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The choice between bank and market debt:  
evidence from sustainable financing  
instruments

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# The choice between bank and market debt: evidence from sustainable financing instruments

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# Resumo

A sustentabilidade financeira é um tema em crescimento na literatura teórica e empírica, nomeadamente pelo seu rápido ritmo de expansão, mas também pelos riscos e oportunidades que cria. Por um lado, as empresas sofrem pressão para adaptarem e transformarem as suas atividades, com um maior foco no longo prazo e na sustentabilidade, o que pode ser visto como um risco, mas esta transição pode ser uma fonte de oportunidades.

Esta dissertação tem como principal objetivo perceber os fatores que determinam a escolha entre instrumentos de dívida sustentáveis emitidos por empresas em mercado *versus* obtidos junto da banca. A análise é então conduzida considerando três níveis de fatores: relacionados com a empresa, com as características contratuais do ativo financeiro emitido e ainda com fatores macroeconómicos. Recorrendo a uma amostra composta por 3,513 empréstimos sustentáveis e 2,882 obrigações sustentáveis, emitidas entre 2018 e 2023, concluímos que as empresas que enfrentam maiores problemas de assimetrias de informação são as que preferem empréstimos bancários sustentáveis. Adicionalmente, conclui-se que as empresas localizadas em países com perfis de risco mais elevados, medido pelo rating do país, têm maior probabilidade de optar por empréstimos bancários.

Palavras-chave: ESG, sustainable finance, sustainable bonds, sustainable loans, debt choice.

Nº de palavras: 9.976



# Abstract

Sustainable finance is a growing topic in the literature due to its fast-expanding rhythm, but also for the risks and opportunities it is creating. While it is true that the firms are under pressure to adapt and transform their activities toward a more sustainable and long-term view, there are also opportunities that companies can explore.

This dissertation aims to understand the choice between the sustainable debt instruments offered by the banks *versus* those offered by the market. The analysis integrates three levels of variables: those related with the issuer characteristics, contractual characteristics, and macroeconomic factors. Using a sample of 3,513 sustainable loans and 2,882 sustainable bonds, issued between 2018 and 2023, we find that borrowers facing higher asymmetries of information will tend to choose sustainable loans. Additionally, it has also been proven that there is a positive relationship between the borrower's country risk, measured by the country rating, and the preference for sustainable banking financing.

Keywords: ESG, sustainable finance, sustainable bonds, sustainable loans, debt choice.

Wordcount: 9.976



# Table of Contents

Agradecimientos .....	iv
Resumo.....	vi
Abstract .....	viii
Table of Contents .....	x
List of Figures.....	xii
List of Tables.....	xiii
Introduction.....	1
Chapter 1.....	6
Literature Review .....	6
1.1. An Introduction to Sustainable Finance.....	6
1.2. Sustainable debt instruments.....	7
1.2.1. The bond market .....	7
1.2.2. The loan market.....	8
1.3. The choice of debt financing instruments .....	9
1.3.1. Conventional <i>versus</i> sustainable debt .....	10
1.3.1.1. Firm-Level Determinants .....	10
1.3.1.2. Contractual-Level Determinants .....	11
1.3.1.3. Macro-Level Determinants.....	13
1.3.2. Loans <i>versus</i> bonds.....	14
Chapter 2.....	16
Research Question and Hypotheses .....	16
Chapter 3.....	19
Data and Methodology .....	19
3.1. Sample selection.....	19
3.2. Variables and Model .....	25

3.2.1 Dependent variable.....	25
3.2.2 Independent variables.....	25
3.3. Descriptive statistics of the sample.....	27
Chapter 4.....	31
Results.....	31
4.1. Are financially healthier companies more likely to choose sustainable bonds?.....	31
4.2. Do companies with better ESG performance prefer sustainable bonds? .....	32
4.3. Do higher asymmetries of information favor the choice for loans? .....	33
4.4. Is the cost of capital positively related with sustainable loans? .....	33
4.5. Do companies located in high-risk countries prefer loans? .....	33
4.6. Additional results .....	34
Conclusion.....	47
List of References.....	49
Appendices.....	54

# List of Figures

<b>Figure 1:</b> Sustainable bonds distribution per year and type. Source: DCM Analytics (2018-2023) .....	2
<b>Figure 2:</b> Sustainable loans distribution per year and type. Source: Loan Analytics (2018-2023) .....	2
<b>Figure 3:</b> Sustainable instruments distribution per industry. Source: DCM/Loan Analytics (2018-2023) .....	3
<b>Figure 4:</b> Sustainable instruments distribution per region. Source: DCM/Loan Analytics (2018-2023) .....	4

# List of Tables

<b>Table 1:</b> Sample distribution by product type.....	21
<b>Table 2:</b> Sample distribution by year.....	21
<b>Table 3:</b> Sample distribution by geography .....	22
<b>Table 4:</b> Sample distribution by industry .....	23
<b>Table 5:</b> Top 10 borrowers of the sample.....	24
<b>Table 6:</b> Descriptive Statistics – Continuous variables .....	29
<b>Table 7:</b> Descriptive Statistics – Discrete Variables .....	30
<b>Table 8:</b> Determinants of debt choice .....	35
<b>Table 9:</b> Determinants of debt choice - Green instruments.....	37
<b>Table 10:</b> Determinants of debt choice - Sustainability-linked instruments..	39
<b>Table 11:</b> Determinants of debt choice - Switchers.....	41
<b>Table 12:</b> Determinants of debt choice – Adding the spread.....	43
<b>Table 13:</b> Determinants of debt choice – Adding the log total assets .....	45



# Introduction

According to the most recent Global Risks Report (World Economic Forum, 2024), the world is undergoing critical changes, being the extreme weather the most likely to cause a material crisis in 2024 and approaching the point of no return, making climate change an unavoidable topic. Thus, all current activities must adapt and transform themselves to address this concern. Finance is no exception, leading to the concept of sustainable finance, that has been growing along recent years.

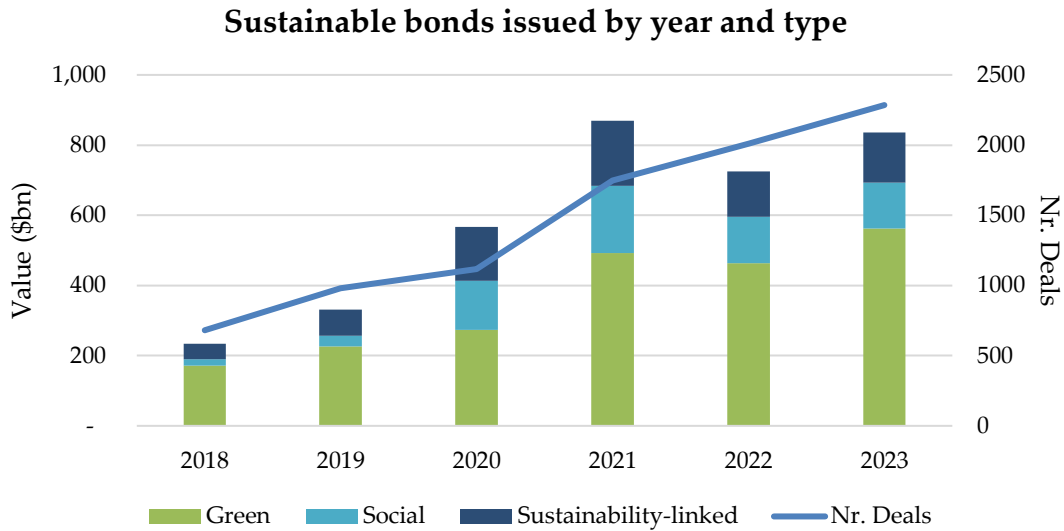
Worldwide, several initiatives emphasise the importance of this topic, such as the commitment of governments to targets set by the United Nations, commonly known as the Sustainable Development Goals<sup>1</sup>. At the European level, we can list the Paris Agreement on climate change and the European Commission's action plan that follows three principles: (i) redirect the capital towards sustainable investments; (ii) manage financial risks arising from ESG factors and promote transparency; (iii) and prioritize activities for a distant future (Coleton et al., 2020). Additionally, the creation of the EU Taxonomy regulation played a critical role in supporting the European sustainable finance market (Cicchello et al., 2022).

Figures 1 and 2 represent the issuances under the sustainable bond (SB) and sustainable loan (SL) markets, respectively, between 2018 and 2023. The SBs market is significantly larger, averaging 3.4 times more issuances and 4.6 times higher value than the SLs market. Nevertheless, both evidence an increase trend, although public debt demonstrates a more pronounced growth trajectory, while banking financing suffered a fall in 2023. Regarding their diversity, bonds are

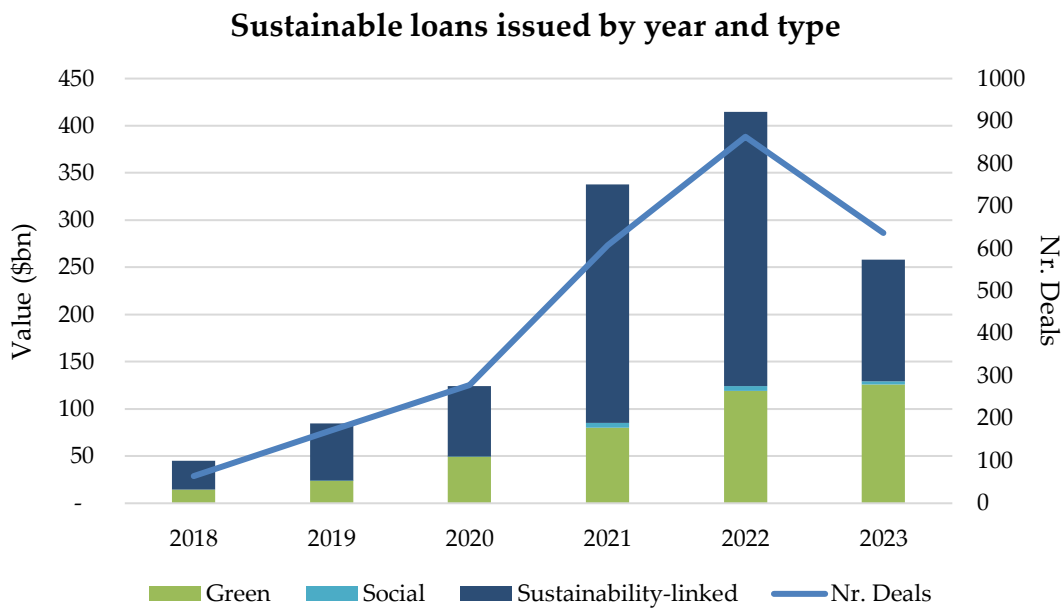
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<sup>1</sup> Available at <https://sdgs.un.org/goals>

predominantly dominated by the green category, representing more than 60% of the market. Loans exhibit a more balanced composition between the green and sustainability-linked categories, although the latter dominates.



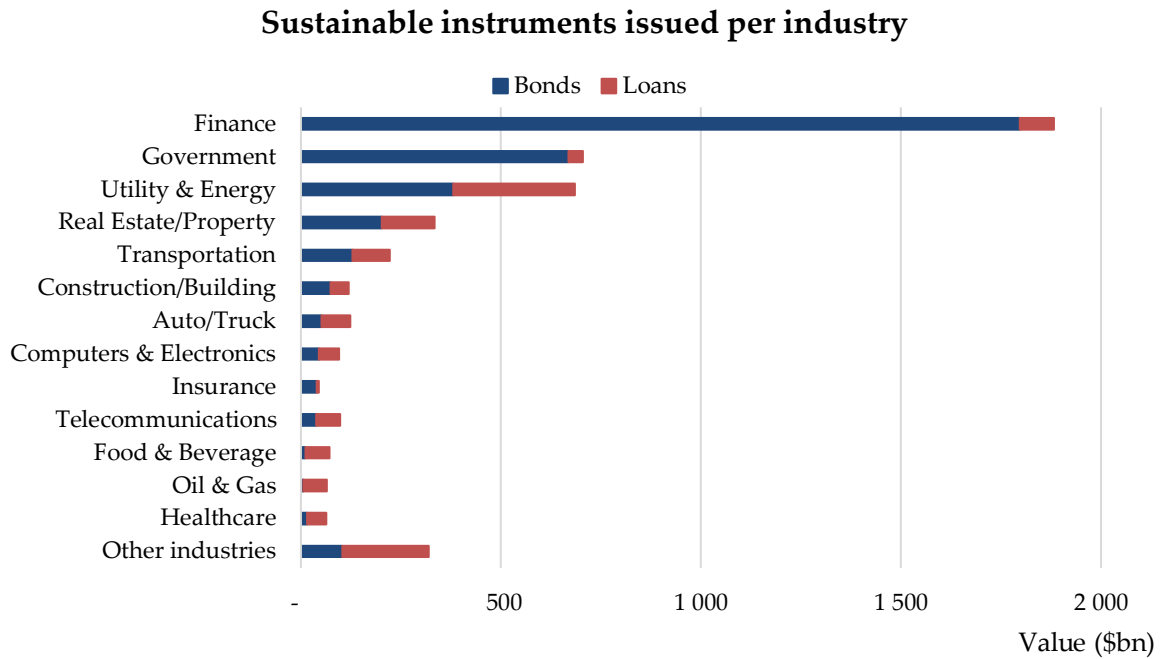
**Figure 1:** Sustainable bonds distribution per year and type. Source: DCM Analytics (2018-2023)



**Figure 2:** Sustainable loans distribution per year and type. Source: Loan Analytics (2018-2023)

Regarding the industrial profiles, Finance borrowers are the main players (figure 3), representing 50% of the bond market value. Following, we can highlight the Government (with 19% of the bond market) and the Utility & Energy sector (with 24% of the loan market and 11% of bonds). This last supports

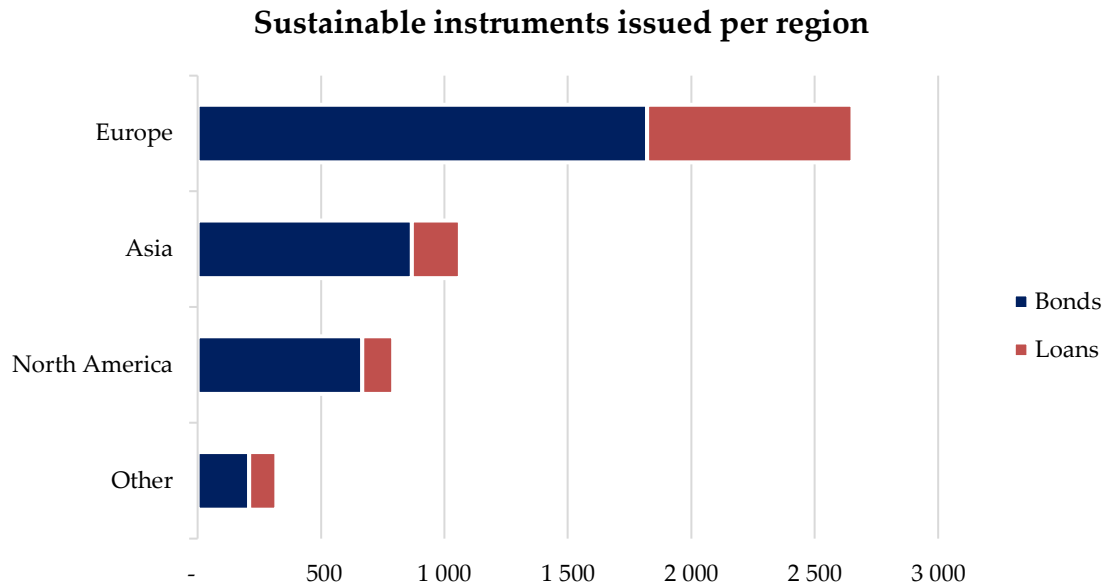
the idea presented by Dursun-de Neef et al. (2023) and Flammer (2021) that the green instruments are prevalent within industries where the environment is financially material to the company’s operation.



**Figure 3:** Sustainable instruments distribution per industry. Source: DCM/Loan Analytics (2018-2023)

Figure 4 shows that Europe is on top of the issuers, with 51% and 66% of the value of SBs and SLs, respectively. Asia comes in second place, followed by North America. The “Other” category includes Latin America, South Pacific, Middle East and Africa, which account for only 6% of the SBs value and 9% for SLs.

According to the United Nations Conference on Trade and Development [UNCTAD] (2022), the majority of developing countries are not present in the market since they continue to encounter some barriers (e.g., small markets, perception of comparatively high risks, lack of company-level sustainability data).



**Figure 4:** Sustainable instruments distribution per region. Source: DCM/Loan Analytics (2018-2023)

This dissertation aims to contribute to the literature of sustainable debt instruments, by attempting to respond to the following question: “What are the main motivations for firms to choose between sustainable market financing and sustainable banking financing?” Based on this research question, the following research hypotheses were developed: (i) Financially healthier companies are more likely to choose sustainable market financing, while financially distressed firms prefer sustainable banking financing; (ii) Companies with stronger ESG ratings are more likely to choose sustainable public placement borrowings compared to loans; (iii) Firms with higher levels of asymmetric information are more likely to choose sustainable private instruments; (iv) Sustainable bonds offer a lower cost of capital compared to sustainable loans; (v) Companies located in higher-risk countries are more likely to choose loans over bonds.

Using a sample of 3,513 SLs and 2,882 SBs, results show a preference for loans over bonds from companies suffering from higher asymmetric information problems, corroborating the third hypothesis. Regarding macro considerations, the findings validate an increased reliance on loans from issuers located in

countries with higher risks, supporting the fifth hypothesis. Conversely, the first, second and fourth hypotheses go against our expectations: we find that better company's creditworthiness and ESG performance do not suggest a preference for the bond market, nor does the cost of capital positively relate to the issuance of loans. Nevertheless, these variables do not have a very representative sample, which can result in misleading conclusions.

In addition, other variables such as *switcher*, *number of banks*, and *volatility* suggest a positive relationship with the choice of bank debt, while *maturity* and *currency risk* show a negative influence on it.

This work starts with a literature review on the preference for sustainable markets *vis-à-vis* conventional markets, and an analysis of the choice between banks and market financing. Chapter 2 defines the question and hypotheses formulated; chapter 3 describes the sample selection and the model to follow; while chapter 4 presents the models' specifications and results. Finally, the conclusion summarizes our findings and provides suggestions for future research considering the limitations of this work.

# Chapter 1

## Literature Review

### 1.1. An Introduction to Sustainable Finance

Sustainable finance is defined as the incorporation of environmental, social, and governance (ESG) considerations into financial decisions (Edmans, 2023). The first element (E) addresses the management of climate change, while the second (S) covers issues related to inequity, inclusion, labour relations, and communities. Finally, governance (G) stands for board structures, executive remuneration, and employee relations (Coleton et al., 2020; Edmans & Kacperczyk, 2022). Despite this definition, Coleton et al., (2020) stress the lack of consensus over the definition of each ESG element (e.g., banks focus on their own G rather than that of their clients), leading to distinct conclusions and, consequently, decisions regarding risk management (Coleton et al., 2020).

According to Edmans & Kacperczyk (2022), addressing sustainable finance no longer gives respect only to socially responsible investors but also to those with entirely financial goals. Its quick growth can be attributed, in part, to the realisation of financial benefits (e.g., increased power to attract clients and employees with higher ESG awareness) but also business opportunities (Edmans & Kacperczyk, 2022). Similarly, Coleton et al. (2020) argue that banks are reacting due to pressure from stakeholders and the recognition of new risks. Additionally, sustainable finance allows for avoiding costs associated with regulatory intervention (Mathew & Sivaprasad, 2022).

Despite its relevance, implementing sustainability has challenges, such as the evaluation of the sustainability of a company, task that becomes harder with disagreeing ratings about ESG performances (Berg et al., 2022; Edmans & Kacperczyk, 2022). Additionally, self-labelled funds lead to inconsistent

standards and poor-quality data, fomenting greenwashing - false or exaggerated claims of being environmentally friendly (Gao & Schmittmann, 2022) - and credibility concerns (UNCTAD, 2022). Other obstacles include the time horizon, ambiguity over the financial advantages, and a lack of data to design the products (Coleton et al., 2020).

## 1.2. Sustainable debt instruments

For the instruments of sustainable finance, attention can be drawn to debt capital, syndicated loans, equity capital markets, and M&A activities involving sustainable companies. This dissertation focuses on the first two.

### 1.2.1. The bond market

With their first issuance date in 2007, green bonds (GBs) are one of the most explored instruments. Its proceeds finance climate-related projects, namely renewable energy, energy efficiency, and clean transport projects (Flammer, 2021; International Capital Market Association [ICMA], 2023; Löffler et al., 2021). Nowadays, ICMA (2023) created optional principles that describe the standards, assessment, proceeds management, and reporting for GBs issuance. Additionally, the climate bond initiative provides a system for GB label verification, and banks and credit rating agencies introduced indices to provide investors with a benchmark for the performance of GBs (Coleton et al., 2020). Besides its popularity, Flammer (2021) highlights some drawbacks such as the limitations on the use of proceeds and potential costs (e.g., with third-party certification).

Moving to social bonds (SoBs), these aim to provide funding for socially conscious projects. SoBs address social issues, or produce a positive social outcome, and usually have a link between the coupon yields and the social objective; if not achieved, the coupon rate becomes lower (e.g., promote basic

infrastructure, affordable housing, food security) (ICMA, 2023; Mathew & Sivaprasad, 2022). In terms of initiatives, SoBs share the principles defined for GBs (ICMA, 2023).

If the two aforementioned types are combined, we can name them sustainability bonds, which mixes green and social projects (ICMA, 2021; Mathew & Sivaprasad, 2022).

Lastly, there are the sustainability-linked bonds (SLBs), a recent instrument with first issuance of 2018. Due to the early stage of this market, Kölbel et al. (2022) stress the need for caution when drawing conclusions. Unlike the others, these bonds don't place restrictions on the use of proceeds. Thus, they can be applied for all sorts of investments and expenses, and their conditions (e.g., coupon rate) can change based on whether the issuer meets predefined ESG targets within a predefined timeline (Berrada et al., 2023; ICMA, 2023; Kölbel et al., 2022). In terms of principles, these differ from the others for including, in addition, the choice of key performance indicators (KPIs) and the calibration of sustainability performance targets (SPTs) (ICMA, 2023).

### 1.2.2. The loan market

On the banks' side, there are also sustainable funding options identical to the bonds, namely in terms of the use of proceeds requirements. As a result, the related projects are identical.

Similarly, some SLs impose restrictions on the use of proceeds – green loans (GLs) and social loans (SoLs) – while others finance general corporate purposes – sustainability-linked loans (SLLs) (Loan Market Association & The Association of Corporate Treasurers [LMA & ACT] n.d.).

Starting with GLs, the proceeds must be exclusively used to finance qualified green projects (APLMA et al., 2023d; Dursun-de Neef et al., 2023). Thus, according to Dursun-de Neef et al., (2023) we can expect a bigger impact on the

E component than the ESG score and, sometimes, a neglect of the S and G factors (Dursun-de Neef et al., 2023). Another drawback is the lack of standards and products information when compared with the bond market (Coleton et al., 2020). Nevertheless, there are initiatives trying to counter this. For example, the APLMA et al. (2023a) GL principles (GLP) are the most widely used standards in the European Union. These are quite similar to the principles of GBs, trying to propose a methodology to identify usable GLs and the actions required to ensure the proper tracking and transparency (APLMA et al., 2023a; Coleton et al., 2020).

Although they are less common, SoLs are another alternative instrument, where the main goal is to accomplish social benefits such as those identified for SoBs (section 1.2.1) (Alves et al., 2023). Their principals are similar to those set for GLs: use and management of proceeds, selection and project evaluation, and finally, reporting (APLMA et al., 2023b).

SLLs are debt obligations with terms tied to the borrower's ESG performance, establishing a price dependency between the loan's interest rate and the borrower's overall ESG performance indicators (Alves et al., 2023; APLMA et al., 2023d). Additionally, the proceeds can be used for general business needs (Alves et al., 2023; Dursun-de Neef et al., 2023). Regarding the SLL principles (SLLPs) set by APLMA et al. (2023c), these include the criteria for the selection of KPIs and the calibration of SPTs, the definition of terms (e.g., margin reductions), and the reporting and verification principles (APLMA et al., 2023c).

Finally, according to Alves et al. (2023), there are also sustainable loans, which are essentially a combination of the green, social, and sustainability-linked loans. For these, the resource is the borrower's whole balance sheet and not just the implementation of ESG projects. This way, these loans should follow the three related principles: GLPs, SLPs, and SLLPs (Alves et al., 2023).

### 1.3. The choice of debt financing instruments

This subchapter reviews the literature that aims to assess the factors influencing the selection of debt financing instruments. It first examines the motivations to choose sustainable over conventional instruments and then analyses the choice of the financing source (market *vis-à-vis* bank).

### 1.3.1. Conventional *versus* sustainable debt

#### 1.3.1.1. Firm-Level Determinants

Firm-level factors concern the attributes and goals of the enterprises that may impact the selection of instruments.

Starting with governance aspects, the board's characteristics are highlighted. When paired with a long-term debt structure, GBs are more prevalent among firms with a high proportion of female board members, likely due to different risk tolerances between genders (Cicchello et al., 2022). Furthermore, Cicchiello et al. (2022) found a positive relationship between GB issuances and companies with independent directors.

Tang & Zhang (2020) find an increase in institutional ownership following the issuance of GBs, suggesting that the increased media attention to the issue can attract investors. Moreover, Flammer (2021) detects, post-issuance, a rise in equity ownership, mainly by long-term and environmentally conscious investors, reinforcing the signaling effect, in which companies can attract this investor base with pro-environmental signals (Dong et al., 2023; Flammer, 2021).

Regarding the company's ESG performance motivations, green instruments are effective in improving the E component post-issuance, refuting the greenwashing claim (Dursun-de Neef et al., 2023; Flammer, 2021). SLLs, for instance, improve both E and G performance, since raising the overall ESG score is the main goal (Dursun-de Neef et al., 2023). Reinforcing the signaling argument Aleszczyk et al. (2022) highlights the fact that SLLs are mainly issued by

companies with lower ESG risks since, for others, the process may be expensive (Aleszczyk et al., 2022).

This leads to the factor credibility, which refers to the degree of better or greater implementation and the impact of the green projects financed with the proceeds. This can be measured, among others, by the existence of a third-party certification, listing on some exchanges dedicated to sustainable instruments (e.g.: Luxembourg Green Exchange), or even the ESG rating of the issuer (Kapraun et al., 2021).

Other determinants emerge from the firms' overall financial performance. Looking at the current ratio, there is a positive probability of GBs issuance, correlation that is enhanced by larger debt maturity structures (Cicchello et al., 2022; Löffler et al., 2021).

Regarding the effects of the announcement of GBs' issuance on stock performance, Tang & Zhang (2020) show that the investors' attention channel increases stock liquidity and have a positive impact on stock prices. However, this is more significant for first-time issuers and corporate issuers than for financial institutions (Flammer, 2021; Tang & Zhang, 2020).

Dong et al. (2023) refers that by green financing instruments demanding higher information disclosure, including these instruments will allow for more effective hedges of volatility and downside risk (Dong et al., 2023).

Regarding SLLs, economies of scale and information asymmetries can influence positively the choice for this instrument (Alves et al., 2023).

#### 1.3.1.2. Contractual-Level Determinants

The existing literature in sustainable finance also focuses on contractual-level determinants, meaning those comprising the issue terms.

Starting with one of the most controversial topics within this level, Löffler et al. (2021) defends the existence of a *greenium*, meaning a premium attached to GBs

(Löffler et al., 2021). This can also be commonly referred to as the financing cost argument, where investors can increase the bond price and the issuers can benefit from a lower cost of debt (Alves et al., 2023; Tang & Zhang, 2020).

Tang & Zhang, (2020) also explore this question, finding that GBs are issued at a 6.94 bps lower yield when compared with corporate bonds of similar issuers.

Hachenberg & Schiereck (2018) only observes a significant difference for A-rated bonds, where they find a tighter trade, arguing that, besides more expensive to issue, these bonds may offset external costs with certifications.

Löffler et al. (2021) also reach the conclusion that GBs have a lower yield when compared to conventional ones for the primary market. For the secondary, these results only started to become more evident in the later years (starting 2018).

Reconciling the credibility factor discussed in point 1.3.1.1., it is also anticipated, apart from some countries, that bonds issued by governments or supranational entities will evidence lower yields (Kapraun et al., 2021).

Wang et al. (2020) perform the same check specifically in developing countries, where climate considerations may prove difficult. Nevertheless, corporate GBs are found to also have a premium price, primarily for high corporate socially responsible issuers and underwriters, corporate issuers with lower ownership concentration, and held by long-term institutional investors (Wang et al., 2020).

Hachenberg & Schiereck, (2018) study another set of factors contributing to these pricing differences on GBs, concluding that while ESG rating plays an important role, issuance sizes, maturity, and currency do not reveal a significant influence.

Contrarily to the above-mentioned, (Flammer 2021) do not find pricing differences.

On the loan side, the same phenomenon is addressed. In the case of SLLs, the fact that lenders consider reputational risks when selecting the borrowers also

results in a significant premium attributed to a higher ESG reputation (Aleszczyk et al., 2022).

Aleszczyk et al. (2022), for instance, do not find a correlation between the ESG profile and pricing adjustments, especially in situations where borrowers miss targets and there is no longer the increased risk of fines.

Another literature outcome provided by Alves et al. (2023) is that, despite sharing common pricing characteristics, conventional and sustainable loan prices may be influenced differently. While contractual factors that impact conventional loan spreads, such as maturity, currency risk, or transaction size, have no effect on SLs, the credit rating, syndicate structure, and market volatility do.

Additional contractual determinants include longer bond maturities, that have a negative correlation with the issuance of GBs, and the ECB collateral eligibility with a positive effect on its likelihood of issuance (Cicchiello et al., 2022). Furthermore, GBs are more likely to be senior unsecured debt bonds, with lower-rate issuers (Löffler et al., 2021).

#### 1.3.1.3. Macro-Level Determinants

To conclude this conventional *vis-à-vis* sustainable market analysis, macro-level factors include the broader environment in which the company operates.

One key motivation for sustainable financing is the threat of climate-related risks to financial stability. In this sense, Coleton et al. (2020) consider, at first, the physical risk of damaging property and disrupting the economy due climate change catastrophes, and secondly the transition risk arising from the necessary modifications to achieve a reduced carbon economy (Coleton et al., 2020).

Moving to the country-level, Cicchiello et al., (2022) produce relationship checks between the issuance of sustainable instruments and factors such as GDP growth, inflation, or government interest rates.

Regarding the actions of governments, Gao & Schmittmann (2022) highlight the introduction of carbon pricing to create transition risk and avoid large carbon prices in the future. Additionally, nowadays some countries (e.g., Japan and Singapore) already attribute a green bond subsidy to promote the transition (Gao & Schmittmann, 2022).

The need for third party certification also plays a critical role. Nevertheless, it can be costly and require managerial effort and resources (Gao & Schmittmann, 2022; Tang & Zhang, 2020).

Lastly, market conditions, trends, and challenges provide another set of determinants. According the UNCTAD (2022), the value of sustainability-themed financial products increased by around 63% from 2020, and this growth is predicted to continue, with sustainable funds and bonds within developed countries being the primary drivers of this rise.

### 1.3.2. Loans *versus* bonds

The decision of whether to raise debt through banks or directly in the market is another topic frequently examined in the literature.

Starting with the relationship between debt choice and the issuer credit quality, high-rated borrowers prefer to raise public debt (Cantillo & Wright, 2000; Denis & Mihov, 2003; Esho et al., 2001). On the other side, borrowers in the middle of the spectrum or in financial distress are usually the main clientele of banks, allowing for a less damaging intervention and the acquisition of a reputation for financial flexibility (Cantillo & Wright, 2000; Chemmanur & Fulghieri, 1994; Denis & Mihov, 2003; Diamond, 1991; Esho et al., 2001). Nevertheless, Rajan (1992) draws attention to the fact that this flexibility can lead to a future bargaining power from the banks over the firm's profits once the projects begin. De Fiore & Uhlig (2011) share a similar vision but argue that, in the limit, high-risk default companies may even prefer to abstain from

production. In this sense, some authors suggest a pecking order based on a lifecycle associated with reputation, where new borrowers may choose banks to acquire and establish credibility, by being monitored, and may later issue debt directly (Altunbaş et al., 2010; Diamond, 1991).

The access to the public market is also critical in the choice between bonds and loans. According to Cantillo & Wright (2000), once a firm has entered the markets for publicly traded debt, they will probably remain there.

Information problems are also frequently addressed. According to Krishnaswami et al. (1998), the greater the degree of information asymmetry, the higher the reliance on private debt. This happens because banks have an advantage in producing information about the borrowers, being more efficient in resolving this issue through screening and monitoring (De Fiore & Uhlig, 2011; Diamond, 1984). Johnson (1997) supports a similar idea by confirming that firms with lower information and monitoring costs, use more public debt.

Chemmanur & Fulghieri (1994) stress the positive relationship between loans and the minimization of inefficient liquidation.

The size also plays an important role since larger firms, by issuing larger issue sizes, may exploit scale economies in floatation costs of public debt (Esho et al., 2001; Houston & James, 1996; Krishnaswami et al., 1999).

Regarding the maturity, Denis & Mihov (2003) report a positive correlation with the choice for public debt.

Finally, Esho et al. (2001) show that firms with well-developed private bond markets have a higher probability of going for bonds instead of loans.

## Chapter 2

### Research Question and Hypotheses

It is clear, at this point, that a significant amount of literature has examined the selection of debt instruments. Initially, this research was focused on the choice between loans and bonds. However, with the expansion of sustainable finance, the literature has broadened to include the factors influencing decisions about conventional *versus* sustainable markets. Nonetheless, there is investigation missing of both decisions at the same time. This way, this gap leads us to explore the following question: “What are the main factors influencing the choice between sustainable market financing and sustainable banking financing?”. We then intend to explore this topic by answering the five hypotheses defined below.

Starting with firm variables, Cicchiello et al. (2022) and Löffler et al. (2021) discovered a positive association between business performance and the issue of GBs. Conversely, Cantillo & Wright (2000), Chemmanur & Fulghieri (1994), Denis & Mihov (2003), and Esho et al. (2001) explored the choice of debt based on the financial situation of the company and respective ratings, concluding that financial distress has a positive relationship with bank loans. Since this is a conclusion drawn for the conventional market, we will investigate it in the light of the sustainable markets, formulating the following:

*Hypothesis 1 [H1]: Financially healthier companies are more likely to choose sustainable market financing, while financially distressed firms prefer sustainable banking financing.*

Recalling the pecking order proposed by Altunbaş et al. (2009) and Diamond (1991), reputation becomes a critical factor when choosing bank debt over market

debt. Given the sustainable market, credibility is more associated with stronger and greater implementation of ESG projects (Kapraun et al., 2021), which is often correlated with ESG ratings. For example, Aleszczyk et al. (2022) proved the relevance of these ratings when opting for SLs. However, to analyse its weight in the decision between loans and bonds, we propose the following:

*Hypothesis 2 [H2]: Companies with stronger ESG ratings are more likely to choose sustainable public placement borrowings compared to loans.*

The third hypothesis addresses the asymmetries of information. Even though sustainable markets are typically associated with higher disclosures of information (Dong et al., 2023), De Fiore & Uhlig (2011), Diamond (1984), Johnson (1997), and Krishnaswami et al. (1999) reinforce the idea that companies with higher degrees of asymmetry will rely more on banks due to their efficiency in dealing with them. In this sense, we propose:

*Hypothesis 3 [H3]: Firms with higher levels of asymmetric information are more likely to choose sustainable private instruments.*

Moving to contractual characteristics, it was highly stressed that a *greenium* may be linked to green instruments, particularly bonds, when comparing the conventional and sustainable markets (Alves et al., 2023; Löffler et al., 2021; Tang & Zhang, 2020). Furthermore, as Esho et al. (2001), Houston & James (1996), and Krishnaswami et al. (1999) referred, when comparing loans *versus* bonds, market debt may face a lower cost of capital due to economies of scale in floating costs. Thus, this makes us predict that:

*Hypothesis 4 [H4]: Sustainable bonds offer a lower cost of capital compared to sustainable loans.*

Finally, for macro-level determinants, the literature lacks insights into the variation of financing source preferences across countries that may encompass different economic, political, and social environments. Therefore, considering it important to investigate the interaction of these elements, and following the logic of *H1* to a macro level, we propose:

*Hypothesis 5 [H5]: Companies located in higher-risk countries are more likely to choose loans over bonds.*

# Chapter 3

## Data and Methodology

### 3.1. Sample selection

The sample developed for this analysis is composed of SBs and SLs issued between 2018 and 2023. Given that each deal may contain multiple tranches, not all of which may be categorized as sustainable instruments, we consider the tranche as the unit of observation. Regarding the period, we faced a limitation of Loan Analytics, that only started labelling for sustainability in the middle of 2017.

To build this sample, we used two main databases: DCM Analytics and Loan Analytics. The first covers the global debt capital markets, providing data on bonds, classifying the “green bond instrument type” into green, social, and sustainability bonds. A similar extraction was done for loans via Loan Analytics, which covers the global syndicated loan market. This database directly designates the SoLs and identifies the SLLs and GLs by its compliance to the principles (SLLP and GLP, respectively). To complement some variables, we used Refinitiv Eikon and Moody’s (see Appendix A, with detailed information regarding the sources).

To the initial extractions, we made some adjustments, removing the tranches with a perpetual maturity and those that did not provide the issuance size. For the issuer, we disregarded companies belonging to the public sector offering financial services, namely presenting a general industry group (GIG) of “Finance”, “Government”, “Holding Companies”, “Insurance” or “Closed End Funds”, and excluded tranches with use of proceeds of “Securitization”. Finally, we withdraw those tranches issued in countries that did not have, at least, one observation in each of the two markets.

After this data treatment, we reached a final sample of 6,395 observations, of which 3,513 are SLs and 2,882 are SBs. In line with the market trends, table 1 indicates that the green and sustainability-linked instruments are the most prevalent for banking financing, while the green clearly stands out on debt capital markets.

Table 2 provides the distribution of observations per year, confirming the tendency of increase in both markets, although banks financing grew at a more expressive rate (on average 65% growth per year versus 35%).

The breakdown of tranches by borrower geography (table 3), evidences that Europe is the main region for both markets, representing 69.06% of the total value of loan issuances and 45.29% of bonds. Following Europe, Asia represents 13.62% of the SLs value, followed by North America with 11.32%. Similarly, for bonds market, Asia and North America occupy the second place with 24.68% and 24.97% of the total value, respectively. On the other side, Latin America, the Middle East, and the South Pacific exhibit small percentages that, summed, reach only 5% for each market.

In terms of dominant industries (table 4), Utility & Energy present the highest percentages of the total value (26.75% and 34.05% for loans and bonds, respectively), followed by the Real Estate and Manufacturing sectors.

Finally, table 5, recaps the top 10 borrowers in terms of value of tranches issued. These debtors represent 11.17% of the loan market and 11.74% of the bond market, with Ford Motor Co and ENGIE SA in the front with 1.65% and 1.94% of the overall issuance value, respectively.

**Table 1:** Sample distribution by product type

Product type	Loans			Bonds		
	Number of loans	Number of deals	Total Value (\$ million)	Number of bonds	Number of deals	Total Value (\$ million)
Green	1,663	826	315,954	2,413	1,878	560,093
Social	48	25	4,950	83	67	16,064
Sustainability-linked	1,802	1,129	724,305	386	274	95,185
<b>Total</b>	<b>3,513</b>	<b>1,971*</b>	<b>1,045,209</b>	<b>2,882</b>	<b>2,214*</b>	<b>671,343</b>

Note: Table 1 describes the sample distribution by product type. Data from DCM/Loan Analytics, 2018-2023. The number of deals represents the count of unique deals (some may consist of multiple types of tranches).

**Table 2:** Sample distribution by year

Year	Loans			Bonds		
	Number of loans	Number of deals	Total Value (€ million)	Number of bonds	Number of deals	Total Value (€ million)
2018	98	49	39,587	190	133	40,570
2019	209	127	71,224	374	249	79,714
2020	365	193	106,669	401	335	113,912
2021	796	465	285,056	666	552	181,406
2022	1,189	662	331,033	568	467	122,041
2023	856	475	211,640	683	478	133,699
<b>Total</b>	<b>3,513</b>	<b>1,971</b>	<b>1,045,209</b>	<b>2,882</b>	<b>2,214</b>	<b>671,343</b>

Note: Table 2 describes the sample distribution by year. Data from DCM/Loan Analytics, 2018-2023.

**Table 3:** Sample distribution by geography

Borrower geography	Loans				Bonds			
	Number of loans	Number of deals	Total Value (\$ million)	% of Total Value	Number of bonds	Number of deals	Total Value (\$ million)	% of Total Value
Africa	123	29	7,122	0.68%	9	6	282	0.04%
Asia	839	557	142,361	13.62%	1,245	854	165,675	24.68%
Japan	532	371	51,970	4.97%	407	331	60,166	8.96%
Europe	2,039	1,123	721,803	69.06%	1,128	976	304,074	45.29%
United Kingdom	232	107	95,836	9.17%	128	94	45,876	6.83%
Germany	144	106	110,775	10.60%	100	75	59,984	8.93%
France	444	223	142,743	13.66%	87	73	38,844	5.79%
Latin America	57	35	12,414	1.19%	80	60	22,034	3.28%
Middle East	34	19	15,591	1.49%	9	9	6,314	0.94%
North America	290	149	118,359	11.32%	381	280	167,639	24.97%
United States	271	137	113,252	10.84%	318	225	151,436	22.56%
South Pacific	131	59	27,558	2.64%	30	29	5,326	0.79%
Australia	109	53	25,374	2.43%	17	16	3,793	0.57%
<b>Total</b>	<b>3,513</b>	<b>1,971</b>	<b>1,045,209</b>	<b>100%</b>	<b>2,882</b>	<b>2,214</b>	<b>671,343</b>	<b>100%</b>

Note: Table 3 describes the sample distribution by geography. Data from DCM/Loan Analytics, 2018-2023. We excluded countries without one observation in each market.

**Table 4:** Sample distribution by industry

Borrower industry	Loans				Bonds			
	Number of loans	Number of deals	Total Value (\$ million)	% of Total Value	Number of bonds	Number of deals	Total Value (\$ million)	% of Total Value
Agriculture & Forestry	88	46	20,392	1.95%	51	40	14,953	2.23%
Construction	169	102	41,299	3.95%	185	117	15,507	2.31%
Manufacturing	725	453	269,001	25.74%	378	280	129,701	19.32%
Aerospace	7	5	11,936	1.14%	1	1	234	0.03%
Auto/Truck	94	66	70,604	6.75%	91	57	47,335	7.05%
Chemicals	111	75	32,161	3.08%	78	64	18,791	2.80%
Computers & Electronics	173	96	47,442	4.54%	97	71	36,077	5.37%
Food & Beverage	187	108	58,452	5.59%	45	35	11,473	1.71%
Machinery	82	57	30,583	2.93%	32	27	6,674	0.99%
Metal & Steel	46	34	14,461	1.38%	33	24	9,042	1.35%
Textile	25	12	3,364	0.32%	1	1	74	0.01%
Mining	81	50	55,708	5.33%	35	23	6,048	0.90%
Oil & Gas	58	37	49,384	4.72%	21	14	4,505	0.67%
Real Estate	650	414	120,841	11.56%	1,020	896	169,342	25.22%
Retail Trade	72	48	30,287	2.90%	32	28	7,641	1.14%
Services	220	123	67,978	6.50%	97	61	29,821	4.44%
Healthcare	100	62	47,780	4.57%	31	24	12,870	1.92%
Professional Services	120	61	20,198	1.93%	66	37	16,951	2.52%
Transportation, Communications, Electric, Gas & Sanitary service	1,379	663	406,041	38.85%	1,037	726	287,652	42.85%
Utility & Energy	1,067	476	279,582	26.75%	791	546	228,570	34.05%
Multiple	129	72	33,663	3.22%	47	43	10,678	1.59%
<b>Total</b>	<b>3,513</b>	<b>1,971</b>	<b>1,045,209</b>	<b>100%</b>	<b>2,882</b>	<b>2,214</b>	<b>671,343</b>	<b>100%</b>

Note: Table 4 describes the sample distribution by industry. Data from DCM/Loan Analytics, 2018-2023. We excluded companies belonging to GIGs of “Finance”, “Government”, “Holding Companies”, “Insurance” or “Closed End Funds”.

**Table 5:** Top 10 borrowers of the sample

<b>Borrower</b>	<b>Loans</b>		<b>Borrower</b>	<b>Bonds</b>	
	<b>By value of tranches</b>	<b>By number tranches</b>		<b>By value of tranches</b>	<b>By number tranches</b>
Ford Motor Co	1.65%	0.11%	ENGIE SA	1.94%	0.62%
Trafigura Group Pte Ltd	1.59%	0.23%	NTT Finance Corp	1.55%	0.59%
ENEL SpA	1.38%	0.06%	E.ON SE	1.53%	0.42%
Sanofi	1.33%	0.09%	Volkswagen International Finance NV	1.24%	0.31%
Mercedes-Benz Group AG	1.01%	0.03%	Energias de Portugal SA-EDP	1.07%	0.28%
Anheuser-Busch InBev SA/NV	0.97%	0.03%	Toyota Motor Corp	0.99%	0.42%
ENI SpA	0.90%	0.06%	Iberdrola Finanzas SAU	0.92%	0.28%
SunZia Finco Holdings LLC	0.84%	0.06%	Alphabet Inc	0.86%	0.10%
Airbus SE	0.80%	0.03%	Suez SA	0.84%	0.24%
Snam SpA	0.70%	0.11%	RWE AG	0.79%	0.24%

Note: Table 5 describes the sample main borrowers. Data from DCM/Loan Analytics, 2018-2023.

## 3.2. Variables and Model

This research aims to understand the companies' decision-making between sustainable banking and sustainable market financing. Factors examined include firm, contractual and macroeconomic levels and we run a logistic regression model resumed as following:

$$\text{Choice of debt}_{i,t} = \alpha_0 + \beta \text{ Firm level determinants}_{i,t} + \gamma \text{ Contractual level determinants}_{i,t} + \varphi \text{ Macroeconomic level determinants}_{i,t} + \varepsilon_{i,t}$$

Where  $i$  represents the tranche at time  $t$ .

All the models were adjusted for heteroskedasticity, and the standard errors were clustered by country and year. Furthermore, endogeneity issues were also taken into consideration (appendix B provides the correlation test results).

### 3.2.1 Dependent variable

The dependent variable is the choice of debt. This discrete variable assumes the value 1 if the firm chooses a SL and 0 for a SB instead.

### 3.2.2 Independent variables

Appendix A summarizes the variables considered in the models, as well as their source and expected impact based on the extant literature.

Starting with firm-level variables, *company rating* stands for the borrower's S&P and Moody's rating at signing. Following the approach of Pinto & Santos (2020), this is a continuous variable for which we converted the ratings into numbers (AAA=Aaa=1 until D = 22). However, since not all the companies have ratings available, we combined the variables *rated company* and *company rating*, originating the *company rating\*rated*, which assigns the value 0 to non-rated companies (Alves et al., 2023). Considering that the higher the value of this variable, the worse its rating, we expect a positive relationship with the issuance of SLs since companies in financial distress tend to rely more on banks.

A similar approach has been taken for the *company ESG score* (Alves et al., 2023; Pinto & Santos, 2020). We converted the scores using the same logic (A+ = 1 until D = 12) and created the variable *ESG score\*scored* with the same purpose of solving the fall of observations. Following the rationale exposed in H2, we then expect that the better the ESG score, the lower the resource for private financing.

*Log total assets* arise as a proxy for the company size and, consequently, for asymmetries of information. Smaller companies are associated with greater asymmetries of information, and these, in turn, are characterized by a higher reliance on loans.

To enrich the model, we added two dummy variables: *switcher* and *experienced*. *Switcher* is 1 if the company issued both types of instruments, and 0 otherwise, predicting a negative relationship with SBs, as companies entering the public market are unlikely to switch to privates. For *experienced*, the same approach is used, where 1 considers the companies that issued more than one tranche during the period of analysis.

For contract-related variables, the *cost of capital* is the combination of the all-in pricing and the tranche all-in pricing for loans, and the tranche spread to benchmark for bonds, being expected a positive relationship with loans.

We also integrate the *issuance size*, that recalling the possibility of economies of scale for floatation costs, can make us predict that bonds are more associated to greater issuance sizes. Additionally, variables giving insights about the complexity of the operation, such as the *number of tranches* that compose the deal and the *number of banks* involved were also added.

Regarding the *maturity*, it is expected to have a positive relationship with the issuance of SBs.

The *tranche rating* follows the same approach of the other rating variables by being converted into numbers (AAA=Aaa=1 until D = 22), and since not all the

tranches are rated, we added the *tranche rating\*rated* (Alves et al., 2023; Pinto & Santos, 2020).

Finally, considering that the instruments may not be issued in their local currency, we incorporate the *currency risk*.

For macro-level factors, the *country risk* corresponds to the Moody's country rating in the year of the issuance. To look for the impact of markets stability we still control for the *yield curve slope* (computed by the difference between the USA 5-year Treasury Bond rate and the USA 3-month Treasury Bill rate) and *volatility* (that corresponds to the Chicago Board Options Exchange Volatility Index - CBOE).

To finalize, the models are also controlled by fixed effects (FE) of *industry*, *world region*, and *funding purpose* (investment, capital structure, general purposes, project and asset financing, and other restructuring operations).

### 3.3. Descriptive statistics of the sample

For a sample overview, we computed descriptive statistics along with the Wilcoxon rank-sum test, for the continuous variables, and the Fisher's exact test, for the discrete ones. Table 6 summarizes the results, with variables marked <sup>(a)</sup> or <sup>(b)</sup> indicating statistically significant differences at the 1% and 5% levels, respectively, between loans and bonds subsamples.

Starting with the number of observations, the already mentioned fall assisted on *company rating*, *company ESG score*, and *tranche rating* led us to create alternative variables to be considered in the model. In this sense, *company rating\*rated* evidences a higher average for bonds (3.70) than loans (1.48), which contradicts, at some point the literature and H1. The same contradiction appears to occur with the *company ESG score \* scored*, that has better ratings for loans than bonds, and with the *tranche rating\*rated*.

In terms of *total assets*, the average value, in millions, in the bonds' market (\$ 35,904.02) surpasses the average in the loans' market (\$ 15,284.80).

Compared to bonds (171.88 bps), the average *spread* of loans is greater (190.76 bps). However, due to the observable loss of data on the SLs sample, we will integrate this variable in a separated model.

Regarding the *issuance size*, SBs are, on average, smaller than SLs (\$ 232.94 *versus* \$ 297.57 million, respectively), contradicting expectations. The opposite occurs with the number of tranches that compose the deal (3.36 on bonds *versus* 2.96 on loans).

Looking at the average *maturity*, loans are issued, on average, for 6.48 years, and bonds for 8.02.

For the *number of banks*, the difference is notable since loans involve an average of 7.06 banks, against only 4.53 of bonds.

Finally, for macro determinants, loans tend to have always higher values than bonds, and a *country risk* of 4.61 (loans) *versus* 3.75 (bonds) supports the H5. Regarding *volatility* the difference is small (SLs with 21.46 and SBs with 20.36), however, for the *yield curve slope*, the discrepancy becomes more significant (26.82 for private debt and 18.89 for public debt).

**Table 6:** Descriptive Statistics – Continuous variables

Variable name	Loans			Bonds		
	Number	Mean	Median	Number	Mean	Median
<i>Firm</i>						
Company rating <sup>a</sup>	538	9.68	9.00	1,209	8.82	8.00
Company rating*rated <sup>a</sup>	3,513	1.48	0.00	2,882	3.70	0.00
Company ESG score <sup>a</sup>	440	4.90	5.00	759	5.38	5.00
Company ESG score*scored <sup>a</sup>	3,513	0.61	0.00	2,882	1.42	0.00
Total assets (\$ million) <sup>a</sup>	834	15,284.80	4,616.97	1,209	35,904.02	9,844.71
<i>Contractual</i>						
Spread (bps) <sup>b</sup>	351	190.76	160.00	1,227	171.88	135.00
Issuance size (\$ million)	3,513	297.57	101.68	2,882	232.94	92.00
Number of tranches <sup>a</sup>	3,513	2.96	2.00	2,882	3.36	1.00
Maturity (years) <sup>a</sup>	3,513	6.48	5.00	2,882	8.02	5.10
Tranche rating <sup>a</sup>	538	9.83	9.00	1,474	8.11	8.00
Tranche rating*rated <sup>a</sup>	3,513	1.50	0.00	2,882	4.15	3.00
Number of banks <sup>a</sup>	3,513	7.06	5.00	2,882	4.53	3.00
<i>Macro</i>						
Country risk <sup>a</sup>	3,513	4.61	4.00	2,882	3.75	3.00
Volatility <sup>a</sup>	3,513	21.46	20.56	2,882	20.36	19.09
5yTB-3mTB <sup>a</sup>	3,513	26.82	33.30	2,882	18.89	28.75

Note: Table 6 displays the descriptive statistics of continuous variables. Ratings were converted to numbers (AAA=Aaa=1 until D = 22, or A+ = 1 until D = 12, for the ESG score). We ran the Wilcoxon rank-sum test to account for distributions' similarities between bonds and loans samples. (a) and (b) denote variables with p-values below 0.01 and 0.05, respectively.

**Table 7:** Descriptive Statistics – Discrete Variables

<b>Variable name</b>		<b>Loans</b>	<b>Bonds</b>
Rated company <sup>a</sup>	% of total	15.31%	41.95%
	Nr. of D=1	538	1,209.00
ESG Scored company <sup>a</sup>	% of total	12.52%	26.34%
	Nr. of D=1	440	759
Switcher <sup>a</sup>	% of total	10.99%	16.17%
	Nr. of D=1	386	466
Experienced	% of total	80.96%	82.79%
	Nr. of D=1	2,844.00	2,386.00
Rated tranche <sup>a</sup>	% of total	15.31%	51.15%
	Nr. of D=1	538	1,474.00
Currency risk <sup>a</sup>	% of total	15.12%	17.90%
	Nr. of D=1	531	516

Note: Table 7 provides the descriptive statistics of discrete variables. We ran the Fisher's exact test to account for distributions' similarities between bonds and loans samples. <sup>(a)</sup> and <sup>(b)</sup> denote variables with p-values below 0.01 and 0.05, respectively.

# Chapter 4

## Results

To investigate the choice between banking financing (SLs) and market financing (SBs) we conducted 21 models, detailed on the tables 8 to 13.

Our three base models can be briefed on table 8. Acknowledging the high correlation between *company rating\*rated* and *tranche rating\*rated* (appendix B), we conduct a first model without considering the rating of the company ([1]), a second model ([2]) disregarding the tranche rating and a third model ([3]) that includes both variables. For models [4] to [6] we perform the same tests but adding the FE. Since the robustness seem to improve, FE will be considered for the subsequent models.

For [7] to [9] and [10] to [12], we perform the same analysis but for specific types of sustainable instrument (green and sustainability-linked, respectively). Social instruments are not analysed separately due to their insignificant weight in the sample. Regarding other specific subsamples, models [13] to [15] show the results for switchers only, and [16] to [18] and [19] to [21] integrate the *spread* and the *log total assets*, respectively.

### 4.1. Are financially healthier companies more likely to choose sustainable bonds?

The variables *company rating\*rated* and *tranche rating\*rated* aim to proxy the financial health of the borrowers. Unexpectedly, these suggest opposite results.

Looking at the models that assess the variables separately, [1] suggests that, at a 1% significance level and 5% for sustainability-linked subsample ([10]), the likelihood of choosing loan increases with the tranche rating. Adding the FE ([4]) and controlling for green instruments ([7]), the impact of this variable is lost. In

the models disregarding the tranche rating, the company rating has no effect on the choice of debt for the general sample ([2] and [5]). Only for the subsample of switchers ([14]), it suggests a negative relationship with loan issuance at the 1% level, while when adding the *spread* ([17]), this relation becomes positive at 1%, and adding the *log total assets* ([20]), it is negative again at 5%.

When we account for both ratings (models [6], [9], [12], [15], and [21]) the company rating is negatively associated with loans, meaning that companies with poorer prospects will prefer bonds. This, then, leads us to reject the H1. This result contrasts with the conclusions of the conventional market likely due to the low maturity of sustainable markets. While capital markets are more advanced, sustainable banking financing is still recent, so banks may prefer to start with higher-rated companies. Nevertheless, is recommended further analysis with a more complete dataset for future research.

## 4.2. Do companies with better ESG performance prefer sustainable bonds?

Looking at models [1] to [6], and [10] to [12], we predict a negative relationship between the values of the *company ESG score\*scored* and the issuance of loans, at a 1% to 5% significance level. The models controlling for green instruments, switchers, and adding the *spread* and *log total assets* (tables 9, and 11 to 13), do not evidence statistical significance for the ESG score.

In this sense, the results of tables 8 and 10 are strong enough to reject H2. This suggests that companies with better scores will issue loans maybe following the same rational of the conclusion taken for H1, where banks may prefer, in the beginning, more credible borrowers. Nevertheless, the huge fall of observations reinforces the importance to double check these results with a more complete sample for the ESG score.

### 4.3. Do higher asymmetries of information favor the choice for loans?

As explained on chapter 2, the asymmetries of information are highly associated to the firm size that we proxy, in this analysis, by the total assets.

In this sense, the *log total assets*, included in models [19] to [21], always presents a negative impact on the choice of loans at a 1% level of statistical significance. This means that the largest companies, which usually have lower asymmetries of information, will prefer bonds, corroborating the H3.

### 4.4. Is the cost of capital positively related with sustainable loans?

Table 12 resumes the models for which *spread* (in basis points) is added. It was integrated separately due to the loss of observations of this variable, especially for the SLs subsample.

Regarding the results, they conflict with the expectations since *spread* shows a negative relationship with the issuance of sustainable loans, at the 5% to 10% levels, rejecting H4. Nevertheless, caution is again suggested with this conclusion since SLs only have 351 observations with spread information available, which may not be very representative of the real figures. This can then be another topic to be studied in the future with a more informative sample.

### 4.5. Do companies located in high-risk countries prefer loans?

Finally, we examine the *country risk* to address this last hypothesis. With only minor variations in the level of significance, the results show a positive relation between the resource to private debt and the risk of the issuance country. This finding is significant at the 1% level for the majority of models; however, it

becomes significant at the 10% adding the *spread* (models [15] and [17]) or controlling for the subsample of switchers (models [13] and [14]). Finally, for green instruments (table 9), the results are not significant. Having stated this, we accept H5.

#### 4.6. Additional results

We may infer further conclusions about the remaining variables from the base models with FE ([3] to [6]). Unlike expected, *switchers* show a positive relationship with loan issuance for models [4], at a significant level of 5%, and [6], at a 10%. With 1% of statistical significance, the longer the *maturity*, the greater the preference for bonds (models [4] to [6]). Additionally, the likelihood of bank debt, at the 1% level, rises with an increase in the *number of banks* involved in the operation. Regarding the *currency risk*, it exhibits a negative relationship with loans, at the 1% level, for the three models, and finally, higher *volatility* is associated with the preference for loans (1% level for models [4] and [5], and 5% for model [6]).

**Table 8:** Determinants of debt choice

Dependent variable:	Loan = 1 Bond = 0					
	[1]	[2]	[3]	[4]	[5]	[6]
Choice of debt	SL <i>versus</i> SB (w/o FE)			SL <i>versus</i> SB (w/ FE)		
<b>Independent variables:</b>						
Intercept	-0.648 (0.164)	-0.557 (0.231)	-0.616 (0.189)	5.257*** (0.000)	5.265*** (0.000)	5.482*** (0.000)
Rated company	-	-2.600*** (0.000)	1.843** (0.023)	-	-1.636*** (0.000)	2.074*** (0.001)
Company rating*rated	-	0.070 (0.213)	-0.155** (0.028)	-	0.010 (0.812)	-0.139** (0.012)
ESG scored company	0.549 (0.209)	0.427 (0.279)	0.464 (0.282)	0.614 (0.279)	0.441 (0.389)	0.482 (0.392)
Company ESG score*scored	-0.245*** (0.001)	-0.213*** (0.001)	-0.232*** (0.001)	-0.218** (0.023)	-0.187** (0.028)	-0.200** (0.036)
Switcher	0.037 (0.899)	-0.062 (0.823)	0.008 (0.978)	0.500** (0.040)	0.334 (0.173)	0.472* (0.054)
Experienced	-0.016 (0.913)	0.013 (0.929)	-0.013 (0.931)	-0.166 (0.225)	-0.105 (0.456)	-0.190 (0.173)
Log issuance size (\$ million)	0.068 (0.191)	0.010 (0.845)	0.062 (0.243)	0.068 (0.286)	-0.010 (0.859)	0.054 (0.400)
Number of Tranches	-0.062* (0.057)	-0.075*** (0.009)	-0.062* (0.063)	-0.075* (0.089)	-0.120*** (0.008)	-0.065 (0.174)
Maturity (years)	-0.046*** (0.001)	-0.057*** (0.000)	-0.047*** (0.000)	-0.114*** (0.000)	-0.120*** (0.000)	-0.116*** (0.000)
Rated tranche	-3.763*** (0.000)	-	-5.321*** (0.000)	-2.728*** (0.000)	-	-4.364*** (0.000)
Tranche rating*rated	0.152*** (0.009)	-	0.286*** (0.000)	0.066 (0.126)	-	0.179*** (0.002)
Number of Banks	0.172*** (0.000)	0.170*** (0.000)	0.170*** (0.000)	0.123*** (0.000)	0.122*** (0.000)	0.120*** (0.000)
Currency risk	-0.217 (0.289)	-0.311 (0.113)	-0.164 (0.396)	-0.607*** (0.000)	-0.698*** (0.000)	-0.561*** (0.001)
Country risk	0.126*** (0.003)	0.134*** (0.001)	0.127*** (0.002)	0.154*** (0.000)	0.139*** (0.000)	0.156*** (0.000)
Volatility	0.023* (0.000)	0.026** (0.000)	0.023* (0.000)	0.032*** (0.000)	0.033*** (0.000)	0.030** (0.000)

	(0.080)	(0.049)	(0.087)	(0.006)	(0.003)	(0.010)
5yTB-3mTB	0.000	0.000	0.000	-0.001	-0.001	-0.001
	(0.806)	(0.939)	(0.774)	(0.531)	(0.521)	(0.580)
Industry FE	No	No	No	Yes	Yes	Yes
Instrument purpose FE	No	No	No	Yes	Yes	Yes
Region FE	No	No	No	Yes	Yes	Yes
Nr. observations	6.395	6.395	6.395	6.395	6.395	6.395
Correct classification	74.78%	73.45%	74.93%	87.21%	85.93%	87.02%
Pseudo R2	0.25	0.203	0.253	0.522	0.496	0.525

Note: Table 8 provides logistic regression results for the full sample, analyzing the choice between SLs (1) and SBs (0). Models [1]-[3] exclude FE; [4]-[6] include it. Models [1] and [4] exclude company rating. [2] and [5] exclude tranche rating; [3] and [6] include all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*\*) (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

**Table 9:** Determinants of debt choice - Green instruments

Dependent variable:	Loan = 1		
	Bond = 0		
	Green instrument = 1		
Choice of debt	[7]	[8]	[9]
GL versus GB			
<b>Independent variables:</b>			
Intercept	5.818*** (0.000)	6.086*** (0.000)	6.009*** (0.000)
Rated company	-	-2.099** (0.023)	2.328** (0.021)
Company rating*rated	-	0.001 (0.994)	-0.156* (0.063)
ESG scored company	-0.471 (0.648)	-0.43 (0.646)	-0.638 (0.526)
Company ESG score*scored	-0.195 (0.207)	-0.207 (0.142)	-0.172 (0.257)
Switcher	0.316 (0.299)	0.097 (0.744)	0.291 (0.328)
Experienced	-0.188 (0.274)	-0.033 (0.861)	-0.235 (0.224)
Log issuance size (\$ million)	0.055 (0.528)	-0.074 (0.333)	0.045 (0.613)
Number of Tranches	-0.066 (0.412)	-0.124** (0.043)	-0.053 (0.589)
Maturity (years)	-0.105*** (0.000)	-0.112*** (0.000)	-0.107*** (0.000)
Rated tranche	-3.297*** (0.001)	-	-5.046*** (0.000)
Tranche rating*rated	0.042 (0.643)	-	0.163 (0.118)
Number of Banks	0.151*** (0.000)	0.153*** (0.000)	0.147*** (0.000)
Currency risk	-0.530* (0.098)	-0.852*** (0.006)	-0.477 (0.154)
Country risk	0.076 (0.137)	0.05 (0.294)	0.078 (0.134)

Volatility	0.03 (0.156)	0.036* (0.091)	0.028 (0.194)
5yTB-3mTB	0.000 (0.721)	-0.001 (0.602)	0.000 (0.812)
Industry FE	Yes	Yes	Yes
Instrument purpose FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Nr. observations	4.075	4.075	4.075
Correct classification	92.05%	91.26%	91.90%
Pseudo R2	0.673	0.648	0.675

Note: Table 9 provides logistic regression results for green instruments only, analyzing the choice between SLs (1) and SBs (0). Models include FE. Model [7] excludes company rating; [8] excludes tranche rating; [9] includes all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*\*), (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

**Table 10:** Determinants of debt choice - Sustainability-linked instruments

Dependent variable:	Loan = 1		
	Bond = 0		
	Sustainability-linked instrument = 1		
Choice of debt	[10]	[11]	[12]
<i>SLL versus SLB</i>			
<b>Independent variables:</b>			
Intercept	6.007*** (0.000)	5.797*** (0.000)	5.952*** (0.000)
Rated company	-	-1.776*** (0.006)	1.713 (0.279)
Company rating*rated	-	0.003 (0.959)	-0.228** (0.036)
ESG scored company	0.651 (0.184)	0.582 (0.228)	0.536 (0.285)
Company ESG score*scored	-0.241*** (0.003)	-0.211*** (0.008)	-0.215*** (0.004)
Switcher	1.296*** (0.000)	1.254*** (0.000)	1.201*** (0.001)
Experienced	-0.011 (0.964)	0.010 (0.963)	0.017 (0.945)
Log issuance size (\$ million)	-0.053 (0.606)	-0.086 (0.391)	-0.036 (0.730)
Number of Tranches	-0.195** (0.025)	-0.222*** (0.000)	-0.194** (0.041)
Maturity (years)	-0.228*** (0.000)	-0.246*** (0.000)	-0.236*** (0.000)
Rated tranche	-3.188*** (0.000)	-	-4.620*** (0.001)
Tranche rating*rated	0.144** (0.018)	-	0.335*** (0.002)
Number of Banks	0.119*** (0.000)	0.129*** (0.000)	0.115*** (0.000)
Currency risk	-0.330 (0.439)	-0.281 (0.416)	-0.148 (0.704)
Country risk	0.254*** (0.001)	0.262*** (0.001)	0.266*** (0.000)

Volatility	0.031 (0.202)	0.032 (0.172)	0.026 (0.245)
5yTB-3mTB	-0.002 (0.306)	-0.002 (0.343)	-0.002 (0.343)
Industry FE	Yes	Yes	Yes
Instrument purpose FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Nr. observations	2.078	2.078	2.078
Correct classification	90.66%	90.62%	91.10%
Pseudo R2	0.537	0.519	0.543

Note: Table 10 provides logistic regression results for sustainability-linked instruments only, analyzing the choice between SLs (1) and SBs (0). Models include FE. Model [10] excludes company rating; [11] excludes tranche rating; [12] includes all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*\*) (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

**Table 11:** Determinants of debt choice - Switchers

<b>Dependent variable:</b>	Loan = 1 Bond = 0 Switcher = 1		
	[13]	[14]	[15]
Choice of debt			
	<i>SL versus SB</i>		
<b>Independent variables:</b>			
Intercept	-0.299 (0.762)	-0.215 (0.833)	-0.411 (0.708)
Rated company	-	1.731** (0.020)	5.280** (0.021)
Company rating*rated	-	-0.229*** (0.006)	-0.355* (0.093)
ESG scored company	0.540 (0.143)	0.502 (0.178)	0.267 (0.513)
Company ESG score*scored	-0.086 (0.114)	-0.075 (0.168)	-0.045 (0.442)
Switcher	0.000 -	0.000 -	0.000 -
Experienced	0.000 -	0.000 -	0.000 -
Log issuance size (\$ million)	0.142 (0.211)	0.093 (0.389)	0.121 (0.267)
Number of Tranches	0.449*** (0.000)	0.438*** (0.000)	0.472*** (0.000)
Maturity (years)	-0.277*** (0.000)	-0.282*** (0.000)	-0.269*** (0.000)
Rated tranche	0.995* (0.094)	-	-4.154** (0.048)
Tranche rating*rated	-0.184*** (0.008)	-	0.183 (0.360)
Number of Banks	0.086*** (0.002)	0.087*** (0.002)	0.089*** (0.001)
Currency risk	-0.243 (0.408)	-0.248 (0.430)	-0.336 (0.267)
Country risk	0.010* (0.059)	0.084* (0.083)	0.088 (0.103)

Volatility	0.029 (0.248)	0.027 (0.293)	0.027 (0.311)
5yTB-3mTB	0.000 (0.717)	0.000 (0.776)	0.000 (0.829)
Industry FE	Yes	Yes	Yes
Instrument purpose FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Nr. observations	849	849	849
Correct classification	73.97%	73.97%	74.32%
Pseudo R2	0.252	0.251	0.266

Note: Table 11 provides logistic regression results for switcher companies only, analyzing the choice between SLs (1) and SBs (0). Models include FE. Model [13] excludes company rating; [14] excludes tranche rating. [15] includes all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*\*) (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

**Table 12:** Determinants of debt choice – Adding the spread

<b>Dependent variable:</b>	Loan = 1 Bond = 0		
	[16]	[17]	[18]
Choice of debt			
	<i>SL versus SB</i>		
<b>Independent variables:</b>			
Intercept	6.181*** (0.000)	6.663*** (0.000)	6.348*** (0.000)
Spread	-0.004** (0.046)	-0.003* (0.076)	-0.004** (0.045)
Rated company	-	-5.034*** (0.000)	1.439 (0.432)
Company rating*rated	-	0.374*** (0.006)	-0.012 (0.934)
ESG scored company	-1.682 (0.148)	-1.459 (0.168)	-1.869 (0.127)
Company ESG score*scored	-0.098 (0.582)	-0.168 (0.242)	-0.088 (0.633)
Switcher	1.004** (0.012)	1.111*** (0.001)	1.038*** (0.008)
Experienced	-0.974** (0.005)	-1.048*** (0.003)	-1.117** (0.002)
Log issuance size (\$ million)	-0.248 (0.231)	-0.391** (0.042)	-0.259 (0.217)
Number of Tranches	0.653*** (0.000)	0.695*** (0.000)	0.669*** (0.000)
Maturity (years)	-0.191*** (0.002)	-0.235*** (0.000)	-0.190** (0.002)
Rated tranche	-8.195*** (0.000)	-	-9.700*** (0.000)
Tranche rating*rated	0.610*** (0.000)	-	0.654*** (0.000)
Number of Banks	0.173*** (0.001)	0.155*** (0.003)	0.169*** (0.001)
Currency risk	-0.386 (0.375)	-0.847** (0.021)	-0.355 (0.399)
Country risk	0.119* (0.089)	0.100 (0.144)	0.130* (0.062)

Volatility	0.068** (0.047)	0.066** (0.032)	0.0667* (0.059)
5yTB-3mTB	0.005** (0.032)	0.005** (0.044)	0.006** (0.024)
Industry FE	Yes	Yes	Yes
Instrument purpose FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Nr. observations	1.566	1.566	1.566
Correct classification	0.957	0.950	0.743
Pseudo R2	0.754	0.732	0.266

Note: Table 12 provides logistic regression results, analyzing the choice between SLs (1) and SBs (0), adding *spread*, which reduces the sample. Models include FE. Model [16] excludes company rating; [17] excludes tranche rating; [18] includes all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*), (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

**Table 13:** Determinants of debt choice – Adding the log total assets

<b>Dependent variable:</b>	Loan = 1		
	Bond = 0		
Choice of debt	[19]	[20]	[21]
<i>SL versus SB</i>			
<b>Independent variables:</b>			
Intercept	2.919** (0.011)	3.289*** (0.005)	3.241*** (0.005)
Log total assets (\$ million)	-0.623*** (0.000)	-0.696*** (0.000)	-0.660*** (0.000)
Rated company	-	1.152*** (0.010)	4.453*** (0.000)
Company rating*rated	-	-0.120** (0.012)	-0.291*** (0.004)
ESG scored company	0.450 (0.320)	0.358 (0.417)	0.342 (0.451)
Company ESG score*scored	-0.094 (0.134)	-0.071 (0.241)	-0.075 (0.237)
Switcher	1.119*** (0.000)	1.093*** (0.000)	1.057*** (0.000)
Experienced	-0.228 (0.134)	-0.226 (0.129)	-0.164 (0.266)
Log issuance size (\$ million)	0.291*** (0.001)	0.275*** (0.001)	0.281*** (0.001)
Number of Tranches	0.175** (0.045)	0.172** (0.049)	0.163* (0.065)
Maturity (years)	-0.127* (0.095)	-0.136* (0.085)	-0.128* (0.080)
Rated tranche	0.276 (0.507)	-	-3.727*** (0.001)
Tranche rating*rated	-0.071 (0.145)	-	0.204** (0.040)
Number of Banks	0.094*** (0.000)	0.092*** (0.000)	0.090*** (0.000)
Currency risk	-0.546** (0.016)	-0.527** (0.017)	-0.552** (0.015)
Country risk	0.272*** (0.000)	0.266*** (0.000)	0.266*** (0.000)

Volatility	0.032** (0.030)	0.032** (0.032)	0.034** (0.029)
5yTB-3mTB	-0.002 (0.245)	-0.002 (0.232)	-0.002 (0.230)
Industry FE	Yes	Yes	Yes
Instrument purpose FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Nr. observations	2.042	2.042	2.042
Correct classification	0.794	0.790	0.791
Pseudo R2	0.344	0.345	0.356

Note: Table 13 provides logistic regression results, analyzing the choice between SLs (1) and SBs (0), adding *log total assets*, which reduces the sample. Models include FE. Model [19] excludes company rating; [20] excludes tranche rating; [21] includes all variables. Models adjust for heteroskedasticity, and standard errors are clustered by country and year. (\*\*\*), (\*\*), and (\*) denote a statistically significant level of 1%, 5%, and 10%, respectively.

# Conclusion

The aim of this dissertation was to understand the firm-, contract- and macro-level determinants of firms choosing between sustainable bonds and loans. For that purpose, we run a logistic regression model and use a sample of 3,513 SLs and 2,882 SBs issued over the past 5 years.

Our results seem to confirm that firms facing higher levels of information asymmetries prefer loans over bonds when raising new debt funding, in line with those obtained by several authors for the conventional market; e.g. DeFiore & Uhlig (2011), Diamond (1984), Johnson (1997), and Krishnaswami et al. (1999).

Furthermore, this study also supports the prediction of a positive correlation between the countries' higher risk profiles and loan issuances. This result becomes even more relevant considering the fact that macroeconomic determinants have not gotten much attention in previous research of this kind.

Conversely, the models were unable to support the theories developed for the hypotheses of creditworthiness, ESG performance and cost of capital. We find that improved company's creditworthiness and ESG performance do not suggest a preference for the bond market, nor does the cost of capital positively relate to the issuance of loans. However, our results may be influenced by the fact that our sample is relatively small when compared with those of extant empirical literature on the choice of debt. Therefore, conclusions highlight the need of continuing research into how these variables affect the decision with a complete and more informative sample.

In this sense, the data available turned out to be the main limitation of this research, constraining a more accurate representation of the market. This can mainly be explained by the fact that the market is still recent, and thus there are some issues with accurate recordings or obtaining data about sustainable

instruments. The fact that Loan Analytics only started labelling the sustainable instruments recently turned out to be a good example of the job that still has to be done with the data, which is only now starting to become accessible.

Finally, in addition to the hypotheses results, other variables significantly impact positively the loan preference, namely: *switcher*, *number of banks* and *volatility*. Conversely, *maturity* and *currency risk* positively relate to bond issuance.

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# Appendices

## Appendix A: Variable's definition, source and expected impacts.

Variable Name	Definition	Source	Expected results:	
			SL	SB
<b>Dependent variables</b>				
Choice of sustainable debt	Dummy equal to 1 if the borrower closes a sustainable loan deal and 0 if it, instead, closes a sustainable bond deal.	Loan Analytics and DCM Analytics		
<b>Independent variables</b>				
<i>Firm</i>				
Rated company	Dummy equal to 1 if the company has a credit rating from S&P, Moody's and/or Fitch, and 0 otherwise.	Loan Analytics and DCM Analytics	?	?
Company rating	Company rating calculated based on available ratings from S&P, Moody's and Fitch. The rating is converted as follows: AAA = Aaa = 1, AA+ = Aa1 = 2, and so until D = 22.	Loan Analytics and DCM Analytics	+	-
Company rating*rated	Company rating calculated based on available ratings from S&P, Moody's and Fitch. The rating is converted as follows: AAA = Aaa = 1, AA+ = Aa1 = 2, and so until D = 22. For those companies that are not rated, was assigned the value of 0.	Loan Analytics and DCM Analytics	+	-
ESG scored company	Dummy equal to 1 if the company has a ESG Combined Score, and 0 otherwise.	Refinitiv	?	?
Company ESG score	ESG Combined Score. This score combines the individual scores of each ESG component with the ESG Controversies score. The rating can be converted as follows: A+ = 1, A = 2, and so until D = 12.	Refinitiv	+	-

Company ESG score*scored	ESG Combined Score. This score combines the individual scores of each ESG component with the ESG Controversies score. The rating can be converted as follows: A+ = 1, A = 2, and so until D = 12. For those companies that are not rated, was assigned the value of 0.	Refinitiv	+	-
Log total assets	Logarithm of the company total assets, in \$ million.	Refinitiv	-	+
Switcher	Dummy equal to 1 if the company has issued both instrument types, during the sample period, and 0 if it, instead, only closed one type.	Loan Analytics and DCM Analytics	+	-
Experienced	Dummy equal to 1 if the borrower issued more than one tranche, during the sample period, and 0 if, instead, is a first-time issuer.	Loan Analytics and DCM Analytics	?	?
<i><b>Contractual</b></i>				
Cost of capital	Tranche spread to benchmark, for bonds. Combination of all-in pricing and tranche all-in pricing values, for loans.	Loan Analytics and DCM Analytics	+	-
Issuance size	Tranche face value, in \$ million.	Loan Analytics and DCM Analytics	-	+
Number of tranches	Number of tranches that compose the deal.	Loan Analytics and DCM Analytics	?	?
Maturity	Maturity of the tranche, in years.	Loan Analytics and DCM Analytics	-	+
Rated tranche	Dummy equal to 1 if the tranche has a credit rating, and 0 otherwise.	Loan Analytics and DCM Analytics	?	?
Tranche rating	Tranche rating calculated from the borrower's S&P and Moody's rating at signing. The rating is converted as follows: AAA = Aaa = 1, AA+ = Aa1 = 2, and so until D = 22.	Loan Analytics and DCM Analytics	+	-
Tranche rating*rated	Tranche rating calculated from the borrower's S&P and Moody's rating at signing. The rating is converted as follows: AAA = Aaa = 1, AA+ = Aa1 = 2, and so until D = 22. For those	Loan Analytics and DCM Analytics	+	-

tranches that are not rated, was assigned the value of 0.

Currency risk	Dummy equal to 1 if the tranche was issued in a non-local currency, and 0 otherwise.	Loan Analytics and DCM Analytics	?	?
Number of banks	Number of bank subsidiaries involved at any level of the transaction.	Loan Analytics and DCM Analytics	?	?
<b>Macro</b>				
Country risk	Moody's country credit rating at signing. The rating is converted as follows: AAA = Aaa = 1, AA+ = Aa1 = 2, and so until D = 22.	Moody's	+	-
Volatility	Chicago Board Options Exchange Volatility Index (VIX).	CBOE	?	?
5yTB-3mTB	Yield curve slope computed by the difference between the US 5-year Treasury Note rate and the US 3-month Treasury Bill rate.	Refinitiv	?	?

Characters interpretation: - = negative impact on the choice | + = positive impact on the choice | ? = unclear impact on the choice (all drawn from the extant literature).

**Appendix B:** Correlation tests between independent variables.

	Company rating	Company rating*rated	Company ESG Score	Company ESG Score*Scored	Total assets
Company rating	1.00				
Company rating*rated	1.00	1.00			
Company ESG Score	0.12	-0.18	1.00		
Company ESG Score*Scored	0.03	0.23	1.00	1.00	
Total assets	-0.31	0.19	0.08	0.18	1.00
Spread	0.60	0.07	0.02	-0.12	-0.11
Issuance size	-0.10	0.27	-0.10	0.10	0.33
Number of tranches	-0.09	-0.18	-0.01	-0.14	0.08
Maturity	-0.19	0.02	0.10	-0.04	0.10
Tranche rating	0.90	0.57	0.01	0.01	-0.33
Tranche rating*rated	0.69	0.84	-0.22	0.18	0.20
Number of banks	-0.04	0.15	-0.12	0.00	0.25
Country risk	0.24	-0.02	-0.02	-0.05	-0.07
Volatility	-0.03	0.00	0.02	0.08	0.00
5yTB-3mTB	0.07	0.03	-0.03	0.15	-0.01

	Spread	Issuance size	Number of tranches	Maturity	Tranche rating
Spread	1.00				
Issuance size	0.00	1.00			
Number of tranches	-0.13	-0.13	1.00		
Maturity	-0.02	0.02	0.18	1.00	
Tranche rating	0.69	0.00	-0.29	-0.21	1.00
Tranche rating*rated	0.18	0.27	-0.17	0.05	1.00
Number of banks	-0.05	0.47	0.07	0.12	0.03
Country risk	0.00	-0.10	0.14	0.05	0.31
Volatility	0.05	0.03	-0.06	0.01	0.00
5yTB-3mTB	0.02	0.05	-0.14	0.02	0.10

	Tranche rating*rated	Number of banks	Country risk	Volatility	5yTB-3mTB
Tranche rating*rated	1.00				
Number of banks	0.13	1.00			
Country risk	-0.01	-0.12	1.00		
Volatility	-0.02	0.07	0.00	1.00	
5yTB-3mTB	0.04	0.06	0.00	0.38	1.00