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The Green Gap: Investigating the Link Between Sustainability and Financial Decisions in the Iberian Peninsula

Adriana de Sousa Martins

Work project carried out under the supervision of:

Prof. Dr. Melissa Prado

In collaboration with *Novo Banco*

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Abstract

Global warming is expected to rise to 3.1°C without immediate action, far surpassing the Paris Agreement Objectives. This raises a critical question: “What is the dynamic between financial constraints, environmental performance, and the role of banks in incentivizing a low-carbon economy?”. By examining four high-emitting sectors of the Iberian Peninsula, this research offers a fresh perspective on an unexplored region. The findings confirm a positive link between financial stability and reduced emissions, highlighting the potential of sustainable models. However, green financing mechanisms have yet to deliver significant emission reductions, implying an urgent need for stricter oversight by financial institutions.

Keywords

Sustainable Finance; Green Financing; Financial Constraints; Credit Access; Iberian Firms

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Introduction

In today's world, as we face an environmental and climate crisis, it is more important than ever to meet the needs of the present without compromising those of the future generations. This is Humanity's biggest challenge. Climate change is no longer an exclusive worry of the scientific community, but rather a global economic challenge that demands an urgent and transformative shift in business practices in which the financial sector plays a key role (Mijs, 2021). As Mark Claney, United Nations Special Envoy for Climate Action and Finance, recently emphasized in an interview for the World Economic Forum, "time is running out to make the transition to net-zero for a sustainable world" (World Economic Forum, 2024b).

In fact, Claney's comment is right. According to the 2024 UNEP Emissions Gap Report, the current scenario is extremely alarming as the global surface temperature continues to increase. Experts now warn that to limit global warming to 1.5 degrees Celsius, as stipulated in the 2016 Paris Agreement, there must be a reduction in greenhouse gas (GHG) emissions of 42% by 2030 and 57% by 2050, assuming all countries comply. If there is no immediate action, temperatures are estimated to rise to 2.6 – 3.1 degrees Celsius by the end of the century, potentially leading to a global catastrophe for both people and economies. Therefore, businesses and financial institutions are now critical players in the path towards a low-carbon economy. Thus, the core question is not *when* the transition will occur, but rather – and more importantly – *how* and *how swiftly* the business world will adapt (CISL, 2024).

Undoubtedly, over the past two decades, the role of finance has been changing. Nowadays, most businesses have moved beyond the traditional goal of profit maximization and fiduciary duty to shareholder's wealth, as outlined in the neoclassical economic theory. Instead, the concept of *sustainable finance* has gained momentum, indicating a substantive shift towards integrating environmental, social, and governance (ESG) considerations into financial decision--making (Gharleghi et al., 2024). This shift has been driven by the fact that sustainability is currently viewed as both a business opportunity, but also as a compliance requirement imposed by governments and other regulatory institutions. This relation will be explored further on.

It is known that the European Union (EU) has been at the forefront of addressing this urgent global challenge of climate change. As explicit in the *European Green Deal*, EU's current long-term strategy is to "achieve climate neutrality by 2050, through a fair transition encompassing all sectors of the economy" (European Commission, 2020; UNFCCC, 2021). As such, rigorous regulatory frameworks like the European Sustainability Reporting Standards and the Corporate Sustainability Reporting Directive have been introduced. These frameworks not only ensure the adoption of more sustainable business practices and standardization of ESG reporting across EU member states, contributing to a more decarbonized economy, but are also significantly influence the allocation of capital and evaluation of corporate creditworthiness (Bacelar, 2024). This is leading to a shift in the corporate mindset in the EU.

On the one hand, companies, especially those operating in energy-intensive or the so--called *brown* sectors, face increasing pressure to reform their business models and integrate sustainability factors in their daily operations and supply chains. This requires investment in new clean technological processes, strategic changes or even compliance costs, which is inevitably an additional financial burden to companies. As such, most of them lack the necessary resources to fund these changes and are obliged to resort to external financing. On the other hand, under similar stricter policies, banks have also started to incorporate ESG considerations into their financing decisions, risk management strategies and other operational aspects (OECD, 2023). By limiting their lending decision-making requirements and providing green financing, banks may be able to foster the adoption of sustainable business practices and ensure measurable action on ESG parameters.

Thus, one of the main objectives of this thesis is to examine how the current regulatory landscape has influenced the firm-bank relationship. While prior research has established a positive relationship between financial position and environmental performance, few studies have explored the impact of sustainability on financial stability and, consequently, credit access, particularly within the Iberian Peninsula. Hence, this study tries to contribute to this relevant debate. The truth is that Portugal and Spain rank among the top EU countries with the highest share of firms exposed to physical hazards linked to climate change (ECB, 2024). By narrowing down the scope of the research to these markets and focusing on high-emission sectors – Energy, Industrials, Materials and Utilities –, this study offers a unique view of the financial challenges and opportunities posed by climate change, providing valuable insights into its implications for businesses and banks in this region.

Therefore, the purpose of this research is not only to understand the role of financial constraints on a sample of Iberian firms when transitioning to sustainability, but also the green financing's role in it. Moreover, through an empirical panel data analysis using three regression techniques – Pooled OLS, Pooled OLS with controls, and Fixed Effects models –, this research aims to examine: how EU regulatory frameworks are shaping sustainable finance; the advantages and disadvantages of sustainability for companies and financial institutions; the real effects of financial constraints on a firm's environmental performance; and, last but not least, whether firms receiving green financing achieve tangible reductions in their emissions.

To answer the two main research questions, two econometric models were developed. The first is the ICR Model and addresses the question: "Is sustainability a key driver to access bank credit and overcome financial constraints?". The second examines: "What is the role and effectiveness of green financing in meeting EU sustainability goals, specifically in reducing emissions?", answered through the Emissions Model.

In summary, this research confirms the existence of a significant relationship between environmental performance and financial stability. However, green financing has still not reached its full potential in the most polluting sectors of the Iberian Peninsula. On one hand, the ICR model's results show that firms that actively reduced their emissions tend to exhibit stronger financial stability. This proves that environmental performance is indeed a competitive differentiator criterion, similarly to size, profitability, or leverage. On the other hand, the Emissions model's results reveal that green financing has yet to yield the expected environmental outcomes, as suggested by prior studies. This underlines an urgent need for improved regulatory measures and stricter oversight from banks and financial institutions.

The structure of this thesis is as follows: Chapter 1 reviews the latest scientific articles on sustainable finance, EU regulations, financial constraints in brown sectors, and the role of banks in promoting sustainability; Chapter 2 presents the data collection process and a descriptive analysis of the sample; Chapter 3 outlines the econometric models and methodologies used; Chapter 4 discusses the results as well as this study's limitations and suggestions for further research; and Chapter 5 concludes with a summary of the key findings.

1. Literature Review

1.1 Overall Importance of Sustainable Finance

First, it is important to briefly consider the theoretical definitions of *green transition*, *sustainable finance* and *green finance*, as such terms are often misunderstood or misrepresented in the business world. In simple terms, *green transition* is the ESG shift towards a sustainable growth and an economy that is not based on fossil fuels and overconsumption of natural resources (Aalto University Executive Education, n.d.). *Sustainable finance*, as previously explained, is about incorporating these ESG considerations into financial decisions across organizations. Even though there is not a universal definition for *green finance,* Gharleghi et al., (2024) defines it as any type of investment aimed at reducing environmental externalities while contributing to a net-zero transition. This term includes various financial instruments such as green bonds, sustainable-linked bonds and loans (SLLs), among others, which are designed to strengthen companies' financial position and enable investments in positive ESG projects, accelerating their transition to sustainability (Flammer, 2021). In short, these definitions are all intertwined: the *green transition* serves as the overall strategy, *sustainable finance* as the tool for implementation, and *green financing* as the channel for execution.

According to Alshehhi, et al., (2018), 78% of a sample of 132 renowned scientific papers demonstrated a positive relationship between companies with good ESG standards and financial performance. This proves the variety of advantages that sustainable finance creates for businesses. The most important one is higher returns and long-term profitability, as sustainable business models focus on increasing efficiency, productivity and lowering resource usage. This approach not only reduces operational costs and improves risk management but also strengthens a firm's resilience to external shocks (Clark et al., 2015). In fact, D'Apolito et al., (2024) provides further evidence by showing that, in a sample of listed Italian SMEs, the most sustainable firms were the ones with better financing conditions and access to credit in times of distress. Moreover, market positioning and reputation are other key advantages. As proved by Friede et al., (2015), green businesses are more likely to attract a broader client base and ESG-conscious investors. This is because, nowadays, sustainability efforts boost brand image as well as investors' confidence, solidifying a company's position in the market. Finally, another main benefit is competitive advantage. For example, green bond issuance not only facilitates funding but also provokes a positive market reaction, enhancing a company's visibility and credibility (Flammer, 2021). Likewise, the pursuit of sustainability also drives innovation, by unlocking opportunities for new processes/products while enabling companies to differentiate themselves from their competitors (Chen et al., 2022). Overall, these are among the most frequently highlighted benefits in the literature regarding the adoption of sustainability as a long-term business strategy.

Despite these advantages, going "green" is often perceived as a double-edged sword – essential; yet controversial –, since embracing a net-zero transition is seen as an extra burden for businesses due to several challenges. The key constraint is the trade-off between short-term profitability and long-term sustainability goals, as sustainable initiatives and organizational changes often require high upfront costs, such as investments in employee training or new equipment, among others. This is particularly pronounced for small and medium enterprises due to "limited internal capacities" (OECD, 2023) and for companies with shareholders solely focused on immediate profit maximization. Additionally, even though the regulatory pressure is constantly increasing, many businesses are often faced with a lack of clear ESG standards and guidelines, making measurement and reporting harder to achieve, especially when managing complex supply chains. As a consequence, any business that fails to adapt suffers severe consequences, including losing competitive advantage and market positioning, higher regulatory fines or even reduced customer loyalty (D'Apolito et al., 2024).

Despite this duality, one thing remains clear: businesses cannot thrive in a "dead planet" (CISL, 2024). Robust and appropriate regulatory frameworks are crucial not only to overcome these challenges and guide companies in their transition – which goals to attain and how –, but also to ensure transparency, accountability, and effective implementation. As a result, the EU's regulatory landscape plays a vital role in shaping corporate strategies and environmental progress across the Iberian Peninsula.

1.2 Regulatory Context in the EU

In the last decade, regulation has been a key factor in corporate decision-making, driven by a wave of sustainability policies and frameworks that set parameters for ESG practices and disclosure requirements. The establishment of global frameworks, such as the United Nations Sustainable Development Goals in 2015, was a turning point in the business world. This event brought worldwide attention to the ESG matter since the 2030 Agenda for Sustainable Development was defined across all United Nations Member States. Shortly after, in 2016, the Paris Agreement was adopted. As previously discussed, this binding international treaty established long-term goals to combat climate change and had significant implications for companies, which were now expected to align their strategies with these goals and disclose their efforts to stakeholders. This led to the development of a series of policies and regulatory frameworks in the following years, especially in the European Union (EU).

In fact, the EU, home to both Portugal and Spain, has been leading the way in ESG-related policies. The EU's main goal is to create a "financial system that supports sustainable growth" and, since 2016, it has been guiding both companies and financial institutions on how to align their corporate strategies with "EU's international commitments on climate and sustainability objectives" (European Commission, n.d.)

The first step was the implementation of the EU Non-Financial Reporting Directive (NFRD) in 2018, which was targeted at large public-entities and mandated the disclosure of non-financial information based on simplified ESG criteria. In 2020, the EU Taxonomy came into force, establishing a framework that classifies which economic activities are considered environmentally sustainable. This regulation was and still is incredibly important for businesses operating within the EU to ensure compliance with its environmental objectives. Next, the EU

Sustainable Finance Disclosure Regulation (SFDR) was introduced, requiring financial market participants to disclose ESG-related information in their investment process. This framework, based on the concept of double materiality, requires disclosure on both environmental and social factors, marking a tremendous shift towards a more sustainable banking sector (Bacelar, 2024).

In 2021, the European Sustainability Reporting Standards (ESRS) were proposed as part of the Corporate Sustainability Reporting Directive (CSRD), which became effective in 2023. The latter replaced the existing NFDR as it requires companies to disclose more detailed ESG data. Plus, its scope was extended too, covering now around 75% of EU's turnover, meaning that approximately 50,000 companies must report extensive sustainability criteria (Finboot, n.d.). Together with the EU Taxonomy and SFDR, these frameworks form the "EU's regulatory backbone", preventing data abnormalities and greenwashing (Bacelar, 2024).

To be more specific, the CSRD also includes a set of sector-specific standards, encompassing the four sectors examined in this study. Although the adoption of these standards was delayed to 2026 by the European Commission, this implies that soon, the most polluting Iberian firms – including listed companies, large enterprises, SMES and non-EU headquartered firms –, will be obliged to report comprehensive data about their sustainability efforts in regular reports. By helping investors assess which companies are compliant and worth investing in, the CSRD standards will contribute to the achievement of the EU Green Deal's objectives. Adopted in 2022, the Green Deal consists of the allocation of private capital to GHG-reduction initiates or other sustainable projects. As such, one could even say that the CSRD acts as a "filter" to channel funding towards positively impactful businesses (Deloitte, 2023).

These regulations are having a dual impact on corporate behaviour, since companies are increasingly integrating sustainability into their corporate strategies which poses many challenges. For instance, many businesses are being forced to rethink their supply chains in order to comply with all reporting standards and reduce their carbon footprint. In fact, in high-emitting sectors, such as energy or utilities, EU companies are investing not only in renewables technologies, but also on data systems to report their Scope 3 emissions (CarbonChain, n.d.). Similarly, Sastry et al., (2024) states that, under the SFDR, the financial sector is also now incorporating environmental and social parameters in their creditworthiness assessments (section 1.4). However, not all companies have the necessary resources to comply with regulations, which leads to omissions, penalties, closing of subsidies or inaccurate disclosures (CarbonChain, n.d.). The next section will analyse this matter in more depth and its implications on financial position and environmental performance. All in all, this reflects the complex nature and possible repercussions of EU regulations.

1.3 Financial Constraints of Brown Sectors in the Green Transition

Despite the growing awareness for ESG matters and increased regulation, financial constraints remain one of the key barriers of green transition, as specified by the European Investment Bank (Tomasi et al., 2022). Empirical studies define financial constraints as the "forgone profitability", that occurs when a company fails to use its "optimal level of inputs and technology" due to budget constraints (Ferrando et al., 2020). The most common examples are credit constraints, resulting from the lack of external funding. However, liquidity shortages or even difficulties in issuing or borrowing shares are also examples of financial constraints, all of which jeopardize a company's ability to use its capital expenditures effectively and, consequently, invest in sustainable initiatives (Chen et al., 2022).

Specifically, the most polluting sectors – including energy, utilities, industrials, and materials – face substantial financial burdens compared to other industries due to their carbon-intensive operations. In fact, several factors contribute to this. First, the total replacement of outdated or polluting technologies requires significant investments to shift to cleaner alternatives (De Haas et al., 2024), such as renewable sources, upgraded grid infrastructure or even battery storage. Since this poses significant upfront costs, many companies are not able to bear them, which worsens their environmental impact. Second, it is also empirically proven that firms operating in these sectors have higher difficulties in accessing credit. A plausible explanation for this has to do with the fact that such large-scale investments often have extensive collateral requirements. Since their current tangible assets, like coal power plants, may become ineffective or obsolete in a near future and less suitable as collaterals, companies tend to struggle more to secure the necessary loans to transition (Flammer, 2021; Zhang, 2021). Third, these brown sectors are also subject to public scrutiny and regulatory pressures, as explained before. This, combined with the long payback periods and long-term gains typical of the investments needed to implement sustainable businesses, makes these companies perceived as high-risk for certain investors. Again, this is discussed by De Haas et al., (2024), which reflects the complex dynamics of the investments needed to reduce emissions.

However, these financial constraints do not only delay investments in sustainable technologies, but also directly affect a firm's environmental performance. Xu & Kim, (2020), using data on U.S. firms, studies the impact of financial constraints on firm's toxic emissions and highlights two key conclusions. First, financially constrained firms tend to increase their toxic emissions since the financial weight of legal penalties is lower than the weight of the reducing pollution. As such, these firms prioritize immediate financial survival over reducing their carbon footprint. Second, the negative effects of financial constraints are also deeply dependent on the regulatory context. The less stringent the regulations, the less the companies prioritize their environmental performance over the financial one. Once again, this is explained by the fact that non-compliance costs are lower than potential penalties or reputational risks.

All in all, evaluating the financial stability of a company is fundamental when assessing its environmental performance, as further demonstrated in the analytical part. Given this, green financing mechanisms and the active role of banks now emerge as vital solutions to create a financial ecosystem that aligns financial incentives with environmental efforts. This topic will be further explored in the next section.

1.4 Role of Banks in promoting sustainability

Financial institutions, particularly EU banks, play a "crucial role in financing the transition towards a low-carbon economy" (Mijs, 2021; Giannetti et al., 2023). As key intermediaries in capital allocation, these entities have the ability not only to channel funding to sustainable initiatives – namely projects in renewable energy, carbon reduction, energy efficiency, among others –, but also influence corporate behaviour by incorporating ESG indicators in their lending criteria. By doing this, banks have the power to either divest from carbon-intensive sectors and reallocate that capital to greener firms; or continue to invest in brown sectors, but "encourage these polluting firms to set climate targets, invest in cleaner technologies (…) and push them to reduce their emissions" (Sastry et al., 2024).

A highly effective way to achieve this is through green financing. As mentioned in section 1.1, green financial instruments are becoming increasingly popular, because they allow firms to access capital with preferential terms – usually lower interest rates – as long as the agreed-upon environmental objectives are reached. Therefore, this financing supports a company's sustainable transition without compromising its liquidity (Gharleghi et al., 2024). Moreover, research by Abou Khamis et al., (2021) shows that various academic studies widely agree that green financing improves a firm's environmental performance. One example of this is Flammer, (2021), who analyses data from 565 green bonds issued by publicly listed firms and concludes that firms: decrease their CO_2 emissions, improve their environmental ratings and experience a lower cost of capital. This positive impact of sustainable banking on environmental performance will be explored in the analytical part, focusing on Iberian firms.

As explained in section 1.2, banks are increasingly pressured by regulatory bodies, investors, and other stakeholders to place climate change at the centre of their strategies (Mijs, 2021). This shift, however, is also a win-win situation for the financial sector. As Rodrigo Tavares well-stated: “banks and investment houses that fail to consider financially material ESG factors are acting irresponsibly because they are limiting their potential for financial gain, overexposing themselves to unnecessary risks or falling into crowd-pleasing ephemeral practices.” (Tavares, 2024). Overall, this section highlights the positive impact of green financing on firms, but also how banks can benefit from it and “help bridge the financing gap for net-zero transition” (Sastry et al., 2024).

2. Data

2.1 Data Sources

The main data source of this study is Bloomberg, a leading financial software platform that provides real-time macroeconomic data, financial analytics as well as ESG metrics. While environmental data remains scarce, Bloomberg’s guarantee of reporting standards (both financial and environmental), accurate data formatting and vast coverage of global equity markets, makes it a trusted source (Gratton, 2024). This ensured robust and credible findings to further explore the relationship between sustainability and financial decision-making.

2.2 Sample Selection

This paper focuses on publicly traded companies based in Portugal and Spain that operate in four sectors: Energy, Industrials, Materials and Utilities. The sectoral selection was made according to the Bloomberg Industry Classification Standards (BICS) for all the companies available in the database. The detailed list is presented in the Appendix, Table 1.

I selected these sectors as they represent industries with the highest environmental impact and, consequently, those that contribute the most to GHG emissions (Ritchie et al., 2024; Mastrandrea et al., 2024). Additionally, due to their capital-intensive nature, these types of companies are more prone to financial constraints, as they often rely on large external financing to transition towards sustainable business models and invest in decarbonization strategies (Mastrandrea et al., 2024). Moreover, they also face scrutiny from stakeholders and increased regulatory pressure. As such, all these factors position them at the centre of the climate change and sustainable finance debate (Mijs, 2021), especially since these companies are key players in the Iberian sustainability transition.

Regarding the sample itself, since ESG reporting standards are quite recent, there is still limited data available for certain companies. Out of an initial number of 93 firms, 5 were excluded due to temporary regulatory suspension, and 26 had no environmental data, leading to a final sample of 62 companies. As a result, a balanced panel dataset was constructed by extracting 6 key metrics for each firm from 2018 to 2023. To gain valuable insights from a financial standpoint, the selected variables were Market Capitalization, Return on Assets (ROA), Interest Coverage Ratio (ICR or EBITDA to Interest Expense) and Total Debt to Assets Ratio (D/A). To assess the role of sustainability and a firm's environmental performance, the Total GHG Emissions and a dummy variable for Green Financing (encoded 1 if the firm received it and 0 otherwise) were included.

In fact, Total GHG emissions were chosen as the primary proxy for environmental impact, instead of the commonly used ESG scores, because recent studies have concluded that these ratings often lack correlation with a company's mitigation goals and actual environmental performance (Rekker et al., 2021). This is so, because these ratings not only combine a multitude of other social and governance areas – which may mask poor environmental performance – but are also highly subjective and vary significantly across providers and their undisclosed methodologies. Moreover, even when only focusing on the E (Environmental) score, evidence shows that a firm's size is not usually accounted for and there is little correlation with carbon footprint. So, while there is not yet a universally accepted criteria to measure a firm's environmental impact, the GHG emissions data is a plausible option as it is frequently audited, aligns with regulatory trends, and is a measurable and objective indicator (Mastrandrea et al., 2024). These were the key reasons for choosing this variable in order to evaluate a firm's contribution to climate change.

Table 2 in the Appendix provides detailed definitions of all the variables used, with further explanation also given in Chapter 3.1.

2.3 Descriptive Statistics

This section is based on the analysis of Table 3, which provides an overview of the sample by business sector, and Table 4, which presents the sample's main summary statistics. Both these tables are presented in the Appendix.

First of all, the final dataset consists of 50 Spanish and 12 Portuguese companies, spanning over a 6-year period, resulting in a total of 372 observations. According to Table 3, the most predominant sector is Industrials, with a share of 48.39%, followed by Materials (24.19%), Utilities (19.35%) and, lastly, Energy (8.06%). This distribution is a true reflection of the Iberian market and economic importance of these sectors, which will shape the overall trends and results observed in the dataset.

In terms of Market Capitalization, Table 4 shows a wide range of firm sizes, from smaller companies to more dominant players. In fact, Utility companies stand out on average as the most valuable ones (13 326 M€, Table 3), with Energy companies ranking second. This is likely due to the scale of their operations and current high demand for electrical products as well as the fact that both these markets are more regulated, with fixed pricing and reduced risk. This also helps explain why Energy companies have the highest average ICR (1.54, Table 3), above 1, indicating that the majority of these companies have strong financial stability and lower probability of default in case of distress (Maverick, 2024). Conversely, this is not the case for other sectors, since the minimum ICR is -0.241 (Table 4), a value well below 1. Examples include sectors like Industrials, with an average ICR of 0.44, and Materials, with an average ICR of 0.32 (Table 3). This is so, because these companies experience volatile revenues due to higher exposure to commodity price fluctuations. As such, the sample of Iberian firms is quite mixed, with some displaying robust financial stability and others struggling to meet their interest obligations.

In addition, profitability is quite heterogenous across the sample, as observed in Table 4. The standard deviation of 13.33% in the ROA variable reflects significant disparities in operational performance within the dataset. This variation potentially stems from differences in firms' strategies, resources, and market positioning. In particular, the Materials sector exhibits the lowest average value for Market Capitalization and Total Debt to Assets ratio, but it has the highest average ROA (5.34%, Table 3). This is because these types of companies tend to be smaller and less dependent on external financing since they rely heavily on their physical assets, allowing them to generate higher returns on their assets when compared to other sectors (World Economic Forum, 2024a). Despite this, the sample shows an overall moderate leverage level, with an average Total Debt to Assets ratio of 0.35 (Table 4).

In terms of environmental impact, Total GHG emissions vary significantly across the sample, with firms emitting an average of 1,903.90 kt of GHG. This highlights the substantial carbon footprint of some industries. For instance, Energy and Utilities sectors recorded the highest average emissions, at 4,751.51 kt of GHG and 5,109.15 kt of GHG, respectively (Table 3). Nevertheless, these were also the sectors with the highest share of green financing received over the past 6 years, with 80% for Energy and 75% for Utilities. This is proof of these companies' commitment to fund sustainable initiatives. While this is mainly driven by the increased regulatory pressures, around 44% of the firms in the sample reported receiving green financing, highlighting an undeniable growing focus on sustainability. Nonetheless, Industrials and Materials are still lagging behind. This discrepancy may stem from the lack of publicly available environmental data since ESG reporting standards have only been recently adopted, particularly by smaller companies. However, the methods used for addressing these data gaps are outlined later on.

3. Methodology

In this section, I present in detail the models designed to address the two main research questions. To carry out the modelling process and analysis, I relied on RStudio.

The dataset pre-processing steps, including variable cleaning, imputation, creation and transformation, are outlined in detail in Table 5 in the Appendix.

3.1 Econometric Models

As mentioned before, this research will consist of a panel data regression analysis. This statistical method is widely used in econometrics and sustainability literature as it allows to address issues that cannot be tackled with pure cross-sectional or time-series data (Bartram et al., 2022; Xu & Kim, 2021). Instead, this technique combines both these types of observations as it simultaneously captures variations across entities and over time. This means that the panel data analysis not only accounts for time-invariant unobservable variables but also ensures a control over entity-specific heterogeneity (Evans, 2024a). This is extremely important for this study since it ensures a deeper understanding of the dynamic economic relationships between the chosen sustainability and financial indicators while minimizing bias from omitted variables. Moreover, the possibility of exploring the delayed or anticipatory effects of the Total GHG emissions variable contributes to more robust and reliable findings.

There are several types of regression models used with panel data, depending on the research questions answered and data analysed. In this case, I opted for the Pooled OLS, the Pooled OLS adding control variables and the Fixed Effects (FE) models, after having performed diagnostics tests that will be further explained in section 3.1.3. Indeed, each one of these models has distinct advantages and tackles different aspects of the data; yet, together, they form a complementary tool for this analysis.

Firstly, the **Pooled OLS** acts as a baseline model because it groups all entities and time periods together, not accounting for any heterogeneity. Despite being the simplest form of panel data regression, it still gives a preliminary understanding and serves as comparison since it tests the existence of a relationship between the dependent and independent variables without any additional adjustments (Tilburg Science Hub, 2024). Secondly, the **Pooled OLS with controls** is a more refined model than the first. Even though it still ignores entity-specific effects and treats the panel data as if it were a cross-sectional dataset, it partially addresses the omitted variable problem by incorporating control variables that account for observable factors. As such, this isolates the effect of the main variables and show how controls affect the coefficients. Thirdly, the **Fixed Effects** model is a reliable and unbiased choice for several reasons: 1) it controls for unobservable heterogeneity by removing time-invariant characteristics, such as country and sector; 2) it isolates the effect of entity-specific effects as it does not assume that these effects are uncorrelated with other variables, unlike the Random Effects model, and 3) it mitigates the risk of bias from omitted variables and ensures higher accuracy of the estimates (Evans, 2024b).

Building on the methodology outlined, I will apply each of these three distinct regression techniques to two main econometric models: the ICR Model and the Emissions Model. These models address distinct research questions, but, together, aim to explore whether the current sustainability financing mechanisms, combined with corporate financial stability, can effectively reduce emissions and accelerate the transition to a net-zero economy. Section 3.1.1 details the first model, while section 3.1.2 outlines the specifics of the second model.

3.1.1. The ICR Model

The ICR model studies the key drivers of financial stability, with a particular focus on how emissions affect a firm's ability to meet its interest obligations. This relation answers whether sustainability can ease financial constraints and lead to more favourable interest rates in credit access. The general econometric equation of this model is the following:

$$(1)\ ICRi = \beta 0 + \beta 1\ Emissions\ i + \sum_j \beta j\ Control\ Variables\ i + \epsilon i$$

As seen above, the ICR acts as the dependent variable. This ratio indicates a firm's capacity to manage its outstanding debt by representing how many times a company is able to pay interest at any given time with its operational profitability (EBITDA). The higher the ratio, the greater the financial stability and likelihood of accessing credit (Hayes, 2024). In fact, this variable is a well-known credit-granting criteria used by creditors, in particular banks (European Banking Authority, 2020). Conversely, the main independent variable, the Total GHG Emissions, is tested in two forms: 1) log lagged (t-1) emissions, to account for possible delayed effects on financial stability, and 2) change in emissions, so year-over-year differences, to reflect the potential effects of decarbonization efforts over time.

To isolate the true effect of the emissions-financial stability relationship, one must control for three key firm-specific factors: size, profitability and leverage. According to Bartram et al., (2022) and D'Apolito et al., (2024), these factors deeply influence a firm's capacity to absorb shocks and adapt to climate policies, with larger, more profitable and highly leveraged firms having an advantage. As such, these three metrics are commonly used in empirical literature as they ensure that the observed conclusions are not influenced by firm characteristics or market conditions. In this case, firm size is represented by the natural logarithm of Market Capitalization; profitability by the ROA ratio; and leverage by the natural logarithm of the Total Debt to Assets ratio. Additionally, country-, sector- and time-fixed effects were included in the Pooled OLS with controls model. Whereas, for the FE model, both country and sector variables were omitted since they are time-invariant characteristics.

In short, the main objective of this model is to examine the potential trade-offs that firms may face when transitioning and provide valuable insights for financial institutions. In Chapter 4, particularly Table 6, I will verify whether the most-polluting firms exhibit lower ICR values, which affect their creditworthiness, or test if changes in emissions have a delayed effect on a firm's financial stability.

3.1.2. The Emissions Model

The Emissions model gives a more in-depth analysis since it aims to explore the effectiveness of green financing in reducing emissions, while focusing on how financial stability (measured by the ICR) moderates this relationship. In other words, the aim is to study the long-term impact of green financing in reducing future firms' emissions. The equation is as follows:

$$(2)\ Emissions\ i = \beta 0 + \beta 1\ ICRi + \ \beta 2\ Green\ Financing\ i + \beta 3\ (ICR * Green\ Financing) i + \sum_{j} \beta j\ Control\ Variables\ i + \epsilon i$$

By contrast, the Total GHG Emissions is now the dependent variable. This time the variation created was log lead (t+1) emissions in order to examine how the current financing mechanisms and financial stability might impact future emissions' reductions in the selected Iberian firms. The three independent variables are: the ICR, Green Financing and the interaction term (ICR x Green Financing). The Green Financing is a dummy variable and was created according to Bloomberg's typology of a firm's sustainable debt. It includes financing that is classified as green, sustainability-focused, transition-linked, or any other instrument with performance-based sustainability targets. As such, the exclusive presence of any of these types of debt corresponds to 1, while 0 denotes its absence. Table 2 in the Appendix contains a more detailed description of this indicator variable. Moreover, the interaction term was added to assess if firms with green financing experience a different relationship between their financial stability and emissions reductions compared to firms without such financing.

Lastly, no firm-specific control variables were included in this model, as they did not show statistical significance in earlier tests. Instead, the focus was solely on controlling for country-, sector- and, most importantly, time-fixed effects, in both the Pooled OLS with controls and FE models. This is important given the significant developments in ESG policy and regulations during the analysed period (2018 to 2023), as stated previously in section 1.2.

Overall, this second model examines whether a company's ICR impacts its future emissions and the extent to which green financing contributes to this relationship. As such, in Chapter 4 (Table 7), I will evaluate whether firms that have receiving green financing exhibit lower lead emissions, specifically those with higher financial stability.

3.1.3. Diagnostics and Robustness

This section outlines the several tests and robustness measures that were conducted during the modelling process in order to ensure reliable and credible estimates as well as enhance each model's fit and validity. This way, it was possible to address potential econometric issues, like skewness, unobserved heterogeneity, multicollinearity, or even heteroskedasticity, which could have otherwise affected the regression results. To be precise, confidence intervals were set at 95% in all these tests, meaning that any p-value below 0.05 was considered statistically significant.

Firstly, the Hausman test was employed to determine the most appropriate third regression technique by selecting between Random and Fixed Effects models. This robust statistical test evaluates whether the individual unobserved effects are correlated with the explanatory variables (Hausman, 1978), which proved to be true for all cases. As such, the null hypothesis was rejected, confirming that the FE was the most suitable model for this research. Secondly, I also examined the presence of perfect collinearity through a correlation matrix. The results confirmed the absence of multicollinearity, as no variables showed a correlation of 1 with one another. Thirdly, by using the Breusch-Pagan test, heteroskedasticity in the residuals was detected exclusively in the ICR Model. So, there was the need to apply robust standard errors to all econometric equations of this model. Lastly, while checking for individual significance of the variables, the factor (Year) was removed from the FE model in the ICR analysis because it was found to be statistically insignificant. With the entire methodology thoroughly laid out, the results are ready to be analysed/interpreted in the following Chapter.

4. Results and Discussion

This chapter is divided in two parts and presents the final quantitative results, based on the previous econometric equations. The first part examines the regression results of the ICR Model (Table 6, page 20), analysing how the GHG emissions and other firm-specific characteristics influence the financial stability of the Iberian firms, uncovering potential implications for their credit access. The second part focuses on the Emission Model's results (Table 7, page 24) and explores the impact of green financing in reducing emissions as well as the role of financial stability in this relationship. Both these models aim to study the interplay of the environmental performance and financial decisions in the most polluting Iberian sectors.

Firstly, in the ICR Model, each column of Table 6 corresponds to a different regression specification: Pooled OLS (Model 1), Pooled OLS with controls (Model 2) and FE (Model 3). The first three models use the lagged total GHG emissions as the independent variable, while the following three use the change in emissions, but the ICR is the dependent variable in both.

Focusing on the Lagged analysis, the emissions' coefficient is consistently negative across all models, suggesting that higher past emissions are associated with reduced financial stability, measured by the ICR. Although the results are not statistically significant in any of the cases, indicating a weak relationship since the coefficients are statistically indistinguishable from zero, this could be due to the fact that other variables are overshadowing the real effect or other omitted factors' influence. Nevertheless, the negative relation between lagged emissions and ICR is evident, which aligns with D'Apolito et al., (2024)'s conclusion that companies with a sustainable focus benefit economically from this attitude, particularly by enhancing their capacity to pay interest expenses.

The Market Capitalization shows a positive and statistically significant relation with ICR at 1% level in both Pooled OLS models and at 5% level in the FE model. In fact, this is logical since larger firms usually tend to have greater financial health and operational efficiency (Mastrandrea et al., 2024). However, negative coefficients are observed for the D/A ratio and ROA in almost every model, presenting very high significances at 0.1% level, except in the FE model. On one hand, the negative relationship between the D/A and the ICR is expected, since the higher the debt, the more interest needs to be paid, which may affect a firm's ability to meet its interest obligations and, in the long run, its creditworthiness. On the other hand, the negative relationship between the ROA and ICR is less intuitive. In this case, it may mean that higher profitability does not necessarily correlate with an improved financial stability and better conditions to access credit. For example, highly profitable firms usually take on riskier projects, potentially leading to increased financial constraints and difficulties in paying their obligations. All of this aligns with well-known financial theories, such as the Trade-off Theory or the Modigliani-Miller Theorem, which state that companies must balance the benefits of debt financing with its risks, including financial distress (DeMarzo & Harford, 2019). These theoretical foundations appear to be true for these Iberian firms. In fact, this is particularly visible in the Industrials and Utilities sectors, both of which exhibit statistical significance at 5% level due to their intensive emitting-nature, according to Model 2. All in all, one could say that in this context the companies' capacity to invest in sustainable initiatives, for example to lower their emissions, is linked to their financial health.

Next, I will analyse the regression results of the ICR Model, where the change in emissions acts as the independent variable. In this case, I will study the impact of firm's decarbonization strategies in its financial decisions, namely its ability to pay interest expenses.

Focusing on the coefficients of emissions, it is possible to see two different relationships. In both Pooled OLS models (Model 1 & 2), the coefficient is positive, whereas the coefficient in the FE model is negative. Even though this discrepancy in signs allows for distinct interpretations regarding ICR's sensitivity to GHG emissions, the most well-founded and plausible explanation is the one from the FE model, according to several studies (Bartram et al., 2022; Xu & Kim, 2021). One other argument for this is FE's R^2, which is the highest value (0.52) of all the three models. This means that the FE model has the highest explanatory power since it explains 52% of the variation in ICR, meaning that this model provides a better fit and interpretation of the data (Fernando, 2024). Therefore, it is possible to say that once again an increase in GHG emissions is linked to reduced financial stability. Specifically, for every 1 kt increase in the change in emissions, the ICR is predicted to decrease by 0.0002 %.

Similar conclusions to those in the lagged emissions analysis are reached regarding the size and profitability control variables. Again, in all three models, the coefficients for Market Capitalization's show positive signs while the ones for ROA's ones are negative, suggesting significant positive and negative correlations with ICR, respectively.

Additionally, it is also important to analyse the role of leverage, represented by the

D/A's coefficients, because conflicting results emerge across the three models, similar to the lagged emissions analysis. Both Pooled OLS models present negative and statistically significant coefficients, suggesting that higher leverage is associated with lower financial stability, as explained before. In other words, this negative relationship not only implies that firms that have excessive or mismanaged debt face greater challenges in meeting their financial obligations, but also that they struggle to fund their projected investments, including environmental initiatives. This interpretation is supported by Ferrando et al., (2020) and Xu & Kim, (2021), that states that severe financial constraints as well as restricted external financing limit a firm's investments in tangible assets, including sustainable projects to reduce emissions. Conversely, the coefficient in the FE model is positive, yet statistically insignificant. This could infer that firms that leverage their debt effectively or have access to better financing conditions can actually enhance their financial position, by using their leverage to fund profitable projects or manage their liquidity. However, in this case, and given the lack of statistical significance and the fact that FE's model does not account for unobserved external conditions, like economic cycles or even industry dynamics, the reliability of this interpretation may be limited. Still, both these interpretations are worth considering since they uncover the dual role of leverage when achieving financial and sustainability objectives. This rationale is consistent with Chen et al., (2022) that further emphasizes that external leverage can act as a double-edge sword in corporate sustainability strategies, which will also be analysed in dept further ahead.

Overall, both analyses (the lagged and the change in emissions) reach similar results. In fact, the two sets of the three models have identical R^2, meaning that there are no significant differences in interpretations and that both versions of independent variables are plausible to study the ICR Model. All in all, it is possible to reach three conclusions from the results of Table 6. First, previous studies are confirmed in the Iberian context since the selected firms that are actively reducing their emissions or have already reduced their GHG indeed exhibit higher financial stability. This means that more sustainable business models can ease financial constraints and even allow more favourable interest rates. Secondly, high-emitting firms are more likely to face future financial distress, as they become more and more subject to regulatory pressures and reputational risks, which can undoubtedly damage their creditworthiness. Thirdly, and most importantly, the environmental impact now acts as a market selection mechanism, similarly to the control variables of profitability, leverage, and company size.

Table 6
The ICR Model - Regression Results

Explanatory Variables	(°) Using ***Log Lagged Emissions*** as the ***Independent*** Variable — Model 1 Pooled OLS	Model 2 Pooled OLS with controls	Model 3 Fixed Effects	(°) Using ***Change Emissions*** as the ***Independent*** Variable — Model 1 Pooled OLS	Model 2 Pooled OLS with controls	Model 3 Fixed Effects
Intercept	446. 6327 *** (2.217e-09)	582.9085 *** (5.763e-08)		444.3000 *** (2.859e-09)	588.1900 *** (5.781e-08)	
Emissions (°)	-1.5179 (0.748)	-4.5586 (0.3959)	-0.7747 (0.7901)	0.0029 (0.6664)	0.0051 (0.4689)	-0.0002 (0.9138)
Log Market Capitalization	21.4254 ** (0.0028)	21.7476 ** (0.0086)	34.5981 * (0.0237)	20.8540 ** (0.0012)	18.4690 * (0.0102)	33.7951* (0.0258)
ROA	-7.1373 *** (1.785e-15)	-7.1873 *** (3.643e-15)	-7.6392 *** (0.0009)	-7.1578 *** (1.292e-15)	-7.2256 *** (2.648e-15)	-7.6363 ** (0.0010)
Log Total D/A	-156.7335 *** (< 2.2e-16)	-161.8701 *** (< 2.2e-16)	50.6533 (0.3308)	-156.8200 *** (< 2.2e-16)	-162.8800 *** (< 2.2e-16)	51.0819 (0.3418)
Factor (Country) PT		-15.3836 (0.6227)			-18.9420 (0.5418)	
Factor (Sector) Industrials		-115.0176 * (0.0186)			-115.0400 * (0.0189)	
Factor (Sector) Materials		-75.5266 (0.1491)			-85.3540 (0.1032)	
Factor (Sector) Utilities		-100.7940 * (0.0490)			-94.8470 . (0.0633)	
Factor (Year) 2019						
Factor (Year) 2020		-4.9040 (0.8997)			-3.5992 (0.9261)	
Factor (Year) 2021		-18.4244 (0.6353)			-18.3660 (0.6377)	
Factor (Year) 2022		15.5229 (0.6941)			18.6240 (0.6325)	
Factor (Year) 2023		-37.2206 (0.3486)			-33.5420 (0.3898)	
Observations	310	310	310	310	310	310
R2	0.3196	0.3387	0.5114	0.3197	0.3382	0.5113
R2-adj.	0.3106	0.3119	0.3812	0.3109	0.3115	0.3811
Time Fixed Effects	NO	YES	NO	NO	YES	NO
Region Fixed Effects	NO	YES	NO	NO	YES	NO

Notes:

P-values are computed using heteroskedasticity-robust standard errors (HC0) and are presented in parentheses.

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

The second part of the analysis corresponds to the Emissions Model and its regression results are presented below in Table 7, page 24. Since the first part already highlighted the role of emissions in the financial stability of Iberian firms, this second part now focuses on understanding whether the firms that have received green financing in the past 6 years have effectively reduced their future emissions.

Once again, each column of Table 7 corresponds to a different regression specification: Pooled OLS (Model 1), Pooled OLS with controls (Model 2) and FE (Model 3). As a recap, in this model, the dependent variable is log lead emissions while the independent variables are: the ICR, the green financing dummy and their interaction term (ICR x Green Financing). The control variables – country, sector, and year – are essential in this case to account for external factors to the firm and ensure the reliability and robustness of the analysis.

Firstly, against previous evidence, the ICR's coefficients are positive across all three models, with statistical significance in Model 3. This means that firms with higher ICR (that is, better financial health) tend to increase their future emissions. In other words, this positive relation is a signal that in Iberia, from 2018 to 2023, financially stable firms did not face immediate pressure to invest in sustainable initiatives to lower their carbon footprint. Instead, they appear to prioritize short-term profit or growth over environmental goals, suggesting that these companies are allocating their financial resources towards expansion or more capital-intensive projects that, in turn, generate higher emissions. Even though this conclusion contrasts with previous studies like Chen et al., 2022; D'Apolito et al., 2024, Xu & Kim, 2021; Zhang, 2021, as explained before, this is a primary indication that Iberian firms are lagging behind. In fact, according to the Environmental Performance Index (EPI), Portugal and Spain rank slightly below average when compared to other EU countries (Picture 1, Appendix). In terms of the Climate Change Score – a specific measure of a country's progress in combating climate change, including GHG reduction efforts – Spain occupies the 13th position and Portugal the 15th within the EU at the end of 2023, as seen in Picture 2 in the Appendix. Thus, these statistics and the positive ICR coefficients are signs that in both these countries there are too few financial incentives for firms to invest in emissions-reduction projects or that inadequate environmental policies are currently in place.

Furthermore, when focusing on the Green Financing dummy variable, the positive relationship with lead emissions remains. In fact, the green financing coefficient is statistically significant at 5% in the Pooled OLS and at 1% level in the Pooled OLS with control variables. At first glance, these results suggest that firms that have received green financing have not yet reduced their future emissions, which undoubtedly raises questions about the effectiveness of this specific debt mechanism in the Iberian context. This outcome diverges from previous literature that prove the environmental benefits from green financing. For instance, Flammer, (2021) identifies two important mechanisms for such. The first, called "signalling argument", suggests that green debt issuance is a credible sign of a company's commitment to the environment. Plus, according to this paper, green financing, in particular green bonds, not only reduce a firm's emissions and improve its environmental ratings but also attract new investors. The second mechanism, called "cost of capital argument", explicitly shows that firms that have received green financing often access cheaper financing in the future, which is an incentive to their transition and to improve their creditworthiness.

However, the unexpected positive coefficients observed in this analysis may be due to three main reasons: 1) the true effect of green financing can be largely delayed and not show any immediate effects (Hu et al., 2023), since emission-reduction projects often takes years to accomplish, meaning that the lead emissions (t+1) variable may not yet reflect such environmental changes; 2) this type of financing may not be strictly aimed at emission-reduction projects, but to broader environmentally-friendly purposes; 3) the green funds may not be effectively allocated or closely monitored by financial institutions, indicating a potential of greenwashing cases and other inefficiencies (Flammer, 2021). Regardless of the underlying reason, these findings highlight the need for banks to play a more active role in monitoring the environmental outcomes of green credit. Plus, stricter environmental policies and governance frameworks ought to be implemented in Portugal and Spain to ensure effectiveness, transparency and accountability of the firms issuing green debt, as suggested by Zhang, (2021).

Moreover, this is also supported by the interaction term's results since this term describes the joint effect between the ICR and Green Financing on lead emissions. According to Table 7, the coefficients are positive and statistically significant for a p-value of 0.05 in both Pooled OLS models. Specifically, for firms that have received green financing from 2018 to 2023, a 1% increase in ICR translates to an increase in lead emissions of 0.0355 kt in the Pooled OLS and 0.0332 kt in the Pooled OLS with controls. This positive relation proves that the effect of the ICR on future emissions is stronger when firms receive green financing. On the contrary, in the FE model, the coefficient is negative but statistically insignificant, meaning that this negative relation is not robust enough and is potentially influenced by unobservable firm-specific factors that vary across time. If we analyse FE's R^2, only 12% of the variation of lead emissions is, in fact, explained by this model. As such, this quite low explanatory power does not contribute to a credible interpretation. Nevertheless, these two different signs in the interaction term's coefficients clearly highlight the complexity of the role of green financing in achieving environmental goals.

Additionally, these findings also confirm previous suspicions regarding potential misallocation of green funds to polluting projects, greenwashing concerns, and weak monitoring by financial institutions. Another contributing factor could also be the lack of enforcement of clear emission-reduction targets tailored to each sector, resulting in current inadequate environmental policies, as highlighted by the Cambridge Institute for Sustainability Leadership (CISL, 2024). If these challenges are not addressed and greater financial incentives are not implemented soon, then the Iberian firms receiving green financing will likely fail to improve their environmental performance, wasting the benefits of the sustainable debt.

Lastly, it is also important to discuss the control variables, particularly the factor (Year), as it reveals key insights on time trends and dynamics of lead emissions. As seen in Table 7, some coefficients are statistically significant, namely the ones for the years 2020 and 2021, which are significant at 1% and 5% levels in Models 2 & 3. As known, the period analysed (2018 to 2023) covers major developments in ESG reporting and environmental policies as well as key moments of the business cycle. For instance, the COVID-19 led to mandatory lockdowns and a forced reduction in industrial activity in 2020, while the subsequent recovery in 2021 was marked by challenging macroeconomic conditions and regulatory shifts. Therefore, controlling for the Year variable is essential to account for these inevitable effects on emissions patterns.

In summary, Table 7's results reveal some unexpected, yet critical insights on role of green financing in reducing emissions within the Iberian context. Overall, firms that have received green financing are not effectively reducing their future emissions, and this relationship is even stronger for financially stable firms. Even though green financing is a tool to promote sustainability, the results suggest a clear misalignment between its intended purpose and the actual environmental outcomes in both Portugal and Spain. However, in the future, with increasingly more data available, this may disappear.

Having this said, to ensure the success and effectiveness of this sustainable debt mechanism, several actions must be taken as stated in prior studies. First, banks, financial institutions, and governments must implement stricter monitoring of these green funds in order to ensure their proper allocation to sustainable projects. Second, there must be a stronger alignment between financial incentives and sector-specific, attainable environmental goals, as this is essential to encourage Iberian companies to lower their carbon footprint. By doing so, Portugal and Spain could increase their Climate Change Scores and reach the ones of other leading EU countries, like Estonia, Finland, or Greece (Picture 2, Appendix), while gaining competitive advantage and contributing to EU's sustainability goals.

Table 7

The Emissions Model - Regression Results

*Using **Log Lead Emissions** as the **Dependent** Variable*

Explanatory Variables	Model 1 Pooled OLS	Model 2 Pooled OLS with controls	Model 3 Fixed Effects
Intercept	4.5322 *** (< 2e-16)	5.4912 *** (7.679e-16)	
ICR	0.0003 (0.6968)	0.0005 (0.4592)	0.0030 *** (0.001)
Green Financing	1.1588 * (0.0310)	1.4164 ** (0.0070)	0.1791 (0.6309)
ICR * Green Financing	0.0355 * (0.0263)	0.0332 * (0.0283)	-0.0034 (0.7962)
Factor (Country) PT		0.9786 * (0.0141)	
Factor (Sector) Industrials		-1.4382 * (0.0162)	
Factor (Sector) Materials		0.6421 (0.3143)	
Factor (Sector) Utilities		-0.4568 (0.4892)	
Factor (Year) 2019		-0.0435 (0.9292)	0.1404 (0.6093)
Factor (Year) 2020		-0.8035 (0.1012)	-0.7050 * (0.0106)
Factor (Year) 2021		-1.2056 * (0.0163)	-0.7644 ** (0.0075)
Factor (Year) 2022		-0.7684 (0.1206)	-0.4899 . (0.0798)
Factor (Year) 2023			
Observations	310	310	310
R2	0.0593	0.1956	0.1159
R2-adj.	0.0501	0.1659	-0.1336
Time Fixed Effects	NO	YES	YES
Region Fixed Effects	NO	YES	NO

Notes:

P-values are presented in parentheses.

Significance codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1 p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Limitations and Future Research

While this analysis provides valuable insights about the relationship between sustainability and financial decisions – namely, firm’s access to credit in the Iberian context –, there are a few inevitable limitations. The main constraint was the reliance on publicly available data for the environmental parameters, such as GHG emissions and green financing, which suffered from missing values and other inconsistencies. Additionally, the limited sample size and niche sectoral focus influenced the robustness of the results and conclusions. As such, future research could further explore industry-specific, regional subsamples or even how broader macroeconomic conditions shape the relationship between the variables, which could lead to a deeper understanding of the sustainability outcomes.

Moreover, it would also be valuable for future studies to investigate not only the effect of specific types of green debt financing, such as SLLs versus green bonds, but also the actual amount granted, and which were the lending institutions. However, this type of data is still very recent and not widely available yet. Likewise, since the financial and environmental data was collected at a single point in time, I was not able to observe how financial stability and, consequently, how credit access changed over time. For example, this could be achieved by adding an interaction term between "year trend" and GHG emissions (D'Apolito et al., 2024).

Despite these limitations, the findings of this study remain robust and still contribute for the ongoing discussion of sustainable finance as an economic opportunity.

5. Conclusion

As proven throughout this Thesis, the interplay between sustainability and financial decision-making is complex; yet vital to achieve a net-zero transition. In the Iberian context, the findings confirm that firms that exhibit better environmental performance tend to exhibit stronger financial stability, particularly in their ability to cover interest expenses. This supports the idea that sustainability acts as a market selection mechanism, easing financial constraints, improving creditworthiness, and providing competitive advantage. However, significant challenges persist in translating green financing into measurable emission reductions.

Although green financing mechanisms are increasingly popular, the most-emitting Iberian firms that received green debt – particularly those with greater financial stability – faced little immediate pressure to invest in sustainability and reduce their carbon footprint. This discrepancy highlights the urgent need for policy improvements both in Portugal and Spain. These must include more effective and stricter monitoring by banks and financial institutions; the implementation of sector-specific, tailored incentives and regulations; and mechanisms that guarantee that green financing is effectively targeted. Bridging **The Green Gap** (title) and aligning financial practices with environmental goals are essential steps to unlock the Iberian Peninsula's potential to drive meaningful change… because the future is just around the corner.

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Appendix

Table 1
List of companies in the sample

Ticker	Company Name	Country	Sector
ANA SM Equity	ACCIONA SA	ES	Industrials
ACX SM Equity	ACERINOX SA	ES	Materials
ACS SM Equity	ACS ACTIVIDADES CONS Y SERVICIOS SA	ES	Industrials
AENA SM Equity	AENA SME SA	ES	Industrials
AI SM Equity	AIRTIFICIAL INTELLIGENCE STRUCTURES SA	ES	Industrials
ALTR PL Equity	ALTRI SGPS SA	PT	Materials
AMP SM Equity	AMPER SA	ES	Industrials
APPS SM Equity	APPLUS SERVICES SA	ES	Industrials
ART SM Equity	ARTECHE LANTEGI ELKARTEA SA	ES	Industrials
ADX SM Equity	AUDAX RENOVABLES SA	ES	Utilities
AZK SM Equity	AZKOYEN SA	ES	Industrials
CLNX SM Equity	CELLNEX TELECOM SA	ES	Industrials
CMO SM Equity	CEMENTOS MOLINS SA	ES	Materials
CDU PL Equity	CONDURIL ENGENHARIA SA	PT	Industrials
CAF SM Equity	CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES SA	ES	Industrials
ANE SM Equity	CORP ACCIONA ENERGIAS RENOVABLES SA	ES	Energy
COR PL Equity	CORTICEIRA AMORIM SA	PT	Materials
CTT PL Equity	CTT-CORREIOS DE PORTUGAL SA	PT	Industrials
MDF SM Equity	DURO FELGUERA SA	ES	Industrials
ENER SM Equity	ECOENER SA	ES	Energy
EDPR PL Equity	EDP RENOVAVEIS SA	ES	Utilities
EDP PL Equity	EDP SA	PT	Utilities
ENO SM Equity	ELECNOR SA	ES	Industrials
ENG SM Equity	ENAGAS SA	ES	Utilities
ENC SM Equity	ENCE ENERGIA Y CELULOSA SA	ES	Materials
ELE SM Equity	ENDESA SA	ES	Utilities
ECR SM Equity	ERCROS SA	ES	Materials
FDR SM Equity	FLUIDRA SA	ES	Industrials
FCC SM Equity	FOMENTO DE CONSTRUCCIONES Y CONTRATAS SA	ES	Industrials
GALP PL Equity	GALP ENERGIA SGPS SA	PT	Energy
GAM SM Equity	GENERAL DE ALQUILER DE MAQUINARIA SA	ES	Industrials
GVOLT PL Equity	GREENVOLT-ENERGIAS RENOVAVEIS SA	PT	Utilities
GRE SM Equity	GRENERGY RENOVABLES SA	ES	Energy
GSJ SM Equity	GRUPO EMPRESARIAL SAN JOSE SA	ES	Industrials
EZE SM Equity	GRUPO EZENTIS SA	ES	Industrials
HLZ SM Equity	HOLALUZ-CLIDOM SA	ES	Utilities
IBE SM Equity	IBERDROLA SA	ES	Utilities
IBG SM Equity	IBERPAPEL GESTION SA	ES	Materials
LGT SM Equity	LINGOTES ESPECIALES SA	ES	Materials

LOG SM Equity	LOGISTA INTEGRAL SA	ES	Industrials
MAR PL Equity	MARTIFER SGPS SA	PT	Industrials
MPD SM Equity	MINERALES Y PRODUCTOS DERIVADOS SA	ES	Materials
EGL PL Equity	MOTA ENGIL SGPS SA	PT	Industrials
NTGY SM Equity	NATURGY ENERGY GROUP SA	ES	Utilities
NVG PL Equity	NAVIGATOR CO SA/THE	PT	Materials
NEA SM Equity	NICOLAS CORREA SA	ES	Industrials
OHLA SM Equity	OBRASCON HUARTE LAIN SA	ES	Industrials
CASH SM Equity	PROSEGUR CASH SA	ES	Industrials
PSG SM Equity	PROSEGUR COMP SEGURIDAD SA	ES	Industrials
RED SM Equity	REDEIA CORP SA	ES	Utilities
RENE PL Equity	REDES ENERGETICAS NACIONAIS SGPS SA	PT	Utilities
REP SM Equity	REPSOL SA	ES	Energy
SCYR SM Equity	SACYR SA	ES	Industrials
SEM PL Equity	SEMAPA-SOCIEDADE DE INVESTIMENTO E GESTÃO SGPS SA	PT	Materials
SLR SM Equity	SOLARIA ENERGIA Y MEDIO AMBIENTE SA	ES	Utilities
TLGO SM Equity	TALGO SA	ES	Industrials
TRE SM Equity	TECNICAS REUNIDAS SA	ES	Industrials
TUB SM Equity	TUBACEX SA	ES	Materials
TRG SM Equity	TUBOS REUNIDOS SA	ES	Materials
VID SM Equity	VIDRALA SA	ES	Materials
VIS SM Equity	VISCOFAN SA	ES	Materials
WBX US Equity	WALLBOX NV	ES	Industrials

Table 2
Variables Description

Variable Name	Type	Unit	Variable Formula	Long Description
Interest Coverage Ratio (ICR)	Quantitative	Percentage	Ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to Interest Expense	The EBITDA Interest Coverage Ratio indicates a firm's capacity to manage its outstanding debt and know how many times a company is able to pay interest at any given time. The higher the ratio, the better, as it suggests growth and ability to pay debts. This is a credit-granting criteria that is used by creditors, in particular banks, to determine whether they lend to a company or not (EBA). In this case, I choose to use the EBITDA ICR to truly capture a firm's core profitability and operational performance.

Total GHG Emissions	Quantitative	Kilotons (kt)	Sum of all GHG, including direct (scope 1) and indirect (scope 2 and scope 3) emissions	The Total GHG emissions are the sum of all the gases that contribute to the trapping of heat in Earth's atmosphere. These include gases like carbon dioxide (CO2), nitrous oxide, methane, and other smaller trace gases. In this case, for a few companies with insufficient available data in Bloomberg, Total CO2 Emissions were used as proxy.
Market Capitalization	Quantitative	Million Euros	Multiplication of the current price per share by the total shares outstanding	Market capitalization is considered a size variable since it consists of the total market value of a company's outstanding shares. This metric is used for risk-monitoring of a firm's financial health, since larger market capitalizations usually imply stability but could potentially indicate lower growth prospects.
Return on Assets (ROA)	Quantitative	Percentage	Ratio of Net Income by Total Assets	The ROA shows how effectively a company is at managing its assets. The larger the ratio, the better, since this financial ratio indicates how profitable a company in relation to its total assets.
Total Debt to Assets Ratio (D/A)	Quantitative	Percentage	Ratio of Total Debt (Short + Long-Term Debt) by Total Assets (Tangible + Intangible)	This ratio shows the degree to which the company has used leverage (including all types of debt) to finance its assets. The higher the ratio, the more leverage a company carries rather than equity. Values larger than 100% or 1 indicate that a firm has more debt than assets, meaning that it is technically insolvent, since not all debtors would receive payment in case the business is discontinued. This solvency metric is used be as a leverage control variable because it helps investors evaluate the company's ability to meet debt obligations and generate returns. This allows for creditors to assess the company's existing debt and

				repayment capacity, which informs decisions on extending additional credit.
Green Financing	Quantitative	Binary	Dummy variable that assumes 1 if firm received green financing, 0 if otherwise	Variable built according to Bloomberg's definition of sustainable debt. It includes the following debt instruments: loans (tranches), as well as corporate and governmental bonds. Next, the following filters added were: 1) Green Instrument Indicator: any financing that funds environmental projects, including clean transportation, energy efficiency, renewables, conservation, among others; 2) Sustainability Instrument Indicator: investments combining environmental and social benefits; 3) Transition Instrument Indicator: investments targeted to incentivize and contribute to the decarbonization of the carbon-intensive businesses; 4) Sustainability-Linked Indicator: financial instruments with key performance-based sustainability indicators (KPIs). Plus, the issue date of the financing was added to correspond to each fiscal year from 2018 to 2023.
Sector	Qualitative			Variable that returns the sub-sector or industry of operation of each specific company.
Country	Qualitative			Variable that returns the country of origin or headquarters' location of each specific company.
Year	Quantitative	Year		Variable that represents the specific calendar year or time period of financial performance associated with the data.

Table 3
Sample Composition

Business Sector	No. Firms	% Sample	Average Market Cap	Average ROA	Average ICR	Average Total D/A	Average Emissions	% Firms Green Financing
Energy	5,00	8,06	6 762,49	3,51	1,54	0,42	4 751,51	80,00
Industrials	30,00	48,39	2 716,41	1,24	0,44	0,33	429,29	33,33
Materials	15,00	24,19	1 088,64	5,34	0,32	0,30	1 349,28	26,67
Utilities	12,00	19,35	13 325,89	2,52	0,16	0,41	5 109,15	75,00
Sample	62,00	100,00	4 687,73	2,65	0,44	0,35	1 903,90	43,55

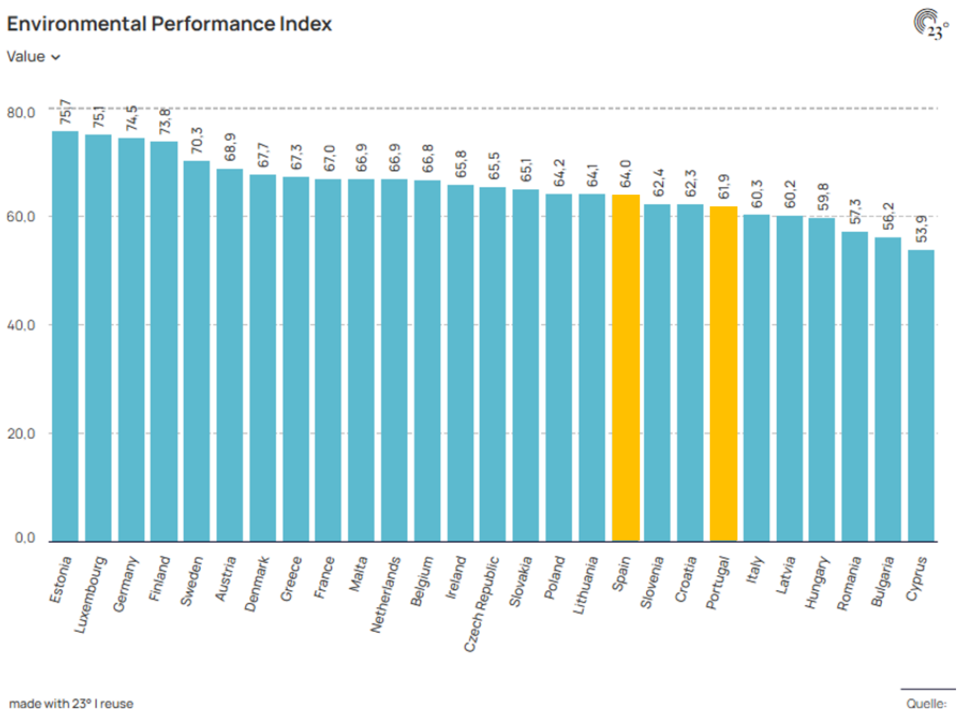
Table 4
Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
ICR	366	0,44	2,55	-24,13	23,87
Total GHG Emissions	311	1 903,90	4 827,55	0,00	32 668,50
Market Capitalization	353	4 687,73	9 938,84	0,00	73 823,73
ROA	368	2,65	13,33	-105,44	187,88
Total D/A ratio	370	0,35	0,20	0,00	2,02

Table 5
Pre-processing Steps

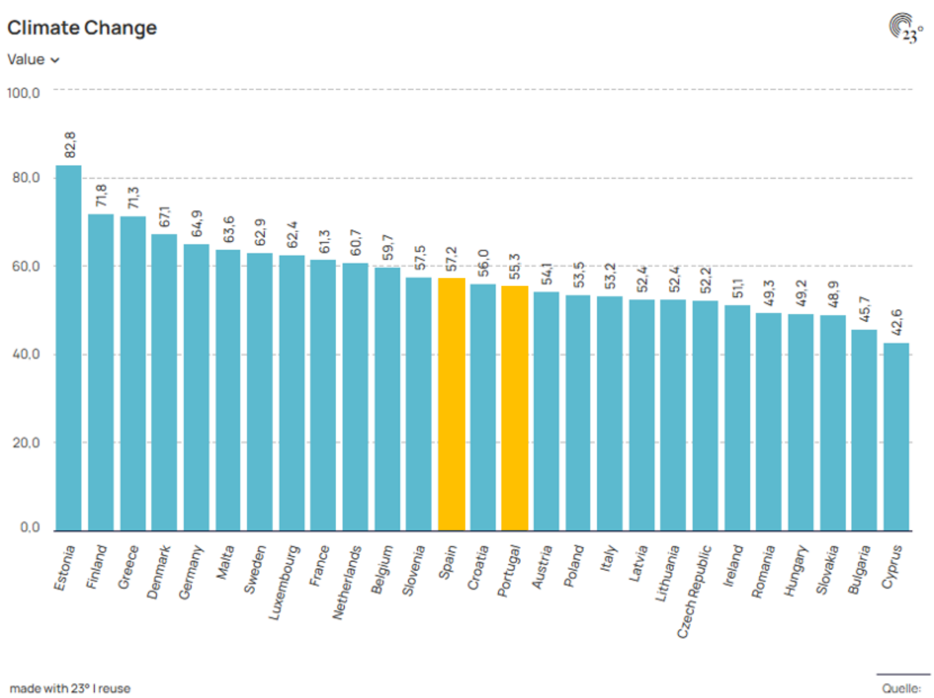
Step	Description	Purpose
Variable Cleaning	Correction of invalid or inconsistent data	Ensure that the dataset and its results are accurate and reliable and fit for analysis
Variable Imputation	Missing values were filled with the corresponding averages by each country, sector and year	Ensure completeness of the sample and ability to proceed to the modelling phase
Variable Creation	Derivation of three additional variables from the Total GHG emissions data: - Lagged emissions (offset by one year) - Change emissions (year-over-year difference) - Lead emissions (shifted forward by one year)	Provide a more comprehensive understanding of the research questions and improve the analysis
Variable Log Transformations	Application of log transformations to the non-normally distributed variables: - Lagged Total GHG Emissions - Lead Total GHG Emissions - Market Capitalization - Total Debt to Assets ratio	Reduce skewness, bring the distribution closer to normal, and allow easier percentage-change interpretations

Picture 1
Environmental Performance Index – EU (27)



Source: 23 Degrees, (2024a)

Picture 2
Climate Change Score – EU (27)



Source: 23 Degrees, (2024b)