

## RESEARCH ARTICLE

# Green bonds and environmental performance: The effect of management attention

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## Abstract

Green bonds have attracted significant interest in the business and financial sectors, yet the environmental performance outcomes among issuing firms have been uneven. Drawing on the attention-based view framework, this study examines the role of corporate green bond issuance in directing attention to environmental issues across organizational levels. Additionally, we investigate how internal conditions, such as growth, profitability, and indebtedness, influence the translation of attention into improved environmental performance. Using a matched sample of 160 paired firms from 23 countries and nine sectors, our results emphasize the significance of both green bond intensity and internal conditions in shaping how green bonds impact environmental performance. These results contribute to the fields of sustainable finance and attention-based view theory, offering new insights into the influence of green bonds on firms' environmental performance.

## KEYWORDS

attention-based view, corporate green bonds, environmental performance, matched samples, sustainable finance

## 1 | INTRODUCTION

In recent years, the issuance of corporate green bonds has experienced exponential growth (Barua & Chiesa, 2019). To illustrate this trend, in 2013, corporate green bonds were virtually nonexistent, with a total issuance of only \$9.2 billion. However, in 2022, the volume of green bonds issued skyrocketed to nearly \$560 billion, according to Environmental Finance (2023). This significant growth underscores the growing interest in green bonds within the business and financial spheres. Corporate green bonds are any bonds in which funds are applied exclusively to finance or refinance, entirely or partly, eligible green projects (i.e., those showing clear environmental benefits), whether new and/or existing, aligned with the four main components of the Green Bond Principles (ICMA, 2018). Corporate green bonds have gained significant attention as a mechanism for directing funds toward environmentally sustainable projects. They play a crucial role

in promoting sustainable development by allocating proceeds solely to projects with evident sustainable benefits. The growth of green bond issuance is attributed to increasing environmental awareness, government commitments, regulatory incentives, investor demand for sustainable criteria, standards and certifications, financial innovation, and competitive performance. These factors signify the alignment of financial and environmental objectives in today's financial market.

Researchers have examined whether there is a market premium associated with the issuance of corporate green bonds (Flammer, 2021; Larcker & Watts, 2020; Tang & Zhang, 2020; Zerbib, 2019), investigating reputational incentives (Cheong & Choi, 2020), exploring investors' attraction (Flammer et al., 2021), and analyzing regulatory factors (Tolliver et al., 2020). Additionally, there is a line of research that analyzes the effect of green bond issuance on firms' environmental performance. Though it might be reasonable to assume that corporate green bonds have a positive impact on

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environmental performance (Benlemlih et al., 2023; Flammer, 2021), previous studies suggest that these improvements are not uniform across all firms (Fatica & Panzica, 2021). For instance, Fatica and Panzica (2021) have found that CO<sub>2</sub> emission reductions are more pronounced and enduring for new projects and emissions subject to external review and auditing. Our aim is to build upon previous studies that investigate the circumstances in which corporate green bond issuance improves environmental performance. Our research questions are as follows: Do corporate green bonds issuers improve their environmental performance after issuing green bonds? Under which circumstances is the effect of corporate green bonds on environmental performance improvement higher?

The amount of corporate green bond issuances is usually small compared to the total long-term debt of the issuing firm. Additionally, these bonds are applied to specific project, which often address a small percentage of the total environmental impact of the issuing firms. However, even if the amount of green bonds issued are financially negligible for a firm, other possible effects must be considered, such as those effects related to the distribution of attention within the firm. Based on the attention-based view (ABV) (Andersén, 2022; Bhandari et al., 2020; Ha, 2021; Ocasio & Joseph, 2018; Ridge et al., 2017; Siren et al., 2020), we propose that the issuance of green bonds serves as a valuable mechanism for directing attention toward environmental issues, spanning from senior management to managers at all levels and encompassing all members of the firm. Under the assumption of the limited rationality of a manager (Eklund & Mannor, 2021), the ABV states that their decisions depend on where they managers focus their attention. In addition, from the perspective of attention distribution, ABV acknowledges that rationally allocating limited attention resources to different aspects of business strategy is a challenge that firms have faced (Ocasio, 1997). Further, green bond intensity—the size of the bond relative to the firm's assets and total indebtedness—may affect the ability to shift attention to environmental issues in the entire firm. Additionally, we argue that the internal conditions of firms—growth, profitability, and indebtedness—affect how this attention can be translated into actions implying an improvement in environmental performance.

For this study, we collected data on green bond issuance between 2013 and 2017 from Refinitiv to assess the impact of issuance over the next 5 years up to 2022; therefore, our sample spans from 2013 to 2022 (10 years). Further, we tested these relationships using a sample based on paired methodology involving a pairing of 80 firms that have issued corporate green bonds with firms that have not issued any corporate green bonds (160 firms in total), based on an approximation in size, performance, risk, country, and industry. This methodology is more powerful and more efficient than independently selected samples as it allows comparison of similar firms (Cochran, 1953; Ortiz-de-Mandojana & Bansal, 2016). Our findings highlight the relevance of both green bond intensity and internal conditions in influencing the impact of green bonds on environmental performance. Specifically, firms with higher green bond intensity, those experiencing growth, and/or those securing additional financial resources (internally or externally) show superior environmental performance improvement.

Our study makes two contributions to the literature on sustainable finance and the ABV. First, we add to the growing body of research on sustainable finance by providing new evidence on the impact of green bonds in facilitating firms' environmental performance improvements. Specifically, our study incorporates the ABV as a theoretical framework to provide a potential explanation of the conflicting empirical findings. We find that the effectiveness of issuing a corporate green bond in directing managers' attention toward environmental strategies and initiatives, leading to subsequent improvements in environmental performance, depends on both the intensity of the green bond and the internal conditions of the firm. Second, our findings contribute to the ABV by highlighting the significance of the attention mechanism's size in driving managers' focus at all levels toward specific environmental issues, thereby enhancing performance in those areas. Furthermore, our results point out the relationship between attention and performance, revealing that simply increasing attention is insufficient yield performance impact. Firms must also have additional internal conditions in place to translate this attention into actions that improve performance.

The paper is organized as follows: the next section reviews the theoretical background; the third section outlines the development of hypotheses; the fourth and fifth sections detail our research methodology and results; the sixth section discusses the findings, and the final section presents the main conclusions, limitations, and future research implications.

## 2 | THEORETICAL BACKGROUND

### 2.1 | Sustainable financial instruments: Corporate green bonds

Sustainable finance allows for the use of different financing products promoting sustainable development: investment funds, bonds, and social venture capital, with the issuance of private debt (bonds) being the most important product for financing projects aimed at sustainable objectives (Environmental Finance, 2023). Assessing the issuance of private debt from listed firms, we find green bonds (positive impact on the environment), social bonds (positive impact on society and community), sustainable bonds (positive impact on the environment and society), and sustainability-related bonds (linked to the achievement or improvement of certain environmental, social and/or corporate governance metrics) (ICMA, 2020a, 2020b). Regarding environmental, social, and governance bond issuance, green bonds are its star product, accounting for 76% of this form of bond issuance until 2022 (Refinitiv Eikon, 2022), reaching a volume of approximately \$560 billion in 2022 (Environmental Finance, 2023).

Previous literature on green bonds has primarily focused on studying the existence of a market premium in the issuance of corporate green bonds (Flammer, 2021; Larcker & Watts, 2020; Tang & Zhang, 2020; Zerbib, 2019), examining reputational incentives in the issuance of corporate green bonds (Cheong & Choi, 2020), and highlighting the pressure exerted by investors as one of the reasons for issuing green bonds (Flammer et al., 2021). Researchers have also

explored the role of regulatory factors in green bonds (Tolliver et al., 2020), revealing significant disparities in international progress regarding the regulatory environment of green bonds. In addition, research has investigated whether the issuance of corporate green bonds is associated with an improvement in the environmental performance of firms. Flammer (2021) argues that corporate green bond issuers improve their environmental impact more than those not issuing this type of asset (i.e., higher environmental ratings and lower CO<sub>2</sub> emissions). However, some studies have aimed to determine the circumstances in which corporate green bond issuance has a greater impact on environmental performance. For example, Fatica and Panzica (2021) show that not all corporate green bond issuances demonstrate the same decrease in the carbon intensity of their assets after issuing green bonds. The reduction in emissions is more pronounced, significant, and lasting in new projects than in emissions for project refinancing purposes. The reduction in emissions is also greater in corporate green bonds that undergo external review and are audited, as well as those issued after the Paris Agreement (Fatica & Panzica, 2021). More recently, Benlemlih et al. (2023) claim that green bond issuances have a positive impact on firms' environmental performance, comparing the environmental ratings of issuing firms with nonissuing firms. However, their results are less conclusive in terms of CO<sub>2</sub> emissions. They do not observe a significant reduction in CO<sub>2</sub> emissions for firms issuing green bonds compared with equivalent firms not issuing green bonds. Therefore, previous studies suggest variations in environmental performance among firms after the issuance of green bonds; however, the internal contexts in this relationship remain insufficiently explored. Accordingly, this study, grounded in the ABV theory, seeks to elucidate the circumstances within firms that contribute to or hinder such improvements. By addressing this gap in the analysis of the connection between green bond issuance and environmental performance, we explore diverse internal contexts of firms, integrating the ABV theory to elucidate this relationship.

## 2.2 | ABV and environmental performance

The ABV is an important theory in management research (Bhandari et al., 2020; Ocasio & Joseph, 2018; Ridge et al., 2017; Siren et al., 2020) and environmental performance (Andersén, 2022; Ha, 2021). The ABV theory argues that the behavior of firms is the result of how they channel and distribute the attention of their managers (Ocasio, 1997). The seed of this theory goes back to Simon (1947) and has been developed over years in studies by March and Simon (1958), Cyert and March (1963), Cohen et al. (1972), March and Olsen (1976), and Friedland & Alford (1991), among others. However, not until the work of Ocasio (1997) was an explicit structure of the ABV devised. Ocasio (1997) defines "attention" as the process by which the managers of an organization allocate limited time and energy to be aware of, code, explain, and focus on business attention according to the three principles: focus of attention, situated attention, and structural distribution of attention. The focus of attention principle states that the issues to which decision-makers direct their attention depend on the questions and answers about which they are

aware. Situated attention states that the issues decision-makers consider and their responses depend on their specific environment and situation. In addition, the importance of situational or contingent factors in explaining their decision-making process is highlighted. Finally, the principle of the structural distribution of attention describes how the focus of individuals' attention is shaped and governed by social, economic, and cultural processes, as well as communication.

The ABV framework begins with the premise that decision-makers' actions are determined by the allocation of their limited attention bandwidth (Eklund & Mannor, 2021). Normally, top management plays a crucial role in decision-making processes. The extent to which the top management team focuses on environmental policies is positively associated with the adoption of an environmental innovation strategy (Liao et al., 2022).

The individual attentional perspectives of top management play a pivotal role in determining organizational behavior (Ocasio, 2011). The topics that managers choose to focus their attention on are influenced not only by their individual attentional perspectives but also by the situational context in which they operate, which Ocasio (1997) refers to as situated attention. Hence, management decision-making is not isolated but is often prompted by various organizational contexts that may draw attention to different issues (Tuggle et al., 2010). The importance of situated attention has been validated in different studies on ABV, such as examining the impact of "newness" in a business opportunity (Shepherd et al., 2017).

According to the ABV, the focus of attention not only influences the specific organizational activities in which top management directly engages but also indirectly impacts the activities of the entire organization. This influence occurs through procedural channels and communication channels, as it shapes the attention focus of other members of the organization (Ocasio, 1997). Consequently, the issues and responses that other organizational members direct their attention to are influenced by this attention allocation (Ocasio, 1997; Ocasio & Joseph, 2018). Decision-making in large firms is not limited to top management; it is a dynamic and distributed process involving middle management and the entire organization. Therefore, it is essential to ensure a seamless flow of attention from top management to middle levels through the firm's governance channels (Dutton & Ashford, 1993).

## 3 | HYPOTHESIS DEVELOPMENT

### 3.1 | The effect of corporate green bonds on environmental performance

To improve environmental performance, previous literature has shown that financial resources are necessary (Berrone & Gomez-Mejia, 2009; Hillary, 2004) but insufficient to achieve high environmental performance levels. Improving environmental performance requires a comprehensive view of the entire organization (Angell & Klassen, 1999; Hunt & Auster, 1990) and effective integration of sustainable practices into business activities (Wagner, 2015). This idea implies that environmental issues have become important not only for

the various functional areas but also for all levels of the organization. Additionally, improvements in environmental performance require stakeholder support (Klassen & McLaughlin, 1993; Sharma & Vredenburg, 1998). A firm must possess dynamic capabilities (Teece, 2007) to adapt to its environment, evolve, and renew itself over time (Wang & Ahmed, 2007) to improve environmental performance.

To achieve these green resources that allow the effective improvement of environmental performance, the firm requires not only having the financial funds but also the attention of managers at all levels on the firm's environmental performance (Symeou et al., 2019), because if resources are obtained from green bonds and managers do not spend them effectively, this will produce only slight performance improvements. If firms want to improve their environmental performance, they must overcome the limitation of managers' attention and focus their attention on environmental issues. This focus on improving environmental performance is stimulated by the firm's first issuance of a green bond. The issuance of a green bond renders the firm aware of improving its environmental performance. It shifts the attention of senior managers to include lower-level managers, thus giving greater importance to the firm's strategic planning process. Therefore, the issuance of a green bond, which is the decision of senior management, shifts the attention of improving the environmental performance of the firm from top management to lower-level managers, the rest of the organization, and stakeholders by encouraging them to be aware of this as it functions as a distribution mechanism. Consequently, a comprehensive approach to improve environmental performance is achieved at all levels of the organization (Aragón-Correa, 1998). Therefore, we propose:

**Hypothesis 1.** The issuance of corporate green bonds improves the environmental performance of the issuing firms.

### 3.2 | Corporate green bond intensity and environmental performance

The topics that are the focus of attention for managers and the importance managers attach to them are determined by the individual's attentional perspectives and context (Tuggle et al., 2010). In ABV, this is called situated attention (Ocasio, 1997). This means that decision-making within the firm is not performed in isolation. Instead, it is often triggered (Ocasio, 1997) by different contextual factors within the firm. Shepherd et al. (2017) posit that the intensity of "novelty" on a specific topic within the firm, such as the "novelty" in a business opportunity, makes the entire organization drive greater attention toward that topic. However, if this intensity decreases, so does the attraction of senior management's attention to this issue. Therefore, attention is diverted to other issues within the firm (Barnett, 2005).

Once it is established that the issuance of the green bond is an appeal for attention and that this attention is a mechanism to be transferred to the rest of the organization, the intensity of the green bond produces a greater signal that is transferred to the rest of the

organization. Therefore, the higher the bond intensity, the greater the attention directed by managers toward environmental issues and the greater its channeling to the remainder of the organization. This helps integration and results in a more intense improvement in the firm's environmental performance. Therefore, the intensity of the green bond is relevant, and we propose:

**Hypothesis 2.** Corporate green bond intensity positively affects the improvement of environmental performance of firms.

### 3.3 | The moderating effect of growth on environmental performance

Although the issuance of a green bond is useful for disseminating attention to environmental issues throughout the organization and helps improve the environmental performance of the issuing firm, this effectiveness is not homogeneous (Fatica & Panzica, 2021). Different internal factors influence and restrict managers' allocation of attention to different topics and their selection of alternative behaviors (Pfeffer & Salancik, 2003). We believe that the effectiveness of the issuance of the green bond and the attracted attention of the managers will depend on internal conditions of the firms related to their growth and management of their resources, both internal and external. These internal conditions can enhance or diminish this improvement in environmental performance through the issuance of this type of asset.

Improving environmental performance requires innovation, creativity, and risk-taking through more proactive and innovative environmental practices (Adams et al., 2016). Growing firms are usually organizations in which the senior management style is entrepreneurial, more likely to take risks while pursuing their business strategy, encourages change and innovation, and competes aggressively with other firms (Covin & Slevin, 1989). These growing firms are increasing their production capacity and are characterized as creative, innovative, and risk-tolerant.

To carry out this improvement in environmental performance, more proactive practices (innovation) (Dost et al., 2019; Potrich et al., 2019) as well as less proactive ones (emission reduction and resource use) may be performed. The difference lies in the double externality of environmental innovation (Rennings, 2000) since it requires significant investments and a long period of return on investment (Adams et al., 2016). Environmental innovation is defined as improvements or inventions intended to reduce the environmental impact of business processes through the introduction of new processes, equipment, institutions, practices, techniques, or products (Albort-Morant et al., 2018). It is the strategy that will intensify the managers' attention to environmental performance because this will allow them to seek new investment opportunities.

Furthermore, if a firm has the attention of managers to improve its environmental performance after the issuance of the green bond and this aspect intensifies with innovation (creativity), implying that the firm is growing, this will mean that the improvement is greater. However, if the

firm is not growing, the attention of managers and the entire organization may be diverted to other, more short-term issues. Therefore, we propose:

**Hypothesis 3.** The positive effect of corporate green bond issuance on environmental performance is stronger if firms are growing.

### 3.4 | The moderating effect of financial resources on environmental performance

Resource endowment has an important influence on the selection of the firm's strategy (Oliver, 1997) and limits its actions, implying that the extent to which a firm adopts improved environmental performance may depend on its available resources (Sharma & Henriques, 2005). To improve environmental performance, in addition to the attention by firm management, financial resources are also needed to execute the firm's new environmental policies (Berrone & Gomez-Mejia, 2009). According to Hillary (2004), financial resources are key to undertaking internal changes to improve the environmental performance of firms. Furthermore, in addition to the resources obtained with the issuance of the green bond, extra resources are needed since the amount obtained through this asset is not large. These extra resources may be obtained internally or externally.

Internally, the extra resources can be obtained by improving financial performance through increasing the firm's profitability. This improvement in financial performance is thus useful for improving environmental performance since this requires long-term thinking (Yadav et al., 2007) and an increased commitment of resources (Wang et al., 2018). With the issuance of green bonds, managers' attention is attracted toward developing new environmental practices. These include, for example, the creation of new green products and processes (Covin & Slevin, 1989) that may have a major impact on the environmental (Huang & Li, 2017) and financial (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Chen et al., 2006; Dangelico & Pujari, 2010) performance of firms. This improved financial performance means more resources can be reinvested in new environmental projects, as they have attracted managers' attention. Conversely, it has been shown that economic barriers hinder this improvement in environmental performance (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013) since managers' attention and the firm's strategy will be focused on saving itself and not on improving its environmental performance. Therefore, we propose:

**Hypothesis 4a.** The positive effect of corporate green bond issuance on environmental performance is stronger if firms are improving their financial performance.

Improving environmental performance requires greater access to external resources obtained by seeking external financing, whether private or public. The ABV theory establishes that the issues on which managers focus their attention are determined by their internal perspectives of attention and the interpretation of external events and context (Ocasio, 1997; Tuggle et al., 2010). In addition to internal financial resources, stronger environmental practices require additional external resources. Therefore, if

**TABLE 1** Hypothesis and literature.

Hypothesis	Literature
Hypothesis 1. The issuance of corporate green bonds improves the environmental performance of the issuing firms.	Angell & Klassen, 1999; Aragón-Correa, 1998; Benlemlih et al., 2023; Berrone & Gómez-Mejía, 2009; Fatica & Panzica, 2021; Flammer, 2021; Hillary, 2004; Hunt & Auster, 1990; Klassen & McLaughlin, 1993; Rueda-Manzanares et al., 2008; Sharma & Vredenburg, 1998; Teece, 2007; Wagner, 2015; Wang & Ahmed, 2007
Hypothesis 2. Corporate green bond intensity positively affects the improvement of environmental performance of firms	Barnett, 2005; Ocasio, 1997; Tuggle et al., 2010; Shepherd et al., 2017
Hypothesis 3. The positive effect of corporate green bond issuance on environmental performance is stronger if firms are growing	Adams et al., 2016; Albort-Morant et al., 2018; Covin & Slevin, 1989; Dost et al., 2019; Fatica & Panzica, 2021; Pfeffer & Salancik, 2003; Potrich et al., 2019; Rennings, 2000
Hypothesis 4a. The positive effect of corporate green bond issuance on environmental performance is stronger if firms are improving their financial performance	Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Berrone & Gómez-Mejía, 2009; Chen et al., 2006; Covin & Slevin, 1989; Dangelico & Pujari, 2010; Hillary, 2004; Huang & Li, 2017; Oliver, 1997; Sharma & Henriques, 2005; Wang et al., 2018; Yadav et al., 2007
Hypothesis 4b. The positive effect of corporate green bond issuance on environmental performance is stronger if firms are increasing their indebtedness	Berrone & Gómez-Mejía, 2009; Hillary, 2004; Ocasio, 1997; Oliver, 1997; Tuggle et al., 2010; Sharma & Henriques, 2005

the firm obtains financing through debt issuance, it will have extra resources to help managers perform the required investments to improve their environmental performance. Therefore, we propose:

**Hypothesis 4b.** The positive effect of corporate green bond issuance on environmental performance is stronger if firms are increasing their indebtedness.

Table 1 is a summary of the literature used in each of the hypotheses in Section 3.

## 4 | METHODOLOGY

### 4.1 | Data collection and sampling

We utilize the matching method to select our sample as it reduces bias and increases accuracy in empirical studies (Rubin, 1973). In

management studies, the matching method is often used to study the evolution of different groups of firms (Ferrier et al., 1999; Kassinis & Vafeas, 2002; Mallette, 1991; Ortiz-de-Mandojana & Bansal, 2016; Short & Toffel, 2010). As an analytical tool, the matching methodology is more effective than independently selected samples because it allows the results of similar groups of firms to be compared (Cochran, 1953). When describing our sample, we identified the firms issuing corporate green bonds as the “treated” group and pairs as the “control” group.

To compile the “treated” group, we first collected all corporate green bond issuance data between 2013 and 2017 from the financial data provider Refinitiv Eikon, obtaining a total of 778 issuances from 233 firms. We chose 2013 as the initial year because this is when the issuance of green bonds took off, and 2017 was chosen because this was the final year to measure the improvement in environmental performance in a period of at least 5 years after the issuances. Therefore, our sample has data in the period from 2013 to 2022. This time frame allows for a comprehensive examination of the progression of environmental performance, acknowledging the premise that the benefits of a robust environmental strategy manifest over the long-term (Aragón-Correa, 1998; Aragón-Correa & Sharma, 2003). Once the sample of treated firms was obtained, we verified the availability of Refinitiv Eikon's environmental data. Of the 233 firms, we had data on the variable “Environmental Pillar Score” of the year of the first issuance from only 86 firms.

Next, we applied the matchmaking method to identify the control group. Pairs should be formed based on a defined set of characteristics likely to be associated with the analysis result (McKinlay, 1977). Our analysis matched firms by total assets, net income before taxes, revenue per share, total long-term debt, sector, and country. To search for matches, we considered the entire universe of firms available in Eikon, with the available data for the “Environment Pillar Score” variable. Concretely, for each of the 86 treated firms, we collected data on all firms in the same sector (nine sectors) and country (23 countries) in the year of the first issuance. That result in a population of 2702 potential control firms. We performed matchmaking by considering the total assets, net income before taxes, revenue per share, total long-term debt, sector, and country (Ortiz-de-Mandojana & Bansal, 2016) of the year of the first issuance.

Of each of the 86 groupings obtained, we performed a clustering through Python using Euclidean (the straight line between two points) distance as a reference for measure, obtaining the two firms with the

greatest match according to total assets, net income before taxes, revenue per share, total long-term debt. Furthermore, we require that the control firm belongs to the same sector and country as the treated firms. Once the pairing according to these six variables had been performed, we chose the firm with the shortest Euclidean distance to the treated firm. In the matchmaking process, we observed that four firms had the same control firm. We chose the one with the shortest distance for these four firms, discarding the other three firms. The other three firms were also eliminated because of incomplete records. Finally, we had a sample of 80 firms that issued corporate green bonds and 80 firms that did not, for a total of 160 firms from 23 countries and nine sectors.

The paired *t*-tests show that the mean differences between corporate green bond issuers and control firms are not significant ( $p > 0.05$ ) for any of the variables with which the pairing has been performed, including firms showing similar total assets, net income before taxes, revenue per share, and total long-term debt during the year of issuance of the first green bond (see Table 2). The pairs also belonged to the same country and sector.

## 4.2 | Variables

### 4.2.1 | Improved environmental performance

Our dependent variable is the improvement in environmental performance that we measured using the environmental performance scores available in the Refinitiv Eikon database. This variable is the weighted average of a firm's relative rating based on the reported environmental information and the three resulting environmental scores (innovation, emissions, and resource usage). The value of this index ranges from 0 to 100, where higher values represent better environmental performance. To calculate the improvement of the environmental variable, the difference between the year of emission and the following 5 years was considered.

### 4.2.2 | Green bonds

We considered the issuance (or nonissuance) of a green bond by the firm. Therefore, this variable is dichotomous and coded with a value

	Treated firms		Control firms		t-test
	Mean	S.D.	Mean	S.D.	
1. Total assets <sup>b</sup>	12.33	47.90	8.70	40.30	0.60
2. Net income before taxes <sup>b</sup>	0.21	0.99	0.08	0.37	0.31
3. Revenue per share <sup>c</sup>	7.41	42.31	3.05	17.93	0.40
4. Total long-term debt <sup>b</sup>	1.58	6.11	0.36	1.15	0.08

<sup>a</sup>N = 80 pairs.

<sup>b</sup>Expressed in trillions of US dollars.

<sup>c</sup>Expressed in thousands of US dollars.

TABLE 2 Descriptive statistics<sup>a</sup>.

of 1 if the firm issued green bonds and 0 if the firm did not issue any green bonds.

### 4.2.3 | Green bond intensity

To measure green bond intensity, we considered, the quotient between the amount of green bonds issued during the first year of issuance and the total assets of that year to measure bond intensity according to the size of the firm. Furthermore, we considered the quotient between the amount of green bonds issued during the first year of issuance and the total long-term debt of that year to measure bond intensity according to obtained financing. These two independent variables were used to test H2.

### 4.2.4 | Growth

We measured growth by considering the variation of total assets during the 5 years following the issuance of the firm's first green bond with the growth of total assets. Previous literature has used the total assets to measure the firm's size (De Villiers et al., 2011).

### 4.2.5 | Additional financial resources

First, we measured additional internal financial resources through financial performance, consisting of the variation of the return on assets (ROA) during the 5 years following the issuance of the first green bond. The ROA is one of the financial measures most commonly used to assess the financial performance of a firm's operations (Murphy et al., 1996). Therefore, we measured the improvement of financial performance by considering the variation in ROA. Second, we measured the additional external financial resources through indebtedness measured by the variation of the total long-term debt during the 5 years following the issuance of the first green bond. This was done to observe if the firm was increasing or decreasing its level of indebtedness relative to the starting year (the year of the first issuance).

### 4.2.6 | Control variables

We controlled several factors that can influence the improvement of firms' environmental performance. First, we controlled for the firm's age, measuring it from the date of the initial public offering (IPO). Older firms are more likely to have the infrastructure required to manage environmental issues at lower costs (Mohan-Neill, 1995). Second, we used leverage as a control variable, calculating the ratio of total long-term debt to total assets (Balakrishnan & Fox, 1993; De Villiers et al., 2011). Third, we controlled the firm's systematic risk through its beta factor, as Roberts (1992) and Cormier and Magnan (2004) find that low volatility improves a firm's ability to make environmental

efforts as a result of having more stable economic performance. Finally, we controlled the year of issuance of the first green bond by the firm (2013, 2014, 2015, 2016, and 2017) as the year of the first issuance variable. In our model, we only considered green bond issues in the first year of issuance by the issuing firm. Table 3 summarizes all variables.

## 4.3 | Data analyses

We had a paired sample; thus, we used linear and moderating regression grouped by pairs instead of randomly grouped to test our hypotheses so that the correlation matrix considers that the firms are not independent but are constructed in pairs. More precisely, we estimated the following regression for firm  $i$  in year  $t$ :

**TABLE 3** Definitions of variables.

Variable	Type	Definition
<b>Dependent variable</b>		
Environmental performance	Continuous	Difference of the Environmental Pillar Score available in the Refinitiv Eikon database between the year of issuance of a green bond and the following 5 years.
<b>Independent variables</b>		
Green bonds	Binary (0,1)	Coded 1 if the firm issues a green bond and 0 otherwise.
Green bond intensity 1	Continuous	Amount of green bonds issued during the first year of issuance, divided by total assets.
Green bond intensity 2	Continuous	Amount of green bonds issued during the first year of issuance, divided by total long-term debt.
<b>Moderating variables</b>		
Growth	Continuous	Difference in total assets between the year of issuance of a green bond and the following 5 years.
Financial performance	Continuous	Difference in return on assets between the year of issuance of a green bond and the following 5 years.
Indebtedness	Continuous	Difference in total long-term debt between the year of issuance of a green bond and the following 5 years.
<b>Control variables</b>		
Age	Continuous	Time elapsed since the firm's IPO, in years.
Leverage	Continuous	Total long-term debt, divided by total assets.
Systematic risk	Continuous	Measured through its beta factor.
Year 1° E.	Dummy	Year of issuance of the first green bond by the firm (2013, 2014, 2015, 2016, and 2017).

TABLE 4 Mean, standard deviation, and Pearson correlation<sup>a</sup>.

Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1. Environmental performance	8.14	15.78	-30.21	73.70											
2. Green bonds	0.50	0.50	0.00	1.00	0.01										
3. Growth	50.23	123.98	-90.16	1330	0.20*	-0.02									
4. Financial performance	-0.08	6.58	-35.18	33.76	-0.17*	0.04	-0.24								
5. Indebtedness	71.02	217.77	-99.91	2054	-0.07	-0.05	0.27***	0.08							
6. Age	32.67	23.72	1.00	148	-0.01	0.04	-0.09	0.01	-0.11						
7. Leverage	0.21	0.15	0.00	0.67	0.13	-0.2	-0.01†	0.13†	-0.13	-0.01					
8. Systematic risk	1.01	0.46	0.10	2.88	-0.21†	0.04	-0.08	0.08	-0.17*	0.06	-0.14				
9. Year 1° E. 2013	0.03	0.16	0.00	1.00	0.02	0.00	0.01	0.01	0.05	-0.08	-0.09	0.12			
10. Year 1° E. 2014	0.16	0.37	0.00	1.00	-0.07	0.00	-0.01	-0.01	-0.07	0.19*	0.18*	-0.11	-0.07		
11. Year 1° E. 2016	0.21	0.41	0.00	1.00	-0.01	0.00	0.03	0.04	0.28***	-0.13	-0.03	-0.04	-0.08	-0.23	
12. Year 1° E. 2017	0.43	0.50	0.00	1.00	0.25**	0.00	-0.01	-0.01	-0.16†	0.11	-0.11	-0.08	-0.14†	-0.38	-0.45

Note: Significance level †0.10; \*0.05; \*\*0.01; and \*\*\*0.001.

<sup>a</sup>N = 160.

TABLE 5 Mean, standard deviation, and Pearson correlation<sup>a</sup>.

Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9
1. Environmental performance	8.32	16.79	-20.13	56.08									
2. Green bond intensity 1	1.30	2.39	0.00	13.39	0.20†								
3. Green bond intensity 2	4.88	7.91	0.00	42.75	0.22*	0.92***							
4. Age	33.65	21.67	3	129	-0.04	-0.14	-0.12						
5. Leverage	0.21	0.13	0.01	-56	0.15	0.47***	0.26*	-0.04					
6. Systematic risk	1.03	0.44	0.19	2.13	-0.17	-0.02	0.09	0.07	-0.27*				
7. Year 1° E. 2013	0.03	0.16	0.00	1.00	-0.02	-0.06	-0.04	-0.01	-0.11	0.10			
8. Year 1° E. 2014	0.16	0.37	0.00	1.00	-0.12	0.14	0.13	0.41***	0.12	-0.10	-0.07		
9. Year 1° E. 2016	0.21	0.41	0.00	1.00	-0.04	-0.06	-0.05	-0.16	0.09	-0.06	-0.08	-0.23*	
10. Year 1° E. 2017	0.43	0.50	0.00	1.00	0.32**	-0.16	-0.15	-0.06	-0.12	-0.09	-0.14	-0.38***	-0.45***

Note: Significance level †0.10; \*0.05; \*\*0.01; and \*\*\*0.001.

<sup>a</sup>N = 80.



$$\text{ENVIRONMENTAL PERFORMANCE}_{it} = \alpha_i + \beta_1 \text{ INDEPENDENT VARIABLE}_{it} + \beta_2 \text{ MODERATING VARIABLE}_{it} + (\beta_3 \text{ INDEPENDENT VARIABLE}_{it} \times \text{MODERATING VARIABLE}_{it}) + \beta_4 \text{ Age}_{it} + \beta_5 \text{ Leverage}_{it} + \beta_6 \text{ Systematic Risk}_{it} + \beta_7 \text{ Year } 1^{\circ} E_{it} + \varepsilon_{it}$$

## 5 | RESULTS

Tables 4 and 5 provide basic descriptive statistics and Pearson correlation coefficients of the variables used in our models. Our results show that there is no high correlation between any of our variables, except for the intensity of green bond 1 and the intensity of green bond 2, with a value of 0.92. It is normal for these variables to have a high and positive correlation because both variables refer to the intensity of the green bond measured in different ways. It is worth mentioning that this correlation between the two does not produce multicollinearity problems since they are two independent variables from different models. Except for the correlation between these two variables, the highest value is 0.47. Additionally, we performed tests, using variance inflation factors (VIF), to ensure that there was no multicollinearity between our variables. In our study, the VIF values range from 1.00 to 2.27, with a mean of 1.45, suggesting that the correlation between variables did not generate relevant multicollinearity problems in our analysis (Hair et al., 1998).

The results of Hypotheses 1, 3, 4a, and 4b are shown in Table 6. These four hypotheses have the same dependent variable (improvement of environmental performance) and the same independent variable (issuance or nonissuance of green bonds). Model 1 constitutes the reference model and includes the control variables; Model 2 includes the direct effect of corporate green bond issuance (H1); Model 3 includes the moderating effect of growth (H3); Model 4 includes the effects of financial performance (H4a); and Model 5 includes the effects of indebtedness (H4b).

The  $F$  statistic, which is a test that allows us to assess the explanatory capacity of a group of independent variables on the variation of the dependent variable, indicates that all the models shown are statistically significant. After each regression, we also calculated the increment of  $F$  using STATA's test command to check whether the inclusion of the new variable in the following model improves it. In this regard, we found that Models 3, 4, and 5 are significant and have no worse degree of significance than their reference model, whereas Model 2 is neither significant nor improves with respect to the previous model. Finally, the coefficient of determination ( $R^2$ ) improves for each model with respect to its reference model.

The results of Hypothesis 2, in which we analyze the influence of green bond intensity on environmental performance, are shown in Table 7. Model 1 shows the reference model and it includes the control variables. Models 2 and 3 include the direct effect of the bond intensity measured in terms of firm size (Model 2) and indebtedness (Model 3).

Hypothesis 1 predicted that the issuance of corporate green bonds leads to a positive effect on environmental improvement. Model 2 of Table 6 shows that the coefficient of the variable

representing the issuance of corporate green bonds is not significant ( $b = 0.69$ ). In addition, as mentioned, the inclusion of the variable representing the issuance of corporate green bonds does not improve the model nor is it significant ( $F(1) = 0.12$ ). Therefore, we disregard the direct effect of the issuance of corporate green bonds on improving issuing firms' environmental performance, thereby rejecting Hypothesis 1.

Hypothesis 2 predicted that the intensity of green bonds positively affects environmental improvement. Model 2 of Table 7 shows that the coefficient of the variable representing this direct effect is significant ( $b = 1.99^*$ ). The  $F$  test on the improvement of the model confirms that the results of this direct effect are significant, improving the model ( $F(1) = 5.08^*$ ). The  $F$  statistic of the general significance of the model ( $F = 2.48^*$ ) shows that the whole model is statistically significant. Model 3 of Table 7 also shows that the coefficient of the variable representing this direct effect is significant ( $b = 0.64^*$ ). The  $F$  test on the improvement of the model confirms that the results of this direct effect are significant, improving the model ( $F(1) = 7.15^{**}$ ). The  $F$  statistic of the general significance of the model ( $F = 2.79^{**}$ ) shows that the whole model is statistically significant. Therefore, for both models, we can argue that bond intensity positively affects the improvement of environmental performance. Thus, we have no evidence to reject Hypothesis 2.

Once the direct effect of improving environmental performance following the issuance of a green bond (H1) was disregarded, we analyzed the effectiveness of attention to produce changes in performance under certain internal firm conditions. Specifically, we sought to analyze Hypothesis 3 by determining whether the issuance of corporate green bonds renders the improvement of environmental performance more intense if firms are growing, and in Hypotheses 4a and 4b, whether the issuance of corporate green bonds renders the improvement of environmental performance more intense if firms are obtaining extra financial resources.

Model 3 in Table 6 shows significant moderating effects of firm growth on the correlation between corporate green bond issuance and environmental performance ( $b = 0.08^{***}$ ). The  $F$  test of model improvement confirms that the effects of moderation are significant and do not worsen the model ( $F(1) = 14.76^{***}$ ), and the  $F$  statistic of the general significance of the model ( $F = 5.22^{***}$ ) shows that the entire model is statistically significant. Figure 1 shows the results of moderation. Therefore, the issuance of corporate green bonds creates a positive effect on environmental improvement for growing firms, whereas the effect is negative for stagnant or shrinking firms. These results support Hypothesis 3.

Model 4 in Table 6 shows significant moderating effects of firm financial performance on the correlation between corporate green bond issuance and environmental performance ( $b = 0.94^{**}$ ). The  $F$  test of model improvement confirms that the effects of moderation are significant and do not worsen the model ( $F(1) = 8.77^{**}$ ), and the  $F$  statistic of the general significance of the model ( $F = 4.51^{***}$ ) shows that the entire model is statistically significant. Figure 2 shows the results of the moderation. Therefore, whereas the issuance of corporate green bonds creates a positive effect on environmental

**TABLE 6** The effect of corporate green bonds on environmental performance<sup>a</sup>.

Control variables	Model 1 <i>b</i> (SE)	Model 2 <i>b</i> (SE)	Model 3 <i>b</i> (SE)	Model 4 <i>b</i> (SE)	Model 5 <i>b</i> (SE)
Age	−0.02 (0.06)	−0.02 (0.06)	−0.01 (0.05)	−0.02 (0.06)	−0.02 (0.06)
Leverage	15.28† (8.64)	15.30† (8.66)	11.37 (8.02)	12.12 (8.66)	13.38 (8.92)
Systematic risk	−5.20† (2.82)	−5.23† (2.83)	−4.86* (2.45)	−6.86* (2.71)	−5.60† (2.82)
Year 1° E. 2013	12.77† (6.43)	12.77† (6.44)	15.60* (6.99)	12.60* (6.28)	15.32* (6.09)
Year 1° E. 2014	4.04 (3.36)	4.04 (3.37)	6.00† (3.06)	3.75 (3.07)	6.18† (3.31)
Year 1° E. 2016	7.28* (3.53)	7.28* (3.55)	6.88* (3.05)	6.35† (3.29)	8.28* (3.20)
Year 1° E. 2017	12.72*** (3.44)	12.72*** (3.45)	13.68*** (3.19)	11.98*** (3.33)	15.03*** (3.26)
Green bonds direct effect		<b>0.69 (1.95)</b>	−3.12 (2.15)	−0.48 (1.95)	−0.06 (0.36)
Growth			0.01 (0.01)		
Financial performance				0.16 (0.12)	
Indebtedness					0.01 (0.01)
Moderating effects					
Green bonds × growth			<b>0.08*** (0.02)</b>		
Green bonds × financial performance				<b>0.94** (0.32)</b>	
Green bonds × indebtedness					<b>0.01* (0.01)</b>
Constant	2.96 (4.73)	2.65 (4.79)	1.32 (4.59)	5.60 (4.82)	0.77 (5.40)
Δ <i>F</i> (df)	3.37* (7)	0.12 (1)	14.76*** (1) <sup>b</sup>	8.77** (1) <sup>b</sup>	6.00* (1) <sup>b</sup>
<i>F</i>	3.37**	3.00**	5.22***	4.51***	4.73***
<i>R</i> <sup>2</sup>	0.14	0.15	0.24	0.20	0.22

Note: Nonstandardized (*b*). Significance level †0.10; \*0.05; \*\*0.01; and \*\*\*0.001.

Abbreviation: SE, standard errors.

<sup>a</sup>*N* = 160.

<sup>b</sup>Model 2 as reference.

improvement for firms that are improving their financial performance, the effect is negative for those firms that have financial issues. These results support Hypothesis 4a.

Model 5 in Table 6 shows significant moderating effects of corporate indebtedness on the correlation between corporate green bond issuance and environmental performance ( $b = 0.01^*$ ). The *F* test of model improvement confirms that the effects of moderation are significant and do not worsen the model ( $F(1) = 6.00^*$ ), and the *F* statistic of the general significance of the model ( $F = 4.73^{***}$ ) shows that the entire model is statistically significant. Figure 3 shows the results of the moderation. Therefore, whereas the issuance of corporate green bonds creates a positive effect on environmental improvement for firms that increase their indebtedness, the effect is negative for those firms that do not increase their indebtedness. These results support Hypothesis 4b.

Finally, we proceed to assess the robustness of our findings by changing the analysis period. Instead of examining the variation in environmental performance over a “long-term” 5 year period, we analyze it over a more intermediate 3 year period. Although environmental results typically materialize in the long-term (Aragón-Correa, 1998; Aragón-Correa & Sharma, 2003), we believe it is relevant to conduct this analysis in an intermediate period to verify the solidity of our findings. Table 8 shows the comparison of our hypotheses between both periods, from which two conclusions can be drawn. The first is that

the results in both periods are similar, except for Hypothesis 4a, providing us with confidence in the robustness of our findings. The second is that environmental results materialize over time, as the models show improvement over a 5 year period compared with a 3 year period.

## 6 | DISCUSSION

Amidst the growing stringency of laws and regulations, as well as the heightened expectations from investors and stakeholders, firms have recognized the imperative of incorporating environmental considerations into their strategic planning processes as a means to enhance their operational and financial performance (Liao, 2018; Tsai & Liao, 2017; Yang et al., 2020). In this context, corporate green bonds have emerged as an alternative financial instrument to support projects aimed at improving firms' environmental performance. Previous studies have demonstrated that these financial instruments can contribute to enhancing environmental performance of firms (Benlemlih et al., 2023; Flammer, 2021) and have highlighted that the extent of these improvements are not homogeneous for all firms (Fatica & Panzica, 2021). Our results also support this view. Despite the fact that the issuance of a green bond is instrumental in directing senior management's attention throughout the organization, not all scenarios

**TABLE 7** The effect of corporate green bonds intensity on environmental performance<sup>a</sup>.

Control variables	Model 1 <i>b</i> (SE)	Model 2 <i>b</i> (SE)	Model 3 <i>b</i> (SE)
Age	0.01 (0.09)	0.04 (0.09)	0.04 (0.09)
Leverage	21.72 (14.34)	4.86 (15.83)	11.07 (14.33)
Systematic Risk	-2.93 (4.46)	-4.01 (4.36)	-4.95 (4.35)
Year 1° E. 2013	9.14 (12.24)	11.09 (11.93)	11.00 (11.76)
Year 1° E. 2014	2.68 (6.88)	1.95 (6.70)	1.30 (6.63)
Year 1° E. 2016	6.29 (5.93)	8.72 (5.87)	8.10 (5.73)
Year 1° E. 2017	14.62*** (5.30)	16.42** (5.22)	16.17** (5.12)
Intensity 1 direct effect		<b>1.99* (0.88)</b>	
Intensity 2 direct effect			<b>0.64** (0.24)</b>
Constant	-1.31 (8.43)	-1.93 (8.20)	-2.53 (8.10)
$\Delta F$ (df)	2.00† (7)	5.08* (1)	7.15** (1) <sup>b</sup>
<i>F</i>	2.00†	2.48*	2.79**
<i>R</i> <sup>2</sup>	0.16	0.22	0.24

Note: nonstandardized (*b*). Significance level †0.10; \*0.05; \*\*0.01; and \*\*\*0.001.

Abbreviation: SE, standard errors.

<sup>a</sup>*N* = 80.

<sup>b</sup>Model 1 as reference.

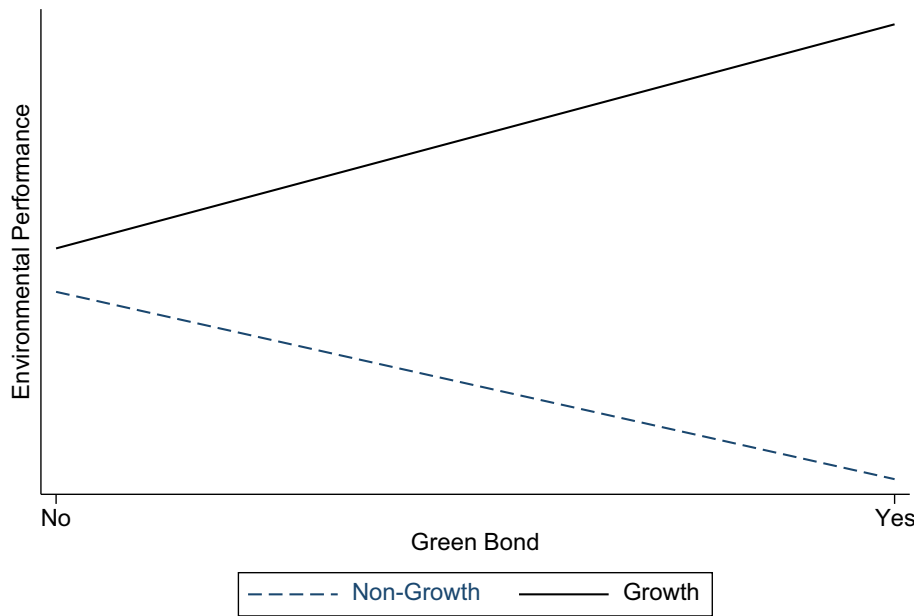
of green bonds issuance show improvements in environmental performance.

Though previous studies have found that corporate green bonds have a positive impact on environmental performance (Benlemlih et al., 2023; Flammer, 2021), our results show that these improvements are not uniform across all firms, in line with Fatica and Panzica (2021). Contrastingly, the issuance of green bonds itself in general contexts may not be sufficient to improve environmental performance. One possible explanation for the lack of a direct correlation between issuing corporate green bonds and environmental performance improvement may be the initial environmental performance level prior to issuing the green bond. In our analysis, we found that firms that issuing green bonds already exhibit a higher environmental performance score (67.94 points) compared with firms that do not issue this type of bond (60.38 points). Though achieving initial advancements in environmental performance may be relatively easier, further improvements often necessitate significant structural changes within the firm, which can be more challenging to accomplish. A second reason for the varied impact of corporate green bond issuance on environmental performance is that the bonds alone may not be sufficient to effectively disseminate attention to environmental issues throughout the entire organization.

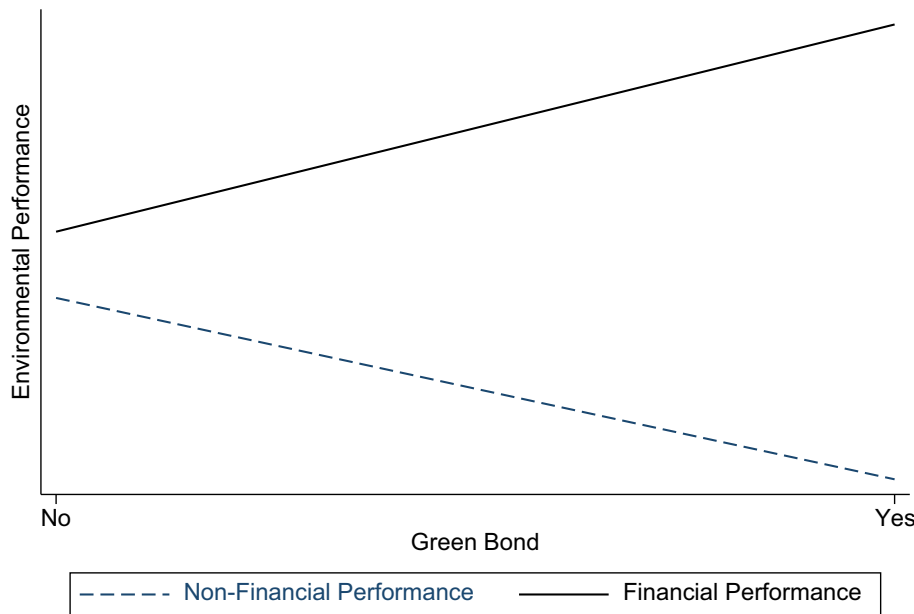
To gain a deeper understanding of conditions under which attention positively influences firms' environmental performance, we analyzed various factors. Our findings reveal that bond intensity plays a crucial role in enhancing the environmental performance of firms when issuing green bonds. One plausible explanation for this finding aligns with the ABV framework, suggesting that higher bond intensity leads to increased attention from managers toward environmental issues within the firm's strategic planning. Further, we examine the moderating effect of growth on the relationship between issuing

corporate green bonds and the environmental performance improvement. Our results indicate that the issuance of corporate green bonds has a positive effect on environmental performance for firms that are growing, whereas the effect becomes negative for firms in a stage of degrowth. One possible explanation for the negative effect in the degrowth context is that managers may use issuing a corporate green bond as a signal, which only seeks to improve the environmental reputation of the firm, rather than a genuine commitment to enhancing the environmental performance. In such cases, the issuance of green bond may be considered a form of greenwashing. Additionally, our results demonstrate that the improvement in environmental performance can be enhanced by accessing additional financial resources either internally or externally. Specifically, we analyze the moderating effect of the availability of additional internal resources (i.e., higher financial performance) and subsequently analyze the moderating effect of external financing (indebtedness).

First, our findings indicate that firms improving their financial performance can greatly enhance their environmental performance through the issuance of green bonds. This is the case in which we observe the maximum environmental improvement. However, for firms that are facing financial difficulties, issuing green bonds does not lead to environmental performance improvement; it can worsen it. This pattern emerges because firms grappling with financial challenges tend to prioritize economic and short-term considerations, diverting their attention away from environmental objectives. These results align with previous studies, which highlight the difficulties faced by financially struggling firms in pursuing high levels of environmental performance. Achieving such performance requires substantial financial resources (Berrone & Gomez-Mejia, 2009) and long-term rewards (Aragón-Correa, 1998; Aragón-Correa & Sharma, 2003). Therefore, firms facing financial difficulties may prioritize conservative



**FIGURE 1** The moderating effect of growth on environmental performance following the issuance of green bonds.



**FIGURE 2** The moderating effect of financial performance on environmental performance following the issuance of green bonds.

initiatives that primarily focus on reputation enhancement and short-term financial benefits (De Villiers et al., 2011). One plausible explanation for this finding is that firms in these scenarios are grappling with pressing business challenges and need to prioritize more immediate issues in the short-term. Consequently, attention and resources could be directed toward these critical concerns, resulting in a limited focus on environmental improvements.

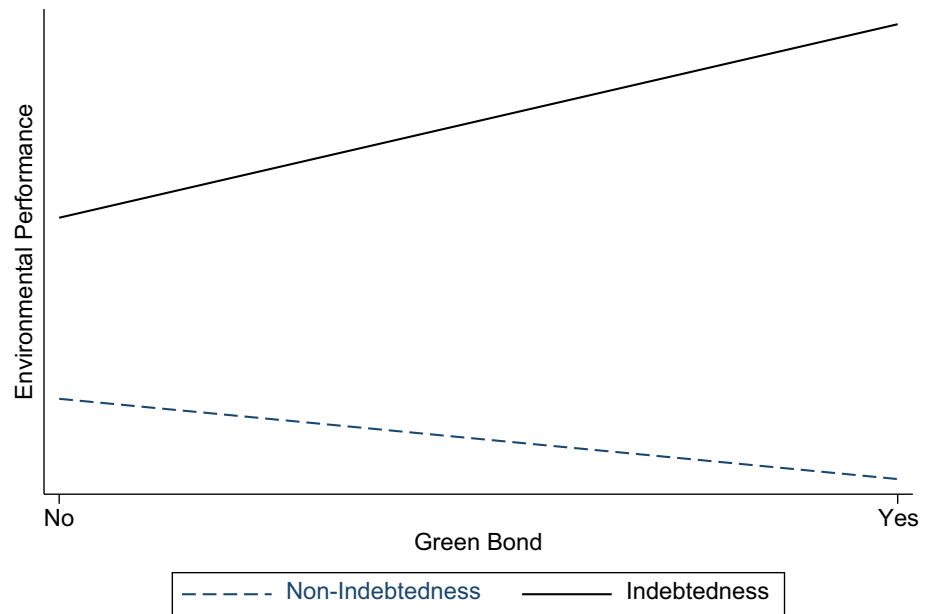
Second, our analysis shows that for those firms that are increasing their external financing, observe an improvement in their environmental performance through the issuance of green bonds. However, for firms that are facing financial difficulties, issuing green bonds does not lead to environmental performance improvement; it can worsen it. The use of green bonds along with obtaining additional resources is necessary to enhance environmental performance, as it captures the

attention of firm managers on environmental issues by providing them with greater financial resources to invest in improving environmental performance. This suggests that additional financial resources, such as indebtedness, play a crucial role as a driver of environmental practices, as the lack of this financial motivation on the part of executives may lead them to divert their attention to other firm issues that require fewer financial resources.

## 7 | CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

Our study explores the impact of green bond issuance on firms' environmental performance under certain internal contexts and introduces

**FIGURE 3** The moderating effect of indebtedness on environmental performance following the issuance of green bonds.



**TABLE 8** Robustness tests.

Hypothesis (H)	3 years <i>b</i> (SE)	5 years <i>b</i> (SE)
Green bonds direct effect (H1)	0.64 (1.73)	0.69 (1.95)
Intensity 1 direct effect (H2)	1.58* (0.72)	1.99* (0.88)
Intensity 2 direct effect (H2)	0.44* (0.19)	0.64** (0.24)
Green bonds × growth (H3)	0.08* (0.03)	0.08*** (0.02)
Green bonds × financial performance (H4a)	0.17 (0.25)	0.94** (0.32)
Green bonds × indebtedness (H4b)	0.01* (0.01)	0.01* (0.01)

Note: Nonstandardized (*b*). Significance level †0.10; \*0.05; \*\*0.01; and \*\*\*0.001.

Abbreviation: SE, standard errors.

the ABV theory as a framework. To conduct the study, we use a matched sample of 160 firms with data between 2013 and 2022. The matching methodology is more efficient than independently selected samples because it allows us to compare performance between similar groups of firms. Our study makes two significant contributions. First, building upon previous research on sustainable finance and environmental performance (Benlemlih et al., 2023; Fatica & Panzica, 2021; Flammer, 2021), we extend these findings by demonstrating the heterogeneity in the effects of issuing green bonds on the environmental performance of firms. By incorporating the ABV theory as a theoretical framework, we provide insights into how the issuance of corporate green bonds can influence managers' attention toward environmental strategies and initiatives within the firm. To enhance the environmental performance of a firm, it is crucial for all managers to share a common vision and commitment to implementing environmental strategies. Our study underscores the importance of this alignment, as it directly contributes to improving the firm's environmental performance. By illuminating the role of attention in the context of

corporate green bonds, we contribute to the literature on sustainable finance and deepen our understanding of the mechanisms that drive environmental performance improvements.

Senior managers can effectively signal their commitment to environmental issues to by issuing a corporate green bond, which increases the attention and focus of the entire management team on these crucial matters. In our study, we contribute to the ABV literature by showing that the issuance of green bonds alone may not be sufficient to disseminate this attention throughout the entire organization. Rather, the relative size of the green bond affects their capability to translate attention from the senior managers to the entire organization allowing environmental performance improvements within the firm. Furthermore, we shed light on the importance of certain causal mechanisms that bridge and act, ultimately driving greater improvements. Our analysis highlights the significance of internal conditions, such as growth, profitability, and indebtedness, in influencing the potential impact of issuing a corporate green bond on their environmental performance. By exploring the attention-behaviors-performance link, our study contributes to a deeper understanding of the complex dynamics involved in achieving environmental performance improvements and underscores the importance of considering internal conditions as influential factors.

We must acknowledge three limitations in our study. First, while financial data providers generally adhere to similar criteria for determining whether a bond is classified as green, the lack of standardized definitions and regulations across all providers introduces slight variations in the classification process. This variability can result in different ratings assigned to green bonds by different analysts. Future studies could consider incorporating data from multiple financial data providers to analyze common emissions data and average scores across databases, promoting greater consistency.

Second, our results regarding the first hypothesis may be influenced by the mean duration of the green bond (8.3 years) and the



specific period analyzed (first 5 years). It is possible that the funds raised through bond issuance, though intended for improving environmental performance, have not yet yielded noteworthy results within the analyzed timeframe. Although we have included the longest period possible when this work was conducted, which avoided measuring improvement in a single year, future research could replicate the analyses using longer periods to capture more comprehensive outcomes. Last, our study primarily focused on internal aspects of firms. To gain a more comprehensive understanding of the effects of green bonds on environmental performance, future research should explore the impact of institutional factors and external aspects within the broader context. This would provide a more holistic perspective and a complete picture of the implications of green bonds for firms' environmental performance. In summary, the increasing societal pressure for firms to have a positive impact has led to the proliferation of sustainable instruments, including social bonds, sustainable bonds, and sustainability-related bonds. As we move forward, it becomes essential for future research to delve into how firms are navigating these new sustainable instruments and their implications. One area of exploration could involve analyzing the impact of social bonds not only on social performance but also on the overall environmental, social, and governance performance of a firm. This research would provide valuable insights into how firms can effectively utilize these instruments to achieve comprehensive sustainability goals.

Our findings have important policy implications, given global efforts to scale up sustainable finance and environmental improvement. Policymakers can use these findings to adapt regulatory frameworks for green finance, recognizing the variable impact of green bond issuance by firms depending on certain domestic conditions. The promotion of green bonds may be most effective for financially sound and growing firms, highlighting the need for differentiated approaches. Practitioners should be aware of the limitations of green bonds as stand-alone tools to achieve comprehensive environmental improvements, emphasizing the importance of integrating them into broader sustainability strategies aligned with specific internal contexts. Researchers can build on our work by studying longer-term effects and other contextual factors that influence the relationship between attention, behaviors, and performance. Our study lays the foundation for future research on optimizing environmental strategies in conjunction with sustainable financial instruments and specific contextual factors, thereby contributing to the evolving field of sustainable finance and guiding environmentally responsible business practices.

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