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How does debt financing, such as green bonds, influence InvestEU financial guarantees across countries, considering the role of the ESG scores in shaping this relationship?

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Academic year 2024-2025
Dissertation for the master of Business Engineering
Master subject and focus: Finance
Daytime schedule

First of all, I would like to express my sincere gratitude to my supervisor, Mr. Maxence Postaire, for his support and guidance throughout the writing of this master's thesis. His valuable and relevant feedback greatly contributed to the quality of this work.

Declaration

During the preparation of this master's thesis, the author(s) utilized ChatGPT and DeepL for the following purpose:

1. ChatGPT was used to

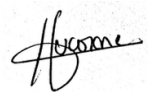
- Review, clarify, and improve the structure and readability of the R code written by the author.
- Support the correction of text to minimise spelling and grammar errors.
- Enhance the clarity of the written content.

2. DeepL was used to enhance the fluency and readability of the written content.

3. After using ChatGPT and DeepL the author(s) diligently reviewed and edited the content produced by the tool. We take full responsibility for the final content presented in this thesis.

By signing this declaration, we affirm that the content of this master's thesis reflects our original work, augmented by the responsible use of AI.

Date: 7 August 2025



Finally, I would also like to thank those who supported me throughout my five-year academic journey at the Université Catholique de Louvain. These include, of course, my classmates, friends, girlfriend, and parents.

Abstract:

This thesis focuses on the InvestEU programme, and its financial guarantees provided to projects aimed at supporting sustainable investment, innovation and job creation in Europe. This programme is part of the European Green Deal which aims to achieve a climate neutral economy by 2050. In addition, two other key concepts are at the heart of this study, namely ESG ratings and green bonds. ESG ratings are increasingly adopted by companies not only for financial and reputational reasons, but also in response to environmental and social pressures. Green bonds are a type of financial instrument that raise capital specifically for sustainable and low carbon projects.

Based on a dataset of 109 projects approved under the InvestEU programme between 2022 and 2024, along with country-level indicators, an Ordinary Least Squares (OLS) regression was conducted. The results suggest that both the number of green bonds issued and ESG scores are negatively associated with the operation amount allocated by InvestEU to projects. However, these effects are not statistically significant.

To the best of my knowledge, this thesis contributes to the existing literature by examining the financial guarantee system of the InvestEU programme, jointly evaluating ESG ratings and the issue of green bonds in the context of public guarantees and integrating these two independent variables into the same model.

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Introduction

Over the last century, human consumption and lifestyles have put a lot of pressure on the Earth, leading to the degradation of our environment (Mukhtar et al., 2023). This can be illustrated by the advance each year of Earth Overshoot Day which is *“the day on which human demand for the Earth's natural resources exceeds the Earth's supply”* (Schulz, 2023). This trend demonstrates the need to rethink our consumption habits and adopt more sustainable practices. It has consequently impacted the way the professional world is working, the way of doing business 50 years ago is not the same as today because the challenges are not the same and they will always evolve but we must find the right way to meet these challenges. We therefore need to deal with some new environmental challenges in order to decrease our negative externalities to our environment.

However, before going further, let's make sure that each main concept used for this thesis is well defined and understood to facilitate reading.

First of all, debt financing can be defined as the *“money that a company or government borrows in order to do business or finance its activities”* (Debt Finance, 2025). It can be done via bonds which are *“an official paper given by the government or a company to show that you have lent them money that they will pay back to you at a particular interest rate”* (Bond, 2025). Green bonds raise money that must be used for eco-friendly projects and can therefore have an impact on corporate ESG performance (Zheng et al., 2023).

Then, financial guarantees is an agreement between a lender and a tiers party, considered as a guarantor, which guarantees that debt will be repaid to the lenders if the borrower defaults (2050 Long-Term Strategy - European Commission, n.d.). In this case, the guarantor is the InvestEU programme while the lender is the different implementing partners, also called financial partners (InvestEU Programme - European Union, n.d.).

The Environmental, Social and Governance (ESG) concept focuses on mitigating environmental risks that would come from companies' operations by making companies more accountable from a non-financial point of view (Ni et al., 2024). In fact, ESG scores aim to evaluate the environmental and social impacts of a company as well as the sustainability of its practices (Ni et al., 2024) by integrating environmental, social and governance concerns into

companies business models (Gillan et al., 2021). Moreover, high ESG score means that they have well integrated in their operations the concept of green sustainability (Zheng et al., 2023). They can be determined by several organizations, the most famous ones are the MSCI ESG Research, Sustainalytics, Gartner and Forrester, and Ernst & Young's OCEAN™ Rating System (*Who Sets an ESG Score? - ESG | The Report*, n.d.).

In order to meet the new environmental challenges, the European Commission has set a framework called the European Green Deal which is a plan including various policies in order to be a climate neutral economy by 2050. In fact, to reach this final goal, the European Commission has set some intermediate objectives such as reducing the European Union's greenhouse gas emissions by 55% compared to the 1990 level (*2050 Long-Term Strategy - European Commission*, n.d.). However, achieving these objectives comes at a cost, which is why the European Union has launched programmes to support economies in reaching these targets. For example, achieving 2050's goal which consists of not exceeding a rise in temperatures of more than 2° C will cost around USD 12 trillion over the next two and a half decades (Jankovic et al., 2022).

One of these programmes is called "InvestEU" and it aims to mobilize at least €372 billion in investment by 2027 through financial instruments and guarantees. It is organized around four policy windows which are the main areas of investment, and these are Sustainable Infrastructure Policy Window (SIW), SME Policy Window (SMEW), Research, Innovation, and Digitisation Policy Window (RIDW) and Social Investments and Skills Policy Window (SISW). Furthermore, each project can cover one or more eligible area(s) and the first five top eligible areas are energy, multi, mobility, research development and innovation and, finally, environment (including Seas and Oceans) (*InvestEU Indicators - European Union*, n.d.).

Awareness of environmental issues is more and more important, which can be illustrated by the fact that there is, nowadays and across all the EU countries, more people who are supporting sustainable finance than people who oppose it (Olumekor & Oke, 2024). People are therefore asking for more transparency about non-financial activities undertaken by companies, they want to be able to assess the environmental performance of companies (Yu et al., 2020) but also to be able to compare them across companies (Tullio et al., 2025). Moreover, embracing the ESG concept is beneficial for companies because it enables them to reduce financial constraints

and to improve their reputation among eco-friendly investors and consumers by disclosing information and therefore reducing the information asymmetry (Ni et al., 2024). Furthermore, more and more companies are integrating these scores in their reports as it will help investors to make choice so they could therefore be considered as a competitive advantage (Ni et al., 2024) (*Qu'est-ce que les critères environnementaux, sociaux et de gouvernance (ESG) ?*, 2024).

However, as mentioned above, embracing such initiatives that consist of being more transparent about its own practices while implementing new practices or thinking about new ways of doing existing practices to make them more sustainable is not for free (Wang & Wang, 2024). Indeed, having credit access with good financial conditions can be a huge challenge for companies, especially for Small and Medium-sized Entreprises (SMEs) as they are considered riskier. In this landscape, public guarantees scheme has become more and more famous in many countries in order to tackle this problem (Akcigit et al., 2024).

Given all this, it might be interesting to explore the relationship between these concepts, namely the InvestEU programme, ESG scores and green bonds, in order to determine how InvestEU distributes its financial guarantees among participating countries and their projects to help companies become more sustainable and environmentally and socially responsible. In other words, it would be interesting to assess whether this European Commission programme is a reward programme that provides more funds to companies with high ESG scores and a greater number of green bonds issued, i.e., those that are already actively engaged in sustainability efforts, rather than to companies that are only beginning to adopt sustainable practices or not doing so at all. In addition, to my knowledge, there is a gap in the existing literature on the operation of the programmes set up by the European Commission as part of the European Green Deal, and more specifically on the InvestEU programme.

This is where my research question arises;

“How does debt financing, such as green bonds, influence InvestEU financial guarantees across countries, considering the role of the ESG scores in shaping this relationship?”

After collecting data on 109 projects approved by the InvestEU programme over the period 2022-2024 and on countries involved in these projects, an OLS linear regression was carried out. The results suggest that both the number of green bonds issued and ESG ratings have a

negative effect on the operation amount allocated by InvestEU to projects, although these effects are not statistically significant. This thesis contributes, to my knowledge, to the existing literature by examining the financial guarantee system of the InvestEU programme, jointly evaluating ESG ratings and the issue of green bonds in the context of public guarantees and integrating these two independent variables into the same model.

The remainder of this thesis is organised as follows, a Literature Review section on relevant topics. The Sample Selection & Data Description section aims to explain where data come from as well as the period of the study. Then, the Methods & Empirical Analysis section is about the methodology and variables used to address this research question as well as the empirical results. There is also a

Contributions section which simply presents the contributions of the thesis. Finally, the Limitations & Conclusion section provides a discussion, highlights limitations and potential future research, and concludes the thesis.

Motivations

Firstly, it would be particularly valuable to quantify, in concrete terms, the actions undertaken by the European Union within the framework of the European Green Deal. While its existence is widely known, the specific measures being implemented to achieve one of its main objectives, becoming a climate neutral economy by 2050, are often less well understood. For this reason, it is important to gain a better understanding of this green deal and some of the tools being used to make these goals achievable, such as the InvestEU programme.

Secondly, understanding the correlation between debt financing and financial guarantees that serve a similar or identical purpose, as in the case of green bonds and InvestEU guarantees, may be relevant because if the correlation is positive, it could pave the way for further research on the subject, but also for controls on the issue of green bonds that might be made solely to receive subsidies or financial guarantees from an external stakeholder. Furthermore, the ESG framework now plays a central role in financial decisions, but it is sometimes hijacked by deceptive practices such as greenwashing, which could undermine the effectiveness of green financing.

From a more optimistic perspective, examining these relationships could encourage companies to initiate or strengthen their efforts to improve their ESG scores, with the aim of securing more funds and financial agreements. However, it is essential that such efforts are carried out ethically and not driven solely by financial interests.

Finally, whether the motivations come from a more academic and technical background or simply from curiosity, they pursue the same objective, which is to understand what the European Commission thinks when it sets up such programmes and how it implements them.

Literature Review

Investment

Every project requires fundings to ensure its viability, especially green projects because they often demand higher investment due to greater financial constraints compared to conventional, non-sustainability-focused projects. Moreover, some scholars argued that to be able to tackle and manage climate change, it requires an effort from all stakeholders (Olumekor & Oke, 2024). It is also important for the public policy that investors have incentive to invest in these projects because, otherwise, they will require government subsidies to be financially viable (Mansouri & Momtaz, 2022).

However, it has been shown that companies with a particular focus on their ESG metrics will benefit from an ESG premium which creates incentives to invest in such companies (Mansouri & Momtaz, 2022). Moreover, investors should keep in mind that companies addressing environmental challenges could offer more investment opportunities in the future, because they give priority to environmental practices in a world where the pressure for more environmental responsibilities is increasing (Wang & Wang, 2024).

On the other hand, some regression model analyses have revealed that government-guided funds differ from venture capital funds in that they focus more on the social externalities of an investment than on operating profits. Investments from these funds increase the level of green innovation in beneficiary companies as governments provide financial support and offer some guidance and assistance to help them move to sustainable practices (Hao et al., 2025). We could therefore assume that, for companies that are already addressing the challenges associated with

various ESG criteria, this type of financial support will accelerate the processes already in place in these companies (Hao et al., 2025).

Investment & Information Disclosure

On the investors side, some studies have revealed that investors are more confident investing in projects that decrease the information asymmetry and therefore reveal relevant and reliable information (Bhutta et al., 2022). This voluntary disclosure from companies about their practices is explained by the stakeholder theory which states that companies disclose environmental information in order to attract investors by improving their reputation and relationship with stakeholders (Patel et al., 2024). However, this theory explains partially the reason why companies disclose this information, in fact two other concepts also explain this behaviour which are the legitimacy theory and the agency theory. They suggest, respectively, that companies disclose such information to maintain their reputation and their operations and that banks mislead society through this disclosure by directing financial resources to polluting industries with substantial financial returns (Patel et al., 2024).

Thus, the more reliable a company is, the more people invest in it and the more it can fulfil its ESG programme and have a positive impact on society while improving its market performance. Companies should therefore be clear about what they intend to do with the money and provide updates on their projects and progress to strengthen their relationship with their investors because such firms will be able to raise funds quite quickly for new projects (Bhutta et al., 2022).

Environmental, Social and Governance

Some scholars agree to state that corporate sustainability improves the overall performance of a company by enhancing information asymmetry, improving internal governance, reducing debt cost, alleviating financial constraints and therefore boosting financial performance, enterprise value and stock price performance (Zhang-Hangjian et al., 2025). Indeed, according to some other studies, companies with a high ESG score could benefit from easier access to commercial credit financing which is “*a credit relationship that arises from a transaction of goods or services, such as deferred payment or advance receipts*” (Yang et al., 2025).

Companies, with a strong ESG score, can diminish the risks associated to legal, environmental and managerial aspects, i.e. they borrow money at a lower rate and more favourable conditions, and they can therefore do more deals as their cost of debt is lower (Yang et al., 2025). In addition to a lower borrowing rate, as ESG factors become increasingly important in the market, these companies will obtain a better credit rating and will therefore be able to use a wider range of products to raise funds (Yang et al., 2025). For example, a study has shown that startups with important focus on their ESG properties benefit from a better and sustainable valuation even if these enterprises will underperform in their first year (Mansouri & Momtaz, 2022).

By assuming their ESG responsibilities, companies could obtain much more than a lower interest rate when they borrow money. They could also attract more suppliers and thus diversify their fundraising and associated risks by demonstrating strong ethical and social values (Yang et al., 2025) so in order to maximize customer loyalty, companies are focusing on the environmental part of their business to gain both public recognition and societal support (Zhang-Hangjian et al., 2025). It therefore enables them to reduce the concentration of suppliers and increase their bargaining power with them and even, to a certain extent, prevent other companies from entering into direct competition with them. Companies can also report on their ESG activities in order to reduce the information asymmetry between them and their investors, which creates a strong bond of trust with the latter as they can assess the company's performance from a more holistic point of view (Yang et al., 2025). Indeed, ESG information gives shareholders a clear picture of a company's overall performance, not just its financial performance. (Mukhtar et al., 2023).

Credit Guarantees

In recent years, many environmental regulations have been put in place to protect our planet by reducing the negative outcomes of companies resulting from their activities. However, these regulations may affect the profitability of the company and therefore its financial risk since implementing such regulations generates additional costs (Wang & Wang, 2024). In particular, SMEs often find it more difficult to obtain a line of credit, as they are perceived as riskier by banks due to their limited resources (Akcigit et al., 2024). Credits loans are therefore really important because they mitigate the financial risk of companies arising from environmental restrictions by guaranteeing lenders that the loan conditions will be honoured even in case of

financial difficulties on the part of the borrower (Wang & Wang, 2024). These loans are often made possible by government agencies and financial institutions (Wang & Wang, 2024). Moreover, some studies have revealed that companies dealing with strict environmental rules are more exposed to financial risk but also that there exists a positive relationship between environmental performance of a company and its credit rating. This highlights the importance of credit because the more you are under pressure and environmental regulations, the more financially risky you are, but if you can overcome these factors, you get better environmental ratings and therefore a better credit rating (Wang & Wang, 2024).

Public guarantee programmes seem to be the most common method to deal with this phenomenon, for example, Turkey set up such a programme, which was the world's largest guarantee programme, to recover from two post-crisis tightening's of domestic credit markets, illustrated by one of the lowest GDP growth rates since the 2009 crisis, as well as a negative credit growth. Such programmes are designed to reduce the probability of default by borrowers, in this case SMEs, so that lenders, i.e. banks, can lend more money without worry so it acts as a guarantor for companies with limited access to credit (Akcigit et al., 2024).

This type of programme, whose aim is to give companies access to credit in order to stimulate their activity, works effectively in the short term but, in the long term, its impact can be uncertain, as companies have higher levels of debt and therefore damage their viability. In fact, in the short term, this programme has already shown that it stimulates employment and sales while reducing borrower defaults, so it works effectively as it achieves its objective (Akcigit et al., 2024). Moreover, another study shows that responding positively to environmental regulations by focusing on green practices strengthens financial stability and contributes to the well-being of the world (Wang & Wang, 2024).

Green Bonds

The United Nations has set the goal of keeping temperatures below a certain level through the Paris Agreement, by integrating ESG strategies into companies' long-term vision. However, financing these projects remains a problem, as they would require several trillion US dollars, but some financial instruments can help to finance climate-friendly projects such as the green bonds as they are part of the low-carbon funding which aims to raise capital for a sustainable and low-carbon economy (Bhutta et al., 2022). Green bonds aim to use capital in a more

efficient way than we used to do, i.e. by mitigating the adverse effects of industrialization around the world (Bhutta et al., 2022). Furthermore, green bonds enable companies to obtain cheaper financing (Cicchello et al., 2022).

The green bond market has experienced extraordinary growth since the European Investment Bank issued the world's first climate bond in 2007. Moreover, the European market has grown particularly rapidly, and, in 2022, it accounted for around 51% of the global green bond market, making it the world leader (Cicchello et al., 2022). Indeed, green bonds are getting more and more attention over the past years, which can be demonstrated by their growing issuance at the global level, i.e. from \$81 billion in 2016 to \$487.1 billion in 2022 (Li et al., 2025). Even during the COVID19 crisis, its popularity was not affected. In fact, the supply of these instruments was reduced while demand was not affected by the crisis (Kozioł et al., 2022). Then, the more a country's economic environment is stable, the more green bonds will be issued and to determine whether a country's economic situation is stable or not we can consider a bunch of factors including GDP growth, inflation, sovereign credit rating, etc (Mertzanis & Houcine, 2025). Obviously, institutional support for sustainable development is also very important, as a more supportive institutional environment will enable the green bond market to develop more rapidly, as will public awareness of the current environmental situation and the social pressure that could result from this awareness (Mertzanis & Houcine, 2025).

An eco-friendly initiative, such as green bonds, has a positive impact on companies as it enables them to have a long-term vision. In addition, it seems that green bonds are slightly affected by the effect of liquidity risk and that this effect diminishes over time. This shows that the green bond market is reaching maturity, which should reassure investors (Bhutta et al., 2022). From the company's point of view, issuing these bonds would not be so costly, as stakeholders value the company's social commitments and therefore provide cheap financing, resulting in a lower cost of debt for green bonds (Bhutta et al., 2022). We can therefore expect small companies to adopt green bonds rather than conventional bonds as they face higher information costs (Cicchello et al., 2022).

However, investing in such bonds can seem risky because the return on these projects is uncertain, and they are less financially viable projects than projects financed by traditional bonds (Bhutta et al., 2022). But some studies revealed that companies trying to raise funds for

their ESG projects and being more eco-responsible will receive a positive response from the market (Bhutta et al., 2022). The level of supervision also influences the supply and reliability of green bonds as stronger supervision increases investor confidence in these instruments (Jankovic et al., 2022). However, bonds with a higher credit rating are considered less risky, and therefore investors do not seek a higher return than if they had a lower credit rating (Jankovic et al., 2022).

Green Bonds & Information Asymmetry

As already seen in the previous sections of the literature review, the greater the disclosure of information, the greater the confidence of the market and the greater the funds raised by the company and it seems that green bonds disclose more information than similar conventional bonds. Furthermore, issuing green bonds might attract the attention of institutional investors and improve the operational performance of the company so it therefore influences the decision of investors and the capital flow (Li et al., 2025).

Then, a minimum part of the amount that has been raised through green bonds has to be dedicated to the green project for which these last have been issued, it can therefore explain why green bonds disclose more information than conventional ones (Li et al., 2025), but it also makes them less convenient for broader financing needs (Cicchello et al., 2022). However, it also represents a way for companies to showcase their commitment to sustainability. A study has shown that bonds with a higher allocation to green projects provide more information about the project and its progress (Li et al., 2025). Furthermore, the higher the proportion of the amount to be invested in a sustainable project, the more companies are willing to issue green bonds because the yield will decrease (Jankovic et al., 2022).

Furthermore, a third-party certification could also play a role in the information disclosure process as this measure has been introduced by the international green bond market in order to assess the reliability and authenticity of green projects. For example, in some countries like China, this certification is not mandatory, but it sends a positive signal to regulators when these bonds have been certified as it demonstrates that the bonds are not being used for deceptive purposes. This measure is also intended to inform investors about the projects and boost their confidence in green bonds (Li et al., 2025).

Hypotheses Development

Hypothesis 1: *ESG scores have a negative impact on the money that the InvestEU programme put on projects via its financial guarantees and its implementing partners.*

Indeed, this hypothesis can be explained by the fact that a good ESG score makes it easier to access better financial terms and conditions (Yang et al., 2025), to build a strong image with customers and therefore to attract environmentally-friendly customers (Zhang-Hangjian et al., 2025). So, companies with a high ESG score should, in theory, be in a favourable economic situation. Moreover, the fact that there is no consensus on how to measure it could also make it not reliable.

Hypothesis 2: *The number of green bonds issued has a negative impact on the support provided by the InvestEU programme through its financial guarantees and implementing partners.*

It can be explained by the fact that green bonds, which are used to fund sustainable projects (Bhutta et al., 2022), allow companies that issue them to have less expensive financing options (Cicchello et al., 2022). In addition, as these bonds are already well perceived by the market and have already raised funds for the development of sustainable projects, less support may be needed (Bhutta et al., 2022).

Sample Selection & Data Description

This section provides an overview of the dataset used to answer the research question. It first presents the temporal and geographical scope of the study, and then explains the data collected at project and country level, as well as their sources.

First of all, InvestEU has been set up for all 27 EU countries but it also operates in Iceland, Norway and Switzerland (*InvestEU Operations - List - European Union*, n.d.). In addition, the InvestEU programme started in 2021 and will end in 2027, so information is already available on projects that have been approved by the investment committee since the creation of the programme. However, on their website, projects are only listed publicly between 2022 and 2024 for a total of 186 projects (*InvestEU Operations - List - European Union*, n.d.).

On the one hand, at project level, certain data have been collected such as the amount of the InvestEU operation, which is the amount that InvestEU, thanks to its guarantees, has invested

in each project via its implementing partners and which would not have taken place without the support of InvestEU. These data are at the heart of my research question and are therefore essential to my analysis. Moreover, the number of countries involved in the project and the number of policy windows covered by the project has been collected for each project. The eligible area(s) covered by the project and whether the project is individual funding or a framework operation were also collected for each project. All these data were collected directly from the InvestEU programme website (*InvestEU Operations - List - European Union*, n.d.).

On the other hand, at country level, a Bloomberg terminal was used because it is an integrated service that aims to gather rich data on all market sectors and workflows (“Welcome to the Terminal,” n.d.), making it a very interesting and reliable source of data. It has enabled to collect ESG and green bonds data, as well as on the general economic situation of each of the thirty countries participating in the InvestEU programme. These economic data exclusively include the percentage of women on board, the Non-Seasonally Adjusted (NSA) GDP by expenditure, the NSA Harmonised Index of Consumer Prices with the 2015 prices as a base and the government debt in percentage of the GDP. The NSA version of GDP by expenditure and the Harmonised Index of Consumer Prices were used, as this was the only version of the data available for both. Then, the level of education has also been collected but on the UNSECO website.

However, the data related to ESG ratings and the percentage of women on a company's board of directors were not really collected at country level, but rather at company level, for each of the thirty countries. In addition, for each company providing an ESG rating or a percentage of women on the board of directors, its turnover over the last 12 months was collected and data were collected as of 31 December of each year, i.e. 31/12/2021, 31/12/2022 and 31/12/2023, to collect the company's annual turnover.

The Appendix 1 provides more information on all the functions used to collect these data on the Bloomberg terminal, as well as the filters used on these functions to extract the correct data.

Finally, it is important to note that to better understand and evaluate how the investment committee validated the projects, each piece of country-specific data have been extracted from 2021 to 2023 to consider only what was observable at that time. Moreover, for GDP, I also had to collect data for 2020 in order to calculate growth.

Methods & Empirical Analysis

This part of the thesis deals with all the analysis that has been done by covering and explaining the methodology that has been used as well as the description of each variable used for the linear regression analysis but also the categorization of each variable. Finally, this section presents the empirical results and their analysis.

Methodology

Quantitative research was carried out, using the data described in the previous section, to answer the research question of this thesis as it allowed the analysis of the correlation between the amount of InvestEU's operation put into each project while considering the role of green bond issuance and ESG scores.

In order to identify this correlation, a linear regression model was required:

$$\textbf{Model: } \log.OPAM. = ESG + \log.GB. + \text{Control Variables}$$

This model aims to understand how the InvestEU programme works and how it influences the amount invested by its implementing partners in the different projects through its financial guarantees, while considering the number of active green bonds issued in each country participating in the project, but also the average ESG rating of each country participating in the project.

This model was estimated using OLS linear regression as it enabled me to assess the impact of variable, i.e. independent variables, on another one, i.e. the dependent variable. However, the data must satisfy certain assumptions under the OLS linear regression model: the linearity of the model, the independence of the error terms, the normality of the residuals, homoscedasticity and absence of multicollinearity. These criteria were evaluated after the models had been run to verify the validity and robustness of the results (Sampaio, 2023) (*OLS Regression*, n.d.).

The first difficulty encountered was the different periodicity of the data, sometimes even between countries for the same variable. To ensure consistency, all data were harmonised on an annual basis. This is the case for GDP, which is provided on a quarterly or annual basis depending on the country, so that for this type of data, when it is on a quarterly basis, a sum of the quarterly data was made for each year. Moreover, for the monthly NSA Harmonised Index

of Consumer Prices, an average for each year has been made. As other data provided at country level are available on an annual basis, no further transformation has been carried out.

Then, as previously mentioned in the previous section, ESG data and the percentage of women were collected at the company level for each of the thirty countries. In order to obtain a representative ESG rating by country, a weighted average of the ESG ratings of all companies within each country was therefore carried out. The weighting was based on each company's annual revenue. Thus, for each year, an ESG rating is calculated for each country, taking into account the weight of each company in the country's economic landscape. The same logic has been applied to the Bloomberg ESG Disclosure score as well as for the percentage of women on board.

Finally, another main challenge for this quantitative analysis was the fact that some of the data collected were at national level and therefore had to be manipulated in order to be attributed to projects. For each project, the data at country level have therefore been calculated as the average of the values for all the countries participating in the project.

Moreover, it is also important to note that a $\log()$ transformation has been done, for some variables, in order to get a better distribution and it only occurs when the values are positive. The $\log()$ used is the log in base 10.

Unfortunately, of the 186 projects listed publicly on the InvestEU website, only 137 have data on the amount of the InvestEU operation (*InvestEU Operations - List - European Union*, n.d.). Within these 137 projects, some of them have been eliminated due to a lack of clarity about some information so I decided to not take any risk that could lead to unreliable and biased results; therefore, the analysis was made on 109 publicly available projects.

Variables

Dependent Variables

- **log.OPAM.:** This variable is continuous and refers to the operational amount invested by InvestEU in the project. This variable is expressed in millions of euros.

Independent Variables

- **ESG:** This variable is continuous and refers to the representative ESG rating of the project by averaging the representative ESG ratings of the countries participating in the project. This measure ranges from 0 to 10, with 10 being the best possible rating in terms of ESG performance and is based on Bloomberg's ESG rating.
- **log.GB.:** This variable is continuous and refers to the average number of green bonds issued by the countries participating in the project.

Control Variables

Control variables were selected according to their potential impact on the independent variable for the model in order to take account of the complexity of the world in which we live and all the factors that can influence the support provided by the InvestEU programme to a project. It clarifies the multiple factors at play and their interaction with the independent variables. Control variables can be linked to a project itself or to countries involved in a project.

On the one hand, regarding variables linked to the project itself, transformations using the base 10 logarithm were carried out on the number of countries and the number of eligible areas covered by a project. They are respectively noted as log.NBCOUN. and log.NBELIGAREAS.. There are also untransformed data on a project, namely the number of policy windows covered by a project, as well as two binary variables, namely the fact that one of the eligible areas targeted by the project is “Energy” and that one of the eligible areas addressed by the project is “SMEs and small mid-caps”. These last two variables were selected because the energy sector is one of the main sectors in which green bonds have been issued in Europe in 2021 (Jankovic et al., 2022) and because SMEs face more financial constraints as they are considered riskier (Akcigit et al., 2024). Untransformed variables are, respectively, noted as NBPOLWIN, ENERGY and SME.

On the other hand, regarding data about countries involved in a project, there are also some transformed variables with a base 10 logarithm such as government debt in percentage of the GDP but also the level of education which refers to the “*participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, both sexes (%)*” (Country Profile – Technical Cooperation Group on the Indicators for SDG 4, n.d.), young people and adults are people aged between 15 and 64 (Browse - UIS Data Browser, n.d.). The untransformed variables are the percentage of women on a company's board of directors,

inflation which refers to the harmonised NSA consumer price index and, finally, GDP growth based on NSA GDP figures by expenditure. These are respectively noted in the thesis as log.GOVDEBT., log.EDUCATION., X.WOMEN, INFLATION and GDPGROWTH. The variables log.GOVDEBT., INFLATION and GDPGROWTH were selected as indicators of a country's economic stability, which in turn may in turn influence companies' willingness to develop green projects (Mertzanis & Houcine, 2025). Finally, the variables X.WOMEN and log.EDUCATION. are relevant because it has been shown that the more women there are on a company's board, the more sustainable the company's financial performance, and that the level of education is negatively correlated with sustainable finance. (Olumekor & Oke, 2024).

Other Variables

- **ESGDISC:** This variable is continuous and refers to the average Bloomberg ESG Disclosure score for the countries participating in the project.
- **FRAMOP:** This variable is binary and takes the value 1 if the type of approval concerns a framework operation and takes the value 0 if it concerns individual financing or an investment operation.

The variables listed under “Other Variables” were not directly used in the model but were instead used to test for potential endogeneity of ESG and to assess heterogeneity using FRAMOP.

Empirical Analysis

Descriptive Statistical Analysis

Table 1 presents the descriptive statistics of each variable used in the model. ESG has a larger standard deviation than log.GB., indicating greater disparities in ESG ratings from one project to another.

Table 1. Descriptive Statistics of Variables

Variable	N	Mean	Std. Dev.	Min	Max
log.OPAM.	109	2.189	0.449	1.130	3.114
ESG	109	4.365	0.785	2.077	5.567
log.GB.	109	1.842	0.528	0.477	2.860
log.NBCOUN.	109	0.422	0.619	0.000	1.462
NBPOLWIN	109	1.046	0.210	1.000	2.000
ENERGY	109	0.541	0.501	0.000	1.000
SME	109	0.110	0.314	0.000	1.000
log.GOVDEBT.	109	0.045	0.235	-0.527	1.306
INFLATION	109	117.150	9.553	101.752	149.520
GDPGROWTH	109	0.045	0.029	-0.003	0.163
X.WOMEN	109	0.316	0.080	0.112	0.452
log.EDUCATION.	109	1.295	0.109	0.980	1.636
log.NBELIGAREAS.	109	0.162	0.274	0.000	1.041

Main Test Regression Results

Table 2 shows the result of the main OLS linear regression which important in answering the research question or at least giving an overview of it.

Neither ESG nor log.GB. are significant at the 1%, 5% or even 10% level, suggesting that the investment committee from InvestEU programme does not really consider these metrics when it comes to validate a project. As long as the ESG metric is concerned, its non-significantly effect on the operation amount from InvestEU on projects can be explained by the fact that ESG lack of homogeneity as the way of evaluating the Environmental, Social and Governance pillars differ from one institution to another. For the number of green bonds issued by countries in which projects are implemented, its insignificant effect could be explained by the fact that the greater the number of green bonds issued, the more mature the market, but also by the fact that investors are receptive to these bonds and are already investing in companies issuing green bonds, which therefore may not need significant financial support.

However, other variables are significant, the most significant being log.NBCOUN. which is significant at the 1% level. Then, there is ENERGY, which is significant at the 5% level. There are also X.WOMEN and log.NBELIGAREAS. which are significant at the 10% level. All have a positive impact on the dependent variable, except for log.NBELIGAREAS., which has a

negative effect. Finally, the model is statistically significant at the 1% level and has an adjusted R-squared of 14.12%.

Table 2. OLS Linear Regression Results – Initial Model

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	2.0276	1.2775	1.5872	0.1158	
ESG	-0.0502	0.0877	-0.5722	0.5685	
log.GB.	-0.1809	0.1495	-1.2102	0.2292	
log.NBCOUN.	0.3598	0.1192	3.0183	0.0033	**
NBPOLWIN	-0.1291	0.2197	-0.5875	0.5583	
ENERGY	0.2432	0.0938	2.5923	0.0110	*
SME	0.2790	0.1824	1.5300	0.1293	
log.GOVDEBT.	-0.2143	0.2148	-0.9974	0.3211	
INFLATION	-0.0053	0.0082	-0.6480	0.5185	
GDPGROWTH	-0.0219	2.4541	-0.0089	0.9929	
X.WOMEN	1.9554	1.0431	1.8746	0.0639	.
log.EDUCATION.	0.4732	0.4302	1.1000	0.2741	
log.NBELIGAREAS.	-0.3801	0.2031	-1.8714	0.0643	.
Residual standard error: 0.4166 on 96 degrees of freedom					
Multiple R-squared: 0.2366, Adjusted R-squared: 0.1412					
F-statistic: 2.4800 on 12 and 96 DF, p-value: 0.0072					
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

OLS Hypotheses

As already discussed in the methodology section, an OLS linear regression must verify certain hypotheses in order to be valid. Indeed, this type of linear regression counts five hypotheses which are the linearity of the model, the independence of errors, the presence of homoscedasticity, the normality of residuals and the absence of multicollinearity.

Figure 1 illustrates the relationship between the residuals and the fitted values. As shown in the graph, this relationship appears to be linear. The linearity of the model hypothesis is therefore respected (*Understanding Diagnostic Plots for Linear Regression Analysis | UVA Library*, n.d.).

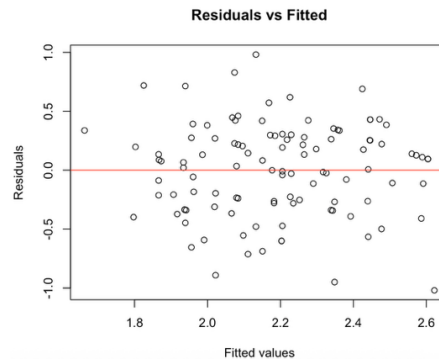


Figure 1. Residuals vs Fitted Plot

Then, the Table 3 shows all the statistic values and p-values for the Durbin-Watson, Breusch-Pagan and Shapiro-Wilk tests. Regarding the Durbin-Watson test, the statistic is approximately equal to 2, which means that there is no autocorrelation in the residuals since its null hypothesis, which is that first-order autocorrelation does not exist, is not rejected as the p-value is equal to 0.0734, which is above the 0.05 threshold. (*Durbin Watson Statistic - Overview, How to Calculate and Interpret*, n.d.). Then, the Breusch-Pagan test, which is used to test whether there is heteroscedasticity in the model, has a statistic of 14.5138 and a p-value of 0.2691, the null hypothesis is therefore not rejected meaning that the model has homoscedasticity (*Breusch-Pagan Test for Heteroscedasticity*, n.d.). Finally, as the two other tests, the Shapiro-Wilk test has a statistic of 0.9882 and a p-value of 0.4610 and the null hypothesis is therefore not rejected meaning that the model follows a normal distribution (*Shapiro-Wilk Test Calculator: Normality Calculator, Q-Q Plot*, n.d.).

Table 3. Results of Dubrin-Watson, Breusch-Pagan and Shapiro-Wilk Tests

Test	Statistic	p-value
Durbin-Watson	1.7461	0.0734
Breusch-Pagan	14.5138	0.2691
Shapiro-Wilk	0.9882	0.4610

The Scale-Location plot, showed in the Appendix 2, is used to demonstrate whether there is homoscedasticity or not, shows that residuals are spread equally around fitted values coming from the OLS regression model, so it strengthens the result coming from the Breusch-Pagan test (*Understanding Diagnostic Plots for Linear Regression Analysis | UVA Library*, n.d.). Then, the Q-Q plot is used to demonstrate whether the residual of a model follows a normal

distribution or not. In the Appendix 3, residuals follows a straight line which confirms the results found by the Shapiro-Wilk test (*Understanding Diagnostic Plots for Linear Regression Analysis* | UVA Library, n.d.).

Finally, the Table 4 shows the VIF for each variable included in the OLS regression model. Thus, measure shows the multicollinearity of a variable in the linear regression and a VIF between 1 and 5 is considered as moderately correlated while a VIF greater than 5 is considered as highly correlated and when it is greater than 10, corrective actions must be taken to reduce multicollinearity. In the Table 4, all values are below the threshold of 5, so the model has been kept unchanged (*Variance Inflation Factor (VIF)*, n.d.).

Table 4. VIF of Variables

Variable	VIF	Variable	VIF
ESG	2.948104	log.GOVDEBT.	1.585994
log.GB.	3.869183	INFLATION	3.832160
log.NBCOUN.	3.389037	GDPGROWTH	3.190650
NBPOLWIN	1.327673	X.WOMEN	4.352630
ENERGY	1.372407	log.EDUCATION.	1.378418
SME	2.047265	log.NBELIGAREAS.	1.933003

Robustness Tests

To ensure the robustness of the results, a robustness test has been carried out by identifying the outliers thanks to the Cook's distance as it "*is a statistical measure used to identify influential observations in your data set when fitting a linear regression model*" (Taneja, 2023). As shown in the Appendix 4, the Cook's distance method has enabled to identify nine outliers and the

Table 5 shows the result of the OLS regression model without them. ENERGY is significant at the 0.1% level while SME and log.NBELIGAREAS. are significant at the 1% level, contrary to the initial model. Moreover, log.NBCOUN. and X.WOMEN are still significant, respectively, at the 1% level and at the 10% level. Finally, in this linear regression, the coefficient estimate of ESG is positive.

Table 5. OLS Linear Regression Results - Without Outliers

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	0.8037	1.1351	0.7081	0.4808	
ESG	0.0049	0.0847	0.0575	0.9542	
log.GB.	-0.1478	0.1375	-1.0752	0.2853	
log.NBCOUN.	0.3844	0.1225	3.1386	0.0023	**
NBPOLWIN	-0.0004	0.2099	-0.0021	0.9983	
ENERGY	0.2854	0.0824	3.4656	0.0008	***
SME	0.5227	0.1690	3.0928	0.0027	**
log.GOVDEBT.	-0.1605	0.2419	-0.6637	0.5087	
INFLATION	0.0048	0.0077	0.6289	0.5311	
GDPGROWTH	2.5400	2.3001	1.1043	0.2725	
X.WOMEN	1.6320	0.9569	1.7056	0.0917	.
log.EDUCATION.	0.1540	0.4071	0.3782	0.7062	
log.NBELIGAREAS.	-0.5950	0.1810	-3.2874	0.0015	**

Residual standard error: 0.3502 on 87 degrees of freedom
Multiple R-squared: 0.3737, Adjusted R-squared: 0.2873
F-statistic: 4.3259 on 12 and 87 DF, p-value: 2.322e-05

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Then, a second robustness test was carried out by applying the stepwise function via the Akaike Information Criterion (AIC) to the initial model in order to take into account only the most important variables (*Stepwise Regression: A Comprehensive Guide* | by Arko Sengupta | Medium, n.d.). The AIC can be defined as “a measure used to evaluate how well a statistical model fits the data while also considering the complexity of the model” (*Stepwise Regression: A Comprehensive Guide* | by Arko Sengupta | Medium, n.d.). As shown in Table 6, which presents the results of this second robustness test based on stepwise selection, the model is composed of the intercept and only two variables, which are log.NBCOUN. and ENERGY. The intercept and log.NBCOUN. are statically significant at the 0.1% level while ENERGY is statically significant at the 10% level.

Table 6. OLS Linear Regression Results – Stepwise Variable Selection

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	1.9969	0.0629	31.7359	< 2e-16	***
log.NBCOUN.	0.2570	0.0647	3.9741	0.0001	***
ENERGY	0.1554	0.0800	1.9427	0.0547	.

Residual standard error: 0.4140 on 106 degrees of freedom
Multiple R-squared: 0.1673, Adjusted R-squared: 0.1516
F-statistic: 10.6463 on 2 and 106 DF, p-value: 6.119e-05

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Heterogeneity Test

The heterogeneity test consists of analysing whether the same variables have similar effects across two sub-samples of the initial sample. In this thesis, the sub-samples are constructed based on the FRAMOP variable.

Table 7 shows the results regarding the individual financings/investment operations while Table 8 shows the results regarding the framework operations. In the individual financing sub-sample, three variables are significant. Among them, ENERGY remains significant at the same level as in the initial model, whereas log.NBCOUN. and X.WOMEN do not. In the framework operation sub-sample, only SME and log.EDUCATION. are, respectively, significant at the 5% and the 10% level. However, the p-value of the overall F-test, for the framework operation sub-sample, is greater than 0.05 meaning that the model does not significantly explain the variation of the dependent variable (Frost, 2017).

Table 7. OLS Linear Regression Results - Individual Financing/Investment Operation Sub-Sample

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	1.9302	1.4539	1.3275	0.1894	
ESG	-0.0316	0.0931	-0.3396	0.7354	
log.GB.	-0.2325	0.1608	-1.4456	0.1535	
log.NBCOUN.	0.3637	0.1437	2.5316	0.0140	*
NBPOLWIN	0.1914	0.6402	0.2990	0.7660	
ENERGY	0.2662	0.1075	2.4760	0.0161	*
SME	-0.6775	0.4390	-1.5433	0.1280	
log.GOVDEBT.	-0.2596	0.2242	-1.1582	0.2514	
INFLATION	-0.0054	0.0083	-0.6451	0.5213	
GDPGROWTH	-0.3842	2.4620	-0.1560	0.8765	
X.WOMEN	2.9357	1.1432	2.5680	0.0127	*
log.EDUCATION.	0.0992	0.4390	0.2260	0.8220	
log.NBELIGAREAS.	-0.6237	0.4328	-1.4411	0.1548	
Residual standard error: 0.4044 on 60 degrees of freedom					
Multiple R-squared: 0.3097, Adjusted R-squared: 0.1717					
F-statistic: 2.2436 on 12 and 60 DF, p-value: 0.0203					
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

Table 8. OLS Linear Regression Results - Framework Operation Sub-Sample

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	-0.1559	6.3739	-0.0245	0.9807	
ESG	-0.4971	0.4980	-0.9983	0.3285	
log.GB.	-0.6051	0.9201	-0.6576	0.5173	
log.NBCOUN.	0.4150	0.5033	0.8245	0.4181	
NBPOLWIN	-0.2477	0.3694	-0.6706	0.5091	
ENERGY	0.2626	0.2027	1.2954	0.2080	
SME	0.5577	0.2586	2.1561	0.0418	*
log.GOVDEBT.	-0.9680	1.2438	-0.7782	0.4444	
INFLATION	-0.0326	0.0557	-0.5849	0.5643	
GDPGROWTH	-2.2217	15.2835	-0.1454	0.8857	
X.WOMEN	6.9692	6.9605	1.0012	0.3271	
log.EDUCATION.	5.6089	3.0916	1.8143	0.0827	.
log.NBELIGAREAS.	-0.3400	0.3320	-1.0241	0.3164	

Residual standard error: 0.4018 on 23 degrees of freedom
Multiple R-squared: 0.4872, Adjusted R-squared: 0.2197
F-statistic: 1.8211 on 12 and 23 DF, p-value: 0.1047

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Endogeneity Test

Endogeneity refers to the potential correlation between the independent variable and the error term, i.e. unexplained variation, in the dependent variable which can leading to unreliable statistical tests. It can arise for several reasons including simultaneity which occurs “*when the predictor and dependent variables causally influence each other*” (*What Is Endogeneity? - Statistics Solutions*, n.d.). In my case, ESG scores may influence log.OPAM., but log.OPAM. could also affect ESG scores as the more funds you obtain, the more sustainable investments you can make in order to improve your ESG scores.

To test this potential endogeneity, a Two-Stage Least Squares regression was used. This method consists of using « *instrumental variables uncorrelated with the error term to estimate the model parameters. These instrumental variables are correlated to the endogenous variables but not with the error term of the model* » (*Two-Stage Least Squares Regression*, n.d.). ESG was treated as endogenous and ESGDISC was chosen as the instrumental variable. Indeed, as shown in Table 9, ESGDISC is strongly correlated with the ESG. An instrument is considered weak if its “*correlation with the endogenous regressors, conditional on any controls, is close to zero*”

(Andrews et al., 2019). However, the first stage F-statistic is greater than 10, suggesting that ESGDISC is not a weak instrument. This result is confirmed by the weak instrument test, presented in Appendix 5, as the statistic is greater than 10 and the p-value is below 0.05 (Staiger & Stock, 1997).

Table 9. First Stage Regression Results – 2SLS Model

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	-1.6661	0.1202	-13.8612	<2e-16	***
ESGDISC	10.5542	0.2087	50.5763	<2e-16	***

Residual standard error: 0.158 on 107 degrees of freedom
Multiple R-squared: 0.9598, Adjusted R-squared: 0.9595
F-statistic: 2557.9664 on 1 and 107 DF, p-value: < 2.2e-16

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 10 shows the statistical results of the 2SLS model applied to the initial model. It reveals no substantial differences compared to the OLS linear regression applied to the initial model, with similar p-values and coefficient estimates in both models. This suggests that ESG is exogenous. Furthermore, this conclusion is supported by the Wu-Hausman test, presented in the Appendix 5, since the p-value is greater than 0.05 and therefore does not reject the null hypothesis that ESG is exogenous (Rehal, 2022).

Table 10. Two-Stage Least Squares (2SLS) Regression Results

Variable	Estimate	Std. Error	t value	Pr(> t)	Signif.
(Intercept)	2.1142	1.2914	1.6371	0.1049	
ESG	-0.0637	0.0925	-0.6889	0.4925	
log.GB.	-0.1796	0.1495	-1.2012	0.2326	
log.NBCOUN.	0.3538	0.1199	2.9511	0.0040	**
NBPOLWIN	-0.1330	0.2199	-0.6049	0.5467	
ENERGY	0.2431	0.0938	2.5910	0.0111	*
SME	0.2792	0.1824	1.5307	0.1291	
log.GOVDEBT.	-0.2159	0.2149	-1.0045	0.3177	
INFLATION	-0.0059	0.0083	-0.7085	0.4804	
GDPGROWTH	-0.0279	2.4544	-0.0114	0.9909	
X.WOMEN	1.9870	1.0455	1.9006	0.0604	.
log.EDUCATION.	0.4984	0.4337	1.1492	0.2533	
log.NBELIGAREAS.	-0.3782	0.2032	-1.8616	0.0657	.

Residual standard error: 0.4166 on 96 degrees of freedom
Multiple R-squared: 0.2365, Adjusted R-squared: 0.141
Wald test: 2.4917 on 13 and 96 DF, p-value: 0.006904

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Contributions

This thesis aims to contribute to the existing literature in three ways. First of all, many studies have examined government support for businesses through guarantees, but they have never been devoted to the financial guarantee system of the InvestEU programme in particular (Akcigit et al., 2024). Then, this study differs from others in that it attempts to understand a public guarantee programme through the simultaneous consideration of green bond issuance and ESG ratings, which, to my knowledge, has not yet been explored in the literature (Akcigit et al., 2024). Lastly, although the impact of ESG ratings on green bond issuance has already been studied, these two metrics have, to my knowledge, never been used together as independent variables in the same model (Bhutta et al., 2022).

Limitations & Conclusion

In this section of the thesis, the conclusion of the research is presented, as well as the limitations of the work and possible future research on this or similar subjects.

Discussion

According to some scholars, public guarantee programmes are used to get access to credits for companies in order to stimulate their activities (Akcigit et al., 2024). According to the literature, it seems that having a good ESG rating can lead to cheaper financing options and a wide range of financial instruments to raise funds (Yang et al., 2025). Moreover, issuing green bonds would also make it possible to benefit from cheaper financing (Cicchello et al., 2022), as investors attracted by this type of bond are prepared to forego a certain return (Bhutta et al., 2022). My results suggest, with the exception of those from the linear regression with no outliers, that the higher the ESG ratings and the more green bonds are issued, the less a public guarantee programme, such as InvestEU, will support you for a project. This result is in line with the literature, as these projects are likely to already benefit from favourable market conditions and may be perceived as less risky or more likely to obtain private financing. However, it is important to note that these effects are not statistically significant, and the observed relationships should therefore be interpreted with caution.

Conclusion

As a reminder the research question is: “How does debt financing, such as green bonds, influence InvestEU financial guarantees across countries, considering the role of the ESG scores in shaping this relationship?”. After reviewing the existing literatures about this topic and similar ones which were relevant in order to bring some knowledge and make this search clearer, I ended up with two hypotheses: “ESG scores have a negative impact on the money that the InvestEU programme put on projects via its financial guarantees and implementing partners” and “the number of green bonds issued has a negative impact on the support provided by the InvestEU programme through its financial guarantees and implementing partners”. The results provided by the OLS linear regression are consistent with the two hypotheses, as both ESG and log.GB. have a negative estimated coefficient except for the outlier-free robustness test for which ESG has a positive coefficient estimate. However, these results are not statistically significant as they have p-values greater than 0.05. This suggests that neither ESG ratings nor the number of green bonds issued in the countries concerned by a project influence the InvestEU programme's decision to allocate financial guarantees to a project. However, other variables such as log.NBCOUN., ENERGY and X.WOMEN have a positive and significant influence on log.OPAM. while log.NBELIGAREAS. has a significant and negative influence. Moreover, the five hypotheses of an OLS linear regression are respected.

Other tests were then carried out, such as robustness, heterogeneity and endogeneity tests. Given that the four variables that significantly influence log.OPAM. are also significant in the first robustness test and that all variables in the second robustness test, except for the intercept, are also significant in the initial model, this suggests that the results are robust. In addition, the heterogeneity test revealed that the same variables are not considered depending on the type of project approval, i.e. either a framework operation or an individual financing/investment operation. The endogeneity test performed on ESG did not reveal any significant endogeneity, which reinforces the reliability of the statistical results.

Limitations

This work faced some challenges and has known some limitations which are important to have in mind. In fact, it was not easy to obtain quantitative data on the InvestEU programme and on the European Green Deal in general, and even when some data were found, their content was

not always clear. Furthermore, for future papers, it might be interesting to carry out similar analyses using ESG ratings from an institution other than Bloomberg, and to research other projects orchestrated by the European Commission.

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Appendices

Appendix 1. Bloomberg Terminal Parameters

1. ESG ratings

Function: Equity Screening (EQS) because it enabled me to “*to perform sophisticated searches for equity securities*” (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.)

Filters:

- Equity securities must have active trading status
- Country of domicile must be one of the thirty countries in which InvestEU operates. Country of domicile is defined as the “*country where the company's senior management is located*” (*Bloomberg-Global-Equity-Indices-Methodology.Pdf*, n.d.).
- Security must be company’s primary security as it shows the most representative security for a given company
- BESGPRO function which enabled me to display all companies that are covered for Bloomberg ESG data (Library, n.d.)

2. Green Bonds

Function: Search Fixed Income Securities (SRCH) function (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.) which includes fixed income securities such as corporate bonds and government bonds.

Filters:

- Only corporate bonds and government bonds as fixed income securities
- Include private securities and consolidation of duplicate bonds (to avoid considering the same bond many times)
- Only Bloomberg verified bonds
- Green instrument indicator, so that bonds resulting from my research are labelled with a green leaf which means that they are considered to be green bonds (mkaczmariski, 2024).

3. Non-Seasonally Adjusted (NSA) GDP by expenditure

Function: ECST function because it enabled me to extract economic data (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.)

4. NSA Harmonised Index of Consumer Prices (with the 2015 prices as base)

Function: ECST function because it enabled me to extract economic data (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.)

5. Government Debt in percentage of the GDP

Function: ECST function because it enabled me to extract economic data (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.)

6. Percentage of women on a company's board

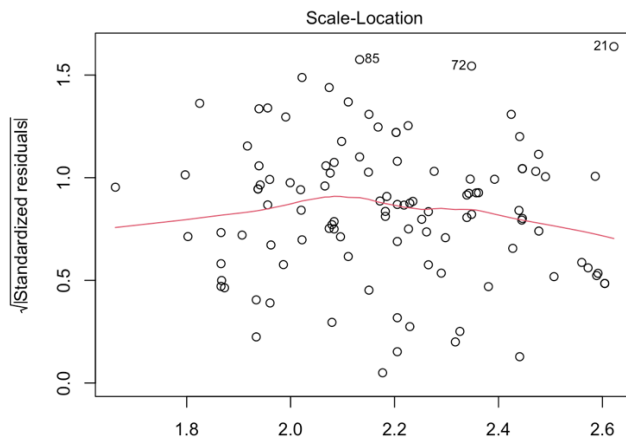
Function: EQS function because it enabled me to “to perform sophisticated searches for equity securities” (*Getting-Started-Guide-for-Students-English.Pdf*, n.d.)

Filters:

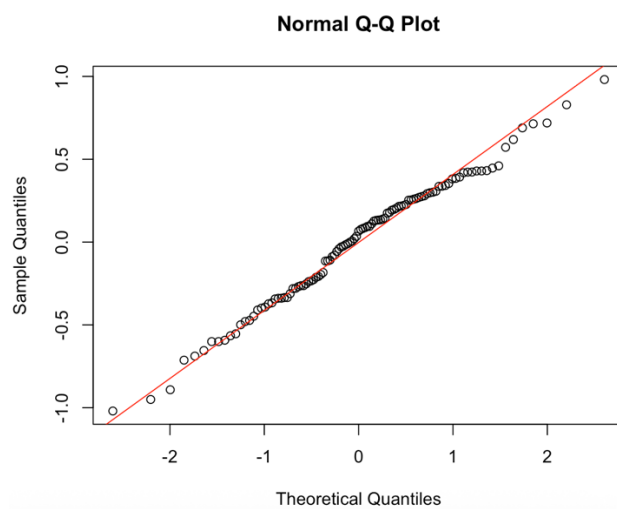
- Equity securities must have active trading status
- Country of domicile must be one of the thirty countries in which InvestEU operates.
Country of domicile is defined as the “country where the company's senior management is located” (*Bloomberg-Global-Equity-Indices-Methodology.Pdf*, n.d.).
- Security must be company's primary security as it shows the most representative security for a given company

“% of women on board (latest available figure) (BLOOMBERG L.P.)” criterion was selected as the display criterion

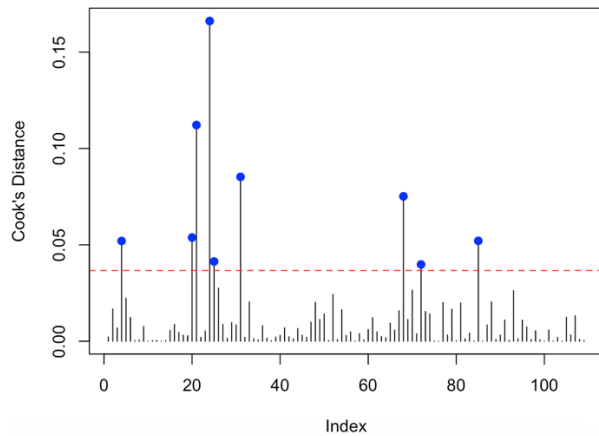
Appendix 2. Scale-Location Plot



Appendix 3. Normal Q-Q Plot



Appendix 4. Outliers Identified via the Cook's Distance



Appendix 5. Results of Weak Instruments and Wu-Hausman Tests

Test	df1	df2	statistic	p-value
Weak instruments	1	96	850.3251	<2e-16
Wu-Hausman	1	95	0.2101	0.6477