THE RELATIONSHIP BETWEEN THE INFORMATION CONTENT IN ESG' SCORES AND THE COST OF DEBT: EVIDENCE THAT THE LEVEL OF INDEBTEDNESS, AGENCY COSTS, AND THE TYPE OF FINANCIAL SYSTEM MATTER

Carlos Francisco Alves
Faculdade de Economia, CEF.UP, Universidade do Porto
Rua Dr. Roberto Frias,
4200-464 Porto, Portugal
E-mail: calves@fep.up.pt
http://orcid.org/0000-0003-3861-8554

Lilian Lima Meneses
Faculdade de Economia da Universidade do Porto

Abstract

This paper provides evidence that conventional risk measures (Merton Distance to Default, Altman Z-Score, Z-Score and Volatility) fail to capture all the relevant information to assess borrower risk. Moreover, the paper shows that the additional information contained in ESG scores has a negative relationship with the cost of debt, and this relationship is economically significant. In addition, companies whose sustainability generates the major concerns (i.e., the most indebted companies and those with the highest agency costs) benefit the most from ESG performance. Finally, the paper provides evidence that the return on companies' ESG efforts in terms of the cost of debt is higher in countries with bank-based financial systems, where long-term relationships between lenders and borrowers prevail, than in countries with market-based financial systems.

Keywords: cost of debt; ESG; risk metrics; default risk; stakeholder orientation

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1. INTRODUCTION

The ESG (Environmental, Social, and Governance) score measures a company's environmental impact, social responsibility, and quality of corporate governance. In recent years, several studies have examined the impact of ESG scores on various financial outcomes (for a review, see Gillan et al., 2021). However, the role of ESG in influencing default risk and the cost of debt has received only limited attention (Erragragui, 2018; Atif and Ali, 2021; Gillan et al., 2021). Some papers have found a negative relationship, suggesting that lenders perceive borrowers with higher ESG performance as less risky (e.g., Goss and Roberts, 2011; Ge and Liu, 2015; Polbennikov et al., 2016; Crifo et al., 2017; Zerbib, 2019; Jang et al., 2020; Apergis et al., 2022; Gao et al., 2022; Agnese and Giacomini, 2023; Kong, 2023). However, certain studies have found no significant relationship (e.g., Menz, 2010; Hoepner et al., 2016; Erragragui, 2018; Gigante and Manglaviti, 2022) or the impact depends on the level of ESG investment (Ye and Zhang, 2011). Finally, others have revealed a positive relationship between ESG performance and the cost of debt (Magnanelli and Izzo, 2017). Thus, the evidence is mixed.

Some potential mechanisms have been proposed to explain the relationship between ESG scores and the cost of debt. One is the direct channel. Better ESG performance corresponds to lower default risk (e.g., Jang et al., 2020). That is to say, lenders directly incorporate the ESG scores into the cost of debt.

Others are indirect channels. The ESG performance of a firm can interact with growth opportunities, influence the expected cash flows and, finally, impact the cost of debt (e.g., Luo and Bhattacharya, 2006). Companies with higher ESG scores may be better positioned to manage ESG risks, such as climate change and labor challenges, which can lead to improved financial performance and lower default risk. This can deliver lower borrowing costs and improved access to credit (e.g., Atif and Ali, 2021).

In the perspective that relates ESG directly to the cost of debt, the ESG score would measure – or, at least, have relevant information on – the risk of default and would be information that justifies a negative relationship between the ESG scores and the cost of debt.

However, it is possible that ESG scores provide lenders with information not captured by traditional financial metrics (Clarkson et al., 2011). The perception of lower risk, not measured by conventional risk measures, can translate into lower borrowing costs for companies with higher ESG scores. The ESG score reduces information asymmetry (Jang et al., 2020). Thus, in this perspective, the ESG score is complementary information rather than a substitute for conventional credit risk measures. In this scenario, the ESG scores provide a full picture of what is happening inside companies. It is said to capture valuable risks that did not exist in the past and are not captured by other metrics.

The World Economic Forum (WEF) has drawn attention to environmental risks that have increased in importance significantly in recent years (World Economic Forum, 2023). In contrast, classic economic risks are no longer major concerns. According to the WEF's 2023 Global Risk Report, six out of ten (including the first four) global risks ranked by severity over the next ten years are environmental risks. However, none of the traditional economic risks is in the top 10 major risks, either over a two-year or a ten-year horizon. Indeed, financial regulators are paying increased attention to the topic (Kalfaoglou, 2021). Consequently, it is natural, to ensure their legitimacy (Eliwa et al., 2021), that lenders (mainly banks and other regulated institutions) attach importance to ESG-related risks not captured by conventional financial risk measures. Thus, one of the main reasons for ESG's impact on the cost of debt is that it measures additional risks and injects new and forward-looking insights into the investment process not considered by classic financial tools.

This paper aims to contribute to this debate, investigating whether ESG scores contain substantial information content not captured by the conventional risk measures (namely, the Altman Z-score, Z-score, Merton Distance to Default, and Volatility). In other words, this research investigates whether, in the context of the cost of debt, the ESG score is complementary or substitute information for conventional risk measures.

Moreover, this paper investigates whether the additional information content benefits all companies similarly. Explicitly, this paper conjectures that, if ESG data provide reliable information on the firms' sustainability beyond the information captured by conventional risk measures, this information will be more relevant in some instances than others. In particular, the paper investigates whether the ESG score effect is more intense for companies whose long-term sustainability may be more questionable. Specifically, it examines whether the ESG effect is moderated by the firm's debt level and its agency costs.

Higher debt and higher leverage generally mean higher levels of risk captured by conventional risk metrics. Therefore, with high debt and leverage, companies are already required to pay more for credit. However, the conventional metrics may not entirely capture the companies' sustainability – that is, they do not capture the full picture. In that case, it is expected that the additional information's benefits will be more pronounced for firms with higher levels of indebtedness. The lenders of these companies will be most concerned about their sustainability, particularly in conditions where they will have to roll over their debt. Even economically viable, heavily indebted organizations could find it challenging to generate enough cash flow to pay off all or a significant portion of their debt. Creditors need information about their long-term sustainability beyond conventional risk indicators based on accounting or capital market information. Therefore, the ESG scores are likely to have a more significant impact on highly indebted firms. However, no research has looked into the possible asymmetry of the ESG effect. This study seeks to shed some light on this issue.

For agency costs, a similar reasoning applies. Managers can invest in risky projects to benefit shareholders at the expense of creditors (Jensen and Meckling, 1976) or desist from investing in projects that benefit debtholders (Myers, 1977). Furthermore, managers can use free cash flow on unprofitable projects or increase their own utility (Jensen, 1986). Therefore, agency costs negatively impact the cost of debt (Chui et al., 2016). However, there has been no investigation into how agency costs interact with ESG performance. This paper offers the hypothesis that the impact of the ESG score interacts with agency costs. That is to say, as with the most indebted companies, those with the highest agency costs benefit most from good ESG performance. This idea finds support not only in the assumption that the sustainability of firms with higher agency costs gives rise to greater concern for creditors, but also in the expected behavior of managers. Indeed, bankruptcy puts the image of managers and firms at risk (Chui et al., 2016). The better the social reputation of firms, the more they are exposed to society and the more managers have at risk. This can lead them to moderate their risk-generating behaviors.

Finally, this paper explores the potential moderating effect of the type of financial system. Companies with higher ESG scores are more likely to have better stakeholder relationships (Hoepner et al., 2016). Such companies are more likely to access cheaper financing because lenders are more willing to lend to companies with a good reputation and strong stakeholder relationships (Clarkson et al., 2011). It can be argued that banks are the most important stakeholders in firms and that they will not want to be perceived as facilitators of harmful ESG practices (Eliwa et al., 2021). This can lead to improved access to credit and more favorable loan terms in contexts where banks and firms have long-term relationships, compared with cases where the relationships are at arm's length.

The relationship between banks and their stakeholders can vary, based on the type of financial system. Banks and stakeholders, who include companies and individual customers, build long-term relationships through bank-based systems. These relationships are based on trust and rely on the bank's reputation and ability to deliver high-quality services (e.g., Marques and Alves, 2021; Moutinho et al., 2022). In market-based systems, the relationships between banks and their stakeholders are more transactional. Banks provide underwriting, advisory services, and securities trading, focusing more on specific transactions than long-term relationships (e.g., Marques and

Alves, 2021; Moutinho et al., 2022). Therefore, if the transmission mechanism of the ESG score is the relationship with lenders, a greater impact can be expected in bank-based systems (e.g., some European countries), where companies rely more on bank loans than market-based financial systems (which is the paradigm in the US but also in Brazil and some European countries). This paper provides evidence of this impact.

This paper uses a dataset of 768 non-financial firms headquartered in 21 countries (19 European, Brazil and the US) from 2013 to 2022. The inclusion of these distinct geographic locations allows us to explore different institutional contexts and realities. Moreover, these countries have different levels of stakeholder orientation. According to Dhaliwal et al. (2014), European countries are predominantly stakeholder-oriented, whereas the USA and Brazil are shareholder-oriented. Including companies from these diverse regions, this study is able to assess the proposed hypotheses in varied institutional and regulatory contexts. This method improves the robustness and generalizability of the findings and provides a more thorough grasp of the topic studied.

The paper is organized as follows. The following section contains the literature review and the formulation of the hypotheses. The subsequent section presents the methodology and the database. Section four presents and discusses the results. The last section presents the study's conclusions.

2. HYPOTHESIS DEVELOPMENT

The ESG score is a measure of a company's performance in the areas of environmental, social, and governance. According to Khan et al. (2016) and Cohen (2023), among others, ESG scores comprehensively assess a company's sustainability practices, enabling investors to make informed decisions. The scores synthesize various data sources, including company disclosures, news articles, and third-party databases. Furthermore, the ESG scores are dynamic, reflecting changes in the company's practices over time.

The literature is extensive on ESG in corporate finance (for a review, see Gillan et al., 2021). Several studies have examined the impact of ESG practices on companies' performance and cost of capital (e.g., Chava, 2014; Flammer, 2015; Ng and Rezaee, 2015). However, contradictory results prevail, and more research is needed (Erragragui, 2018; Atif and Ali, 2021; Gillan et al., 2021). In this field, some literature, albeit relatively scarce, has explored the link between ESG scores and debt financing. This literature rests on two main pillars. First, the impact that the ESG score has on the cost of debt. Second, the mechanisms through which the ESG score relates to the cost of debt. The following paragraphs aim to develop a literature review of these two dimensions to sustain the hypothesis.

2.1 Information content in ESG and the cost of debt

In recent years, several studies have examined the impact of ESG performance on various financial outcomes, including the cost of debt. Some studies found that companies with higher ESG scores have lower borrowing costs than companies with lower ESG scores.

For example, using a dataset of US banking loans, Goss and Roberts (2011) report that borrowers with high social responsibility concerns pay between 7 and 18 basis points more than others who are more responsible. Similarly, Apergis et al. (2022) found that higher ESG scores were associated with lower bond spreads. Moreover, Chava (2014) revealed that the cost of capital (equity and debt) is higher for firms with low environmental performance. Similarly, Oikonomou et al. (2014) and Polbennikov et al. (2016) found that corporate bonds with high composite ESG scores have slightly lower spreads. Zerbib (2019) noted that green bonds are issued at a negative premium. The negative relationship between ESG scores and bond spreads also applies to sovereign borrowing (Crifo et al., 2017). In another approach, Gao et al. (2022) uncovered evidence that the cost of debt is significantly reduced in Chinese corporations that benefit from a positive media ESG spotlight.

The impact can vary according to the borrower's characteristics. Jang et al. (2020) found that companies with higher ESG scores have lower borrowing costs, especially small companies with higher information asymmetry.

Overall, these studies suggest that ESG disclosure contributes to reducing borrowing costs and enhancing the creditworthiness of companies. Furthermore, investors may be willing to accept lower returns from companies with strong ESG practices because of the lower risk of adverse ESG events and the potential for long-term financial outperformance.

However, Ng and Rezaee (2015) conclude that environmental and governance aspects of ESG contribute to reducing borrowing costs, but the same does not apply to the social dimension. Additionally, Ye and Zhang (2011), using data from corporate philanthropy by Chinese corporations, show that expenditures beyond the optimal point tend to increase rather than reduce the cost of debt. Therefore, according to this paper, the relationship between ESG performance and the cost of debt depends on the level of ESG investment.

Moreover, other studies have found no significant relationship between ESG scores and the cost of debt. For example, Hoepner et al. (2016), using data from 28 jurisdictions, found that the country's sustainability score is associated with a decrease in the cost of debt of bank loans but, at the firm level, ESG scores did not impact such costs. Similarly, Erragragui (2018) found that only a few constituents of ESG scores matter in 'creditors' perception of company' risk in the US market and, in particular, environmental concerns increase the cost of debt while governance concerns have no impact.

Additionally, Menz (2010) found that ESG performance does not impact the pricing of corporate bonds. Moreover, Gigante and Manglaviti (2022) concluded that no significant relationship exists between ESG scores and the cost of debt in the European market.

Finally, there is evidence of a positive relationship between ESG performance and the cost of debt. Magnanelli and Izzo (2017), using a dataset of 332 firms from different continents, found that higher ESG scores are associated with a higher cost of debt.

In summary, some literature supports the relevance of the ESG score in explaining the cost of debt, arguing that companies with higher ESG scores tend to have lower borrowing costs. However, other studies have found mixed results, highlighting the need for further research to fully understand the relationship between ESG scores and the cost of debt.

Moreover, from a theoretical perspective, there are reasons to expect firms with higher ESG scores to have lower borrowing costs. Either a higher ESG score corresponds to lower credit risk, given the greater sustainability and better business governance, or a higher ESG score translates into a better long-term relationship with stakeholders, including lenders.

In effect, a firm can use its resources, including the intangible assets of reputation and social capital, to increase its financial performance and risk management (Atif and Alif, 2021). ESG is a strategic resource that firms utilize to enhance their reputation, improve cash flows, attract investors, and mitigate risks (Teece et al., 1997). By achieving a high ESG score, firms demonstrate their commitment to sustainable practices, stakeholder engagement, and long-term value creation, potentially reducing default risk. For instance, ESG performance has been linked to brand value and customer happiness, consumer loyalty, and increasing sales and profitability (Brown and Dacin, 1997; Luo and Bhattacharya, 2006, Bardos et al., 2020). Others contend that

ESG increases productivity (Shrivastava, 1995) and performance due to product differentiation (Albuquerque et al., 2019). Therefore, high scores can be an indicator of higher future cash flows.

Furthermore, Cho et al. (2013) found that sharing ESG data helps reduce knowledge asymmetry, which fosters investor loyalty and trust. In times of crisis, Garel and Petit-Romec (2021) found that firms with responsible environmental strategies experienced better stock returns during the COVID crash. However, Bae et al. (2021) found no evidence that corporate social responsibility scores affect stock returns during the same period.

Therefore, giving due consideration to all the above, the first part of the first hypothesis is as follows:

H1: The level of the ESG score provides relevant information to explain the cost of debt. Specifically:

a) *Ceteris paribus*, the higher the ESG score, the lower the cost of debt.

Having ESG score content that explains the cost of debt, another question arises. Is such content a substitute for traditional credit risk measures, or is it complementary information that provides additional relevance and contributes to reducing information asymmetry? In many countries, ESG information is voluntarily disclosed (Dhaliwal et al., 2014). Therefore, it is unlikely that information on ESG performance provides much incremental information. In this sense, if relevant, it would act as a substitute rather than a complement. However, the ESG score can capture non-financial risks, such as environmental and social impacts, governance practices, and ethical considerations. It is also true, as mentioned earlier, that new and non-financial risks concern firms, creditors, and regulators. It is likewise true that banks are increasingly forced to consider these risks and weigh their clients' environmental and social performance in the balance (Eliwa et al., 2021; Kalfaoglou, 2021). Hence, these other forces point to the relevance of the ESG score's information content and its function as a complement to traditional financial information.

The few empirical studies that have looked into this matter have had mixed results. Atif and Ali (2021) conclude that ESG information is positively related to the Merton Distance to Default (Merton DD) and negatively related to credit default swap (CDS) spreads, indicating its character as substitute information. In the same vein, Ge and Liu (2015) present evidence that ESG performance is associated with lower yield spreads, but credit ratings absorb some of the effects. Jiraporn et al. (2014) found that ESG leads to more favorable bond ratings. Moreover, Hübel and Scholz (2020) discovered that portfolios with pronounced ESG risk exposures exhibit substantially higher risks. According to Dhaliwal et al. (2014), corporate social and financial disclosures are substitutes for each other in lowering the cost of equity capital. Finally, Cheung (2016) contends that firms with high corporate social responsibility scores tend to have low (idiosyncratic and systematic) risk. In contrast, Stellner et al. (2015), using credit ratings and zero-volatility spreads as risk measures, located only weak evidence that superior corporate social performance results in systematically reduced credit risk.

Other studies have shown that the ESG score provides additional information beyond traditional risk measures, such as credit scores and financial ratios. In this context, Jang et al. (2020) showed that ESG information complements credit ratings, especially in small companies. Hong and Liskovich (2015) argue that it is an insurance against 'firms' legal risk. Cho et al. (2013) also conclude that corporate social responsibility scores reduce information asymmetry. Therefore, ESG factors in the risk assessment process can lead to more informed lending decisions and lower company borrowing costs.

Therefore, the second part of the first hypothesis is the following:

H1: The level of the ESG score provides relevant information to explain the cost of debt. Specifically:

b) The information content in the ESG's score is a complement to rather than a substitute for the information content provided in traditional financial risk measures.

2.2 Moderating Effects of the Level of Debt and Agency Costs

Conventional risk metrics fundamentally measure economic and financial risk. However, there is now awareness of other threats and the relevance of risks not previously recognized. As the World Economic Forum (2023, p. 6) points out, "*the world is facing a set of risks that feel both wholly new and eerily familiar*". It is significant that, according to this entity, none of the top ten global risks ranked by severity over the short and long term is economic or financial. It is hard to believe that banks and other creditors are not sensitive to this reality. Indeed, financial regulators are particularly attentive to this and exercise their regulatory power and influence (Kalfaoglou, 2021). On its website, the ECB clearly states that climate change poses risks to the economy and the financial sector and that "*we are firmly committed to doing our part to address climate change, within our mandate*" (European Central Bank, 2023).

Lenders incorporate companies' ESG information into their lending decisions to assess at least two types of risk: reputational risk and credit risk (Weber et al., 2010). Reputational risk is the risk of perceiving the lender as a financial enabler of harmful ESG practices. It predominantly affects credit institutions and other financial institutions. Credit risk is the risk of losing the principal amount of the loan plus any mediation costs that the lending institution has to bear.

Concerning reputational risk, financial institutions avoid being associated with entities with low ESG performance. In this sense, the ESG score should be helpful information for all borrowing companies, regardless of their level of indebtedness. Public knowledge that a bank finances a company with poor ESG practices causes reputational damage, whatever its credit risk. Assuming that the probability of such financing becoming publicly known is the same for all companies, the impact of the ESG on the cost of debt would not be expected to depend on the level of company indebtedness. The level of debt would not be a moderating variable, and the benefit extracted by firms per unit of ESG score would not depend on whether firms have too much or too little debt. However, consider a situation where there is a higher probability of loan relationships becoming known if firms go bankrupt or need restructuring. Here, lenders, for reputational reasons (Weber et al., 2010), will tend to value the ESG score more when firms are highly indebted. A banking loan provided to a non-failing company with a lower ESG score probably will never be known by the public. However, a loan provided to a failing company with a lower ESG score will probably be noticed, and the reputational damage will materialize.

Conventional measures are aimed at capturing credit risk fully. At least, this should be the case with those who incorporate perspectives into their calculations on the company's future cash flows, such as the Altman Z-score and the Merton DD, insofar as both use the company's market capitalization as input.

However, ESG can provide reliable information on firms' sustainability and their competitive advantage beyond the information captured by conventional risk measures. The idea of the full picture once again applies. A company with better ESG performance can use its improved long-term relationship with its stakeholders and critical constituents to generate a comparative advantage and improve its long-term financial performance (Hoepner et al., 2016). Such a company will be better prepared to deal with adverse situations (Brown and Dacin, 1997; Luo and Bhattacharya, 2006; Atif and Ali, 2021). Although not fully captured by conventional risk measures, this information is still valuable for those who have to price credit. However, this information is not necessarily of equal benefit to all firms. This paper hypothesizes that this information is of greater relevance to more indebted companies and those with higher agency costs.

Once higher debt and higher leverage mean higher levels of risk captured by the conventional risk metrics, the gross effect of higher indebtedness is captured and priced throughout the traditional metrics. If a company has a low level of debt and, therefore, is a low-risk borrower according to conventional measures, the remaining concerns of the lender would be negligible. However, if a firm has a high level of debt, despite their risk according to traditional measures, the lenders will naturally pay more attention to additional information. The lenders will be most concerned about the sustainability of these companies. For all companies, the creditors are concerned about the timely fulfilment of the debt service. However, for low-indebted companies, there are potentially two ways to repay the outstanding capital: payment with the cash flows accruing from the company's operations; debt roll-over, where the company takes on new debt to repay the old debt. The highly indebted companies, even those that are economically sustainable, may struggle to generate sufficient cash flow to repay all or even a large part of their debt. Therefore, they will most likely need to finance debt repayment (at least partially) by taking on new debt. Information on their long-term sustainability – going beyond traditional risk measures based on accounting or capital market information – can be crucial for them. Hence, as mentioned previously, the impact of ESG on the cost of debt is expected to be of particular significance statistically and economically in the case of the most indebted companies. Therefore, the ESG effect will tend to have a more significant impact on more indebted companies.

For all the above reasons, the second hypothesis of the paper is as follows:

> **H2:** The information content in the ESG score is especially relevant to companies with a higher level of debt, who benefit more extensively from higher scores.

Regarding agency costs, many authors see ESG efforts as a waste of resources. They contend that managerial agency issues frequently reveal themselves through ESG activities (Benabou and Tirole, 2010; Masulis and Reza, 2015). According to others, managers involved in ESG activities waste time and lose focus on their core responsibilities (Jensen, 2001). The agency perspective would have it that ESG activities are generally not in the interest of shareholders. However, agency costs exist not only in the relationship between managers and shareholders but can affect a wide range of stakeholders (Hill and Jones, 1992). In effect, managers can choose not to invest in projects that help debtors (Myers, 1977) or invest in hazardous ventures that benefit shareholders at the expense of creditors (Jensen and Meckling, 1976). Moreover, managers can invest free cash flow in unsuccessful ventures or boost their utility (Jensen, 1986). As a result, agency expenses may be detrimental to creditors' interests and raise the cost of borrowing (Chui et al., 2016). According to this view, ESG efforts and agency costs would be positively correlated, and both would contribute to an increase in the cost of debt.

However, another view exists. While agency issues may influence some corporate policies related to ESG issues, others may result from good governance and positive stakeholder relations consistent with value maximization. Or, even more radically, ESG performance is positively related to firm value and is negatively associated with firms' risk and agency costs (Hill and Jones, 1992; Ferrell et al., 2016; Rossi and Harjoto, 2020). In this sense, there is nothing to prevent a company from having good ESG performance, which materializes in lower debt costs, while having agency costs that contribute to lower efficiency and higher cost of financing.

Therefore, some literature sees the ESG score as not being a mere manifestation of agency costs. Several studies point to the fact that better ESG performance corresponds to lower financing costs (e.g., Goss and Roberts, 2011) and better relations with consumers that are reflected in brand value, customer happiness, and consumer loyalty. In consequence, this leads to increased sales and profitability (Brown and Dacin, 1997; Luo and Bhattacharya, 2006, Bardos et al., 2020), enhanced potential to increase productivity (Shrivastava,1995) and follow product differentiation strategies (Albuquerque et al., 2019). Hence, in this other view, there is nothing to prevent the ESG score from reducing the cost of debt, while agency costs influence it positively. In this case, the question is whether there is any interaction effect between the two variables. Do agency costs moderate the impact of the ESG on the cost of debt? For the following reasons, this paper hypothesizes that the interaction of the ESG score with agency costs decreases the cost of debt.

When a company takes excessive risks due to agency problems, the likelihood of long-term bankruptcy increases. Consequently, its managers' public image is put at risk. Managers concerned about their public image and security tend to adopt financial policies that minimize their firms' bankruptcy risk (Chui et al., 2016). Thus, the better this public image is, the more managers have to lose if the firm goes bankrupt. Companies with higher ESG scores are companies with a better image (i.e., higher social capital) among their stakeholders and the general public (Hoepner et al., 2016). Hence, they have the most to lose in case of bankruptcy (Chui et al., 2016). They will, therefore, be more concerned about external costs in the event of bankruptcy. In firms with good social capital, the managers are more concerned with maintaining employment and the welfare of employees, and with the relationship with consumers and suppliers. The bankruptcy of the firm jeopardizes all the benefits. Hence, although the information asymmetry that managers benefit from allows them to impose agency costs on shareholders and creditors, managers tend to be more cautious when the firm's relations with its stakeholders are more harmonious.

Additionally, better ESG performance will likely mitigate investor concerns about inefficiencies arising from agency costs. Indeed, the higher the agency costs, the less efficient the use of company assets tends to be. Some tend to be used for comfort and maximizing the welfare of managers. However, better ESG performance can counterbalance this effect because it indicates that companies will have more efficient governance control mechanisms in place and will pay greater attention to using resources sustainably and with social responsibility. All this will help to mitigate the fears of investors, including lenders, concerning agency costs and, thus, minimize their effect on financing costs.

Therefore, the third hypothesis of the paper is as follows:

> **H3:** The information content of the ESG score is of particular relevance to companies with a higher level of agency, who benefit more extensively from higher scores.

2.3 Moderating Effects of Financial System

One of the possible transmission mechanisms from ESG scores to the cost of debt is the long-term relationship with stakeholders. Companies that maintain excellent long-term relationships with stakeholders benefit from better dealings (Cornell and Shapiro, 1987; McGuire et al., 1998), and they secure greater support from these stakeholders in a crisis (Godfrey, 2005). ESG reputation exercises an insurance-like effect in adverse situations (Godfrey, 2005; Godfrey et al., 2009; Shiu and Yang, 2017). Thus, firms that are more stakeholder-oriented will tend to have better long-term relationships with their suppliers, customers, and creditors than firms that are more shareholder-oriented. While the orientation of each firm may change over time and may be distinct from other firms in its country (Alves, 2022), the legal environment and institutional environment in which firms operate, including the financial system, will influence their orientation. Thus, the institutional environment, and therefore the country, may matter.

Evidence shows that debt costs vary according to the type of financial system and the inherent information asymmetry between borrowers and lenders (Carey and Nini, 2007; Moutinho et al., 2022). In particular, there is less information asymmetry in countries with bank-based financial systems due to the long-term relationship between banks and their corporate clients (Marques and Alves, 2021; Moutinho et al., 2022).

Depending on the type of financial system, the relationship between banks and their stakeholders may differ. In bank-based systems, banks have a long-term connection with their stakeholders, which includes businesses and individual clients. The interaction between banks and their stakeholders is more transactional in market-based systems. Therefore, if the relationships with lenders serve as the ESG score's transmission mechanism, it is reasonable to assume that these relationships will have a more significant impact in bank-based financial systems (such as those in some European nations), where businesses rely more on bank loans than those in market-based financial systems (which include the US, Brazil, and some European countries). It, therefore, encompasses companies from countries with typically bank-based financial systems and from countries with a market-based financial system. Thus, the fourth hypothesis is as follows:

H4: The more market-oriented the financial system, the lower the benefit of ESG performance in terms of the cost of debt.

3. METHOD AND DATA

3.1 Sample and Data

This sample includes 768 listed companies, covering the period from 2013 to 2022. The companies were selected on the basis of membership in the S&P 500 Index, the S&P Europe 350 Index, and the Bovespa Index. Financial companies were eliminated. The final sample comprises 403 US companies, 294 European companies, and 71 Brazilian companies from 10 sectors. The number of countries represented is 21. This results in an unbalanced panel with a maximum of 6,988 firm-year observations.

The sample includes companies from different institutional environments. It should be noted that, in the US, firms are predominantly shareholder-oriented and principal-agent problems predominate, whereas, in Brazil and Europe, principal-principal issues prevail. However, European countries are mainly stakeholder-oriented, whilst Brazilian firms are shareholder-oriented. La Porta et al. (1999) show that dispersed ownership is rare in Europe, whereas it predominates in the US. Rogers et al. (2008) proved that ownership concentration prevails in Brazil. Additionally, Dhaliwal et al. (2014)'s measure of shareholder orientation points to a solid orientation for shareholders in the US (-1.55) and in Brazil (-1.92). However, most European countries show a solid orientation for stakeholders – *e.g.*, Austria, 1.25; Belgium, 1.29; Denmark, 2.95; Finland, 1.89; France, 1.12; Germany, 0.81; Netherlands, 1.52; Sweden, 2.90; UK, 0.47.

Furthermore, the sample is diversified in terms of the sectors of activity. It comprises ten industries, using the TRBC Economic Sector Name: Healthcare; Technology; Consumer Cyclicals; Academic and Educational Services; Industrials; Utilities; Energy; Real Estate; Basic Materials; and Consumer Non-Cyclicals.

This study, in line with Bae et al. (2021) and Garel and Petit-Romec (2021), among others, uses ESG scores from the Refinitiv ESG database (formerly Thomson 'Reuters' ASSET4). It also uses Datastream for the remaining financial data. Finally, the World Bank Financial Development and Structure Data provide the sources to build 'countries' financial development, structure indicators, and consumer price indicators. The raw data were winsorized at the 1% and 99% levels.

3.2 Univariate and multivariate analysis

The univariate analyses constitute a preliminary investigation with the aim of ascertaining to what extent there is differentiation of the (marginal and average) cost of debt as a function of the ESG score and the extent to which the ESG score is confounded by traditional risk variables.

The central methodology consists of multivariate regression analysis. The dependent variable is the Marginal Cost of Debt (CoD). The marginal cost captures the effect of changes in the ESG score on the cost of debt more quickly than the average cost. CoD is the cost to the company of issuing new debt, calculated by Refinitiv, adding the weighted cost of short-term debt and the weighted cost of long-term debt based on the 1-year and 10-year points of an appropriate credit curve. It is the debt component of the WACC (Weighted Average Cost of Debt), as computed by Refinitiv.

There are several ways to compute the cost of debt. One is the marginal cost of debt (e.g., Caragnano et al., 2020; Kordsachia, 2021); another is the average cost of debt (e.g., Chui et al., 2016; Eliwa et al., 2021; Kong, 2023); a third is the yield of bonds (Crifo et al., 2017; Apergis et al.; 2022); and a fourth is a spread (e.g., Goss and Roberts, 2011). The third applies exclusively to firms with securitized debt and only computes the cost of debt to the maturities of issued bonds. The average cost of debt – the ratio of current interest payments to total debt – reflects the creditor conditions of the firm at the time of borrowing and not the current conditions. Hence, it takes time to reflect ESG scores or, for example, changes in the capital structure.

On the contrary, the marginal cost, as calculated by Refinitiv, reflects the current financing conditions of the company and is, therefore, likely to immediately incorporate changes in the ESG score. Indeed, determining the appropriate credit curve for a company encompasses various risk factors, including company-specific information, credit ratings, and the current economic environment. Moreover, it is the firm's marginal real cost. It is also an after-tax cost of debt (Kordsachia, 2021) and is, therefore, more appropriate for comparing financing costs between firms in different countries. For these reasons, the dependent variable of the regressions is the marginal cost of debt. However, some univariate analyses use the average cost of debt, and some robustness tests also use this as the dependent variable.

The main variable of interest is the ESG score. The study contemplates two variants. One set of initial regressions uses the ESG scores without adjustment. An additional set of regressions uses orthogonalized ESG variables – that is to say, variables that retain the component of the ESG score that is not explained by any or some of the traditional risk measures.

The set of explanatory variables includes one or more traditional risk measures: Altman Z-Score, the Z-Score, Merton Distance to Default and Volatility.

In addition, the control variables include the SIZE (log of total assets), the INTANGIBLES (i.e., intangible assets/total assets), and the ROA (return on assets). As referenced earlier, the literature suggests that size (negatively), intangibles (positively), and ROA (negatively) can impact a company's cost of debt (see, among others, Chui et al., 2016; Atif & Ali, 2021).

Finally, there are fixed effects. The period (year) fixed effects to control for the decrease in the global level of interest rates due to the monetary policies adopted by the central banks. Given the ratio between the number of observations and coefficients to estimate substantial decreases, cross-section fixed effects were not included to avoid overfitting, in violation of the rule of thumb, the "one in ten rule". However, the regressions include industry and region-fixed effects. This was prompted by certain studies that provide evidence that the cost of debt can vary geographically (Carey and Nini, 2007; Moutinho et al., 2022) and according to the industry (Valta, 2012).

Therefore, the baseline model is the following:

$$CoD_{i,t} = \alpha + \beta_1 ESG_{i,t} + \sum_{j=1}^{4} \beta_{2j} RISK_{j,i,t} + \beta_3 SIZE_{i,t} + \beta_4 INTANGIBLES_{i,t} + \beta_5 ROA_{i,t} + \mu_t + v_i + w_i + \varepsilon_{i,t}$$

where, in addition to the variables already identified, $RISK_{j,i,t}$ stands the risk measure j (j=1,..,4) for the company *i* in the year *t*, and the term μ_t denotes the unobserved time-specific effect, whereas v_i and w_i stand for the industry and region effects, and $\varepsilon_{i,t}$ is a random disturbance.

All regressions use robust standard errors. Propensity Score Match and IV 2LS regressions are applied in the robustness checks.

3.3 The orthogonalization of the variable ESG

A two-step methodology was applied to orthogonalize ESG variables. In the first step, the ESG variable was the dependent variable in a regression that had, depending on the case, one or more traditional risk measures as explanatory variables. In the second step, the residuals of the first regression were the component of the ESG variable not explained by the traditional risk measure (i.e., the orthogonalized ESG variable).

To calculate the orthogonalized ORT_ALL variable, all four traditional risk measures were used as regressors. Only the relevant traditional risk measure was included as a regressor in the first-step regression for the remaining orthogonalized variables. The Altman score was employed to calculate ORT_ALT, the Z-score, to obtain ORT_Z, the Merton Distance to Default to get ORT_Merton DD, and Volatility to obtain ORT_VOL.

The second step's regressions differ from the baseline regression in section 4.2 because an orthogonalized variable replaces the ESG.

3.4 The traditional measures of risk

There are several measures of financial risk, some of which aim to capture the risk of a debtor's bankruptcy. This paper uses four risk measures: the Altman Z-Score, the Z-Score, the Merton Distance to Default, and Volatility.

Altman Z-score

The Altman Z-score model is a widely used approach to assess the risk of corporate bankruptcy (Altman,1968). The Altman Z-score (henceforth, simply, the Altman score) has been extensively applied in academic and industrial contexts. Over the last 50 years, many studies have investigated the performance of the Altman score in predicting corporate bankruptcy. The original paper has more than 23,700 citations, according to Google Scholar. Even today, the model is widely used to measure the risk of default (Pandey et al., 2023). The original formula of the Altman score was applied in this study.

However, some researchers have identified limitations of the Altman score model. For instance, some studies have suggested that introducing predictive variables that can be extracted from the maturity schedule of a firm's long-term debt enhances bankruptcy prediction (e.g., Philosophov et al., 2008). Therefore, other measures are applied.

The Z-score

The Z-score derived by Boyd and Runkle (1993) also measures bankruptcy risk or distance to bankruptcy. Default is considered to occur when firm j's losses in year t exceed its equity. Then, assuming that the return on assets (ROA) or π_{jt}/TA_{jt}, is normally distributed around the mean μ_j, and standard deviation σ_j, the Z-score corresponds to the number of standard deviations of the ROA that the firm is from bankruptcy. It is calculated as follows:

$$Z_{jt} = \frac{\left(\frac{E_{jt}}{TA_{jt}}\right) + \pi_{jt}/TA_{jt}}{\sigma_j}$$

The higher the Z-score, the lower the probability of bankruptcy. The Z has been widely used as a measure of default risk, especially for financial institutions (see, among others, Marques and Alves, 2021; Alves et al., 2023) but also for non-financial institutions (see, among others, Hale and Santos, 2008). It is considered a reliable measure of the risk of default and the firm's resilience.

Merton Distance to Default

The Merton DD, developed by Merton (1974), assumes that a company's assets follow a stochastic process and that the value of its liabilities can be estimated using the equity's market value. The Merton DD is computed as the number of standard deviations between the expected asset value at maturity date T and the liability threshold:

$$Merton\ DD = \frac{\ln\left(\frac{A}{L}\right) + \left(r - {\sigma_A^2}/{2}\right)T}{\sigma_A\sqrt{T}}$$

where *A* represents the market value of the assets, *L* represents liabilities, *r* is the risk-free interest rate (assumed as the expected continuously compounded return), *T* is the maturity of the liability, and σ_A is the volatility of the assets.

A and σ_A are not directly observable. However, at maturity $E_T = Max\ (A_T\text{-}L;0)$. The Black and Scholes formula relates the observable equity value (E) with the non-observable market value of assets (A). The Merton approach was applied to solve for (A, σA), a 2-by-2 system of nonlinear equations. The first equation is the Black and Scholes formula. The second relates the unobservable volatility of asset σ_A to the given equity volatility σ_E:

$$\sigma_E = \frac{A}{E}N(d_1)\sigma_A.$$

The level of debt used to compute Merton DD was, following Bharath and Shumway (2008), the face value of short-term debt plus one-half of the face value of long-term debt.

The Merton DD model has been widely applied in academic and industry contexts. One of the earliest studies on this topic was conducted by Altman (1984), who compared the Merton DD model's predictions with actual default events for a sample of US companies. The study found that the Merton DD model was a reliable predictor of default events, with an accuracy rate of over 80%. Subsequent studies have confirmed the predictive power of the Merton DD model. For example, Campbell et al. (2008) found that the Merton DD model outperformed other popular credit risk models in predicting corporate defaults. Similarly, Bharath and Shumway (2008) found that the Merton DD model was the most accurate in predicting defaults for US firms.

In sum, the literature suggests that the Merton DD model is reliable and accurate for measuring corporate default risk.

Volatility

Volatility is a commonly used risk measure in finance, particularly in investments. It is typically defined as the standard deviation of the returns of an investment over a specified period. In the case of this paper, it was calculated using 5-year historical data, where available.

The greater the volatility, the greater the risk associated with the investment. Moreover, the literature supports the hypothesis that firms with high corporate social responsibility scores tend to have low (idiosyncratic and systematic) risk (Cheung, 2016).

Some studies have investigated the use of volatility as a risk measure, particularly in the context of asset pricing and portfolio management. Nevertheless, volatility is used more in the context of equity investment and is also relevant to investors in bonds and other types of debt. This is not only because volatility impacts the value of the assets but because it is a measure of the firm's total risk. Although it is less geared toward measuring the risk of bankruptcy, this risk measure is helpful because it is based exclusively on market information and does not include accounting information. In an efficient market, the price, the returns and, therefore, the volatility tend to incorporate all the information available and considered relevant, not only accounting and financial information.

3.5 The type of financial system

This paper uses the methodology proposed by Demirguç-Kunt and Levine (2002), Beck and Levine (2002), and Levine (2002) to measure the type of financial system. Therefore, the ' 'country's financial structure indicator (FINSYS) is the first principal component resulting from the aggregation of three indicators: structure-activity, structure size, and structure efficiency. The data is sourced from the World Bank Financial Structure Database.

The higher the value of the FINSYS, the closer the country is to the prototypical market-based financial system. This paper's values range from -1.362 (France) to 1.894 (US).

3.6 Agency costs

The inverse of the asset utilization ratio is a common proxy for agency costs in the finance and accounting literature (Ang et al., 2000; Chui et al., 2016). It indicates how efficient the firm is at generating revenues from total assets. If managers intentionally allocate capital to acquire assets for non-profit maximizing purposes, or if their behavior reduces asset utilization efficiency, agency costs are most likely present, and the asset-to-sales ratio will increase. Therefore, the asset-to-sales ratio measures the propensity for agency activities to be present (Chui et al., 2016). However, asset utilization depends on the type of activity. Hence, although the regressions control for industry, the difference between each firm's asset-to-sales ratio and its industry's historical average (named AS) was used as a measure of agency cost. In other words, the agency costs are measured as the difference between each firm's asset-to-sales ratio (total assets divided by total revenue) each year and the average asset-to-sales ratio of firms in the same sector for the ten years of the sample.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 1 presents the essential descriptive statistics (Panel 1) and the correlation coefficients between the main variables of the study (Panel 2). Two points stand out. First, there is a negative correlation between ESG scores and CoD (-0.16). Second, the relationship between GES scores and financial risk depends on the risk measure. The higher the value of the ESG score, the lower the risk, measured by Merton DD or Volatility. The Altman score correlation (-0.20) indicates the opposite. The Z-score, with a low correlation level (-0.05), aligns with the Altman score.

– Table 1 –

As regards the correlation of the CoD with traditional risk measures, the signs are as expected in all cases (higher risk corresponds to higher cost of debt and vice versa). The absolute value is, however, small in the case of Merton DD.

Therefore, Table 1 suggests that hypotheses H1a) will be accepted. It will enable us to foresee that a higher (lower) ESG score must correspond to a lower (higher) CoD. The low correlation levels between the ESG score and the risk measures, plus the exchanged signs in the case of Altman and Z-scores, also indicate that the information content of the ESG, if relevant, will be a complement to rather than a substitute for the risk measures.

4.2 Test of H1a) and H1b)

4.2.1 Univariate Tests

Table 2 shows that higher ESG scores correspond to a lower cost of debt, whether this is calculated on the basis of the average or the marginal cost of debt. In the construction of Table 2, the observations were sorted and divided into quartiles according to the ESG scores. The column

Q4-Q1 reports the difference between the cost of debt means for the quartiles with higher ESG scores (Q4) and lower ESG scores (Q1). In all situations, the null hypothesis that the mean values for Q1 and Q4 are equal is rejected in favor of the alternative hypothesis that the cost of debt is higher for observations in quartile Q1. Analyzing by regions, the average cost of debt is lower for firms with higher ESG scores in all subsamples. However, the difference is much narrower in the US than in Europe or Brazil.

- Table 2 –

This first, straightforward exercise shows that a higher ESG score is associated with a lower (average or marginal) cost of debt. However, it may be that the difference in the cost of debt in quartiles Q1 and Q4 of the ESG score merely reflects the difference in financial risk corresponding to the observations in each of these quartiles.

Table 3 shows that this is implausible. In this table, the observations were again sorted by ESG scores. It reports the average values for each quartile of various risk measures and the difference in mean values for quartiles Q4 (higher ESG scores) and Q1 (lower ESG scores). The relationship between ESG scores and the financial risk level again depends on the risk measure used. This result aligns with Atif and Ali's (2021) findings that ESG information positively relates to Merton DD. They are also consistent with Cheung's (2016) conclusion that firms with high scores tend to have low risk. The same conclusion (high score, low risk) is reached by measuring risk by volatility. However, using measures strictly or mainly based on accounting information, the conclusion is the opposite. Companies with higher ESG scores are more indebted (higher debt-to-asset ratio) and are closer to bankruptcy (lower Altman and Z-scores) than companies with lower ESG scores. Again, this is true for the entire sample and each regional subsample. The exception is the Altman score in the Brazilian subsample, where a high ESG score corresponds to lower credit risk.

- Table 3 –

Table 4 also helps to support hypothesis h1b). This table shows that traditional risk measures explain very little of the variance in ESG scores. The first column of each panel of this table ("Explanatory Power of Each Risk Measure Alone (%)") reports the R-square of regressions in which the dependent variable is the ESG score, and the explanatory variable is the respective risk measure. The explanatory power of each risk measure is minimal. Panel 1 (Full Sample) shows that the risk measure with the highest explanatory power is the Altman score, which only explains 4.32% of the total variance of the ESG scores. The added explanatory power of each risk measure is also reduced. All risk measures explain only 10.35% of the variance in the ESG variable. This table, therefore, makes it clear that the information contained in the ESG score and the risk measures do not overlap. It seems that, if the ESG score is relevant in explaining the cost of debt, it is because it contains relevant information beyond traditional risk measures.

- Table 4 –

In sum, Table 1 and Table 2 provide a first contribution to support hypothesis H1a), showing a negative association between higher ESG scores and the cost of debt. Table 3 and Table 4 contribute to supporting hypothesis H1b). Table 3 clarifies that, if lenders see companies with higher ESG scores as having lower risk, this is not because these companies have, in effect, a lower risk as quantified by conventional measures. On the contrary, using risk measures based on accounting and financial information (Altman score, Z-Score, and debt-to-assets ratio), higher ESG scores are associated with higher economic or financial risk. Table 4 shows that the traditional risk measures have little capacity to explain the ESG scores. The ESG score is not a substitute for traditional risk measures. Therefore, contrary to others who found that ESG and financial information are substitutes (e.g., Dhaliwal et al., 2014), Tables 3 and 4 indicate that, if ESG scores contribute to explaining the cost of debt, it is because they have information content beyond that captured by conventional risk measures.

4.2.2 Panel Regressions

This section presents panel regressions with robust errors and fixed effects. The dependent variable is the cost of debt approximated by the marginal cost. The independent variables are the ESG score, the traditional risk measures, and additional control variables. The remaining variables are Size (log of total assets), Intangibles (intangible assets over total assets), and ROA (return on assets). The effects applied include industry effects, period effects, and region effects.

Table 5 reports the results. These make it clear that the higher the ESG score, the lower the cost of debt. All the regressions show a negative and statistically significant coefficient for the ESG variable.

- Table 5 -

This table clarifies that this effect does not disappear in the presence of any or all risk measures. In all cases, the coefficient of the ESG variable is negative and statistically significant. Except for Merton DD in regression 2 (coefficient not statistically significant), all traditional risk measures show the expected signs and statistical significance. For all of them, more risk corresponds to a higher cost of debt, and less risk corresponds to a lower cost of debt.

In sum, the regressions reported in Table 5 support hypothesis H1a). These results are in line with the literature suggesting that lenders perceive borrowers with higher ESG performance as less risky (e.g., Goss and Roberts, 2011; Crifo et al., 2017; Apergis et al., 2022; Agnese and Giacomini, 2023; Kong, 2023). Moreover, they align with the papers that found that ESG complements credit risk measures (e.g., Jang et al., 2020), at least for all risk measures other than Merton DD.

4.2.3 Orthogonalization of ESG variable

In order to eliminate doubts as to whether the ESG score contains relevant information complementary to the information contained in traditional risk measures, the variable was orthogonalized. A two-step regression method was applied (see section 3.3). Table 6 reports second-step regressions. All regressions include the control variables of Size, Intangibles, and ROA, as well as period, region, and industry fixed effects.

- Table 6 -

The information contained in the ESG score, after removing the part explained by traditional risk measures, is relevant information to explain the cost of debt. Panel 1 makes clear that a higher value of the orthogonalized ESG variable corresponds to a lower cost of debt. This result, therefore, supports acceptance of hypothesis H1 and, more particularly, hypothesis H1b). In fact, not only are the coefficients of the orthogonalized ESG variables negative and statistically significant, but the coefficients of the traditional risk variables also remain significant and with the expected signs (i.e., signs indicating that higher financial risk corresponds to higher cost and vice versa). The only exception is the Merton DD variable, which is not statistically significant in the first regression. This result indicates that the Merton DD has reduced explanatory power when other traditional risk measures are considered. However, regression five shows that Merton DD is influential when used as the sole measure of financial risk.

Panel 2 reports the regressions for regional subsamples. The coefficients of ORT_ALL are all negative and significant. Although not reported, regressions similar to regressions (2) to (4) calculated for each region also show negative and statistically significant coefficients for each of the risk measures. However, the Merton DD coefficient is only significant for the US, indicating that creditors probably rely more on other measures in other countries.

Note that the coefficient for the US subsample is much lower. For Europe, it is two times the American. For Brazil, the proportion is 5.1. This means that, for each additional point of the ESG score, US firms, in absolute value, see their debt costs decrease less than European firms. This is more impressive when one considers that CoD is, on average, higher in the US than in

Europe. It is about twice as high for Brazilian firms as for US firms. Therefore, in relative terms, the impact is more pronounced in Europe and Brazil than in the US.

In sum, the results indicate that ESG scores have relevant information content and that the higher the score, the lower the cost of debt. This is true for both more shareholder-oriented and more stakeholder-oriented regions. However, in line with Chui et al. (2016) and Eliwa et al. (2021), the effect seems less pronounced in the US, a country characterized by a predominance of agency relationships and shareholder orientation.

4.2.4 Economic significance

Statistical significance may not be accompanied by economic significance. The impact of the ESG on the cost of debt may not be material. Following Marques and Alves (2021), the estimated coefficient for the variable was multiplied by the standard deviation to get an idea of the economic impact. This measures the impact of variation in one standard deviation in the variable on the cost of debt. Figure 1 shows the results.

- Figure 1 -

An increase of one standard deviation in the ESG score (18.8 points) means a decrease, on average, of ten basis points in the cost of debt. If the information contained in all the traditional risk measures is removed, the saving by one standard deviation (16.8 points) is around 9.0 basis points. The ORT_ALT (9.0), ORT_Z (9.2), and ORT_Merton DD (9.0) variables have a similar impact. Finally, the ORT_VOL variable saves 7.0 basis points for each standard deviation. These results align with the findings of Goss and Roberts (2011). They conclude that the premium paid by borrowers with high social responsibility concerns is between 7 and 18 basis points.

Note that the economic impact is, of course, less than that of some traditional risk variables, but not all. The impact of a standard deviation in the ESG score is equivalent to: i) 32% of the impact of a standard deviation of the Altman score; ii) 64% of the impact of a standard deviation of the Z-score; and iii) 55% of the impact of a standard deviation of volatility. However, it is higher than the impact of the Merton DD.

It, therefore, indicates that ESG ratios contain statistically and economically relevant information to explain the cost of debt. This information is a complement to and not a substitute for the information contained in traditional risk measures. Moreover, it is evident that a higher ESG score corresponds to a lower cost of debt.

4.3 Test of H2

The sample was divided by quartiles, alternatively as a function of the absolute dollar amount of long-term debt (LTD) and the debt-to-equity ratio (DtoA). In a subsequent step, the regressions were run using only the observations in each quartile. As explained above, the expectation is that the ESG score is especially relevant and negatively impacts the cost of debt in the case of more indebted firms.

Therefore, the expectation is a negative coefficient for the ESG variable orthogonalized to the highest debt quartiles (Q4). The expected coefficient for the lowest indebtedness levels (Q1) is no longer negative and statistically significant, given that the ESG complementary information will be less relevant there. However, if it is negative and significant for Q1, the coefficient value will be smaller in absolute value than for Q4.

- Table 7 -

Table 7 confirms expectations. All orthogonalized ESG variables show statistically negative coefficients in Q4, either when using LTD (Panel 1.A) or the debt-to-assets variable (Panel 2.A). This means that, for long-term debt levels above USD 10.6 billion and debt-to-assets levels above 39.8%, respectively, the ESG score is relevant information, and a better score corresponds to a lower cost of debt. However, this is not true for long-term debt levels below USD 1.4 billion or debt-ot-asset levels below 18.5%. In the first case (Panel 1.B), the coefficients are insignificant, indicating the absence of relevant information content. The coefficients are significant but positive in the second case (Panel 2.B).

This means that the level of debt, absolute or relative, has a moderate effect on the impact of ESG information on the cost of debt. Having a high ESG score seems especially relevant as a means to reduce the cost of debt in the most indebted firms. In these companies, creditors seem to attribute greater relevance to these scores as a source of information on the company's sustainability. This seems credible because, for these companies, most questions have been asked about their sustainability, particularly their capacity to roll over debt in the medium and long term.

Table 8 confirms this moderating effect, given that, in all cases, the coefficient of the interaction of ESG information with the debt level is negative and statistically significant. Firms with higher debt levels benefit more by having higher scores than less indebted firms. In Panel 1, the DEBT is the long-term debt in USD. In Panel 2, the DEBT is the debt-to-assets ratio (DtoA). In both cases, the moderating effect is evident.

- Table 8 -

4.4 Test of H3

Table 8 shows that, as expected, agency costs increase the cost of financing. The AS variable has a positive impact on the cost of debt. However, it also leads to the acceptance of hypothesis H3. Indeed, whether the orthogonalized ESG variable interacts with AS (Panel 1) or with a dummy (Panel 2), the product of this interaction has a negative coefficient. This dummy takes the value of one if the firm has an asset-to-sales ratio above the average of its sector, and zero otherwise. Hence, the conclusion is that a higher ESG performance tends to reduce the increase in the cost of debt arising from higher agency costs, or that firms with higher agency costs take greater advantage of the beneficial effect of ESG performance.

- Table 9 -

Note that the fact that the ORT (in its different specifications) and AS variables have different signals, with the former contributing to a reduction in the cost of debt and the latter to an increase in it, can also be interpreted as a sign that investors do not see ESG efforts as a waste of resources. Therefore, these results are more consistent with the view of Hill and Jones (1992), Ferrell et al. (2016), and Rossi and Harjoto (2020), that see ESG as positively related to firm value and negatively associated with firms' risk and agency costs than with the view of others (Benabou and Tirole, 2010; Masulis and Reza, 2015) that see ESG as a manifestation of agency costs.

4.5 Test of H4

Finally, this section tests the hypothesis that the type of financial system moderates the impact of the ESG score. The idea is that the negative effect on debt in countries with market-based financial systems is smaller than in countries with bank-based financial systems. The rationale behind such a hypothesis, as explained previously, is that when long-term relationships with banks prevail, and the information asymmetry is correspondingly lower, the price of credit tends to be lower. Better relationships with stakeholders, including lenders, help firms to access cheaper financing because lenders are more willing to lend to companies with a good reputation and strong stakeholder relationships.

- Table 10 -

Table 10 shows that the type of financial system moderates the impact of ESG performance on the CoD. The higher the variable FINSYS – that is, the financial system is more market-oriented – the lower the (negative) impact of the orthogonalized variables of ESG. Therefore, the H4 is accepted.

4.6 Tests of Robustness and Endogeneity Bias

The relationship between the ESG score and the cost of debt can be affected by endogeneity, either through omitted variables or reverse causality. It is impossible to include as regressors all the variables that may affect the cost of debt. Thus, omitted variables – namely, unobservable variables – may simultaneously affect both ESG performance and the cost of debt. Second, the direction between the ESG score and debtor risk and, consequently, the cost of debt may be bidirectional (Bénabou and Tirole, 2010). That is to say, ESG could reflect managerial agency problems, and, in this case, the causality is in the opposite direction; lower debt costs facilitate better financial performance and lead to higher ESG scores. Therefore, the possibility of endogeneity needs to be addressed. Here, three methodologies are applied: i) lagged independent variables; ii) the instrumental variable approach – that is, the two-stage least squares (2SLS); iii) propensity matching scores (PSM).

6.6.1 Lagged Variables

To mitigate the problem of possible reverse causality, following Atif and Ali (2021) and Kong (2023), among others, the orthogonalized ESG variables were lagged for one or two years. The results are presented in Table 11 and confirm the negative impact of the information content of the ESG score, not captured by conventional risk measures, on the cost of debt. Moreover, Table 11 shows the moderating effect of the debt level. Companies with higher debt amounts or debt-to-assets ratios benefit the most. The moderating effect of the type of financial system was also confirmed, but the significance level is only 10%. Finally, the moderating effect of the agency cost is again evident. Therefore, further investigations are needed to verify whether it is the case that the more the financial system is bank-oriented, the greater the benefit in terms of the cost of debt.

- Table 11 -

4.6.2 Instrumental Variable Approach

Table 12 shows the IV 2LS estimations. In these regressions, the variable ORT_ALL is the endogenous regressor. In Panel 1, the instrument is the industry median ESG. As with Benlemlih and Bitar (2018), Atif and Ali (2021), and Kong (2023), the median industry ESG (ESG IND) is the mean score for all industry firms in a specific year. Following Atif and Ali (2021), the industry mean was calculated excluding the firm's score for the same year. The idea is that a firm's score should be correlated with its peers' values in a given industry but not correlated with the credit risk or cost of debt capital of those firms. Effectively, some industries have higher scores than others (Borghesi et al., 2014). The instruments proved to be strong. The F statistics of the first-step regressions largely surpass the thumb rule of 10, and Cragg-Donald's Wald F statistics are greater than Stock-Yogo critical values (10% level).

In Panel 2, in addition to ESG IND, as with Benlemlih and Bitar (2018) and Kong (2023), the company's initial ESG score (ESG INI) is used as an instrument. Again, the idea is that a firm's initial score should be correlated with subsequent values for the same entity but not correlated with the firm's credit risk or cost of debt capital in the following years. The instruments proved to be strong (the F statistics of the first step regressions again surpass the thumb rule) and exogenous (J-statistics do not reject the null hypothesis that the overidentifying restrictions are valid).

The findings confirm that the ESG score's informational component negatively impacts the cost of debt. Moreover, they support the moderating role of absolute and relative levels of indebtedness. The moderating impact of the type of financial system is also supported. Lastly, the moderating effect of agency costs is confirmed.

- Table 12 -

4.6.3 PSM Approach

The third way to eliminate endogeneity bias is a two-step PSM approach – see, among others, Benlemlih and Bitar (2018) and Atif and Ali (2021). First, firm-years with higher ESG scores were matched with lower ESG scores. This step aims to obtain a sample where the firms differ in the ESG scores but no other independent variables. Second, multivariate regressions were estimated for the matched sample.

In the first step, a dummy ESG High takes a value one for the firms in which, in each specific year, the ESG score is above the sample median, and zero otherwise. Table 13 presents the logit regressions pre-match and post-match. Regression two in Panel 1 shows that, in effect, firms differ in the ESG scores after matching but do not differ significantly in other dimensions.

The regressions of the second step are presented in Panel 2. The conclusions remain. Therefore, the PSM approach supports the inference obtained with the baseline regressions.

4.6.4 Additional Robustness Tests

In an additional robustness test, instead of the marginal cost of debt (CoD), the dependent variable is the average cost of debt. The average cost is the interest paid each year divided by the average amount owed that year. Given that the average cost is nominal, in another additional robustness test, the dependent variable was the average cost minus the inflation rate. The inflation rates were computed from the consumer price indexes from the World Development Indicators.

The results (not reported) hold in the two robustness tests, confirming both the negative effect of ESG performance on the cost of debt, the (negative) moderating effect of the level of debt, and the (positive) moderating effect of more market-based financial systems.

Finally, the interaction effect of agency costs and the orthogonalized ESG score remains, using different criteria to build a dummy. Namely, they remain when a dummy identifies the observations with a level of AS above the median or when it only identifies the observations of the higher quarter of AS values.

5. CONCLUSIONS

This paper shows that companies with higher ESG scores tend to have lower debt costs, even when considering traditional risk measures. Therefore, in line with others, this study helps to support the thesis that firms with better ESG performance tend to benefit from lower debt costs.

Moreover, the paper shows that the relationship between ESG scores and financial risk depends on the measure of risk used. When volatility or the Merton DD are used as risk measures, higher ESG scores are associated with lower risk. However, when risk measures based on accounting information are used, companies with higher ESG scores have higher financial risk, such as a greater likelihood of bankruptcy, according to the Altman score or the Z-score. Therefore, the ESG score does not serve as a substitute for economic and financial risk measures.

The traditional risk measures have limited explanatory power for ESG scores. The ESG score provides additional information beyond traditional risk measures. After removing that part of the ESG variable explained by conventional risk measures, the remaining information contained in ESG scores is relevant in explaining the cost of debt. Higher values of the orthogonalized ESG variable correspond to lower costs of debt. In other words, the study shows that the ESG has relevant information content to explain the cost of debt, which is complementary to traditional risk measures' information content.

The economic impact of ESG scores on the cost of debt is statistically and economically significant. An increase of one standard deviation in the ESG score results in an average decrease of 9 basis points in the cost of debt.

In summary, the findings indicate that higher ESG scores are associated with lower debt costs, suggesting that ESG factors provide additional information beyond traditional risk measures in explaining the cost of debt. Furthermore, the relevance of the ESG score is particularly significant for companies with higher debt levels, whether these are measured using the absolute amount of the long-term debt or the debt-to-asset ratio.

The impact of ESG information on the cost of debt is moderate by the level of long-term debt and by the debt-to-asset ratio. Having a high ESG score is more effective in reducing the cost of debt for highly indebted firms than for firms with lower debt levels. This result shows that the relevance of the information content in the ESG score is not identical for all companies.

The type of financial system moderates the impact of the ESG score. The negative impact of the ESG score on debt is smaller in countries with market-based financial systems compared to countries with bank-based financial systems. Bank-oriented financial systems benefit more from the ESG score regarding lower debt costs. This supports the hypothesis that ESG performance is more valuable in areas where long-term bank-firm relationships tend to predominate.

Finally, the findings indicate that agency costs raise the cost of debt. However, increased ESG performance tends to lower the increase in debt cost caused by increased agency expenses. In other words, enterprises with higher agency costs benefit more from the positive effect of ESG performance. This must occur because managers of firms with high ESG performance have more than others to lose, in terms of their public image, in case of bankruptcy. The results obtained – with ESG performance contributing to a reduction in debt costs and agency charges contributing to an increase – might also be read as a signal that lenders do not regard ESG activities as a waste of corporate resources.

Different methodologies were used to address endogeneity concerns, such as lagged variables, the instrumental variable approach (2SLS), and propensity matching scores (PSM). These approaches confirm the negative impact of the ESG score on the cost of debt and support the moderating effects of debt level and financial system type.

Overall, the findings suggest that the ESG score provides relevant information for evaluating the cost of debt, particularly in highly indebted firms. The impact of the ESG score varies based on the level of debt, regional differences, and the type of financial system.

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Table 1 – Descriptive Statistics and Correlation Coefficients

	ESG	CoD	Altman	Z_Score	Merton DD	Volatility	Assets	ROA	Intangibles
					Panel 1 - Descriptive Statistics				
Average	62.54	2.50	3.99	20.23	8.15	34.19	30 000 676 287	6.57	0.10
SD	18.76	1.63	4.30	20.02	11.11	11.63	47 519 255 566	7.04	0.11
Max	96.06	31.45	28.67	122.51	71.20	73.91	283 262 500 336	31.24	0.55
Min	1.13	-0.26	0.26	-4.35	-2.49	16.01	212 951 948	-15.94	0.00
n	7092	7027	6681	7092	7082	7082	7092	7092	6850
					Panel 2 - Correlation Coefficients				
ESG	1.00	-0.16	-0.20	-0.05	0.11	-0.24	0.31	-0.07	-0.03
CoD		1.00	-0.20	-0.13	-0.02	0.21	-0.04	-0.13	0.06
Altman			1.00	0.01	-0.17	0.14	-0.18	0.53	-0.14
Z_Score				1.00	0.02	-0.31	-0.03	0.02	0.01
Merton DD					1.00	-0.22	0.28	-0.30	-0.05
Volatility						1.00	-0.17	-0.06	-0.11
Assets							1.00	-0.12	0.04
ROA								1.00	-0.09
Intangibles									1.00

Obs.: This table reports the summary statistics and the correlation coefficients for the key variables for the period 2013 to 2022. The names and acronyms identify the following variables: ESG (ESG Score), CoD (Marginal Cost of Debt), Altman score (Altman), accounting-based Z score (Z-Score), volatility of stock returns (Volatility), Merton distance to default (Merton DD), the total assets (Assets), the return of assets (ROA) and intangibles over total assets (Intangibles).

Table 2 - Cost of Debt by Quartiles of ESG Score

	Q1	Q2	Q3	Q4	Q4-Q1	t	p-value
				Panel 1 - Full Sample			
Average Cost of Debt	4.06%	3.95%	3.75%	3.19%	-0.87%	-8.44	0.00
	3.76%	*3.76%*	*3.76%*	*3.76%*			
	1843	1783	1723	1743			
Marginal Cost of Debt	2.85%	2.60%	2.37%	2.20%	-0.65%	-11.72	0.00
	1.83%	*1.70%*	*1.43%*	*1.45%*			
	1798	1746	1743	1740			
				Panel 2 - US			
Average Cost of Debt	3.57%	3.61%	3.67%	3.32%	-0.25%	-2.20	0.01
	3.07%	*3.07%*	*3.07%*	*3.07%*			
	954	954	953	954			
				Panel 3 - EU			
Average Cost of Debt	3.82%	3.41%	3.28%	2.90%	-0.92%	-4.99	0.00
	4.31%	*2.97%*	*2.51%*	*2.19%*			
	687	686	686	687			
				Panel 4 - Brazil			
Average Cost of Debt	7.67%	7.80%	6.68%	6.42%	-1.25%	-2.64	0.00
	4.62%	*4.62%*	*4.62%*	*4.62%*			
	133	133	132	133			

Obs.: This table reports the (average and marginal) debt cost by ESG score quartiles. First, the observations were sorted by ESG score, dividing them into quartiles. Then for each quartile were calculated the means cost of debt variable. Finally, for each cost of debt variable, it was calculated the difference in means between Quartile 1 (lowest ESG scores) and Quartile 4 (highest ESG scores) and the t-statistic and p-value for the null hypothesis of equality of means.

Table 3 – Risk Measures by Quartiles of ESG Score

	Q1	Q2	Q3	Q4	Q4-Q1	t	p-value	Q1	Q2	Q3	Q4	Q4-Q1	t	p-value
	Panel 1 - Full Sample							Panel 3 - EU						
Debt-to-Assets	0.29	0.31	0.31	0.31	0.02	2.21	0.01	0.23	0.27	0.29	0.30	0.08	5.68	0.00
	0.26	*0.20*	*0.17*	*0.27*				*0.17*	*0.16*	*0.29*	*0.30*			
	1773	1773	1773	1772				687	686	686	687			
Altman	4.79	3.79	3.25	2.88	-1.92	-12.85	0.00	5.16	3.55	2.76	2.37	-2.79	-13.02	0.00
	5.71	*3.82*	*3.30*	*2.63*				*5.32*	*3.80*	*2.44*	*1.79*			
	1671	1670	1670	1670				649	648	648	648			
Z-Score	21.46	22.21	20.31	18.47	-2.99	-4.42	0.00	24.83	21.99	20.54	20.27	-4.55	-4.20	0.00
	23.49	*21.74*	*18.67*	*16.06*				*22.93*	*17.31*	*15.80*	*16.80*			
	1773	1773	1773	1773				687	686	686	687			
Volatility	0.37	0.34	0.32	0.31	-0.06	-17.07	0.00	0.31	0.29	0.29	0.28	-0.03	-6.86	0.00
	0.13	*0.11*	*0.10*	*0.09*				*0.10*	*0.09*	*0.08*	*0.08*			
	1770	1771	1770	1771				686	686	686	686			
Merton DD	6.59	7.67	8.65	10.13	3.54	9.04	0.00	9.13	10.95	11.69	13.02	3.89	5.54	0.00
	11.57	*10.22*	*10.59*	*11.75*				*13.23*	*12.73*	*12.14*	*12.79*			
	1770	1771	1770	1771				686	686	686	686			
	Panel 2 - USA							Panel 4 - Brazil						
Debt-to-Assets	0.31	0.31	0.33	0.34	0.03	2.49	0.01	0.30	0.42	0.39	0.36	0.05	2.82	0.00
	0.29	*0.23*	*0.18*	*0.19*				*0.17*	*0.24*	*0.20*	*0.14*			
	954	954	953	954				133	132	132	133			
Altman	4.99	4.09	3.56	3.63	-1.36	-5.86	0.00	13.59	11.24	20.20	15.94	2.34	1.08	0.14
	6.20	*4.06*	*3.33*	*3.58*				*18.32*	*15.25*	*22.88*	*17.13*			
	890	*890*	*890*	*890*				132	132	132	132			
Z-Score	21.90	21.92	22.08	17.18	-4.72	-4.96	0.00	12.46	12.99	13.33	12.23	-0.23	-0.22	0.41
	23.97	*24.02*	*22.38*	*16.98*				*8.70*	*13.11*	*11.94*	*8.01*			
	954	954	953	954				133	133	132	133			
Volatility	0.37	0.36	0.34	0.33	-0.04	-7.68	0.00	0.43	0.44	0.38	0.40	-0.03	-1.99	0.02
	0.13	*0.11*	*0.10*	*0.10*				*0.16*	*0.13*	*0.10*	*0.12*			
	953	953	953	953				132	131	132	131			
Merton DD	4.58	5.22	5.92	5.01	0.42	1.44	0.08	13.59	11.24	20.20	15.94	2.34	1.08	0.14
	7.62	*6.16*	*6.27*	*4.88*				*18.32*	*15.25*	*22.88*	*17.13*			
	953	953	953	953				132	131	132	131			

Obs.: This table reports the average risk metrics by ESG score quartiles. First, the observations were sorted by ESG score, dividing them into quartiles. Then for each quartile were calculated the means of the risk measures. Finally, the difference in means between Quartile 1 (lowest ESG scores) and Quartile 4 (highest ESG scores) was calculated for each risk measure, and the t-statistic and p-value for the null hypothesis of equality of means. The names and acronyms identify the following variables: Total debt at the end of the year divided by the total assets (Debt-to-Assets), Altman score (Altman), accounting-based Z score (Z-Score), volatility of stock returns (Volatility), and Merton distance to default (Merton DD).

Table 4 - The Proportion of the ESG Score Explained by Risk Measures

	Explanatory Power of Each Risk Measure Alone (%)	Increase in Explanatory Power Due to the Addition of Each Risk Measure to All Others (%)	Explanatory Power of Each Risk Measure Alone (%)	Increase in Explanatory Power Due to the Addition of Each Risk Measure to All Others (%)
	Panel 1 - Full Sample		Panel 3 - EU	
Debt-to-Assets	0.26	0.07	2.42	0.12
Altman	4.32	2.47	8.16	4.34
Z-Score	0.20	1.54	0.82	1.07
Volatility	5.30	5.37	1.54	0.83
Merton DD	1.31	0.10	1.66	0.03
All Risk Measures		10.35		10.03
	Panel 2 - US		Panel 4 - Brazil	
Debt-to-Assets	0.75	0.01	1.64	1.41
Altman	3.04	2.02	2.36	0.75
Z-Score	0.40	2.15	0.08	0.71
Volatility	2.85	3.72	1.93	1.34
Merton DD	0.25	0.08	0.32	0.01
All Risk Measures		7.53		5.84

Obs.: This table reports the proportion of the ESG Score explained by each risk measure alone and when added to other metrics. The column «Explanatory Power of Each Risk Measure Alone (%)» reports the proportion of the ESG score explained by each risk measure. That is, the R^2 of a regression where the ESG score is the dependent variable, and the risk measure is the single independent variable. The column «Increase in Explanatory Power Due to the Addition of Each Factor to All Others (%)» reports the difference between the R^2 of the regression where all risk measures are explanatory variables, less the R^2 of the regression where all risk measures except the correspondent risk measure are explanatory variables. Variable names are abbreviated in the following way: total debt at the end of the year divided by the total assets (Debt-to-Assets), Altman score (Altman), accounting-based Z score (Z-Score), volatility of stock returns (Volatility), and Merton distance to default (Merton DD).

Table 5 – Impact on Marginal Cost of Debt

	[1]		[2]		[3]		[4]		[5]		[6]	
C	3.680	***	4.100	***	5.143	***	3.867	***	2.387	***	3.626	***
	13.109		*12.951*		*17.249*		*13.841*		*7.857*		*12.370*	
ESG	-0.005	***	-0.005	***	-0.005	***	-0.005	***	-0.004	***	-0.005	***
	-4.926		*-5.727*		*-5.557*		*-5.700*		*-4.323*		*-4.958*	
Z-SCORE			-0.082	***	-0.074	***						
			-15.110		*-13.429*							
ALTMAN			-0.007	***			-0.008	***				
			-11.212				*-12.853*					
VOLATILITY			0.018	***					0.016	***		
			10.368						*9.595*			
MERTON DD			0.000								-0.001	
			0.197								*-0.628*	
SIZE	-0.002		-0.038	***	-0.057	***	-0.005		0.025	*	0.001	
	-0.175		*-2.699*		*-4.251*		*-0.410*		*1.940*		*0.082*	
INTANGIBLES	0.861	***	0.767	***	0.588	***	0.862	***	1.053	***	0.855	***
	6.731		*6.138*		*4.577*		*6.786*		*8.387*		*6.660*	
ROA	-0.033	***	-0.006	**	-0.014	***	-0.032	***	-0.029	***	-0.034	***
	-13.708		*-2.276*		*-4.954*		*-13.603*		*-12.431*		*-13.490*	
Industry fixed	Yes		Yes		Yes		Yes		Yes		Yes	
Period fixed	Yes		Yes		Yes		Yes		Yes		Yes	
Region fixed	Yes		Yes		Yes		Yes		Yes		Yes	
N	6988		6553		6988		6850		6978		6978	
R2	0.494		0.536		0.511		0.505		0.503		0.494	
R2 Adj	0.492		0.534		0.509		0.503		0.502		0.492	

Obs.: This table reports the baseline regressions. The dependent variable is the marginal cost of debt. Numbers in italic are the t-statistics based on the robust standard errors. Variable names are abbreviated in the following way: ESG Score (ESG), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (Merton DD), log of total assets (SIZE), Intangibles assets over total assets (INTANGIBLES), and return on assets (ROA). The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 6 – Impact of Orthogonalized Content of ESG Score on Marginal Cost of Debt

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Panel 1 - All Sample					Panel 2 - Regional Subamples		
						US	EU	Brazil
ORT_ALL	-0.005 ***					-0.003 **	-0.006 ***	-0.013 ***
	-5.386					*-2.110*	*-3.158*	*-4.852*
ORT_ALT		-0.005 ***						
		-5.538						
ORT_Z			-0.005 ***					
			-5.846					
ORT_VOL				-0.004 ***				
				-4.382				
ORT_MDD					-0.005 ***			
					-5.327			
ALTMAM	-0.078 ***	-0.070 ***				-0.093 ***	-0.053 ***	-0.004
	-14.840	*-13.125*				*-13.752*	*-6.311*	*-0.125*
Z-SCORE	-0.006 ***		-0.008 ***			-0.007 ***	-0.007 ***	-0.027 ***
	-10.558		*-12.833*			*-6.888*	*-6.245*	*-5.356*
VOLATILITY	0.019 ***			0.018 ***		0.017 ***	0.020 ***	0.021 ***
	11.643			*10.604*		*7.386*	*6.195*	*4.117*
MERTON DD	0.000				-0.002 *	-0.006 *	-0.001	0.004
	0.145				*-1.390*	*-1.627*	*-0.610*	*1.085*
N	6553	6563	6988	6978	6978	3453	2573	527
R-squared	0.538	0.513	0.506	0.586	0.495	0.518	0.388	0.606
Adj. R-squared	0.536	0.511	0.504	0.584	0.493	0.514	0.382	0.587

Obs.: This table reports the regressions using the ESG orthogonalized variables instead of the ESG scores as a metric of ESG performance. The dependent variable is the marginal cost of debt. Numbers in italic are the t-statistics based on the robust standard errors. Variable names are abbreviated in the following way: ESG Score (ESG), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (MERTON DD), Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_MERTON DD). In all regressions, a constant and the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 7 – Regressions on Extreme Quartiles of Debt and Debt to Asset Ratios (Panel 1)

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Panel 1.A - Q4 Total Long Term Debt in USD (High)					Panel 1.B - Q1 Total Long Term Debt in USD (Low)				
ORT_ALL	-0.005 ***					0.001				
	-2.515					*0.456*				
ORT_ALT		-0.009 ***					-0.000			
		-4.601					-0.095			
ORT_Z			-0.009 ***					0.002		
			-5.010					*0.848*		
ORT_VOL				-0.006 ***					0.002	
				-3.318					*0.855*	
ORT_MERTON DD					-0.009 ***					0.002
					-5.146					*0.986*
ALTMAM	-0.129 ***	-0.116 ***				-0.058 ***	-0.055 ***			
	-5.573	*-4.854*				*-9.592*	*-9.131*			
Z-SCORE	-0.005 ***		-0.007 ***			-0.001		-0.003 *		
	-5.651		*-6.458*			*-0.496*		*-1.548*		
VOLATILITY	0.033 ***			0.033 ***		0.007 ***			0.002	
	10.425			*9.851*		*2.419*			*0.720*	
MERTON DD	-0.002				-0.002	0.011 ***				0.009 **
	-0.854				*-0.680*	*2.363*				*2.078*
N	1629	1629	1752	1746	1746	1667	1667	1712	1712	1712
R-squared	0.630	0.593	0.586	0.601	0.577	0.442	0.437	0.409	0.409	0.410
Adj. R-squared	0.624	0.586	0.580	0.595	0.571	0.433	0.428	0.401	0.400	0.402

Table 7 – Regressions on Extreme Quartiles of Debt and Debt to Asset Ratios (Panel 2)

	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]
	Panel 2.A - Q4 Debt-to-Assets Ratio (High)					Panel 2.B - Q1 Debt-to-Assets Ratio (Low)				
ORT_ALL	-0.013 ***					0.006 ***				
	-6.629					*2.775*				
ORT_ALT		-0.014 ***					0.005 ***			
		-7.585					2.592			
ORT_Z			-0.015 ***					0.006 ***		
			-8.073					*3.127*		
ORT_VOL				-0.013 ***					0.006 ***	
				-6.729					*3.119*	
ORT_MERTON DD					-0.015 ***					0.005 ***
					-7.982					*2.878*
ALTMAM	-0.168 ***	-0.159 ***				-0.054 ***	-0.052 ***			
	-8.647	*-7.888*				*-8.525*	*-8.243*			
Z-SCORE	-0.010 ***		-0.007 *			-0.006 ***		-0.009 ***		
	-7.873		*-5.439*			*-3.104*		*-4.422*		
VOLATILITY	0.025 ***			0.024 ***		0.008 **			0.007 **	
	9.234			*9.008*		*2.259*			*2.059*	
MERTON DD	0.006 **				-0.003	-0.001				-0.001
	1.935				*-0.982*	*-0.166*				*-0.348*
N	1628	1628	1797	1788	1788	1667	1667	1735	1735	1735
R-squared	0.638	0.597	0.568	0.579	0.560	0.421	0.411	0.401	0.397	0.394
Adj. R-squared	0.632	0.591	0.562	0.573	0.554	0.411	0.403	0.392	0.388	0.385

Obs.: This table reports the regressions on extreme quartiles of debt and debt to asset ratios. The dependent variable is the marginal cost of debt. Panel 1 shows regressions performed using the highest (lowest) quartile in total long-term debt (respectively, Panel 1.A and Panel 1.B). Panel 2 shows regressions performed using the highest (lowest) quartile in debt to asset ratio (respectively, Panel 2.A and Panel 2.B). Numbers in italic are the t-statistics based on the robust standard errors. Variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_MERTON DD), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (MERTON DD). In all regressions, the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 8 – Moderating Effect of the Level of Debt

	[1]	[2]	[3]	[4]	[5]	[4]	[7]	[8]	[9]	[10]
	Panel 1. Long-Term Debt					Panel 2. Debt-to-Assets Ratio				
ORT_ALL	0.011 ***					0.010 ***				
	2.761					*5.928*				
ORT_ALL*DEBT	-0.019 ***					-0.051 ***				
	-4.152					*-10.540*				
ORT_ALT		0.015 ***					0.013 ***			
		3.761					*7.633*			
ORT_ALT*DEBT		-0.024 ***					-0.060 ***			
		-5.232					*-12.964*			
ORT_Z			0.017 ***					0.014 ***		
			4.798					*9.233*		
ORT_Z*DEBT			-0.027 ***					-0.066 ***		
			-6.523					*-15.349*		
ORT_VOL				0.016 ***					0.014 ***	
				4.271					*8.691*	
ORT_VOL*DEBT				-0.023 ***					-0.061 ***	
				-5.576					*-13.220*	
ORT_MERTONDD					0.018 ***					0.015 ***
					4.794					*9.453*
ORT_MERTONDD*DEBT					-0.027 ***					-0.066 ***
					-6.340					*-15.068*
N	6514	6524	6948	6948	6948	6552	6562	6987	6977	6987
R-squared	0.539	0.513	0.510	0.510	0.498	0.551	0.532	0.530	0.524	0.519
Adj. R-squared	0.537	0.512	0.508	0.508	0.497	0.549	0.530	0.528	0.522	0.517

Obs.: This table reports the regressions, including the interaction of the level of debt (DEBT) with the orthogonalized variable as an explanatory variable. The dependent variable is the marginal cost of debt. In Panel 1, the variable DEBT is the long-term total debt in USD (LTD). In Panel 2, the variable DEBT is the debt-to-asset ratio. Numbers in italic are the t-statistics based on the robust standard errors (DtoA). Other variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_Merton DD), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (Merton DD). In all regressions, a constant and the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 9 – Moderating Effect of the Agency Costs

	[1]	[1]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Panel 1 - Continuously Variable Agency Costs (AS)					Panel 2 - Dummy Variable Agency Costs				
ORT_ALL	-0.005 ***					-0.003 **				
	-4.897					*-2.261*				
ORT_ALL*[AS or Dummy]	-0.001 ***					-0.006 ***				
	-2.988					*-3.344*				
ORT_ALT		-0.005 ***					-0.002 ***			
		-5.258					*-2.375*			
ORT_ALT*[AS or Dummy]		-0.001 ***					-0.007 ***			
		-2.988					*-4.451*			
ORT_Z			-0.005 ***					-0.003 ***		
			-5.378					*-2.687*		
ORT_Z*[AS or Dummy]			-0.001 **					-0.006 ***		
			-2.038					*-3.307*		
ORT_VOL				-0.004 ***					-0.002 **	
				-3.840					*-1.736*	
ORT_VOL*[AS or Dummy]				-0.001 *					-0.004 ***	
				-1.630					*-2.526*	
ORT_MDD					-0.005 ***					-0.003 ***
					-5.002					*-2.549*
ORT_MDD*[AS or Dummy]					-0.001 **					-0.003 ***
					-2.067					*-2.549*
AS	0.023 **	0.009	0.023 **	0.022 ***	0.013 *	0.025 ***	0.012 *	0.024 ***	0.022 ***	0.015 *
	2.278	*0.862*	*2.558*	*2.458*	*1.441*	*2.597*	*1.292*	*2.728*	*2.565*	*1.639*
N	6428	6438	6862	6852	6852	6428	6438	6862	6852	6852
R-squared	0.538	0.512	0.508	0.506	0.496	0.539	0.513	0.509	0.507	0.496
Adj. R-squared	0.536	0.510	0.506	0.504	0.494	0.537	0.511	0.507	0.505	0.494

Obs.: This table reports the regressions, including the interaction of a proxy for agency costs with the orthogonalized variable as an explanatory variable. The dependent variable is the marginal cost of debt. In Panel 1, the variable proxy for agency costs is AS (the difference between each firm's asset-to-sales ratio and its industry's historical average). In Panel 2, the proxy for agency costs is a dummy that takes the value one if the firm has an asset-to-sales ratio above the average of its sector and zero otherwise. Numbers in italic are the t-statistics based on the robust standard errors. Other variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_Merton DD). In all regressions, a constant and the following control variables: the difference between each firm's asset-to-sales ratio and its industry's historical average (AS), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (Merton DD), log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, where included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 10 – Moderating Effect of the Type of Financial System

	[1]		[1]		[3]		[4]		[5]	
ORT_ALL	-0.007	***								
	-4.285									
ORT_ALL*FINSYS	0.001	*								
	1.448									
ORT_ALT			-0.008	***						
			-4.862							
ORT_ALT*FINSYS			0.001	*						
			1.291							
ORT_Z					-0.008	***				
					-5.169					
ORT_Z*FINSYS					0.003	***				
					2.978					
ORT_VOL							-0.007	***		
							-4.615			
ORT_VOL*FINSYS							0.002	***		
							2.677			
ORT_MDD									-0.008	***
									-5.111	
ORT_MDD*FINSYS									0.002	***
									2.583	
N	6553		6563		6988		6978		6978	
R-squared	0.532		0.504		0.506		0.506		0.495	
Adj. R-squared	0.530		0.502		0.504		0.504		0.493	

Obs.: This table reports the regressions dedicated to analyzing the moderating effect of the type of financial system. The dependent variable is the marginal cost of debt. Variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_Merton DD); AS is the difference between each firm's asset-to-sales ratio and its industry's historical average; FINSYS is the country's financial structure indicator. In all regressions, the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (Merton DD), as well as industry fixed and period fixed effects, were included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 11 – Impact on Marginal Cost of Debt by Lagged ESG Variables

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Panel 1 - Lag 1					Panel 2 - Lag 2				
ORT_ALL	-0.005 ***	0.006 ***	-0.004 ***	-0.007 ***	-0.005 ***	-0.005 ***	0.004 **	-0.005 ***	-0.008 ***	-0.005 ***
	-4.902	*3.343*	*-3.562*	*-4.112*	*-4.597*	*-4.564*	*2.477*	*-3.784*	*-3.882*	*-4.156*
ORT_ALL*D_to_A		-0.040 ***					-0.037 ***			
		-8.184					*-8.055*			
ORT_ALL*LT DEBT			-0.000 **					-0.000 *		
			-1.795					*-1.609*		
ORT_ALL*FINSYS				0.001 *					0.002 *	
				1.371					*1.828*	
ORT_ALL*AS					*-0.001* ***					-0.001 **
					-2.376					*-2.343*
ALTMAM	-0.060 ***	-0.057 ***	-0.076 ***	-0.080 ***	-0.077 ***	-0.071 ***	-0.064 ***	-0.086 ***	-0.091 ***	-0.087 ***
	-9.227	*-9.266*	*-13.001*	*-17.810*	*-15.037*	*-9.884*	*-9.162*	*-12.756*	*-15.470*	*-15.456*
Z-SCORE	-0.005 ***	-0.005 ***	-0.007 ***	-0.007 ***	-0.006 ***	-0.006 ***	-0.005 ***	-0.007 ***	-0.008 ***	-0.007 ***
	-6.126	*-6.120*	*-8.319*	*-8.681*	*-9.930*	*-5.964*	*-5.899*	*-7.941*	*-8.302*	*-9.535*
VOLATILITY	0.019 ***	0.019 ***	0.019 ***	0.018 ***	0.019 ***	0.019 ***	0.019 ***	0.020 ***	0.018 ***	0.019 ***
	10.516	*10.005*	*10.061*	*11.689*	*10.680*	*9.721*	*9.364*	*9.379*	*8.956*	*10.047*
MERTON DD	0.002	0.002	-0.001	-0.002	-0.001	0.001	0.002	-0.001	-0.002	-0.001
	0.795	*1.065*	*-0.438*	*-1.004*	*-0.380*	*0.470*	*0.915*	*-0.414*	*-0.868*	*-0.396*
N	5959	5959	5959	5959	5959	5342	5342	5342	5342	5342
R-squared	0.455	0.440	0.468	0.437	0.438	0.425	0.425	0.456	0.425	0.425
Adj. R-squared	0.452	0.437	0.465	0.434	0.435	0.422	0.422	0.453	0.422	0.422

Obs.: This table reports the regressions using lagged ESG orthogonalized variables. The dependent variable is the marginal cost of debt (CoD). The variable ORT_ALL lagged one year in Panel 1 and two years in Panel 2. Numbers in italic are the t-statistics based on the robust standard errors. The variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); D_to_A is the ratio debt-to-assets; LT DEBT is the dollar amount of long-term debt; AS is the difference between each firm's asset-to-sales ratio and its industry's historical average; FINSYS is the country's financial structure indicator; Altman Score (ALTMAN); accounting-based Z score (Z-SCORE); volatility of stock returns (VOLATILITY); and Merton Distance to Default (Merton DD). In all regressions, a constant and the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The symbols ***, ** and *, respectively, show statistical significance at 1%, 5% and 10%, for one-sided tests.

Table 12 – Impact on Marginal Cost of Debt – Instrumental Variable Approach

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Panel 1 - Instruments Exactly Identified					Panel 2- Instruments Overidentified				
ORT_ALL	-0.006 ***	0.069 ***	0.022 ***	-0.154 ***	-0.013	-0.009 ***	-0.002	0.027 **	-0.015 ***	-0.007 ***
	-5.593	*4.683*	*4.173*	*-3.373*	*-0.859*	*-4.404*	*-0.433*	*2.257*	*-2.768*	*-3.330*
ORT_ALL*D_to_A		-0.173 ***					-0.026 ***			
		-5.254					*-2.403*			
ORT_ALL*LT DEBT			-0.000 ***					-0.000 ***		
			-4.421					*-8.641*		
ORT_ALL*FINSYS				0.120 ***	-0.001 **				0.005 **	
				3.744	*-1.932*				*1.679*	
ORT_ALL*AS										-0.001 ***
										-2.589
ALTMAM	-0.044 ***	-0.088 ***	-0.108 ***	-0.083 ***	-0.076 ***	-0.074 ***	-0.072 ***	-0.076 ***	-0.074 ***	-0.077 ***
	-9.082	*-11.356*	*-17.168*	*-4.553*	*-12.569*	*-13.137*	*-16.655*	*-8.641*	*-12.747*	*-14.435*
Z-SCORE	-0.004 ***	-0.004 ***	-0.006 ***	-0.000	-0.006 ***	-0.007 ***	-0.007 ***	-0.004 **	-0.007 **	-0.006 **
	-4.986	*-3.772*	*-5.902*	*-0.098*	*-8.587*	*-9.481*	*-8.871*	*-2.951*	*-8.373*	*-10.391*
VOLATILITY	0.020 ***	0.014 ***	0.018 ***	0.021 ***	0.021 ***	0.020 ***	0.019 ***	0.013 ***	0.021 ***	0.020 ***
	13.149	4.985	*8.544*	*3.737*	*8.308*	*11.019*	*12.191*	*4.755*	*11.778*	*11.815*
MERTON DD	0.004 ***	0.015 ***	0.011 ***	-0.001	-0.002	-0.002	-0.001	-0.002 *	-0.001	-0.001
	2.681	*7.233*	*5.634*	*-0.218*	*-0.481*	*-0.955*	*0.355*	*-1.390*	*-0.670*	*-0.312*
N	6553	6552	6552	6552	6553	6553	6552	6552	6552	6553
F statistics	169.44	128.94	108.49	249.4698	246.6479	247.86	250.56	234.71	243.3995	247.4972
Cragg-Donald/J - Statistic	33.5	120.32	376.06	23.29	229.21	0.28	0.38	0.13	0.31	0.72

Obs.: This table reports the regressions using IV 2SLS. The dependent variable is the marginal cost of debt (CoD). Panel 1 uses the median industry ESG score (ESG IND) as an additional instrument. Panel 2, in addition to ESG IND, uses each firm's initial (ESG INI) score as an additional instrument. Numbers in italic are the t-statistics based on the robust standard errors. The variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); D_to_A is the ratio debt-to-assets; LT DEBT is the dollar amount of long-term debt; AS is the difference between each firm's asset-to-sales ratio and its industry's historical average; FINSYS is the country's financial structure indicator; Altman Score (ALTMAN); accounting-based Z score (Z-SCORE); volatility of stock returns (VOLATILITY); and Merton Distance to Default (Merton DD). In all regressions, a constant and the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The line Cragg-Donald/J - Statistic reports the Cragg-Donald Statistic in Panel 1 and the J - Statistic in Panel 2. The symbols ***, ** and * show statistical significance at 1%, 5% and 10%, respectively.

Table 13 – Impact on Marginal Cost of Debt – Propensity Score Match Approach

	[1]	[2]		[3]	[4]	[5]	[6]
Panel 1 - Pre-Match and Post-Match Diagnostic Test			Panel 2 - Multivariate Regression				
	Pre-Match	Post-Match					
			ORT_ALL	-0.005 ***	0.011 ***	-0.011 ***	-0.005 ***
				-5.187	*6.076*	*-4.709*	*-5.025*
SIZE	0.045 *	0.034	ORT_ALL*D_to_A		-0.054 ***		
	1.869	*1.412*			*-10.627*		
INTANGIBLES	0.000	0.000	ORT_ALL*FINSYS			0.004 ***	
	0.288	0.415				*2.600*	
ROA	-0.005	-0.005	ORT_ALL*AS				-0.001 **
	-1.193	*-1.366*					*-2.093*
ALTMAM	0.000	0.000	ALTMAM	-0.077 ***	-0.074 ***	-0.082 ***	-0.078 ***
	0.381	*0.368*		*-13.771*	*-13.933*	*-14.238*	*-17.048*
Z-SCORE	0.001	0.002	Z-SCORE	-0.007 ***	-0.007 ***	-0.007 ***	-0.007 ***
	0.656	*0.943*		*-9.050*	*-8.516*	*-8.616*	*-8.805*
VOLATILITY	0.005 *	0.002	VOLATILITY	0.019 ***	0.017 ***	0.019 ***	0.019 ***
	1.945	*0.984*		*10.470*	*9.776*	*10.258*	*12.286*
MERTON DD	-0.003	0.002	MERTON DD	-0.001	0.000	-0.002	-0.002
	-1.095	*0.682*		*-0.541*	*0.093*	*-0.975*	*-1.164*
N	6860	5712	N	5712	5711	5711	5712
McFadden R-squared	0.001	0.001	R-squared	0.537	0.551	0.544	0.537
			Adj. R-squared	0.534	0.549	0.542	0.534

Obs.: This table presents the regression results using the propensity score matching approach. Panel 1 reports the pre-match propensity score regression (column [1]) and post-match diagnostic regression (column [2]). The dependent variable is HIGH_ESG, a variable set to 1 if the ESG score exceeds the median and 0 otherwise. Panel 2 reports multivariate regressions using the observations that HIGH_ESG equals one and the correspondent matched observations as a sample. The dependent variable is the marginal cost of debt. Numbers in italic are the t-statistics based on the robust standard errors. The variable names are abbreviated in the following way: Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); D_to_A is the ratio debt-to-assets; AS is the difference between each firm's asset-to-sales ratio and its industry's historical average; FINSYS is the country's financial structure indicator; Altman Score (ALTMAN), accounting-based Z score (Z-SCORE), volatility of stock returns (VOLATILITY), Merton Distance to Default (Merton DD). In all regressions, a constant and the control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects, were included. The symbols ***, ** and * show statistical significance at 1%, 5% and 10%, respectively.

Figure 1 - Absolute between effects on marginal cost of debt of a one (between) standard deviation change of the ESG Scores or Risk measures. Variable names are abbreviated in the following way: ESG Score (ESG), Altman Score (ALTMAN), accounting-based Z score (Z_SCORE), volatility of stock returns (VOLTALITY), Merton Distance to Default (Merton DD), Orthogonalized Content of ESG Score not captured by all risk measures (ORT_ALL); Orthogonalized Content of ESG Score not captured by the Altman Score (ORT_ALT); Orthogonalized Content of ESG Score not captured by the Z Score (ORT_Z); Orthogonalized Content of ESG Score not captured by the Volatility (ORT_VOL); Orthogonalized Content of ESG Score not captured by the Merton Distance to Default (ORT_Merton DD). The coefficients were estimated in regressions, including as control variables log of total assets (SIZE), intangibles assets over total assets (INTANGIBLES), and return on assets (ROA), as well as industry fixed, period fixed and region fixed effects.