companies have to be able to either already perform well in regard to their sustainability or to provide a credible transition plan to improve their sustainability.

The increased demand for SLBs has fueled a discussion about the pricing mechanisms and the existence of a potential premium for issuers, similar to the so-called Greenium in the green bond market. Even though the existence of a Greenium in the green bond market is still being debated (Hinsche, 2021) and the SLB market is still very young, there are two research papers which try to detect a potential premium for SLB issuers. Kölbel and Lambillon (2022) apply a matching method in their research, which has also been used in a similar manner to calculate a potential green bond premium (Zerbib, 2019, Larcker & Watts, 2020; Flammer 2021). They find a statistically significant average sustainability premium of -29.2 bps, indicating that issuers can benefit from a SLB issuance. Employing a similar method, an analysis by the Climate Bond Initiative (2022b) supports these results, as they find 14 SLBs in the years 2021 and 2022 that were priced with a significant premium, ranging from -4 bps to -34 bps.

Moreover, Kölbel and Lambillon (2022) show that the average penalty coupon step-up is lower than the average sustainability premium, indicating that companies could benefit from lower costs of capital even in the scenario that they fail to achieve their sustainability performance targets. These results suggest that there could be a “free lunch” for SLB issuers. However, the authors also point out that one-third of SLB issuers do not benefit from a premium at all, showing that the SLB market is still very young and that pricing mechanisms are very volatile. The second paper searching for a potential SLB premium, by Berrada, Engelhardt, Gibson and Krueger (2022), makes use of a one-period SLB pricing model to measure and analyze the potential mispricing of SLBs. The authors demonstrate that one-quarter of SLBs is overpriced at issuance and will experience a following price drop in the secondary market. This indicates that the industry overestimates SLB issuance benefits, which leads to a price premium for issuers (Berrada et al., 2022).

## 2.5 Risks and Challenges for Sustainability-Linked Bonds

As explained above, SLBs offer a great opportunity for companies to finance their sustainability transition. However, researchers and financial market participants are also pointing out potential problems in regard to a SLB’s credibility and effectiveness. For instance,

the ICMA (2020) recommends using science-based emission targets to ensure that a company's sustainability transition is Paris aligned. However, it does not define how to evaluate a KPI's and SPT's ambitiousness in relation to different sectors and how to assess the target's materiality regarding the company's sustainability transition (Vulturius, 2022). Consequently, companies might choose more feasible SPTs, thereby decreasing a SLB's transition effectiveness. Moreover, as SLBs are general-purpose instruments, investors are skeptical about the lack of transparency regarding the use of proceeds and their contribution to the issuer's sustainability transition (Liberatore, 2021).

Furthermore, investors are skeptical about whether the penalty coupon step-up is high enough in most cases, to ensure sufficient incentivization for companies to prioritize their sustainability transition. In fact, Kölbel and Lambillon (2022) show that companies might benefit from a "free lunch", suggesting that SLB penalty coupon step-ups are not high enough. Finally, SLB investors are concerned about the potential reputational harm of profiting from a margin adjustment in case the SLB issuer should fail to reach their targets (Wass, 2021). Overall, there is substantial greenwashing concern from both, the issuer side in regard to choosing the right KPIs and SPTs, as well as the investor side (Natixis, 2021).

So far, research has focused on the functionality of a SLB's incentive characteristics and the pricing mechanisms in the market. However, in order to ensure a successful transition towards a zero-emission economy, the type of SLB issuer is crucial as well. In fact, high-emitting sectors are imperative for an economy-wide transition (CBI, 2022a). Moreover, within these high-emitting sectors, companies differ vastly in their progress with regard to decarbonization and their sustainability transition. Refinitiv (2022) calculates ESG<sup>6</sup> ratings that evaluate a company's sustainability level relative to the respective industry level. For instance, Shell PLC, one of the biggest oil and gas companies worldwide, has a Refinitiv ESG Rating of A+, which marks it as an ESG leader (Refinitiv, 2023). Even though the industry itself is very carbon-intensive, Shell PLC has the best sustainability performance relative to all 404 rated companies in the oil and gas industry. Taking this into consideration, a successful transition not only includes carbon-intensive industries but especially needs to target companies that are falling behind, subsequently termed as ESG laggards. Consequently, an efficient SLB market with the

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<sup>6</sup> ESG ratings contain ecological, social and governance criteria to assess a company's sustainability level.

goal of a successful economy-wide sustainability transformation requires accessibility and market structures that particularly attract carbon-intensive industries and ESG laggards.

### **3. Conceptual Framework**

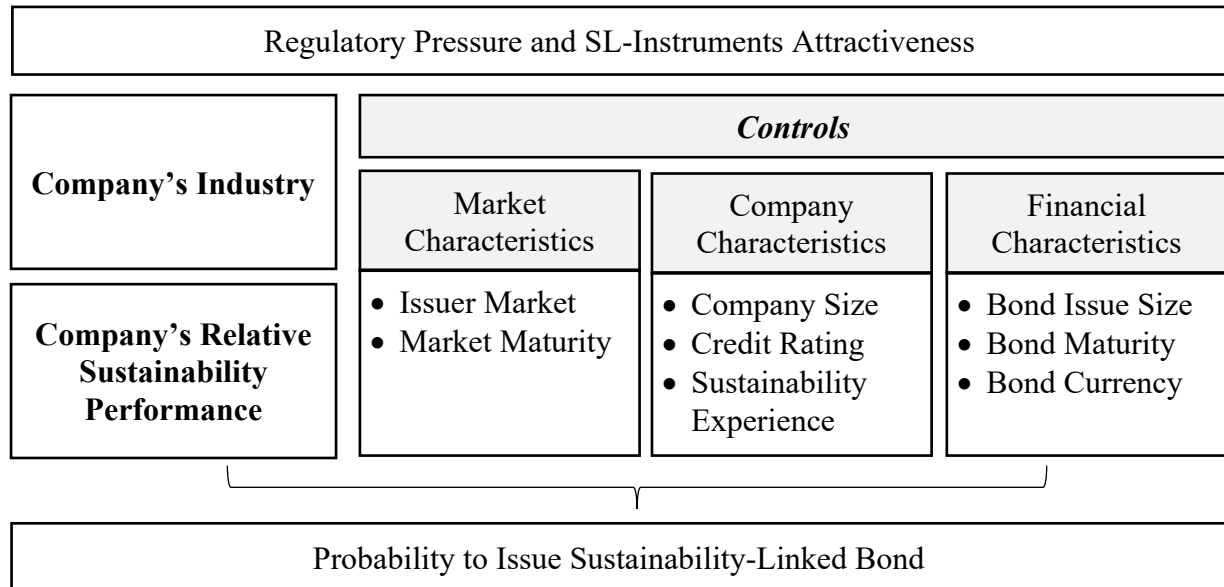
The following section develops a conceptual framework to assess the efficiency of the regulatory pressure for transformation and the SLB market in attracting those companies that are crucial for a successful sustainability transition. With the overarching goal to achieve the 2°C Paris target, the sustainability legislations should create pressure particularly for carbon-intensive industries and ESG laggards to transform their economic activities, as explained above. Complementary, the SLB market should offer an attractive environment for these companies to finance their sustainability transition. The efficiency of the sustainability legislations and the SLB market in attracting carbon-intensive industries and ESG laggards is measured through the probability to issue a SLB. Based on the pressure for transformation through regulatory requirements and the assumption of an efficient SLB market, carbon-intensive industries and ESG laggards should have a higher probability to issue a SLB compared to low-carbon industries and ESG leaders. The subsequent analysis tests this hypothesis by estimating the probability to issue a SLB based on a company's industry and sustainability performance, while controlling for influential market, company and financial characteristics. The following framework defines the potential criteria which could represent either possible barriers to entering the SLB market or opportunities to more precisely address carbon-intensive ESG laggards. As seen in figure 1, the framework divides the potentially influential factors into five broad categories, including a company's industry and relative sustainability performance, as well as market, company and financial characteristics.

#### **3.1 Sustainability Transformation Target Groups**

Due to the fact that companies from carbon-intensive industries have a higher pressure to implement their sustainability transformation, as explained above, they should have a higher probability to issue a SLB to obtain debt financing and to communicate their transition strategy. As of January 27<sup>th</sup> 2023, there are 773 SLBs outstanding, with the majority of issuers coming from the industrials (19%), materials (17%) and utilities (15%) sectors (see figure 2 in the appendix). This indicates that companies from carbon-intensive sectors are already present in the SLB market. Nevertheless, the SLB market might be less receptive to carbon-intensive companies, due to investor concern regarding greenwashing and transition credibility, as explained above. Consequently, companies from carbon-intensive industries would have to

overcome a higher entry barrier to the SLB market than low-emission companies, making them more hesitant to choose a sustainability-linked structure for their financing instrument.

Figure 1. SLB Market Structure



Source: Isabelle Hinsche

Moreover, companies that are lagging behind in terms of their sustainability performance and transition should have a higher incentive and consequently a higher probability to issue a SLB. However, in order to issue a SLB, companies have to choose appropriate KPIs and SPTs. This process is likely easier for companies that already have an existing sustainability strategy or are at least aware of their own sustainability performance, for instance in the form of an ESG rating. Moreover, an ESG rating might also improve a company's transition credibility amongst sustainability investors. The influence of sustainability knowledge and credibility in the sustainable finance market would suggest that companies which lack an ESG rating might have to overcome a higher barrier to enter the SLB market.

### 3.2 Market Characteristics

Market characteristics might influence the probability to issue a sustainability-linked instrument through several channels. First, the level of adaptation of sustainability regulations can differ between countries and consequently lead to varying supportive environments. For instance, Steffen (2021) shows that even though a lot of green financial policies are decided on the EU level, adaptations on a country level can diverge. By conducting a comparative analysis

of green financial policy output among OECD countries, he shows that France, UK and the Netherlands have the highest green financial policy density among European countries. This is supported by findings from D’Orazio and Thole (2022), who develop an index to analyze country-level engagement in climate-related policies. According to their results, France and the Netherlands have the highest climate-related financial policy index (CRFPI) followed by Germany, UK and Sweden. Moreover, not only do countries differ in regard to the number of sustainability regulations but D’Orazio and Thole (2022) also find that a higher density of regulations has a significant impact on climate change mitigation. D’Orazio and Dirks (2022) demonstrate that both, short-term and long-term climate-related financial policies have a negative effect on a country’s carbon emissions. This shows that the density and the type of country-level regulations create differing market environments that ultimately affect an economy’s transition outcome. Consequently, the issuer market could likely influence the probability to issue a SLB. Furthermore, a more mature SLB market, with a higher number of established issuers and lower pricing volatility, is likely to attract more companies. Overall, the issuer market and the SLB market’s maturity could potentially influence the probability to issue a SLB.

### 3.3 Company Characteristics

Regarding the potential influence of company characteristics, the first aspect is a company’s size. As the EU sustainability legislations apply to companies based on their employee count, smaller companies might not need to adhere to regulations such as the NFRD<sup>7</sup> yet and are therefore exposed to a lower regulatory pressure than larger companies. Moreover, issuing a financing instrument with a sustainability structure involves additional costs in terms of both, financial and administrative costs (Gianfrate & Peri, 2019). These costs are relatively lower for larger companies, as they primarily consist of a fixed component, and could thereby influence a company’s probability to issue a SLB. Secondly, the company’s financial background, measured in terms of credit rating, could also have an effect on a potential SLB issuance. On the one hand, if a company has a lower credit rating than competitors, it could aim to improve the attractiveness of its financing instrument by choosing a sustainable structure. On the other hand, the SLB market could be less receptive to issuers with a low credit rating, creating a market barrier. Finally, a company’s experience with sustainable financing instruments might

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<sup>7</sup> The NFRD currently applies to public-interest companies with an employee count larger than 500 (European Commission, 2023b).



have an influence on the probability to issue a SLB as well. For instance, if a company has already issued another type of sustainable financing, such as a green bond, they might profit from an existing sustainability reporting structure, as well as an established credibility amongst investors and consequently confidence regarding the use of sustainable financing instruments.

### 3.4 Financial Characteristics

The last category of potentially influential factors are financial characteristics, representing the company's financing needs. First, the company's desired issue size for the financing instrument could play a role in the decision regarding a sustainability-linked structure. Because the issuance of a sustainability-linked instrument is relatively more costly, as explained above, a company might be more likely to choose a sustainability-linked structure for a larger issuance size, especially if they hope to profit from a pricing premium compared to a conventional bond structure. Moreover, also the desired financing length and currency could potentially influence the decision for a SLB issuance. Overall, the conceptual framework has identified eight different market, company and financial characteristic channels (see figure 1) that could influence the probability of a SLB issuance, apart from a company's industry and sustainability performance. Based on this framework, their respective significance and effect will be assessed in the next section.

## 4. Methodology

### 4.1 Probit Choice Model

Based on the developed conceptual framework for the SLB market in section 3, the following analysis uses a probit choice regression model to assess whether the current regulatory pressure for transformation and the SLB market structures successfully attract carbon-intensive industries and ESG laggards. For this purpose, the regression estimates a company's probability to issue a SLB based on its industry and relative sustainability performance. The binary outcome variable is the observation that the bond has a sustainability-linked structure or not. The independent variables are chosen according to the influential factors determined in the conceptual framework. The subsequent regression analysis determines the significance of the respective independent variables and the likelihood of a sustainability-linked structure based on the assessed significant factors, using a standard normal cumulative distribution function. The robustness of the analysis will be tested by additionally running the regression using a logit choice model, based on a logistic cumulative distribution function. Finally, the

respective risk ratios of the significant influential factors will be calculated based on the logit regression coefficients, in order to obtain a comparable measure of influence.

#### 4.2 Data and Sample Selection

The analysis focuses on the European SLB market, more precisely on countries for which the European sustainable finance legislations, such as the EU Taxonomy and NFRD, apply and for which issuers are thus embedded in a common regulatory environment with a unified understanding of sustainability. Consequently, it only includes issuer entities that are part of the European Union. The first SLB in the European market was issued by Enel S.p.A. on 10.09.2019. Therefore, the database includes all public bond issuances from 01.09.2019 until 02.11.2022. Moreover, as the analysis wants to evaluate the efficiency of the SLB market structures, the market itself should have reached a certain level of maturity, in order to reduce potential effects due to the infancy and volatility of the market. Therefore, the sample only includes SLB markets that have at least five different SLB issuers on a country level. Finally, this paper focuses on the SLB market mechanisms and the sustainability transition of the real economy. Therefore, the sample excludes financial and governmental institutions as bond issuers. Applying these rules to the database, the final sample consists of 2,138 bonds, including normal, green, sustainability, social and (green) sustainability-linked bonds. The primary data source for the identification of the bond sample and the subsequent analysis is Bloomberg, as well as Refinitiv for the companies' ESG and environmental rating data. The respective Bloomberg and Refinitiv data points are matched based on the individual bond's ISIN.

#### 4.3 Data Summary

The sample includes 823 companies that have issued at least one bond in the time from 01.09.2019 until 02.11.2022, out of which 85 companies have issued at least one SLB. As seen in table 1a, France has the highest number of companies that have issued at least one SLB, in the following denoted as SLB companies, followed by Luxembourg and the Netherlands. Austria and Germany only have six SLB issuers each, but Austria has the highest density of SLB issuers. In fact, more than a quarter (27%) of the companies that were active in the debt financing market from 2019 until 2022 have issued a SLB. The majority of SLB companies comes from the materials (21%), industrials (16%) and consumer discretionary (16%) sector (see table 1b). This is in line with the observation by CBI (2023) that the worldwide SLB market already includes some issuers from carbon-intensive sectors.

Table 1. Company and Bond Level Summary Statistics

a. Company's Country of Domicile

Country	Has Issued SLB Indicator		
	0	1	Total
Austria	16	6	22
Germany	102	6	108
France	136	23	159
Italy	95	12	107
Luxembourg	116	14	130
Netherlands	171	13	184
Sweden	102	11	113
<b>Total</b>	<b>738</b>	<b>85</b>	<b>823</b>

Source: Bloomberg as of 02.11.2022.

b. Company's Industry

Industry	Has Issued SLB Indicator		
	0	1	Total
Communications	61	4	65
Consumer Discretionary	175	14	189
Consumer Staples	54	11	65
Energy	43	4	47
Health Care	73	6	79
Industrials	133	14	147
Materials	89	18	107
Technology	54	3	57
Utilities	56	11	67
<b>Total</b>	<b>738</b>	<b>85</b>	<b>823</b>

Source: Bloomberg as of 02.11.2022.

c. Company's ESG Rating

ESG Rating	Has Issued SLB Indicator		
	0	1	Total
A+	53	14	67
A	291	21	312
A-	200	29	229
B+	253	10	263
B	63	7	70
B-	58	4	62
C+	34	1	35
C	52	1	53
C-	8	0	8
D+	4	0	4
D	2	0	2
D-	22	0	22
NR	956	55	1011
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Refinitiv as of 02.11.2022. Company's ESG rating at the time of issuance.

Looking at companies' sustainability performance, 14% of currently ESG-rated companies have issued a SLB, compared to only 8% of non-ESG-rated companies (see table 2a, appendix). This could indicate that an ESG rating increases the probability to enter the SLB market. However, the biggest group of sustainability-linked issuers (38%) does not have an ESG rating, indicating that an ESG rating might not necessarily be an entry barrier to the market. Taking a closer look, the majority of companies that have an ESG rating at the time of issuance either have an A+, A or A- rating (see table 1c). In fact, 26% of companies with an A+ ESG rating, which thereby belong to the top sustainability performers within their respective industries, have issued a SLB. This suggests that the majority of SLB issuers already have an above-average sustainability performance and that the SLB market includes almost no sustainability

laggards. The same holds true for companies' environmental performance at the time of the bond issuance (see table 2b, appendix).

Taking a bond-level view at the sample data, the majority of SLBs was issued in EUR (68%), followed by USD (20%), and are either callable (82%) or at maturity (15%) bonds, thereby mirroring the conventional bond market (table 2c and 2d, appendix). This is also the case for payment rank distributions, with the majority of SLBs being either senior unsecured (84%) or secured (14%), as well as for issue size and time to maturity (table 2e and 2g, appendix). Moreover, in terms of fiscal year revenue and employee count, sustainability-linked bond issuers have a slightly lower average revenue and employee count (table 2g, appendix). Interestingly, the majority of sustainability-linked bond issuers have a credit rating at the time of issuance in the range of B to BBB+ (table 2f, appendix). This could indicate that companies choose a sustainability-linked structure in order to increase attractiveness in contrast to companies with an A- credit rating. The highest density of sustainability-linked issuers can be found for BBB+ rated issuers, supporting this hypothesis (table 2f, appendix).

#### 4.4 Empirical Methodology

As explained above, the following analysis uses a probit choice regression model to estimate a company's probability to issue a SLB based on potentially influential factors. The base regression model for studying the effect of a company's industry and controlling for market, company and financial characteristics can be seen in equation 1, with further variables for the issuer's sustainability performance being added in the subsequent analysis.

$$(1) \quad Pr(SLB = 1) = \Phi(\beta_0 + \beta_1 * Industry + \beta_2 * Control Variables)$$

The term  $\Phi$  defines the standard normal cumulative distribution. *SLB* is a binary dependent variable that denotes whether a bond has a sustainability-linked structure ( $SLB=1$ ) or not ( $SLB=0$ ). The independent categorical variable *Industry* captures the company's sector according to Bloomberg's BICS classification system. A company's relative sustainability performance is measured using the company's Refinitiv ESG rating, which represents a company's ESG performance relative to its respective industry level. The variable *ESGRating* defines the companies' relative sustainability performance based on their respective Refinitiv ESG ratings, namely being a sustainability leader (A+ to B-), a sustainability laggard (C+ to D-) or having no ESG rating. The classification as a sustainability leader or laggard is based

on the definition by Refinitiv (2022) that companies with an ESG rating of A+ to B- have a sustainability performance higher than 50% of sustainability ratings within the same industry, whilst companies with a rating of C+ to D- have a sustainability performance lower or equal to 50%. The same method is used for developing the variable *EnvRating*, which is based on the Refinitiv Environmental rating. The Environmental rating only considers the environmental criteria resource use, emissions and innovation, whilst excluding social and governance criteria.

The market controls include *Country* and *IssueDate*, to capture the potential effect of the issuer market, as well as the maturity of the market. An alternative robustness measure for *IssueDate* is *NSLBIssuers*, which measures the number of existing SLB issuers in the market at the time of the bond issuance. Furthermore, the company controls include *Revenue* and *EmployeeCount* as measures for the company's size, as well as an alternative robustness measure called *Revenue Group*, based on the fiscal year 2021 revenue, which includes more data points and allows to test for significant effects on the respective group size levels. Moreover, the analysis includes the company's *CreditRating* at the time of the bond issuance. For the variable *CreditRating*, the sample is divided into four credit rating groups, differentiating between Upper Investment Grade (AA to A-), Lower Investment Grade (BBB+ to BBB-), Speculative Grade (BB+ to CCC) and having no credit rating. Additionally, a company's sustainability experience in the form of earlier sustainable finance issuances, such as a green bond, is controlled for with the dummy variable *SFExperience*.

Finally, for the financial controls, the independent variables are the bond's *IssueSize*, *Maturity* and *Currency*. Moreover, the analysis additionally includes an alternative measure for issue size, with the variable *IssueSize Group* sorting the bond issuances into six different issuance groups with an increasing issuance volume. A detailed description of all independent variables can be found in table 3. The subsequent analysis incorporates a company's industry and sustainability performance, as well as the eight defined market, company and financial criteria, which were outlined in section 3.2, 3.3 and 3.4. The ensuing probit regression analysis estimates whether the above defined independent variables have a significant effect on the probability to issue a SLB.

Table 3. Overview of Variables

Variable	Description	Type	Unit
SLB	The issued bond has a SLB structure.	Quantitative	Binary (0 or 1)
Industry	An issuer's industry (BICS Level 1).	Qualitative	Categorical
ESGRating	The issuer's Refinitiv ESG rating group: Leader (A+ to B-); Laggard (C+ to D-); No Rating. The ESG rating at the time of the bond issuance is used for the variable.	Quantitative	Group (1-3)
EnvRating	The issuer's Refinitiv Environmental rating group: Leader (A+ to B-); Laggard (C+ to D-); No Rating. The Environmental rating at the time of the bond issuance is used for the variable.	Quantitative	Group (1-3)
<u>Market Characteristics</u>			
Country	An issuer's country of domicile (ISO Code).	Qualitative	Categorical
IssueDate	The bond's issuance quarter calculated based on the issuance date.	Quantitative	Quarters
NSLBIssuers	Number of SLB Issuers in the market at time of the bond issuance.	Quantitative	N. Issuers
<u>Company Characteristics</u>			
Revenue	The issuer's revenue during the fiscal year of the bond issuance.	Quantitative	USD millions
Revenue Group	The issuer's revenue during the fiscal year 2021 grouped according to size, revenues in USD millions (1 ≤ 500 < 2 ≤ 1,000 < 3 ≤ 5,000 < 4 ≤ 10,000 < 5 ≤ 25,000 < 6 ≤ 50,000 < 7).	Quantitative	Group (1-7)
EmployeeCount	The issuer's employee count during the fiscal year of the bond issuance.	Quantitative	N. Employees
CreditRating	The issuer's credit rating group: Upper Investment Grade (AAA-A); Lower Investment Grade (BBB); Speculative Grade (BB-D); NR. The issuer's BB composite credit rating at the time of the bond issuance is used for the variable.	Quantitative	Group (1-4)
SFExperience	The issuer has issued a sustainable finance instrument before (dummy=1).	Quantitative	Binary (0 or 1)
<u>Financial Characteristics</u>			
IssueSize	The bond's issuance size.	Quantitative	USD millions
IssueSize Group	The bond's issue size group, issue sizes in USD millions (1 ≤ 250 < 2 ≤ 500 < 3 ≤ 750 < 4 ≤ 1,000 < 5 ≤ 1,250 < 6).	Quantitative	Group (1-6)
Currency	Bond issuance currency.	Qualitative	Categorical
Maturity	The bond's maturity size group, maturity in years (1 ≤ 5Y < 2 ≤ 10Y < 3 ≤ 15Y < 4 ≤ 20Y < 5; Perp.=6).	Quantitative	Group (1-6)

## 5. Results

### 5.1 SLB Market Attracts Carbon-Intensive Industries - But Not ESG Laggards

The first probit regression estimation (1) focuses on the companies' industry effect on the probability to issue a SLB, including the *Industry* variable with the low-carbon communication sector as a base level, as well as the respective market, company and financial characteristic controls. The results in table 4 show that the carbon-intensive sectors materials and utilities have a significant positive effect on the probability to issue a SLB, as well as the consumer staples sector. The industry effect stays significant when adding the companies' relative sustainability performance to the regression (2 and 3), including the *ESGRating* variable with the ESG leaders as the base group, whilst dropping in column 2 the insignificant control variable *Revenue* and in column 3 the insignificant control variable *Currency*. Moreover, the results show that being an ESG laggard, as well as having no ESG rating, has a significant negative impact on the probability to issue a SLB. The same holds true when including the *EnvRating* instead (4).

Running the final two regression models (table 4, column 3 and 4) using a logit choice model to ensure the robustness of the test results confirms that both, industry and sustainability performance, have a significant effect on the probability to issue a SLB (see table 5, appendix). Moreover, the Pearson goodness-of-fit test and a model specification test are both insignificant, supporting the chosen regression model (see table 12, appendix).

Calculating the individual risk ratios based on the logistic regression coefficients (see table 6), the results show that being a company from the carbon-intensive sectors materials ( $\beta= 3.612$ ) or utilities ( $\beta=3.885$ ) more than triples the probability to issue a SLB compared to a company from the low-carbon communication sector. Moreover, companies that do not have an ESG rating have a 52% decrease in the probability to issue a SLB, whilst companies considered as ESG laggards even have an 80% decrease (see table 6, column 1). The effect is only slightly smaller when using the Refinitiv Environmental rating, which focuses on the company's environmental performance, excluding social and governance criteria. The results in table 6 (column 2) show that Environmental laggards have a decrease of 75% in the probability to issue a SLB. This emphasizes that the environmental criteria are in fact the driving force behind the ESG rating effect on the probability to issue a SLB.

Table 4. Probit Regression Results – Industry and Sustainability Performance

	(1)	(2)	(3)	(4)
	SLB	SLB	SLB	SLB
<b>Industry Base: Communications</b>				
Consumer Discretionary	.196 (.367)	.081 (.332)	.075 (.31)	.065 (.314)
Consumer Staples	.68* (.389)	.715** (.335)	.714** (.328)	.656** (.33)
Energy	.62 (.484)	.51 (.401)	.499 (.389)	.465 (.389)
Health Care	.353 (.407)	.218 (.361)	.198 (.356)	.191 (.354)
Industrials	.289 (.375)	.336 (.339)	.327 (.332)	.279 (.332)
Materials	.662* (.369)	.798** (.319)	.789** (.312)	.767** (.314)
Technology	-.171 (.492)	.071 (.411)	.038 (.406)	-.013 (.406)
Utilities	.468 (.432)	.88* (.476)	.875* (.473)	.843* (.472)
<b>ESGRating Base: ESG Leader</b>				
ESG Laggard		-.822** (.375)	-.82** (.372)	
No ESG Rating		-.443*** (.166)	-.444*** (.169)	
<b>Env.Rating Base: Env. Leader</b>				
Env. Laggard				-.66** (.312)
No Env. Rating				-.456*** (.169)
<i>Country Control</i>	Y***	Y***	Y***	Y***
<i>IssueDate Control</i>	Y***	Y***	Y***	Y***
<i>Revenue Control</i>	Y			
<i>CreditRating Control</i>	Y***	Y***	Y***	Y***
<i>SF Experience Control</i>	Y			
<i>Currency Control</i>	Y**	Y		
<i>IssueSize Control</i>	Y**	Y**	Y**	Y**
<i>Maturity Control</i>	Y***	Y**	Y*	Y**
Constant	-35.789*** (8.475)	-35.103*** (4.335)	-34.799*** (4.217)	-34.814*** (4.22)
Clustered SE	Y	Y	Y	Y
Observations	1622	2122	2122	2122
Pseudo R <sup>2</sup>	.221	.237	.23	.229
Log-Likelihood	-283.898	-397.403	-401.279	-401.905
Chi <sup>2</sup>	116.133	177.048	167.078	167.608

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. The regression estimations only include 1,622 observations in column 1, as 448 bond issuances do not have a reported company revenue during the bond issuance year and some observations are omitted due to perfect prediction. The regression estimations in column 2, 3 and 4 include 2,122 observations, because 16 conventional bond issuances do not report their issuance volume. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.



Based on these findings, it can be said that the probability to issue a SLB is higher for some carbon-intensive industries. This is in line with the observation by the Climate Bonds Initiative (2023) that the SLB market includes an increasing number of issuances by carbon-intensive industries.

Table 6. Estimated Risk Ratios – Industry and Sustainability Performance

	(1)	(2)
	SLB	SLB
<b>Industry Base: Communications</b>		
Consumer Discretionary	1.095 (.677)	1.056 (.657)
Consumer Staples	3.271* (2.004)	2.939* (1.810)
Energy	2.460 (1.761)	2.299 (1.639)
Health Care	1.363 (.954)	1.365 (.951)
Industrials	1.770 (1.166)	1.614 (1.064)
Materials	3.612** (2.125)	3.453** (2.035)
Technology	1.135 (.90)	1.035 (.818)
Utilities	3.885* (2.936)	3.653* (2.756)
<b>ESGRating Base: ESG Leader</b>		
ESG Laggard	.197** (.153)	
No ESG Rating	.476*** (.122)	
<b>Env.Rating Base: Env. Leader</b>		
Env. Laggard		.254** (.164)
No Env. Rating		.463*** (.120)
Constant	4.20e-25*** (4.34e-24)	3.52e-25*** (3.65e-24)
Clustered SE	Y	Y
Observations	2122	2122
Log-Likelihood	-421.237	-421.497

*Note.* Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB. The two equations include the industry, market and financial characteristics variables, as well as the *ESGRating* (1) and *EnvRating* (2) variables respectively. This is an excerpt of the full regression results, which can be found in table 11 in the appendix.

The insignificant effect for the carbon-intensive energy and industrial sector (see tables 4, 5 and 6) could be due to the fact that these sectors generally have a better availability of eligible green bond projects both in size and sustainability measures compared to other sectors. This is supported by the fact that renewable energy is the largest (35%) use of proceeds category as of 2022 (CBI, 2022a), followed by buildings (27.1%) and transport (18.1%), which is the biggest industry group of the industrial sector according to the used BICS classification system. Consequently, the energy and industrial sectors are likely more indifferent between issuing a green bond or SLB compared to other industries, leading to an insignificant effect.

Regarding the companies' sustainability performance, ESG laggards and non-ESG-rated companies have a significantly lower probability to issue a SLB. The lower probability for non-ESG rated companies suggests that not having an ESG rating represents a barrier to the SLB market, even though the SLB instrument was designed in a way that companies can choose KPIs and SPTs independently of an ESG rating. One explanation could be that the SLB market values a company's sustainability awareness and experience, represented in the form of an existing ESG rating. In order to test for the potential effect of a company's sustainability experience and knowledge, the dummy variable *SFExperience* is included in the regression (see table 8). As explained in section 4.4, the dummy variable represents whether a company has used any type of sustainable finance instrument before and has consequently acquired a certain level of sustainability experience and knowledge. However, the dummy variable is insignificant, indicating that the lack of sustainable finance experience does not constitute a barrier to enter the SLB market

An alternative explanation could be that the SLB market interprets an ESG rating as a sustainability credibility tool and is thus leaning more towards companies that have an existing ESG rating. Furthermore, the results point out that the SLB market does not particularly attract ESG laggards, but rather that they have a very low probability to issue a SLB. This could be due to investors' greenwashing concerns and skepticism regarding SLB's transition effectiveness and credibility, which in turn leads to higher reservation towards companies that are lagging behind in their sustainability transition, the ESG laggards. Overall, the SLB market efficiently attracts carbon-intensive industries, but not ESG laggards. This observed market barrier is a clear area of concern and needs to be addressed with appropriate policies to ensure an efficient SLB market and thereby a successful sustainability transition of the real economy.

## 5.2 Influential Market, Company and Financial Characteristics

Taking a closer look at the variables for the market, company and financial characteristics (see table 8), the issuer market and maturity of the SLB market both have a significant effect on the probability to issue a SLB. Firstly, the *Country* variable results show that Germany, France, Italy, Luxembourg, the Netherlands and Sweden have a significant negative impact on the probability to issue a SLB, compared to Austria. Secondly, the variable *IssueDate* has a significant positive effect on the probability to issue a SLB, emphasizing that as the SLB market becomes more mature, the probability to issue a SLB increases. Using an alternative measure for the SLB market maturity in the form of the variable *NSLBIssuers* supports this result (see table 7, appendix).

In regard to the company characteristics, a company's revenue and sustainable finance experience both do not have a significant effect and are thus only included in the first regression (table 8, column 1). Moreover, using the variable *EmployeeCount* as an alternative measure for a company's size does not find a significant effect on the probability to issue a SLB (see table 7, appendix). As the data availability for a company's revenue and employee count for the issuance year 2022 is still limited at the time of this research, an additional variable called *Revenue Group* is included to test for a company's size effect. This variable uses the companies' fiscal year 2021 revenue, which allows for more data points to be included. However, the company size effect on the probability to issue a SLB stays insignificant (see table 7, appendix). In contrast, the issuer's credit rating at the time of the bond issuance has a significant positive impact on the probability to issue a SLB (table 8).

Regarding the three financial characteristics, the bond's currency has a significant impact on the probability to issue a SLB in the first regression, but the effect turns insignificant in the second regression and the variable is thus subsequently excluded (table 8, column 1 and 2). Moreover, the bond's issue size coefficient is significant but indicates a very small positive effect (see table 8). Finally, the bond's maturity has a significant positive impact on the probability to issue a SLB. The significance of the market, company and financial characteristics is tested by running the regressions using a logit choice model (see table 9, appendix). The significance of the market, company and financial characteristics variables is confirmed and the respective risk ratios are estimated based on the logit regression coefficients (see table 10).

Table 8. Probit Regression Results – Market and Financial Characteristics

	(1)	(2)	(3)	(4)
	SLB	SLB	SLB	SLB
<b>Country Base: AU</b>				
DE	-1.532*** (.422)	-1.654*** (.436)	-1.697*** (.443)	-1.663*** (.437)
FR	-1.201*** (.355)	-1.29*** (.355)	-1.333*** (.363)	-1.328*** (.358)
IT	-1.128*** (.368)	-1.236*** (.386)	-1.301*** (.398)	-1.279*** (.392)
LU	-1.519*** (.385)	-1.212*** (.37)	-1.175*** (.367)	-1.148*** (.363)
NL	-1.541*** (.375)	-1.304*** (.38)	-1.271*** (.379)	-1.254*** (.379)
SE	-2.383*** (.41)	-1.672*** (.436)	-1.382*** (.378)	-1.35*** (.374)
<b>Issue Date</b>	.138*** (.035)	.135*** (.018)	.134*** (.017)	.134*** (.017)
<b>Revenue</b>	0 (0)			
<b>CreditRating Base: Upper Investment Grade</b>				
Lower Investment Grade	.805*** (.303)	1.115*** (.326)	1.139*** (.336)	1.12*** (.332)
Speculative Grade	1.149*** (.327)	1.492*** (.304)	1.549*** (.31)	1.542*** (.306)
No Rating	1.037*** (.299)	1.298*** (.283)	1.323*** (.285)	1.332*** (.284)
<b>SF Experience</b>	.183 (.238)			
<b>Currency Base: EUR</b>				
GBP	.235 (.408)	.222 (.318)		
JPY	1.197 (.765)	.835 (.755)		
NOK		.813 (.615)		
SEK	1.076*** (.246)	.472 (.336)		
USD	.189 (.203)	.245 (.193)		
<b>Issue Size</b>	0** (0)	0** (0)	0** (0)	0** (0)
<b>Maturity Base: &lt;5Years</b>				
5Y < M < 10Y	.539*** (.155)	.261** (.128)	.232* (.122)	.241** (.121)
10Y < M < 15Y	.597*** (.22)	.219 (.201)	.16 (.208)	.168 (.206)
15Y < M < 20Y	.206 (.505)	.108 (.324)	.062 (.326)	.071 (.325)
20Y < M		-.43*** (.167)	-.396* (.203)	-.384* (.213)
Perpetual	-.259 (.426)	-.587 (.432)	-.648 (.445)	-.611 (.435)
Constant	-35.789*** (8.475)	-35.103*** (4.335)	-34.799*** (4.217)	-34.814*** (4.22)
Clustered SE	Y	Y	Y	Y
Observations	1622	2122	2122	2122
Pseudo R <sup>2</sup>	.221	.237	.23	.229
Log-Likelihood	-283.898	-397.403	-401.279	-401.905
Chi <sup>2</sup>	116.133	177.048	167.078	167.608

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. The regression estimations only include 2,122 observations when adding the market and financial controls, because 16 conventional bond issuances do not report their issuance volume. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.

Firstly, looking at the issuer market, companies from all included countries are less likely to issue a SLB compared to the base country Austria. The highest decrease (92%) in the probability to issue a SLB is found for companies that are domiciled in Germany (see table 10). A possible explanation could be the density of sustainable finance policies in the respective countries. However, Steffen (2021) shows that France has the highest number of green financial policies, followed with a wide gap by Germany, the Netherlands and Italy. A potential explanation for the high density of SLBs in Austria, which were all issued starting September 2020, could be the political announcement, as part of Austria's government program for 2020-2024, to exempt sustainable investments from the capital gains tax (Bundeskanzleramt, 2020). In anticipation of a subsequently higher investor demand for sustainable investments, companies had a higher incentive to issue a SLB. Nevertheless, all countries demonstrate a similar probability to issue a SLB compared to Austria. This indicates that even though the regional sustainable finance policy density might differ, European regulations are the higher-level policies and successfully set a uniform environment for sustainable finance to thrive.

Secondly, the market maturity results demonstrate that with every quarter that the SLB market grows and matures, the probability to issue a SLB increases by 24% (see table 10). This can be seen as an opportunity, because with a more mature SLB market, transparency and SLB mechanisms should improve, thereby decreasing greenwashing as well as credibility concerns and as a result attracting more SLB issuers.

Thirdly, in order to take a closer look at a bond's issue size effect on the probability to issue a SLB, the categorical variable *IssueSize Group* is used (see table 7, appendix). The probit regression results show a significant positive impact for bonds with an issue size larger than \$1,250 million. Calculating the risk ratios accordingly, the probability to issue a SLB almost triples ( $\beta=2.972$ ,  $SE=1.428$ ) if the bond has an issue size larger than \$1,250 million, compared to the base issue size smaller than \$250 million. This finding implies that the SLB market currently attracts primarily issuers with larger financing needs.

Table 10. Risk Ratios – Market and Financial Characteristics

	(1) SLB	(2) SLB
<b>Country Base: AU</b>		
DE	.081*** (.052)	.083*** (.052)
FR	.150*** (.068)	.150*** (.068)
IT	.162*** (.082)	.164*** (.083)
LU	.191*** (.088)	.197*** (.090)
NL	.170*** (.087)	.172*** (.089)
SE	.128*** (.067)	.131*** (.068)
<b>IssueDate</b>	1.237*** (.052)	1.238*** (.053)
<b>IssueSize</b>	1.001** (.000)	1.001** (.000)
<b>Maturity Base: &lt;5Years</b>		
5Y < M < 10Y	1.448* (.326)	1.477** (.329)
10Y < M < 15Y	1.260 (.424)	1.276 (.426)
15Y < M < 20Y	1.277 (.640)	1.289 (.644)
20Y < M	.60 (.238)	.612 (.251)
Perpetual	.277 (.225)	.300 (.246)
<b>CreditRating Base: Upper Investment Grade</b>		
Lower Investment Grade	8.698*** (5.821)	8.445*** (5.634)
Speculative Grade	16.732*** (10.655)	16.593*** (10.539)
No Rating	11.106*** (6.760)	11.322*** (6.877)
Constant	4.20e-25*** (4.34e-24)	3.52e-25*** (3.65e-24)
Clustered SE	Y	Y
Observations	2122	2122
Log-Likelihood	-421.237	-421.497

Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB. The two equations include the industry, market and financial characteristics variables, as well as the *ESGRating* (1) and *EnvRating* (2) variables respectively. This is an excerpt of the full regression results, which can be found in table 11 in the appendix.

Fourthly, the estimated risk ratio results for a bond's maturity show that bond issuances with a maturity between five to ten years increase the probability to issue a SLB by 45% (see table 10). A possible explanation could be that the time frame for the first SPT assessments tends to be around five to ten years, often 2025 and 2030. Only on rare occasions do companies already set SPTs to, for example, be climate neutral by 2050. This result implies that the SLB market favors short-term targets, which promise short-term transition results, and is likely driven by investors' concern regarding the materiality and ambitiousness of the SLB's sustainability targets. A short-term target allows for a better assessment of whether the chosen KPI's are material to a company's current economic activities and the set SPTs are ambitious enough to ensure a real transition impact. This finding does not necessarily have to be a barrier, but it is an important realization, especially for ESG laggards, which initially might consider setting long-term targets for their transition. Instead, the SLB market analysis suggests that they should set credible and ambitious short-term targets in line with a long-term transition path.

Finally, a company's credit rating at the time of issuance also has a highly significant effect. Companies with a lower investment grade ( $\beta=8.698$ ) are more likely to issue a SLB than companies with an upper investment grade. The effect is similar in size for companies with no credit rating ( $\beta=11.106$ ) and more than twice as big for companies with a speculative credit rating grade ( $\beta=16.732$ ). These findings demonstrate that the SLB market does not consider a lower credit rating as a hindrance. Instead, companies might use a sustainability-linked structure to increase the attractiveness of their financing instrument, compared to competitors with a better credit rating and a conventional bond issuance. This is a convincing argument and opportunity for the SLB market to attract more companies to issue a SLB.

## **6. Discussion and Conclusions**

In order to ensure a successful sustainability transition of our real economy and thereby achieve our climate goals, the European Green Deal Investment Plan has introduced several extensive sustainability legislations. The financial sector is a key channel to implement these regulatory requirements with the aim to push companies towards transitioning and to advance the economy's overall sustainability transition. Consequently, the capital market has developed an instrument to incentivize companies to align their activities with the two-degree climate path and to actively manage their climate risks: the sustainability-linked bond. The SLB incorporates a company-level sustainability perspective, encourages the issuer to set ambitious sustainability targets and incentivizes their achievement by demanding a payment in the case

of failure to reach these goals. With the opportunity to communicate their transition strategy and a potential premium for SLB issuers, the instrument has gained a lot of attention leading to a rapidly increasing SLB market. But does the SLB market efficiently attract those companies that are most crucial for a successful sustainability transition?

This paper developed a conceptual framework to assess whether the SLB market works efficiently by ensuring accessibility and attractive market structures for potential SLB issuers, with a particular consideration of carbon-intensive industries and ESG laggards. The analysis is conducted by running a probit and logit choice model to estimate a company's probability to issue a SLB and subsequently calculating the respective risk ratios for the significant influential factors. The results show that the SLB market efficiently attracts carbon-intensive industries. In fact, being a company from the carbon-intensive sectors materials and utilities more than triples the probability to issue a SLB. Thus, for carbon-intensive ESG leaders, SLBs are an attractive instrument to finance and transparently communicate their sustainability transition.

However, the SLB market does not efficiently attract ESG laggards. The results demonstrate that companies considered as ESG laggards have an 80% decrease in the probability to issue a SLB, compared to an ESG leader. Moreover, companies with no ESG rating are also less likely to issue a SLB compared to ESG leaders, with a decrease of 52% in the probability to issue a SLB. These findings point out that the SLB market leans towards companies with an existing ESG rating and that the market demonstrates a reservation towards companies that are lagging behind in their sustainability transformation.

Additionally, the paper analyzed eight market, company and financial characteristics that could potentially influence the probability to issue a SLB. Firstly, the results show that the issuer market has a significant effect on the probability to issue a SLB, with all countries, apart from Austria, having a similar probability to issue a SLB. This implies that the European sustainability legislations successfully establish a comparable investment environment. Secondly, the probability to issue a SLB increases with the SLB market's maturity, pointing out the growth potential of the SLB market. Both findings can be seen as an opportunity for the SLB market to adapt current policies and adjust market structures to better attract ESG laggards, whilst the market is still developing.



Regarding the company characteristics, the results show that a company's size and sustainable finance experience do not have a significant effect on the probability to issue a SLB. However, the regression results and risk ratio estimations show that the fifth criterion, a company's credit rating at the time of the bond issuance, has a significant impact on the probability to issue a SLB. Companies with a lower investment grade, speculative grade or without a credit rating are more likely to issue a SLB, compared to a company with an upper investment grade credit rating. The increase in the probability to issue a SLB is particularly high for companies with a speculative grade rating. These findings imply that a low credit rating does not represent a barrier to entering the SLB market. On the contrary, companies with a lower credit rating might use a sustainability-linked structure to increase the attractiveness of their financing instrument, compared to competitors with a higher credit rating, that use a conventional financing instrument. This can be seen as an opportunity for the SLB market to attract more issuers.

For the financial characteristic, the regression results indicate that a bond's currency does not significantly affect the probability to issue a SLB. However, having a bond issue size larger than 1,250 million USD almost triples the probability to issue a SLB, demonstrating that the bond's issue size has a significant impact. Finally, the eighth defined criterion is a bond's maturity, for which the analysis finds that a bond issuance with a maturity of five to ten years increases the probability to issue a SLB by 45%. This is in line with the commonly used time frame for SPTs being 2015 or 2030, rather than a long-term goal of for instance zero emissions by 2050. This finding implies that the SLB market favors short-term targets with the promise of short-term results and is likely driven by investors' concern regarding the materiality and ambitiousness of SLB sustainability targets. A closer time frame allows for a better comparability and assessment of whether the chosen KPIs are material to a company's economic activity and whether the respective SPTs are ambitious enough. Nevertheless, the practice to use climate-aligned transition pathways to set appropriate KPIs and SPTs is starting to become more prominent and could lead to a higher credibility for long-term targets as well. This finding is particularly interesting for ESG laggards, which might be more prone to choose long-term targets, due to the challenge of their sustainability transition. The results suggest that they should rather set an ambitious short-term target that is aligned with a long-term transition path instead.

To conclude, the paper makes two important contributions to the existing SLB literature, which has so far been mainly focused on the functionality and pricing of sustainability-linked instruments (Berrada et al., 2022, Kölbel & Lambillon, 2002; Vulturius, 2022; Liberadzki et al., 2021), by analyzing the efficiency of the SLB market in ensuring the accessibility and market structures for potential SLB issuers, with a particular consideration for carbon-intensive ESG laggards. In order to ensure a successful sustainability transition of the real economy, the SLB market needs to address those companies that are most crucial for advancing the economy's transition, namely carbon-intensive industries and ESG laggards.

Firstly, this paper shows that the SLB market does efficiently attract companies from carbon-intensive industries, but that those companies are predominantly ESG leaders. Companies without an ESG rating and ESG laggards have a significantly lower probability to issue a SLB, demonstrating a SLB market entry barrier for companies with a lower or nonexistent ESG rating. Consequently, the SLB market so far fails to attract a significant fraction of companies that are crucial for a successful sustainability transition. This result points out the need for sustainability policies, as well as sustainable finance market structures and instruments that are better adapted for ESG laggards.

Secondly, the paper identifies four success factors for the SLB market to improve the accessibility and credibility of the SLB market:

- 1) Any regulatory adaptations to better attract ESG laggards should be implemented through European policy adjustments rather than singular local customizations, as the European sustainability legislations have been successful in establishing a common sustainable finance investment environment among the different EU countries.
- 2) The findings demonstrate that with growing maturity, more companies will consider entering the SLB market. This potential needs to be seized by providing appropriate market structures that satisfy investors' expectations regarding transparency and credibility standards. Through improving transparency and market mechanism whilst growing, the SLB market can work on diminishing credibility and greenwashing concerns, thereby also creating a better environment for ESG laggards.

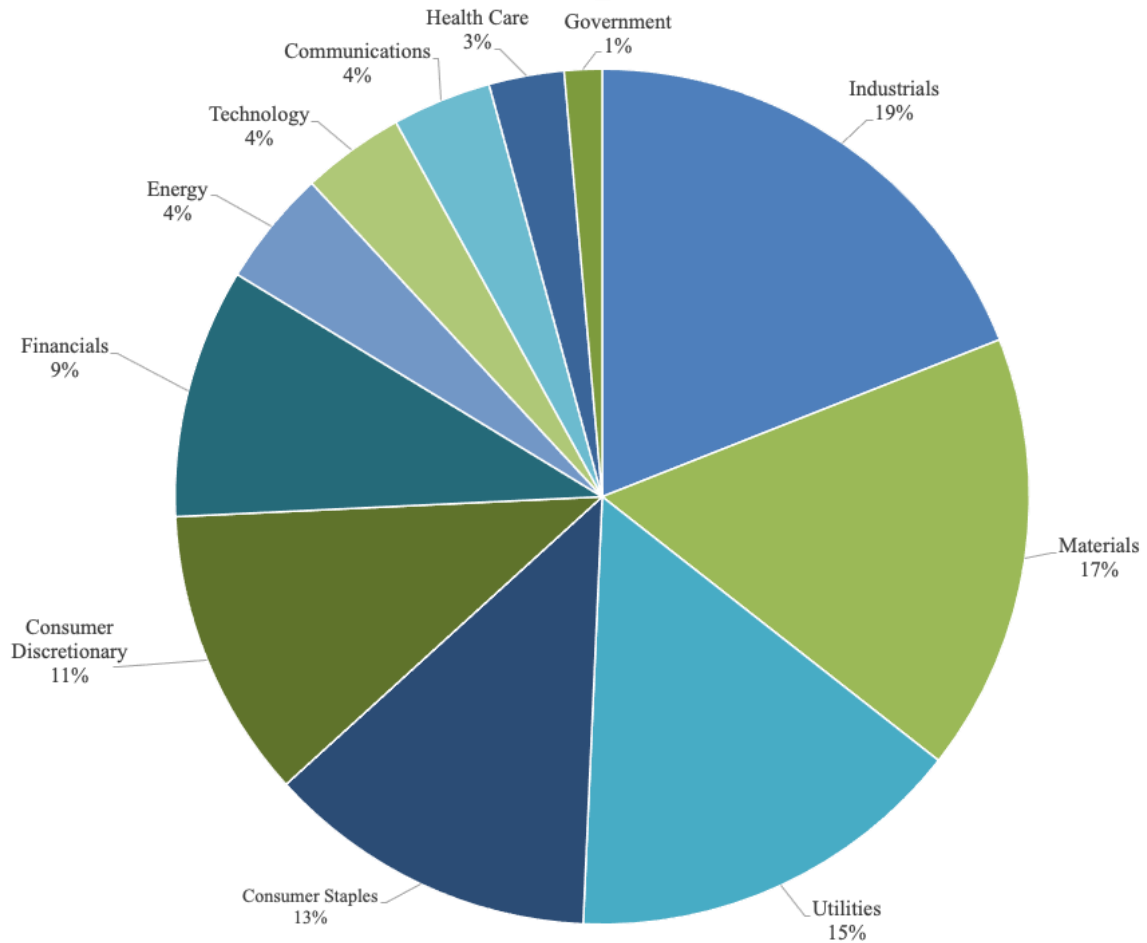
- 3) The SLB market's preference for short-term sustainability targets should encourage ESG laggards to focus on credible and ambitious short-term targets that are in line with a long-term transition pathway. Using a climate-aligned transition pathway when setting KPIs and SPTs is becoming more prominent and can assist in setting credible and ambitious sustainability targets.
- 4) A company's lower credit rating is not a hindrance, but rather an opportunity for the SLB market to address a large target group. Companies with a lower credit rating can use a sustainability-linked structure not only to finance and communicate their transition strategy, but also to increase the attractiveness of their financing instrument compared to competitors with a better credit rating, but conventional financing instrument.

This paper focuses its analysis on the efficiency of the SLB market from a market perspective. Further research could extend the analysis to incorporate the company and investor perspective on the SLB market structures, to gain a better understanding of the market barriers and incentives from a potential SLB issuer and investor point of view. Moreover, the market mechanisms are continuously developing, as the SLB market is still very young, with the first European SLB issuance only in 2019. As transparency and reporting legislations are slowly being put into action, the pressure for companies to transition will increase in the upcoming years and will thereby affect the market dynamics as well. Any policy and market behavior adjustments should be evaluated and implemented with these developments in mind.

## Appendix

### Figures

Figure 2. Worldwide SLB Issuances by Industry



Source: Bloomberg Data as of 27.01.2023

## Tables

Table 2. Additional Company and Bond Level Summary Statistics

a. Company ESG Rating in 2022

ESG Rating	Sustainability-Linked Indicator		
	0	1	Total
A+	11	2	13
A	62	10	72
A-	74	19	93
B+	59	11	70
B	32	3	35
B-	32	5	37
C+	17	1	18
C	21	1	22
C-	3	0	3
D+	2	1	3
D	1	0	1
D-	1	0	1
NR	423	32	455
<b>Total</b>	<b>738</b>	<b>85</b>	<b>823</b>

Source: Refinitiv as of 02.11.2022.

b. Issuer Environmental Rating at time of bond issuance

Env. Rating	Sustainability-Linked Indicator		
	0	1	Total
A+	193	25	218
A	200	12	212
A-	183	17	200
B+	130	20	150
B	94	5	99
B-	84	5	89
C+	26	0	26
C	37	1	38
C-	25	2	27
D+	26	0	26
D	12	0	12
D-	29	0	29
NR	957	55	1012
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Refinitiv 02.11.2022.

c. Bond Currency

Currency	Sustainability-Linked Indicator		
	0	1	Total
EUR	1475	97	1572
GBP	36	2	38
JPY	7	2	9
NOK	23	1	24
SEK	241	11	252
USD	214	29	243
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Bloomberg as of 02.11.2022.

d. Bond Maturity Type

Maturity Type	Sustainability-Linked Indicator		
	0	1	Total
AT MATURITY	569	22	591
CALL/PUT	3	0	3
CALL/SINK	30	0	30
CALLABLE	1199	116	1315
CONV/CALL	2	0	2
CONV/CALL/PERP	2	0	2
CONV/PUT	9	0	9
CONVERTIBLE	67	2	69
PERP/CALL	69	2	71
PERPETUAL	9	0	9
PUTABLE	5	0	5
SINKABLE	32	0	32
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Bloomberg as of 02.11.2022.

Table 2. Additional Company and Bond Level Summary Statistics

e. Bond Payment Rank

Payment Rank	Sustainability-Linked Indicator		
	0	1	Total
1st lien	68	0	68
2nd lien	6	0	6
Jr Subordinated	70	1	71
Secured	231	20	251
Sr Preferred	1	0	1
Sr Subordinated	5	0	5
Sr Unsecured	1541	119	1660
Subordinated	24	1	25
Unsecured	50	1	51
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Bloomberg as of 02.11.2022.

f. Issuer Credit Rating at time of bond issuance

Credit Rating	Sustainability-Linked Indicator		
	0	1	Total
AA	24	1	25
AA-	35	0	35
A+	88	1	89
A	61	0	61
A-	134	1	135
BBB+	127	26	153
BBB	126	16	142
BBB-	161	6	167
BB+	73	4	77
BB	43	5	48
BB-	49	10	59
B+	32	5	37
B	85	8	93
B-	24	0	24
CCC+	10	1	11
CCC	5	0	5
NR	919	58	977
<b>Total</b>	<b>1996</b>	<b>142</b>	<b>2138</b>

Source: Bloomberg as of 02.02.2023.

g. Revenue, Employee Count, Bond Issue Size and Time to Maturity

	SL Indicator	N	Min	Median	Mean	Max	SD	t-value
Revenue	N	1,594	0	7,934.55	19,313.64	263,310	3,0018.88	25.03
(USD Millions)	Y	96	0	6,099.26	14,531.15	90,570.35	21,739.51	6.44
Employee Count	N	1,288	1	31,483	62,580.96	526,896	79,203.13	27.47
	Y	82	97	17,000	54,428.55	413,000	96,458.22	5.12
Issue Size	N	1,980	.16	551.01	554.26	4115.28	444.94	47.32
(USD Millions)	Y	142	30.23	592.19	657.38	2161.04	412.91	12.8
Time to Maturity	N	1,916	.50	6	7.74	63.04	7.27	35.65
(Years)	Y	140	30.23	7.01	7.95	30.02	4.16	24.26

Source: Bloomberg as of 02.11.2022.

Table 5. Logit Regression Results – Industry and Sustainability Performance

	(1)	(2)
	SLB	SLB
<b>Industry Base: Communications</b>		
Consumer Discretionary	.108 (.688)	.069 (.698)
Consumer Staples	1.406** (.706)	1.275* (.712)
Energy	1.013 (.836)	.937 (.835)
Health Care	.348 (.787)	.353 (.785)
Industrials	.673 (.748)	.567 (.752)
Materials	1.509** (.675)	1.462** (.681)
Technology	.162 (.886)	.053 (.887)
Utilities	1.66* (.978)	1.59 (.979)
<b>ESGRating Base: ESG Leader</b>		
ESG Laggard	-1.834** (.843)	
No ESG Rating	-.875*** (.337)	
<b>Env.Rating Base: Env. Leader</b>		
Env. Laggard		-1.539** (.705)
No Env. Rating		-.902*** (.337)
<i>Country Control</i>	Y***	Y***
<i>IssueDate Control</i>	Y***	Y***
<i>Revenue Control</i>		
<i>CreditRating Control</i>	Y***	Y***
<i>SF Experience Control</i>		
<i>Currency Control</i>		
<i>IssueSize Control</i>	Y**	Y**
<i>Maturity Control</i>	Y*	Y*
Constant	-65.619*** (10.019)	-65.747*** (10.074)
Clustered SE	Y	Y
Observations	2122	2122
Pseudo R <sup>2</sup>	.226	.226
Log-Likelihood	-403.17	-403.579
Chi <sup>2</sup>	176.727	175.309

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.

Table 7. Probit Regression Results – Additional Control Variables

	(1) SLB	(2) SLB	(3) SLB	(4) SLB
<b>Industry Base: Communications</b>				
Consumer Discretionary	.106 (.303)	-.142 (.337)	.089 (.353)	.058 (.308)
Consumer Staples	.749** (.321)	.456 (.362)	.614* (.368)	.712** (.326)
Energy	.521 (.387)	.385 (.413)	.13 (.465)	.518 (.383)
Health Care	.222 (.349)	.111 (.38)	.216 (.393)	.161 (.354)
Industrials	.369 (.326)	-.035 (.34)	-.016 (.38)	.33 (.331)
Materials	.802*** (.304)	.475 (.338)	.397 (.365)	.793*** (.307)
Technology	.043 (.4)	-.492 (.451)	-.34 (.462)	.054 (.407)
Utilities	.907** (.459)	-.236 (.361)	.403 (.458)	.878* (.476)
<b>ESGRating Base: ESG Leader</b>				
ESG Laggard	-.799** (.371)	-.853** (.375)	-.647* (.364)	-.834** (.368)
No ESG Rating	-.431** (.168)	-.357** (.17)	-.304* (.182)	-.46*** (.171)
<b>NSLBIssuers</b>	.013*** (.002)			
<b>Revenue Group Base: &lt;=250 M. USD</b>				
<=500 M. USD		-.266 (.577)		
<= 700 M. USD		-.07 (.502)		
<= 1000 M. USD		.408 (.502)		
<=1250 M. USD		-.171 (.46)		
> 1250 M. USD		-.164 (.485)		
<b>Employee Count</b>			0 (0)	
<b>IsseSize Group Base: &lt;=250 M. USD</b>				
<=500 M. USD				.012 (.221)
<= 700 M. USD				.048 (.204)
<= 1000 M. USD				.149 (.226)
<=1250 M. USD				.291 (.262)
> 1250 M. USD				.662** (.286)
<i>Country Control</i>	Y***	Y***	Y***	Y***
<i>IssueDate Control</i>		Y***	Y***	Y***
<i>Revenue Control</i>				
<i>CreditRating Control</i>	Y***	Y***	Y***	Y***
<i>SF Experience Control</i>				
<i>Currency Control</i>				
<i>IssueSize Control</i>	Y**	Y	Y	
<i>Maturity Control</i>	Y**	Y***	Y***	Y**
Constant	-2.439*** (.515)	-45.769*** (5.128)	-35.9*** (9.365)	-35.104*** (4)
Clustered SE	Y	Y	Y	Y
Observations	2122	1679	1331	2122
Pseudo R <sup>2</sup>	.22	.266	.205	.232
Log-Likelihood	-406.434	-267.941	-244.847	-400.426
Chi <sup>2</sup>	151.528	136.552	82.296	170.694

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.



Table 9. Logit Regression Results – Market and Financial Characteristics

	(1)	(2)
	SLB	SLB
Industry Variable	Y	Y
ESGRating Variable	Y	
Env.Rating Variable		Y
<b>Country Base: AU</b>		
DE	-3.219*** (.895)	-3.184*** (.885)
FR	-2.455*** (.694)	-2.439*** (.681)
IT	-2.413*** (.779)	-2.377*** (.766)
LU	-2.195*** (.707)	-2.139*** (.7)
NL	-2.333*** (.735)	-2.303*** (.738)
SE	-2.666*** (.744)	-2.621*** (.733)
<b>IssueDate</b>	.252*** (.041)	.253*** (.041)
<b>IssueSize</b>	.001** 0	.001** 0
<b>Maturity Base: &lt;5Years</b>		
5Y < M < 10Y	.445* (.256)	.469* (.252)
10Y < M < 15Y	.294 (.43)	.31 (.424)
15Y < M < 20Y	.23 (.648)	.246 (.644)
20Y < M	-.593 (.415)	-.568 (.437)
Perpetual	-1.567* (.947)	-1.451 (.943)
<b>CreditRating Base: Upper Investment Grade</b>		
Lower Investment Grade	2.411*** (.731)	2.368*** (.726)
Speculative Grade	3.178*** (.686)	3.16*** (.681)
No Rating	2.67*** (.644)	2.689*** (.642)
Constant	-65.619*** (10.019)	-65.747*** (10.074)
Clustered SE	Y	Y
Observations	2122	2122
Pseudo R <sup>2</sup>	.226	.226
Log-Likelihood	-403.17	-403.579
Chi <sup>2</sup>	176.727	175.309

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.

Table 11. Estimated Risk Ratios – Complete Results

	(1) SLB	(2) SLB
<b>Industry Base: Communications</b>		
Consumer Discretionary	1.095 (.677)	1.056 (.657)
Consumer Staples	3.271* (2.004)	2.939* (1.810)
Energy	2.460 (1.761)	2.299 (1.639)
Health Care	1.363 (.954)	1.365 (.951)
Industrials	1.770 (1.166)	1.614 (1.064)
Materials	3.612** (2.125)	3.453** (2.035)
Technology	1.135 (.90)	1.035 (.818)
Utilities	3.885* (2.936)	3.653* (2.756)
<b>ESGRating Base: ESG Leader</b>		
ESG Laggard	.197** (.153)	
No ESG Rating	.476*** (.122)	
<b>Env.Rating Base: Env. Top Performer</b>		
Env. Laggard		.254** (.164)
No Env. Rating		.463*** (.120)
<b>Country Base: AU</b>		
DE	.081*** (.052)	.083*** (.052)
FR	.150*** (.068)	.150*** (.068)
IT	.162*** (.082)	.164*** (.083)
LU	.191*** (.088)	.197*** (.090)
NL	.170*** (.087)	.172*** (.089)
SE	.128*** (.067)	.131*** (.068)
<b>IssueDate</b>	1.237*** (.052)	1.238*** (.053)
<b>IssueSize</b>	1.001** (.000)	1.001** (.000)
<b>Maturity Base: &lt;5Years</b>		
5Y < M < 10Y	1.448* (.326)	1.477** (.329)
10Y < M < 15Y	1.260 (.424)	1.276 (.426)
15Y < M < 20Y	1.277 (.640)	1.289 (.644)
20Y < M	.60 (.238)	.612 (.251)
Perpetual	.277 (.225)	.300 (.246)
<b>CreditRating Base: Upper Investment Grade</b>		
Lower Investment Grade	8.698*** (5.821)	8.445*** (5.634)
Speculative Grade	16.732*** (10.655)	16.593*** (10.539)
No Rating	11.106*** (6.760)	11.322*** (6.877)
Constant	4.20e-25*** (4.34e-24)	3.52e-25*** (3.65e-24)
Clustered SE	Y	Y
Observations	2122	2122
Log-Likelihood	-421.237	-421.497
AIC	.422	.423
BIC	-15489.47	-15488.95

Note. Standard errors are in parentheses \*\*\* p<.01, \*\* p<.05, \* p<.1. Standard errors are clustered at the issuer level, as some companies have issued more than one SLB.

Table 12. Pearson Goodness-of-Fit and Model Specification Test

a. Pearson Goodness-of-Fit Test

Number of observations	2,122
Number of covariate patterns	2,077
Pearson chi2(2050)	2016.65
Prob > chi2	.696

b. Linktest

Number of observations	2,122
LR chi2(2)	241.10
Prob>chi2	.000
Pseudo R2	.231

SLB	Coefficient	Std. err.	z	P> z
_hat	.705	.269	2.63	.009
_hatsq	-.116	.103	-1.13	.259
cons	-.143	.165	-.87	.385

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