The Effects of Green Bonds on Analyst Forecasts around the World*

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Abstract

This paper examines the effects of corporate green bond issuances on earnings forecasts of equity analysts. Analyzing a global sample of listed companies from 40 countries, we find that analyst earnings forecasts become more accurate after green bond issuances. Green bond issuances attract attention from analysts, media, and institutional investors. The improvement in analyst forecast accuracy is more pronounced for firms offering greater accessibility to green bond related information, such as post-issuance reports. The effect is also stronger in countries with less stringent prior disclosure requirements. Overall, our findings demonstrate that equity analysts integrate unique information from green bond issuances into their earnings forecasts.

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1. Introduction

After over 4,500 comment letters and two years of deliberation, on March 6, 2024, the U.S. Securities and Exchange Commission (SEC) adopted its first climate disclosure rule with a 3-2 commissioner vote. This rule mandates listed companies to disclose climate-related risks, and for larger firms, greenhouse gas emissions. The adoption of the new rule provoked significant debate over the necessity of climate-related information disclosure, with discussions centering on potential regulatory overreach and First Amendment conflicts.[1] The controversy surrounding this disclosure rule continued, and in March 2025, the SEC voted to end its defence of the climate disclosure rule. While numerous firms engage in voluntary environmental reporting practices, a consensus regarding the importance and financial relevance of such environmental information has yet to be reached.

The emerging green bond market presents a good setting to examine the financial relevance of environmental information and sheds light on the debate over climate-related information disclosure. Green bonds, one of the most prevalent green financial instruments, enable issuers to allocate proceeds to finance or refinance projects that address climate and environmental issues. In practice, corporate green bond issuances require disclosure of details about the underlying green projects and post-issuance progress through green bond frameworks, external reviews, and impact reports.[2] Issuing green bonds signals issuers' environmental commitments (Flammer, 2021; Lu, 2025) while unveiling new nonfinancial information about their green initiatives. Existing studies also highlight a debate regarding their effectiveness, with some arguing that these instruments may bring limited improvements to the issuers' environmental performance (Tomunen and Yi, 2024). In this paper, we examine whether the issuance of a company's first green bond leads to greater analyst forecast accuracy. Answering whether green bond issuances contribute valuable information to a firm's earnings forecasts, or its

[1] The implementation of the new rule is also subject to challenges from the Major Questions Doctrine and Agency Deference, both of which are common deregulatory tools. See https://www.thomsonreuters.com/en-us/posts/esg/sec-climate-rule-first-amendment/ https://blogs.law.columbia.edu/climatechange/2023/12/11/the-secs-final-climate-disclosure-rule-must-respond-to-emerging-legal-risks/ for more details. The SEC announced in April 2024 that it would temporarily hold the implementation of its final climate disclosure rules until ongoing judicial challenges are resolved. In March 2025, the SEC decided to end its defense of the rules in the litigation.

[2] Typical green bond disclosure files include green bond frameworks, second-party opinions (SPOs), third-party assurances, allocation reports, and impact reports. Although disclosing these files is not universally mandatory, it aligns with best practices and investor expectations. One of the most influential voluntary guidelines for green bond frameworks, the Green Bond Principles established by the International Capital Market Association, recommends green bond issuers to report regularly after green bond issuances.

broader information environment, is crucial for investors and policymakers in the context of market development and regulatory frameworks.

The influence of corporate green bond issuances on information environments remains an open empirical question. On the one hand, issuing green bonds reduces information asymmetry and strengthens external monitoring. The disclosures associated with green bonds provide novel information regarding the issuing firm's environmental commitments and the underlying green projects. Green bond disclosures offer unique information by presenting project-specific details on environmental impacts and associated financial prospects, thus alleviating information asymmetry (Lang and Lundholm, 1996). Furthermore, green bonds are important signals of firms' green commitments and marks potential organizational and operational changes toward sustainability. They expand firm media coverage (Lu, 2025) and analyst coverage, therefore drawing more public attention. Institutional investors with environmental and social mandates also direct more attention to green bond issuers, recognizing their enhanced sustainability commitments. Surveillance from the media, analysts, and institutional investors raises the stakes of earnings management and misreporting, thereby incentivizing higher-quality corporate reporting. Therefore, issuing green bonds could potentially improve analyst forecast accuracy of the issuers.

Although green bond issuances boost public visibility and information availability, the impact of issuing a green bond on analyst forecasts can be constrained by non-standardized disclosure practices and the limited effectiveness of monitoring by institutional investors and external parties. The unstructured nature of green bond reporting imposes high processing costs for readers, which can harm the information environment of a firm. Unlike regulatory bodies, non-legal monitoring institutions like the media, analysts, and institutional investors lack enforcement capacity and face efficiency challenges. Chen, Harford, and Li (2007) show that institutional investors, especially those with short-term horizons, often favor passive trading over active monitoring for private gains. Scrutiny by analysts and media can motivate selective information disclosure, as it places pressure on managers to meet performance targets and investor expectations (Goldman, Martel, and Schneemeier, 2022), potentially undermining the quality of corporate information environments.

Beyond monitoring challenges, regulatory deficiencies in the global green bond market further compromise their effectiveness of green bonds as commitment devices. The green bond

market is a young market and lacks standardized international regulations.[3] The regulatory deficiencies may allow firms to misrepresent their environmental impacts or divert proceeds from stated purposes. Tomunen and Yi (2024), Bhagat and Yoon (2023), and Aswani and Rajgopal (2022) document limited environmental performance improvements and market responses following green bond issuances. Greenwashing in the green bond market degrades issuers' information environments, as issuers engaging in greenwashing disseminate disinformation to the public.

In our research, we compare firms that have issued at least one green bond to corporate bond issuers that have not entered the green bond market. We use a sample consisting of listed firms that are corporate bond issuers from 40 countries and regions spanning from 2010 to 2022. Our green bond issuance records are sourced mainly from Environmental Finance. There are 703 listed green bond issuers in our sample. We focus on financial analysts' earnings forecast-based measures, particularly average analyst forecast error, to assess the quality of corporate information environments. As shown by Harford, Jiang, Wang, and Xie (2019), analysts play an important intermediary role in the information environments of firms they cover. These analysts possess both the expertise to identify important firms and interpret corporate disclosures, and the career incentives to work carefully on understanding the implications of firm actions and deliver accurate forecasts. Consequently, analyst forecasts serve as reliable indicators of the quality of information environments.

Our empirical findings lend support for the conjecture that analyst earnings forecast accuracy improve with green bond issuances. We find that average analyst forecast error experiences statistically significant declines after the issuance year of the first green bond, with economically sizable magnitudes. These observed changes in analyst forecasts capture enhanced transparency and reduced asymmetry within issuers' information environments. The results are robust across alternative treatment years, analyst forecast measures, and sample compositions. Our findings highlight the impacts of corporate green bonds and the financial relevance of the nonfinancial information disclosed over the lifespan of green bonds.

Given that firms decide whether to issue green bonds, the choice of treatment is not random, and therefore, our baseline design is subject to selection bias. The improvements in analyst forecast accuracy could be attributed to corporate green projects or more broadly environmental, social, and governance (ESG) transformation actions regardless of green bond

[3] The European Union (EU) carried out the EU Green Bond Regulation in November 2023 to enhance the transparency of green bonds and reduce the risk of greenwashing.

issuances. To alleviate endogeneity concerns, we build a synthetic control sample for the treatment group.[4] For more rigorous causal inference, we employ the average number of green bonds underwritten by the investment banks that previously served as lead bond underwriters for the focal firm as an instrumental variable (IV). The choice of the IV arguably satisfies relevance and exclusion restriction. Banking relationships play a significant role in the underwriting market of corporate bonds (Yasuda, 2005). As underwriters compete for green bond issuances, those with more experience in managing green bonds have incentives to recommend green bond issuances to their existing conventional bond issuer clients. Meanwhile, the number of green bonds underwritten by investment banks should not directly influence analyst earnings forecasts. The green bond underwriting history of investment banks is shaped by the demand for green instruments in the overall market and the operating strategies of the banks. Both the synthetic control analysis and the two-stage least squares (2SLS) regressions implementing the IV approach produce evidence that is consistent with the argument that corporate green bond issuances are associated with increased analyst forecast accuracy.

The impact of green bond issuances on forecast accuracy is more pronounced for firms with larger green bond issuance volumes and for "pure play" green companies, whose primary business activities are dedicated to the green economy. At the country level, green bond issuances have a greater impact in countries with higher participation rates in the Science Based Targets initiative and in countries with weaker prior disclosure requirements, where the additional information provided by green bonds has a more significant influence. Furthermore, green bond issuances provide a more substantial informational benefit in industries where environmental factors are financially material, underlining the varied effects of green bond issuances based on firm-specific factors.

Information disclosure through green bond issuances works as an information dissemination vehicle that provide financial analysts with better understanding of issuers' green projects and commitments. The information in green bond pre-and post-issuance disclosures are unique in the way that they are project-based with use of proceeds explained and operational progress updated regularly. We confine our analyses on green bond issuers and find that the improvements in analyst forecast characteristics are more pronounced for issuers that make their green bond disclosure files publicly accessible. Our results underscore the importance of

[4] For each green bond issuer, we assign weights to conventional bond issuers in the same industry to construct a synthetic control unit that is the nearest neighbor to the green bond issuer. The matching method follows Abadie, Diamond, and Hainmueller (2010).

information accessibility around green bond issuances and the significant role of environmental information in financial forecasting. We document evidence that firms experience more stringent external monitoring after their first green bond issuances, as they experience an increased analyst coverage, media coverage, and institutional ownership. The issuing firms demonstrate improved financial reporting subsequent to their first green bond offering. Our analysis also reveals that green bond issuances are associated with significant reduction in earnings volatility. This increased earnings stability enhances the predictability of firm performance, contributing to the improvement in forecast accuracy.

This paper makes two main contributions. First, by investigating the impact of green bond issuances on analyst earnings forecasts, we contribute to the strand of literature discussing the firm-level real effects of green bond issuance. Prior literature finds mixed evidence on the secondary market reactions to green bond issuance and the existence of "greenium", the yield difference between green and conventional bonds.[5] Despite the ongoing debate over whether green bonds can yield excess returns in the secondary market and reduce borrowing costs, the connection between green bond issuances and information environments remains underexplored. The findings of this paper show that issuing corporate green bonds improves corporate earnings forecast accuracy, extending beyond the aspects of firm value and borrowing costs. The issuance of green bonds draws increased scrutiny from multiple stakeholders in the financial market and release new information, both of which facilitate analysts' understanding of a firm's performance.

Second, this research adds to the works exploring the financial implications of nonfinancial information disclosure. Related studies, including Grewal, Riedl, and Serafeim (2019) and Moss, Naughton, and Wang (2024) examine corporate level mandatory ESG disclosure. While these studies focus on mandated nonfinancial disclosures, green bond disclosures are unique as they involve nonfinancial information released after the issuance of a financial instrument. This paper extends the strand of literature on nonfinancial information disclosure by showing that the accessibility of information shapes both the overall corporate information environment and analysts' judgement. Making green bond disclosures more accessible can better facilitate investor and analyst understanding. Furthermore, in line with the findings of Dhaliwal, Radhakrishnan, Tsang, and Yang (2012), our results suggest that nonfinancial information has

[5] The papers discussing the stock market reactions to green bond issuances include Bhagat and Yoon (2023), Aswani and Rajgopal (2022), Flammer (2021), and Tang and Zhang (2020). The papers focusing on the greenium include Larcker and Watts (2020), Caramichael and Rapp (2022), and Zerbib (2019).

significant financial relevance. Analysts can infer useful information from both the act of issuing green bonds and the associated nonfinancial disclosures. Issuers who make their green bond disclosures available experience more substantial improvements in analyst forecast accuracy.

2. Literature and Hypothesis Development

In this section, we introduce the institutional background of green bonds and discuss relevant literature to develop hypotheses for our empirical analyses.

2.1 Green Bonds

The green bond market has grown in response to the increasing need for responsible investing and firms' demand to finance their environmentally friendly projects since its inception in 2007. Panel A of Figure 1 displays the development of the global green bond market in recent years. Both the aggregate volume and the number of green bond issuances followed an upward trend until the year of 2021. The issuance volume experienced a marginal decline in 2022 and rebounded in 2023. Corporate entities have been one of the major issuers in the green bond market, issuing 31% of the total green bonds in 2023. Vasakronan, a Swedish property company, issued the first corporate green bond in November 2013, marking the starting point for corporate green bond markets.

The process of green bond issuances usually consists of four steps. Prior to issuing green bonds, issuers need to identify eligible green projects and design a green bond framework that sets out the use of proceeds of the funds raised from the green bonds.[6] The green bond framework should undergo independent reviews from a second party (commonly an ESG consulting service provider) and a third party (typically an auditing firm) to verify the adherence with the Green Bond Principles (GBP) or other green bond standards.[7] The third step is the actual issuance of a green bond. This process parallels conventional bond issuance, which entails a series of essential steps, including regulatory approval, underwriting, credit

[6] For a project to be identified as green, it must align with an internationally recognized taxonomy (e.g., the EU Taxonomy and Common Ground Taxonomy). A green taxonomy is a regulatory classification system that highlights which investment options or economic activities are sustainable.

[7] The GBP are voluntary process guidelines for green bond issuances developed by the International Capital Market Association. The GBP outline the best practices for issuing green bonds and disclosing relevant information. Alignment with the GBP is voluntary, and it is not the only set of principles that the issuer can choose from. Another commonly used green bond issuance guidance is the Climate Bond Standard published by the Climate Bonds Initiative.

ratings, road shows, and book building. Finally, issuers should disclose the use of proceeds and publish audited reports regarding the allocation of the funds and the impact of their issued green bonds on a regular basis.

Aside from the rapid developments of the global green bond market, greenwashing has emerged as one of the biggest concerns for corporate green bonds. Corporate greenwashing refers to the case where firms convey false or misleading information about their environmental practices to shareholders and stakeholders. Curtis, Weidemaier, and Gulati (2024) emphasize the absence of enforceability of green commitments in the green bond market. In 2023, Caramuru Alimentos, a Brazilian soybean and corn processing company and issuer of green bonds, faced allegations of greenwashing. Investigations showed that funds raised through these bonds were channeled to Caramuru's soy suppliers, who were involved in illegal deforestation and land grabbing.[8] In 2022, Reclaim Finance, a climate campaign group, called on investor attention for potential greenwashing in the use of green bonds proceeds by Airport Authority Hong Kong.[9] Reclaim Finance argued that the green bonds were funding the construction of a new runway, which could harm coastal and marine biodiversity. Lam and Wurgler (2024) reveals that a large proportion of green bonds are refinancing launched projects with no novel green features. In instances of greenwashing, the information contained within the green bond disclosures loses its value, as it introduces disinformation into the market and compromises the issuer's information environments.

The regulatory frameworks governing green bonds is currently fragmented across international markets. While the EU implemented the EU Green Bond regulation in December 2023, other countries and regions lack comprehensive regulatory guidance. The regulatory inadequacies make greenwashing a predominant risk factor in the green bond markets. Beyond country-level regulations, issuers need to satisfy exchange-specific compliance requirements where their instruments are listed. For instance, the Luxembourg Green Exchange asks issuers to follow disclosure protocols and impose delisting penalties for non-compliance.

There is mixed evidence in the existing literature regarding the effects of issuing green bonds on stock returns and borrowing costs. For the reaction to green bond issuance in equity markets, Tang and Zhang (2020) and Flammer (2021) find positive equity market reactions to green bond issuances, while Bhagat and Yoon (2023) and Aswani and Rajgopal (2022) report

[8] See https://www.ft.com/content/81c0fe03-6569-422c-bda9-82f5a9631c57 for more.
[9] See https://www.scmp.com/business/article/3162333/sustainable-finance-greenwashing-concerns-raised-hong-kong-airport-floats for more details.

insignificant equity market reactions. For the borrowing costs of green bonds, Baker, Bergstresser, Serafeim, and Wurgler (2018), Zerbib (2019), and Caramichael and Rapp (2024) document the existence of greenium. Larcker and Watts (2020) and Flammer (2021) find no significant difference in the yields of green bonds and conventional bonds. D'Amico, Klausmann, and Pancost (2023) develop a model to analyze the risk-free yield spread between sovereign green and conventional bonds. Daubanes, Mitali, and Rochet (2024) build a signaling model that shows the motivation to issue green bonds is amplified by managers' interest in stock price.

Other studies on green bonds examine their impact on corporate environmental performances and other types of corporate bonds. Flammer (2021) points to the environmental impacts of corporate green bonds by showing that after a green bond issuance, issuers reduce their greenhouse gas (GHG) intensities. Additionally, Benincasa, Fu, Mishra, and Paranjape (2022) show that green bonds have positive spillover effects on the pricing of subsequent conventional bonds.

2.2 Green Bond Issuances and Analyst Forecasts

The issuances of corporate green bonds can potentially improve analyst forecast accuracy through two channels: enhanced monitoring and new information disclosure. The decision to issue a green bond attracts attention from media, analysts, and institutional investors. Lu (2025) provides evidence indicating that firms experience escalated media coverage following the issuance of green bonds. Previous research has shown that media not only redistributes information to the public but also has a monitoring role to firms through its investigative reports (Miller, 2006; Dyck, Morse, and Zingales, 2010). The amplified media coverage brings intensified media monitoring and scrutiny, raising the cost for issuers to disseminate inaccurate or deceptive information.

Meanwhile, institutional investors with environmental and social mandates seek to allocate funds to firms that show commitments to green transformation and excellence in environmental performance (Gantchev, Giannetti, and Li, 2022; Starks, Venkat, and Zhu, 2025; Gibbons, 2024). The issuance of a green bond signals commitments to environmental issues and attracts institutional owners to the issuer's shareholder base, eventually leading to a clientele effect. The influx of institutional investors is particularly important because their monitoring role is essential for investor protection (Gillan and Starks, 2000; Cheng, Huang, Li, and Lobo, 2010).

Firms have incentives to strengthen their reporting quality in response to the attention of institutional owners. Interaction with institutional investors establishes closer connections between green bond issuers and analysts through common institutional clients, as shown by Li, Wong, and Yu (2020). With institutional owners acting as information dissemination channels, analysts gain more knowledge of green bond issuers, potentially leading to more precise forecasts.

Beyond institutional investors, financial analysts also observe firms' decisions on green bond issuances. As discussed in Harford, Jiang, Wang, and Xie (2019), analysts would strategically allocate their attention to cater to the needs of institutional investors and cover firms that are more important to their career. Therefore, financial analysts may direct more of their attention to green bond issuers. Appendix B provides detailed evidence from earnings call transcripts and analyst research reports documenting financial analysts' attention to both green bond issuances and firms' prospective green bond issuance strategies. The cases presented in Appendix B demonstrate analysts' consideration of the purposes and benefits of issuing green bonds.

Analysts, as argued in Jensen and Meckling (1976), have a comparative advantage in monitoring corporate governance. Analysts have the professional knowledge to detect potential inadequate corporate governance practices and have the career incentives to blow a whistle on corporate misconduct (Yu, 2008; Dyck, Morse, and Zingales, 2010). Meanwhile, analysts may invest more effort towards firms with enhanced media exposure. Bradshaw, Lock, Wang, and Zhou (2021) show that increased media coverage leads to more attention from analysts. Analysts can produce more accurate forecasts for green bond issuers as issuers experience increased media coverage following green bond issuances. Therefore, increased analyst coverage could encourage firms to raise their disclosure transparency. The media, analysts, and institutional investors collectively enhance monitoring of the green bond issuers, and the issuers have incentives to be more cautious with their financial and nonfinancial reporting.

Another important aspect of green bond issuances is the information disclosed in the process of issuing green bonds. Goldstein, Kopytov, Shen, and Xiang's (2024) theoretical models suggest that environmental information disclosures are important for corporate information environments, as they augment the price informativeness about ESG performance. Previous research on non-financial information, such as the works of Dhaliwal, Radhakrishnan, Tsang, and Yang (2012) and Chen, Hung, and Wang (2018), indicates that CSR information is important for analyst forecasts and firm profitability, respectively. Information accompanying

green bond issuances, while very different from other types of non-financial disclosures, can contribute to analyst earnings forecast accuracy in the following ways.

Firstly, the action of a green bond issuance itself sends a signal to the market that reveals the type of the issuing firm (Flammer, 2021). The issuance of a green bond conveys to the market that the issuer is the type of firm with a strong commitment to environmental initiatives. Secondly, as introduced in section 2.1, the process of issuing a green bond requires the disclosure of a green bond framework, external review, and post-issuance reports. These documents present fresh nonfinancial information regarding the issuers' green projects, environmental commitments, and long-term plans for sustainability transition. Such disclosures are valuable to analysts, as supported by several recent studies. Sautner, Vilkov, van Lent, and Zhang (2023) provide evidence that financial analysts actively use and increasingly incorporate environmental information into their discussions and forecasts. Derrien, Krueger, Landier, and Yao (2025) confirm that analysts revise forecasts according to ESG news, and Park, Yoon, and Zach (2024) show that analysts integrate ESG risks in their assessments.

Furthermore, green bond disclosures offer unique project-specific information with a comprehensive description and detailed environmental impacts of the underlying projects of the green bonds. These project-specific information included in green bond disclosures offers additional transparency and verifiability absent in conventional bond disclosures, which typically provide only a general overview of how proceeds will be used. Following the issuances of green bonds, the release of new information can facilitate assessments of firm risks and reduces information asymmetry among investors. This enhanced transparency and information flow can hold financial relevance especially when the green projects financed by the bonds entail revenue-generating or cost-effective initiatives. For example, when green bonds finance infrastructure such as public transit systems powered by renewable energy, they demonstrate potential for future cashflow generation. Thus, the nonfinancial information disclosed with green bond issuances inherently carries financial implications. By detailing green projects and reducing asymmetry, green bond disclosures refine the overall corporate information environments.

Conversely, one can argue that green bonds have minimal influence on a company's analyst earnings forecasts. Institutional investors whose monitoring costs outweigh the potential financial gains from influencing firm management would prefer short-term trading rather than monitoring (Chen, Harford, and Li, 2007). Journalists and analysts' career incentive for

monitoring green bond issuers can be limited for smaller-sized issuers (Dyck, Morse, and Zingales, 2010). The incremental change of scrutiny strength might be so small that green bond issuers see no need to improve the quality of their financial and nonfinancial reporting. From the perspective of managers, analysts and media attention poses stress on meeting performance targets and can induce more earnings management and selective disclosing (Matsumoto, 2002; Bernhardt and Campello, 2007; Goldman, Matrel, and Schneemeier, 2022). Hence, the intensified attention from these three types of potential monitoring groups following the issuances of green bonds may have limited impacts on analyst forecast accuracy.

The potentially restricted effects of green bond issuances may be further reflected in green bond disclosure practices, where firms typically disclose their green transition agendas and environmental project developments. The disclosures bundled with green bond issuances do not have a standardized form, giving the issuers chances to exploit the lack of guidance and meet the minimal disclosure requirement by providing low-quality information (Christensen, Hail, and Leuz, 2021). The accessibility, ambiguity, and readability of the information can harm the financial materiality of green bond disclosure and lead to confusion among investors and analysts. Lastly, greenwashing by green bond issuers can contaminate the information environments by adding disinformation to the financial market.

Hypothesis 1: *Green bond issuances enhance the accuracy of analysts' consensus forecasts for the issuers.*

Green bond disclosures contain information that is useful to analysts in generating earnings forecasts. Green bond frameworks and reports introduce the underlying green projects that could be revenue-generating or cost-saving (e.g., construction of energy farms, waste recycling systems). As shown by Chi, Hwang, and Zheng (2025), information regarding these projects could be useful for analysts as alternative data and can help analysts enhance their forecasts. Since publishing frameworks and post-issuance reports for green bonds is not universally mandated, some issuers disclose more information regarding their green bonds than others. The accessibility of disclosures matters because if information about green bonds is difficult to locate, it will not reach its readers effectively and will raise the processing costs associated with green bond disclosures. We conjecture that green bond issuers who make their green bond related files more accessible experience more pronounced improvements in analyst earnings forecast accuracy.

Hypothesis 2: *The improvements in analyst forecast accuracy are more pronounced when green bond issuers make their green bond disclosures accessible.*

3. Data and Summary Statistics

This section discusses the data sources for our main variables and describes the final sample constructed for our analyses.

3.1 Green Bond Data

Our green bond issuance history dataset integrates information from three sources: Environmental Finance, Bloomberg, and LSEG Refinitiv. Environmental Finance is an online news and analysis provider focusing on sustainable finance. We use Environmental Finance as the main source for green bond issuance history and augment the data with additional issuance history from Bloomberg and LSEG Refinitiv. Figure IA1 of Internet Appendix compares the green bond issuance data of publicly listed firms across the three data sources. The Environmental Finance data covers more green bond issuances in the 2010s, while Bloomberg has a greater coverage from 2021 to 2022. Combining these three datasets of green bonds allows us to build a comprehensive dataset for green bond issuances. We exclude green bonds that were issued through private placements (those without bond identifiers) and green bonds issued by private firms and other non-listed entities. Although the green labels of the bonds in the data sources are self-labeled by issuers, we remove bonds that fail to align with any established sustainable bond principles.

3.2 Analyst Forecasts

We measure the quality of corporate information environments with analyst forecast error (*AFE*). Analysts serve as an information intermediary between firms and investors as they intake information released by firms and produce forecasts and recommendations to investors. They are also one of the major consumers of the information and signals released by firms, as they rely on them to produce accurate forecasts and make recommendations to fulfil their intermediary role between firms and investors (Gibbons, Iliev, and Kalodimos, 2021). Analyst forecast error is calculated as the equally weighted average absolute earnings per share (EPS) forecast error of one-year-ahead forecasts scaled by beginning-of-year stock price following

Chang, Ljungqvist, and Tseng (2023). We use Worldscope and I/B/E/S as our data sources for the firm-level variables and analyst earnings forecast details, respectively.

3.3 Final Sample and Summary Statistics

The final sample contains 5,846 listed bond issuers from 40 countries with firm financials covered by Worldscope and analyst forecast details covered by I/B/E/S. The sample firms include 703 green bond issuers, while the remainder constitute conventional bond issuers that have not issued a green bond. Panel B of Figure 1 shows the volume of green bond issuances by country for firms in the sample. Firms residing in countries in North America, the European Union, and East Asia are major issuers of green bonds. Panel A of Table 1 provides a breakdown of the sample by country. Japan, China, and the United States are the three nations with the largest number of public green bond issuers in our sample. The composition of our public green bond issuer sample is comparable to that of Flammer (2021) and Tang and Zhang (2020), with China and the United States remaining the primary sources of green bond issuing firms, while Japan has emerged as a significant contributor in recent years.[10]

Table IA1 provides an overview of the green bond issuer selection procedures we applied to our dataset. While the raw data encompasses over three thousand corporate green bond issuers, our final sample consists of 703 unique listed issuers after excluding private firms and those lacking financial and analyst data. We also report both the number of listed green bond issuers before and after merging with I/B/E/S analyst forecast details in Panel A of Table 1. We lose many of the green and conventional bond issuers due to limited I/B/E/S data coverage, especially for firms domiciled in China, Japan, and Sweden. Figure IA2 plots the number of new unique listed green bond issuers that enters the corporate green bond market throughout our sample period. The number of unique new issuers shows a year-on-year increase, except for a decline in 2022. Panel B of Table 1 summarizes the main variables.[11] Of all the observations in our sample, around 14% derives from green bond issuers. Median analyst

[10] Flammer (2021) uses an international sample of green bonds issued from 2013 to 2018. Tang and Zhang (2020) use an international sample of green bonds issued from 2007 to 2017. The number of green bond issuers in Japan surged during 2020 - 2022. The reason why Japan has so many unique listed green bond issuers can be attributed to the parent firms' tendency of issuing through multiple listed subsidiary entities. For example, Sumitomo Corporation issued green bonds through six of its subsidiaries, and the Mitsubishi Group issued green bonds through four of its subsidiaries.

[11] We also summarize analyst forecast dispersion in Table 1 Panel B. We use this variable to examine the role of information released with green bond issuances. The number of observations for analyst forecast dispersion falls below that of analyst forecast error, since firms with single-analyst EPS forecast coverage lack necessary data to calculate forecast dispersion.

forecast error is 1.29% of the beginning-of-year stock price. On average, a firm in the sample is followed by 10.23 analysts. Panel C of Table 1 reports the summary statistics for the main variables for green bond issuers and conventional bond issuers. Green bond issuers are generally firms of larger sizes, with lower leverage ratios and higher levels of analyst coverage relative to their conventional counterparts.

4. Green Bonds and Analyst Forecasts

In this section, we perform baseline analyses on the relationship between green bond issuances and analyst forecast characteristics. We begin by introducing our research design and baseline findings, followed by addressing potential endogeneity concerns. The final subsection explores heterogeneous effects of green bond issuances.

4.1 Baseline Results

To study the effect of green bond issuance on analyst forecasts, we estimate the following specification in the baseline regression:

$$Analyst\ Forecast\ Error_{i,t} = \beta_0 + \beta_1 After\ GB\ Issuance_{i,t} + \boldsymbol{X}_{i,t}\gamma + \eta_i + \delta_t + \epsilon_{i,t} \quad (1)$$

The dependent variable is analyst forecast error. The independent variable is *After GB Issuance*, a binary variable that indicates whether a firm has issued its first green bond.[12] This variable remains zero for firms that are not green bond issuers. The coefficient β_1 captures how analysts forecast error change with the issuance of green bonds for green bond issuers. We also include firm and year fixed effects to control for unobservable but persistent differences between firms and temporal variations throughout the sample period. The vector of control variables $\boldsymbol{X}_{i,t}$ follows the specification of Batta, Qiu, and Yu (2016). It consists of various firm characteristics, including firm size, leverage, market-to-book ratio (*M/B*), return on assets (*ROA*), capital expenditure (*Capex*), sales growth, property plant and equipment (*PPE*), research and development expenditure (*R&D*). Additionally, control variables incorporate GDP per capita, excess yearly return, a binary variable indicating secondary equity issuance (*Stock Issuance*), the number of unique analysts covering the firm (*Analyst Count*), the average analyst forecast horizon (*Horizon*), and the yearly median of the daily bid-ask spreads (*Bid-ask Spread*).

[12] We focus on the first issuance of green bonds because subsequent green bond issuances may not attract as much attention from the market as the first green bond, and the disclosure around subsequent green bonds could contain repetitive content that already came out with the issuance of the first green bond.

Table 2 reports the baseline estimation results of the impact of green bond issuance on corporate analyst forecasts. The first column estimates the treatment effects of green bond issuances without including control variables. In column (2), we add the full set of control variables to the regression specification. The coefficient of *After GB Issuance* is negative and statistically significant across all specifications in Table 2, supporting the hypothesis that green bond issuance reduces analyst forecast error. This evidence indicates improvements in corporate information environments. According to column (2), issuing firms, on average, experience a 1.29% reduction in their average analyst forecast error. The results are economically significant, with coefficients in column (2) representing improvements of 12% of the sample standard deviation in forecast accuracy. The regression specification with a single explanatory variable and fixed effects in column (1) has an R-squared value of 0.25. This value is not substantially lower than the R-squared from regressions with control variables in column (2), suggesting that the explanatory power of our baseline estimation is not primarily driven by control variables.

We plot the dynamic effects of first green bond issuance on analyst forecast error using the two-way fixed effects (TWFE) specification in Equation (1) in Figure 2. We replace the *After GB Issuance* variable with a series of indicators measuring the number of years until or since the green bond issuance year in our estimation. Figure 2 includes the estimated coefficients normalized to the year before first green bond issuance and their 95% confidence intervals. Before the first issuance, there are no differential pre-trends in analyst forecast error, suggesting that the analyst forecast characteristics of green bond issuers and conventional bond issuers have evolved similarly in the absence of treatment. In the period following their initial green bond issuance, issuers experience decreases in average forecast error, compared to control firms. The decline in analyst forecast error exhibits a certain degree of persistence, remaining present four years after the initial issuance.

To examine whether post-issuance analyst forecast modifications originate from a niche group specializing in environmental practices or reflect broader collective enhancement by majority analysts, we first test whether the impact of green bonds is stronger for firms covered by fewer analysts. Table IA2 in the Internet Appendix presents baseline results for firms with below- and above-median analyst coverage. The comparable effects across the two groups, regardless of coverage level, indicates that the baseline impact of green bonds is less likely to be predominantly attributed to a small group of expert analysts that are particularly paying attention to green bonds. If the outcome is primarily driven by specialized analysts, we would

expect amplified effects in firms with limited analyst coverage. We additionally compute relative forecast accuracy, following the methodology of Harford, Jiang, Wang, and Xie (2019), for individual analysts covering green bond issuers during the periods preceding and following issuance. The distributional patterns of individual forecast accuracy—measured in relation to the full cohort of analysts covering the same firm—demonstrate consistency across the pre- and post-issuance intervals. The Kolmogorov-Smirnov test for the equality of the distributions of relative forecast accuracy produces a D statistic of 0.01 (p-value = 0.49), failing to reject the null hypothesis of distributional equivalence. The distributional equivalence suggests that the enhanced forecast accuracy is more plausibly a result of collective improvements within the analyst population rather than selective gains in individual analyst performance.

4.2 Robustness Tests

Our empirical estimation results are robust to alternative event dates, alternative measures, and an alternative control group. The regression estimations reported in Table 3 evaluate the robustness of the baseline results. In column (1) of Panel A, we consider the announcement date of a firm's first corporate green bond as the treatment date, rather than the actual issuance date. In column (2) of Panel A, we expand the control group to include all listed firms that have not issued a green bond, including those that did not issue any bonds during the sample period. In column (3) of Panel A, we consider a subsample that excludes firms in the banking industry, given their significant role as major issuers of green bonds.[13] The estimations with alternative treatment dates, and alternative samples validate the reduction in analyst forecast error following green bond issuances or announcements.

Panel B of Table 3 summarizes the estimations deploying alternative calculation methods of analyst forecast characteristics. In column (1), we substitute the single-period measures with a three-period forward average of forecast error. Column (2) uses logarithmic transformations of analyst forecast error as dependent variable. The final specification in column (3) of Panel B uses an alternative scaling method. The absolute average analyst forecast error is scaled by actual EPS (Loh and Shultz, 2018). The estimations incorporating alternative measures consistently yield significant negative coefficients on the binary variable indicating the impact of green bond issuances.

[13] See Internet Appendix Figure IA3 for green bond issuance by industry. The banking sector leads in both aggregate green bond issuance volume and the number of green bonds issued.

In order to ensure that our baseline results are not driven by influential outliers, following Leone, Minutti-Meza, and Wasley (2019), we implement robust regression methodology (M-estimators). The corresponding results are reported in column (1) of Table 3, Panel C. To address the potential influence of country- and industry-specific green finance regulatory and policy variations on corporate green bond issuance decisions, we replace year fixed effects with country-year fixed effects in column (2) of Panel C, and with industry-year fixed effects in column (3). The M-estimators and the regressions incorporating alternative fixed effects yield similar inferences.

Recent studies on the staggered two-way fixed effects estimation emphasize that traditional TWFE relies on assumptions of homogeneity in treatment effect. When treatment effects are heterogeneous, standard TWFE regression estimates can be greatly biased due to the "forbidden" comparisons between cohorts that are both already treated. To address concerns about the reliability of the standard TWFE estimator, we employ heterogeneity-robust staggered treatment estimators developed by Sun and Abraham (2021), Callaway and Sant'Anna (2021), Borusyak, Jaravel, and Spiess (2024), De Chaisemartin and D'Haultfeuille (2020), and a stacked regressions design to our baseline regression specification. These estimators yield sensible results under arbitrary heterogeneous treatment effects. We report the results in Table IA3 of the Internet Appendix. Across all estimators, we consistently observe the impact of green bond issuances in reducing analyst forecast error.

4.3 Addressing Endogeneity Concerns

Green bond issuances are not random. Green bond issuers are typically outperformers in environmental and social practices. Control firms could also undertake green projects without issuing green bonds because they want to avoid public scrutiny that comes with the increased public attention after green bond issuance. In this section, we use the synthetic control method (SCM), an instrumental variable, and placebo tests to address the potential selection bias inherent in our green bond issuer treatment group.

4.3.1 Synthetic Controls

In accordance with Abadie, Diamond, and Hainmueller (2010), we create synthetic control units for each green bond issuer in our sample. The SCM allows the data to identify control units through a weighted average of potential candidates. This methodology aims to minimize the pre-treatment distance between the artificial control unit and the treated unit. For each green

bond issuer, we assign weights to conventional bond issuers within the same industry.[14] In constructing the synthetic control units, we employ ordinary least squares to minimize the distance between pre-issuance trends of firm characteristics—such as size, Return on Assets (ROA), and leverage—and firm ESG performance, as measured by Refinitiv ASSET4 ratings, for green bond issuers and the control units. The pre-issuance trends are measured in a two-year window before the issue year of the first green bonds following Flammer (2021). Of all the green bond issuers in the sample, we were able to construct synthetic control units for 580 of them.[15]

We plot the differences between treatment units and synthetic control units around the first green bond issuance in Figure IA4. Each panel in Figure IA4 represents a specific metric used to construct the synthetic controls. Each point in these panels denotes the estimated differential between the treatment and control groups at a particular time relative to the initial issuance year, along with their corresponding confidence intervals. Regarding all firm characteristics and ESG performance metric employed in constructing control units, they share similar pre-issuance trends with the treatment units, as the estimated differences before first issuance (periods to first issuance < 0) across all panels of Figure IA4 are not statistically different from zero. Table 4 presents the results of running the regression specified in Equation (1) with analyst forecast accuracy as dependent variable in the synthetically matched sample. All specifications in Table 4 support the baseline results that the issuance of the first green bond has negative impacts on mean analyst forecast error. The absolute magnitude of the coefficients in Table 4 is slightly smaller than the baseline estimation, and the regression estimations in the synthetically matched sample support the baseline findings.

4.3.2 Underwriter Green Bond History

To further alleviate the concern for potential endogeneity issues, we conduct two-stage least squares (2SLS) regression with an instrumental variable (IV). We incorporate the average number of green bonds underwritten by the investment banks that had previously served as the primary underwriter for a firm's bonds as an instrumental variable. This IV satisfies the two key criteria. It is closely related to a firm's decision of green bond issuance, since the

[14] Our pool of potential controls includes conventional bond issuers within the same SIC 2-digit industry code across different countries. We do not limit our control units to be within the same country because firms learn from their international peers about using green bonds as a financial instrument. Green bond issuances are not likely to be a behavior that clusters within the same country.

[15] We lost some of the green bond issuers in the process of constructing synthetic control units because some of the green bond issuers were not covered by the ESG ratings from ASSET4 in the pre-treatment period.

investment banking relationship is one of the key determinants in the underwriting market of corporate bonds (Yasuda 2005). As investment banks compete in the green bond underwriting markets, investment bankers who are experienced with green bonds have incentives to approach clients and recommend issuing green bonds, raising their clients' chances of issuing green bonds. Meanwhile, an investment bank's green bond underwriting history is unlikely to directly affect client firms' information environments, except through green bond issuances. The green bond underwriting history of banks are shaped by market demand for green instruments and their operating strategies and these factors are external to individual firm's information environments. Regulatory framework governing investment banks mandate information barriers between debt underwriting teams and equity research divisions, which strategically minimizes the chance that underwriters' green bond business directly influences equity analysts' forecasts. Accordingly, the impact of underwriter green bond expertise on firm-level information environments should be mediated only through the corporate decision to issue green bonds.

A potential challenge to the exclusion restriction could arise if higher-quality underwriters with extensive green bond experience tend to engage with firms with better information environments or financial performance. Through scatter plots and OLS fitted lines in Figure IA5 of the Internet Appendix, we analyze the distribution of firm characteristics across different levels of underwriter green bond expertise. Most characteristics - including leverage, M/B ratio, ROA, sales growth, analyst forecast error, forecast dispersion, analyst coverage, and forecast horizon - show stable relationships with underwriter green bond history. The only exception is firm size, where the scatter plot indicates that larger firms are slightly more likely to engage with underwriters with more experience in green bonds. These patterns suggest that firm characteristics show minimal variation with underwriter green bond expertise and our choice of IV likely satisfies the exclusion restriction condition.

Table 5 reports the 2SLS estimation results with the average number of green bonds underwritten by investment banks that had worked as the primary bond underwriter as an IV. In the first stage, as shown in specification (1) we regress the binary variable indicating the issuance of the first green bond on the IV. The IV passes the weak instrument test, with a Cragg-Donald F statistic of 1180.3. The coefficient on the average cumulative green bond underwritten by investment banks that had worked as the primary underwriter of the firm is positively significant, fulfilling the relevance condition. Columns (2) and (3) present the second-stage regression results. In both specifications, the coefficients on the predicted value

of *After GB Issuance* are negative and statistically significant. The results imply that the analyst forecasts of green bond issuers become more accurate and less dispersed after the issuance of the first green bond.

4.4 Heterogeneity in Green Bond Impacts

The baseline findings in the previous section suggest that corporate analyst forecast error reduces after the issuances of green bonds. In this section, we present tests that explore the heterogeneity in the impacts of green bond issuances.

4.4.1 Climate Commitments, Materiality, Culture, and Legal Origins

Societal demands for corporate environmental responsibility represents a dimension that could potentially influence the impacts of green bond issuances. Within economies where corporate environmental commitments are highly valued by investors and the public, green bond issuances attract greater attention, and analysts would dedicate more efforts to producing forecasts for green bond issuers. We use the participation rate in the Science Based Targets initiative (SBTi) among publicly traded companies to quantify country-level corporate green commitment. SBTi, a United Nations organization, provides frameworks and tools for firms to declare their science-based net-zero targets.[16] We classify firms into groups representing high and low levels of SBTi participation using the sample median of 3.4% as the threshold. Results reported in columns (1) and (2) of Table 6 Panel A show that green bond issuances significantly affect analyst forecast accuracy only in countries with high SBTi participation rates. The statistically significant difference in coefficients between high and low SBTi groups, with an F statistic of 4.22, indicates that green bond issuances exert stronger effects in countries that value green commitments more.

A firm's exposure to environmental-related issues varies with its industry. We classify industries into two groups based on the Sustainability Accounting Standards Board (SASB) materiality standards. The first group includes firms operating in industries where at least one environmental factor is deemed financially material by SASB. [17] The second group consists of firms in industries where no environmental factors are classified as material. Columns (3) and

[16] The participation in SBTi is not required by governments. Its voluntary nature enables measurement of corporate environmental commitment independent of regulatory pressure.
[17] The SASB identifies six environmental factors that a considered financially material: greenhouse gas emissions, air quality, energy management, water and wastewater management, waste and hazardous materials management, and ecological impacts.

(4) of Table 6 Panel A present regression results for firms at different levels of industry exposure on environmental factors. Although issuing green bonds significantly reduces analyst forecast error in both groups, the effect is more pronounced among firms in industries with environmental materiality. The difference between the two coefficients produces a significant F statistic of 5.61. These findings indicate that green bond issuance generates stronger improvements in forecast accuracy for firms whose financial performance is more closely tied to environmental factors.

National regulatory differences on information transparency could amplify the impact of green bond issuances on analyst forecasts, as green bonds bring new signals and disclosures. When pre-existing regulatory requirements on disclosure is less extensive, the inclusion of new information accompanying green bonds would generate greater incremental impacts. Following Maffett (2012), we adopt La Porta, Lopez-De-Silanes, and Shleifer's (2006) required disclosure intensity index as a metric for ex-ante disclosure requirement at the national level. Our sample is segmented according to the median value of disclosure requirements to test the influence of green bond issuances on analyst forecast error in different national contexts. The results detailed in Panel B of Table 6 demonstrate a more salient impact of green bond issuances in countries characterized by weaker pre-existing disclosure requirements, as indicated by the more negative coefficient on *After GB Issuance* in column (2). Panel B of Table 6 demonstrates that firms in countries exhibiting weaker ex-ante disclosure requirements experience more pronounced impacts on analyst forecasts following green bond issuances, with the coefficient differences between disclosure requirements groups being statistically significant.

Lastly, country characteristics influence firms' environmental decisions (Ferrell, Liang, and Renneboog, 2016). Liang and Renneboog (2017) argue that in non-common law countries, the law systems emphasize stakeholder benefits and therefore firms typically exhibit superior environmental awareness. To explore whether the relationship between the issuance of the first corporate green bond and firm information environment differs with law systems, we run the baseline regression in Equation (1) in two subsamples: firms incorporated in common-law countries and firms incorporated in non-common-law countries. Columns (1) and (2) of Table IA4 Panel A in the Internet Appendix present the estimation results of the baseline model within subsamples consisting of firms in these two types of legal systems. The impact of green bond issuance is significantly negative in both subsamples, with the estimated coefficient for common law countries slightly smaller in absolute magnitude than the coefficient for countries

with other law systems. The test on the equality of two coefficients does not reject the null hypothesis.

We further examine the heterogenous impacts of green bond issuances across distinct non-English legal origin countries. The regression results documented in columns (3) and (4) of Table IA4 Panel A demonstrate differential outcomes for firms established in countries with French and German legal systems, as well as Nordic nations (specifically Denmark, Finland, Norway, and Sweden) operating under Scandinavian legal systems, respectively. The most pronounced reduction (2.12%) in analyst forecast error following green bond issuances occurs in Nordic countries, traditional leaders in climate mitigation initiatives.While the difference in the coefficients between Nordic and French-German civil law firms is not significant, the larger magnitude of impact reflects greater investor attention for environmental investments in Nordic markets, and more comprehensive green bond disclosure practices by Nordic issuers. In terms of green bond regulation, despite the EU's more comprehensive regulatory framework for green bonds, our findings are not primarily driven by the additional regulation imposed on EU issuers. Panel B of Table IA4 shows that green bond issuances significantly impacts EU and non-EU issuers, with no statistical difference between their coefficients.

4.4.2 Issuance Characteristics

In this section, we explore whether the main treatment effects from the baseline estimation vary depending on the features of green bond issuances. Although green bond issuances signify a commitment to environmental matters, the extent of this commitment can vary among firms. We attempt to proxy the level of environmental commitment through two dimensions: the volume of the green bond issuances and the primary business activities of a firm. Our focus is on firms with larger green bond issuance volumes and "pure play" green companies, whose main business activities are dedicated to the green economy. We define two binary variables: (1) *Large Volume Issuance,* which indicates whether the volume of the initial green bond issuance exceeds the average issuance volume, and (2) *Pure Play*, denoting whether a firm operates exclusively within the environmentally sustainable sector.[18]

In column (1) of Table 7, we examine the intensive margin of green bond issuances by converting the binary treatment variable to *GB Issuance Volume*, a continuous treatment variable that corresponds to the green bond issuance volume after green bond issuances, and

[18] The sizes of green bonds are scaled by the total assets of the issuer. In this study, we define the firms whose green revenue exceeds 90% of their total revenue as "pure play" green companies. We use the green revenue data from the FTSE Russell Green Revenues.

zero otherwise. Column (1) demonstrates that the effect of green bond issuance volume has a negative significant coefficient, suggesting a significant impact of increasing green bond issuance volume on analyst forecast accuracy. In using green bond issuance volume as the treatment variable, the continuous treatment design has an underlying assumption that high-dose units would have the same treatment effects as low-dose units (Callaway, Goodman-Bacon, and Sant'Anna, 2024). Following Cook, Jones, Logan, and Rose (2023), we present balancing test results in Figure IA6 of Internet Appendix to evaluate the extent to which green bond issuance volume correlates with covariates. The coefficient estimates indicate that the control variables do not show significant association with the magnitude of green bond issuance volume, except for GDP per capita.

We incorporate interactions of the environmental commitment measures with the main independent variable, *After GB Issuance*, and report the estimation results in Table 7. Column (2) shows estimation results with the interaction term between *Large Volume Issuance* and *After GB Issuance*. The negative significant coefficient on the interaction term confirms that the enhancements in analyst forecasts are more pronounced for firms issuing larger-sized green bonds. Column (3) of Table 7 presents regression results in which bond issuers are classified based on their categorization as "pure play" green companies. The interaction term has a statistically significant negative coefficient. The empirical evidence suggests the influence of green bond issuances on the improvement analyst forecast accuracy is notably stronger for two specific subsets of firms: large-scale green bond issuers and firms that operate as "pure play" companies. While large-scale issuers likely demonstrate stronger commitment and provide more information through green bond issuances, pure play issuers benefit from their concentrated business focus and introduce less noise to their information environment when issuing green bonds.

5. Channels and Mechanisms

The previous section provides evidence that analyst earnings forecast accuracy enhances after issuing green bonds. In this section, we discuss channels through which green bond issuances influence analyst forecasts.

5.1 Green Bond Disclosures

5.1.1 Disclosure of New Information and Analyst Forecast Dispersion

While issuing green bonds offers analysts additional information pertinent to the issuer's business activities, ambiguous disclosure may cause confusion among the analysts. Lang and Lundholm (1996) document that firms engaging in more comprehensive disclosure practices experience lower levels of analyst forecast dispersion. Before the issuances of green bonds, analysts relied on a shared set of public information on the issuers' ESG practices, along with different sets of private information on issuers' green projects and commitments. When firms disclose information about green projects and commitments through green bonds, analysts will place less weight on their private information, resulting in diminished disagreements among their forecasts. Bastianello, Décaire, and Guenzel (2024) argue that disagreement among analysts arises largely from differences in how analysts allocate weights to different types of information. Green bond issuances redirect analysts toward a shared focus on environmental information, making analysts converge their predictive weights and reducing forecast dispersion. Moreover, vague disclosures are unlikely to effectively reduce dispersion among analysts. Rajgopal and Venkatachalam (2011) and Bochkay, Markov, Subasi, Weisbrod (2022) find that the quality of information is inversely related to analyst forecast dispersion. Thus, analyst forecast dispersion is expected to reduce if green bond disclosures are informative.

We analyze the changes in analyst forecast dispersion after the issuance of the first corporate green bond by substituting the dependent variable in Equation (1) with analyst forecast dispersion (*AFD*). The findings are reported in Table 8. Analyst forecast dispersion is measured as the standard deviation of analysts' one-year-ahead EPS forecasts scaled by the beginning-of-year stock price, following Boone and White (2015). In column (1) of Table 8, the dependent variable is the analyst forecast dispersion, whereas in column (2), it is the natural logarithm of analyst forecast dispersion. Across both specifications, the coefficient on *After GB Issuance* is negatively significant, indicating that analyst forecasts become notably less dispersed following the issuances of the first green bond. The magnitude of the coefficient in column (1) suggests a 5.75% reduction in analyst forecast dispersion after green bond issuances, which is equivalent to a 10% reduction of sample standard deviation of forecast dispersion.

The observed outcome indicates that the reduction in forecast errors is not a consequence of discrepancies in analysts' assessments of future earnings of green bond issuers. The decrease in forecast dispersion aligns with the idea that additional public information fosters greater consensus of beliefs across analysts by improving the precision of the shared public information. Furthermore, these results imply that disclosures accompanying green bonds are

informative and relevant, with analysts placing greater weights to this new public information, thereby reaching a less dispersed distribution of analyst forecasts.

5.1.2 Disclosure Accessibility

The accessibility of disclosures released during and after green bond issuances plays a crucial role in determining the ability for new information to reach its intended recipients and in reducing the information processing costs for investors and analysts. Maintaining a high level of information accessibility facilitates new information flow into the overall information environments. Issuers of green bonds typically report their green project details and progress through their official websites. Nevertheless, some issuers restrict their disclosure documentation exclusively to data vendors, while a portion of issuers choose to abstain from disclosing information. Since our analyses focus on first-time green bond issuances, the availability of pre-issuance disclosures is particularly useful for investors and analysts around the time of issuance.

Within a sample of green bond issuers, we interact the variable indicating green bond issuances with three binary variables measuring the accessibility of green bond information. Disclosures Publicly Available denotes the accessibility of green bond disclosure documentation through search engines. Disclosures Available on Official Websites stands for the presence of green bond-related disclosures on issuers' official websites. Pre-issuance Disclosures Available indicates whether a green bond issuer publishes pre-issuance documents detailing their green projects and environmental initiatives.[19] In cases where green bond issuers that do not make the information available, analysts and investors would have to search for relevant information through press releases and other sources. The process of information retrieval can be tedious and may impede the effectiveness of information dissemination.

We report the regression results of adding the interaction term denoting disclosure accessibility to the baseline specification in Equation (1) in Table 9. Column (1) addresses the overall accessibility of disclosures on search engines. The interaction between Disclosures Publicly Available and After GB Issuance is negatively significant, indicating that the negative impact of green bond issuances on the average analyst forecast error is estimated to be 0.83% greater for firms with better information accessibility compared to those whose disclosures are

[19] We measure the presence of pre-issuance disclosures through the availability of second party opinions on green bond frameworks. Pre-issuance disclosures of green bonds usually consist of green bond frameworks and second-party opinions. While some of the issuers delete their frameworks after green bond issuances, SPO providers typically maintain access to the SPOs on their websites. The presence of an SPO implies the presence of a framework, even though the framework might have been deleted.

not publicly available. The negative significant coefficients on the interaction terms in columns (2) and (3) of Table 9 also suggest that the reduction of analyst forecast error is significantly larger when green bond issuers publish their disclosures on official websites and release pre-issuance documents.

The findings in Table 9 highlight the importance of information accessibility in the green bond market. The enhancement of the corporate information environments resulting from green bond issuance is particularly pronounced when the information can effectively flow to intended readers. The significant role of information in green bond disclosures additionally explains the persistence of the effect of green bond issuances in Figure 2. Green bond frameworks and post-issuance reports typically address the plans for sustainability efforts of the issuers within the life of a green bond or even over a longer future horizon. It is also a common practice for issuers to release updated versions of the green bond disclosures every one or two years. While monitoring attention and scrutiny may fade away within a shorter timeframe, the information contained in green bond disclosures can continue to be valuable to the analysts over a longer period after the first issuance.[20]

5.1.3 Placebo Tests and the Uniqueness of Green Bond Information

This section examines the informational uniqueness of green bonds by differentiating their effects from the impacts of conventional bond issuances through placebo tests isolating the unique characteristics and information carried by green bonds from conventional bonds. We randomly select 703 conventional bond issuers from the pool of all bond issuers, excluding green bond issuers, as placebo treatment firms. We then designate the year of their first bond issuance as the treatment year and run the baseline regression specification in Equation (1). We repeat this procedure 1000 times and plot the histograms of the estimates on the placebo treatment in Figure 3. Figure 3 plots estimated coefficients on the indicator of bond issuance when the dependent variable is analyst forecast error. The true estimate from Table 3 is marked by the black solid line and is on the far negative side of the coefficient distributions. The probability of obtaining the true estimate is 0.12%, indicating that the informational effects are uniquely associated with green bonds, rather than simply with the act of bond issuance.[21]

[20] Green bonds' information benefits extend beyond the issuer and propagate through corporate ownership structures. Analysis of parent and sister companies (Internet Appendix Table IA5) shows that green bond issuances improve the analyst forecast accuracy for immediate parents, but not ultimate parents. The results in Table IA5 also indicate that green bond issuances bring positive spillover effects to the information environments to sister firms of the green bond issuers.

[21] In cases where green bond issuers are U.S. energy sector firms and their green bonds are allocated energy plant projects, the information in their green bond disclosures may partially overlap with the plant-level operational and

We further investigate the impact of conventional bond issuances on a firm's analyst forecast characteristics by replacing the independent variable in the baseline design with a binary variable indicating the first conventional bond issuance. The coefficient estimates for a subsample of conventional bond issuers (excluding green bond issuers) are presented in Table IA6. The issuance of conventional bonds does not have a statistically significant impact on analyst forecast accuracy and analyst forecast dispersion. The distribution of the coefficients of bond issuance in the placebo tests and the estimates on conventional bond issuances indicates that our results are driven by green bond issuances rather than general bond issuance activities. [22]

5.2 Enhanced Monitoring

Prior literature has documented a growing demand for sustainable assets among institutional investors (Krueger, Sautner, and Starks, 2020), an amplification of media coverage for issuers after green bond issuances (Lu, 2025), and analysts' attention to the environmental practices of the firms they cover (Sautner, Vilkov, van Lent, and Zhang, 2023). We focus on the monitoring effects and information inflows to corporate information environment to understand the impact of green bond issuances. In this section, we examine whether the issuances of green bonds attract attention from analysts, media, and institutional investors, and whether the extra attention received after green bond issuance is associated with boosted financial reporting quality. Specifically, we estimate the regression specification in Equation (1) with an alternative set of dependent variables that are measures of attention from different parties.

We use the number of unique analysts that produce EPS forecasts for a firm (*Analyst Count*) and a binary variable indicating whether a firm is covered by at least one analyst (*Analyst Coverage*) to quantify analyst attention. We measure media attention using news article data

financial disclosures mandated by the Federal Energy Regulatory Commission (FERC). While other countries do not mandate plant-level financial disclosure, some, including the European Union, require energy sector firms to disclose certain operational information related to energy generation of energy plants. To eliminate the impact of alternative disclosure sources, Table IA7 presents subsample analyses excluding U.S. energy sector firms (column 1) and excluding energy sector firms from all countries (column 2). Our baseline findings are robust, with significantly negative coefficients for both subsamples.

[22] In addition to the analysis of initial green bond issuances, we examine the incremental effects of subsequent issuances (column (1) of Internet Appendix Table IA8) and the ramifications of green bond maturity (column (2) of Internet Appendix Table IA8). Subsequent issuances show limited incremental impact on analyst forecast accuracy, potentially because they typically occur before the initial bond's expiration, thus contributing marginally to the issuer's disclosure schedule and attracting less attention. Moreover, we find no significant reversal of the observed effects following the maturity of all outstanding green bonds.

from RavenPack, with articles considered directly relevant when their firm relevance scores exceed a threshold of 90. We take the logged number of news articles related to a firm each year (News Coverage) to measure media attention and use the percentage of institutional ownership (Inst Ownership) to quantify attention from institutional investors.

Table 10 presents the estimation results of regressing measures quantifying analyst and institutional investor attention on green bond issuances. Analysts are more inclined to initiate coverage of firms that issue green bonds, as shown by column (1) of Table 10. The logistic regression results indicate that the chance of being covered by analysts significantly rises following green bond issuances. Additionally, the Poisson estimation results in column (2) indicate that after the issuance of the first green bond, the difference in the logarithm of the number of analysts covering EPS forecasts is expected to increase by approximately 0.02 units, which is roughly equivalent to a 2% increase in analyst coverage.

Corporate media visibility increases significantly following the first issuance of green bond. The results in column (3) illustrate that the number of news articles covering a firm increases after its first green bond issuance. In column (4) of Table 10, we narrow the scope of news articles to business articles only and exclude those related to lawsuits, the macro economy, and politics. We find similar results that media coverage on green bond issuers intensifies after green bond issuances. Column (5) of Table 10 shows that the issuances of green bonds are associated with a 1.24% unit increase in institutional ownership. The results in Table 10 confirm that after the issuance of the first green bond, issuers attract more attention from analysts and institutional investors.

Increased attention implies increases in public scrutiny. Do green bond issuers raise the quality of their financial reporting and improve their internal control practices after green bond issuance? Assigning variables measuring the quality of financial reporting and internal control to the left-hand side of Equation (1), we investigate the relationship between corporate financial reporting and internal control subsequent to the issuance of green bonds. Specifically, we use the probability of financial report restatements (*Restatements*) and abnormal accruals (*Abnormal Accruals*) as the measures for financial reporting quality. [23] For internal control quality, we consider the number of earnings guidance announced in a year (*Guidance Count*) and EPS announcement delay (*EPS Announcement Delay*). Regression results in Table IA9

[23] We adopt the abnormal accruals calculation method from Jones (1991), the abnormal accruals are estimated using regression-based methods and the observations in the regression are grouped based on their SIC industry classification and their firm ID.

show that the issuance of corporate green bonds is associated with better financial reporting and internal control quality. The regression results in column (1) of Panel A show a negative and significant coefficient for the binary variable indicating financial report restatements, suggesting that green bond issuances reduce the likelihood of financial statement restatements. Moreover, in column (2), our results indicate that green bond issuances have a significant positive impact on the number of earnings guidance provided. The length of EPS announcement delay reduces significantly after green bond issuance as well, as indicated by the negative significant coefficient on green bond issuances in column (3) of Panel A.

We report the impact of green bond issuances on corporate abnormal accruals in Panel B of Table IA9. In column (1), the regression-based calculation of abnormal accruals is performed on firms grouped by industries, while in column (2) the regressions are fitted on individual firms. Both specifications have nominal abnormal accruals as the dependent variable. Columns (1) and (2) produce significantly negative coefficients on the independent variable for green bond issuances when the dependent variables are measures of abnormal accruals. These findings indicate a negative association between the issuance of green bonds and the practice of earnings management. The collective findings presented in Panels A and B of Table IA9 illustrate that issuance of the first green bond enhances both the quality of financial reporting and the robustness of internal control practices.

5.3 Real Effects Evidenced by Earnings Stability

Beyond signaling environmental commitments, green bonds can illuminate deeper, systematic shifts in a firm's operation and risk management. Over the long term, investments in green projects have the potential to enhance issuers' resilience by fostering operational efficiency and financial stability. Accordingly, green bonds may associate with real effects, as firms undertake investments and adopt practices that lead to greater operational efficiency and financial stability, resulting in more stable earnings. A prior study by Hoepner, Oikonomou, Sautner, Starks, and Zhou (2024) provides evidence that corporate ESG engagement can deliver tangible improvements in corporate risk profiles and lead to reductions in downside risk. Our empirical evidence indicates that increased analyst predictive accuracy can be mechanically explained by the stabilization of earnings after green bond issuances, complemented by our examination of changes in earnings volatility subsequent to green bond issuances.

Earnings volatility is proxied by the standard deviation of asset-scaled earnings before extraordinary items over the most recent five-year rolling window and multiplied by 100, following Dichev and Tang (2009). As shown in Table 11, green bond issuances are associated with significant reductions in raw earnings volatility in column (1) and the natural logarithm of earnings volatility in column (2). In column (1), the coefficient of -0.26 suggests that the issuance of the first green bond is associated with a decrease earnings volatility by 0.26 units. In column (2), using the logarithm of earnings volatility as the dependent variable, the coefficient of 0.06 implies an approximate 6% increase in earnings volatility. These results are broadly consistent and suggest that post-issuance earnings exhibit greater persistence and stability, which enhances the predictability of earnings and contribute to improved forecast accuracy.

The reduction in earnings volatility following green bond issuances may reflect shifts in firm's real activities, such as improvements in operational efficiency or enhancements in risk management practices. Specifically, enhanced operational efficiency may result from investments in energy-efficient technologies, which can generate cost savings and promote more consistent earnings performance. Changes in risk management practices may involve the implementation of more rigorous environmental risk assessments, which can help stabilize operations and mitigate potential disruptions. Greater operational and financial stability, in turn, facilitates analysts to predict future performance, thus enabling analysts to generate forecasts with greater precision.

5.4 Analyst Effort Allocation

Analysts may allocate more efforts to green bond issuers as a response to elevated interest from public stakeholders and institutional investors. We measure analyst efforts with per-analyst frequency of forecast revisions (*Revisions per Analyst*), calculated as the total number of forecast revisions a firm receives divided by the number analysts who provide at least one forecast for the firm within a year. This measure follows Harford, Jiang, Wang, and Xie (2019). We test the change of analyst effort allocation before and after green bond issuance by replacing the dependent variable in our baseline analysis with Revisions per Analyst and report the empirical findings in column (1) of Table 12. The positive significant coefficient on After GB Issuance suggests that when a firm becomes a green bond issuer, on average, each of the analysts covering the firm increases their number of forecast revisions by 1.25 times. More

frequent revisions of analyst forecasts imply that analysts strategically devote more efforts to the green bond issuers.

The allocation of efforts by analysts further connects to the level of bias green bond issuers experience when receiving analyst forecasts. Prior literature documents that analyst forecasts are subject to biases, and the cross-sectional variation in analyst forecasts is linked to analyst-level attributes (Korhtari, So, and Verdi, 2016). Here we test whether analysts' forecast bundling patterns and decision fatigue, which are also linked to the strategic allocation of analyst efforts, influence the improvements in forecast precision following corporate green bond issuances.

Drake, Joos, Pacelli, and Twedt (2020) show that concurrent issuance of earnings forecast across multiple companies diminishes forecast accuracy. We identify analyst forecasts as bundled when an analyst issue at least one other EPS forecast for a different firm on the same calendar day as the focal firm's forecast. A firm is designated as having a high proportion of bundled forecasts (*Bundled*) if the percentage of its earnings forecasts originating from analysts who bundle its forecast exceeds the sample median of 25%. Forecasts for firms with higher bundled forecast ratios experience smaller improvements in analyst forecast precision after green bond issuances, as the coefficient on the interaction between After GB Issuance and Bundled is significantly positive in column (1) of Table 12. This is consistent with Drake, Joos, Pacelli, and Twedt (2020) finding that bundled forecasts tend to be less accurate.

Hirshleifer, Levi, Lourie, and Teoh (2019) document evidence that cognitive decision fatigue leads to decreased accuracy in analyst judgements. We capture analyst decision fatigue with decision rank, which is the logarithm of one plus the number of forecasts an analyst has issued before forecasting for the focal firm. In column (2) of Table 12, we interact the average decision rank of a firm across analysts covering a firm (*Decision Rank*) with After GB Issuance. The positive and significant interaction coefficient indicates that green bond issuers with a lower average analyst decision rank experience smaller reductions in analyst forecast error post-issuance. These results suggest that analyst decision fatigue attenuates the positive impact of green bonds on the information environments.

The increase in analyst effort devoted to green bond issuers aligns with the view that career prospects influence analysts' coverage choices. Analysts are more inclined to allocate greater effort to green bond issuers when it benefits their professional development. One potential advantage of covering green bond issuers is to prioritize the needs of institutional clients, as

their trading commissions on these issuers generate revenue for analysts' employers. We examine the change in daily trading volume before and after the first green bond issuance in Table IA10 of Internet Appendix. We obtain equity trading data from TAQ and calculate institutional trading volume by identifying retail trading following Boehmer, Jones, Zhang, and Zhang (2021) from the total trading volume. Columns (1) and (2) present regression results with average daily total trading volume and trading volume from institutional investors, respectively.[24] Both columns illustrate that the issuance of green bonds induce significant increases in both total trading volume and institutional trading volume. The findings in Table IA10 confirm institutional investors' demand for green assets and suggest the potential benefits for analysts to cover green bond issuers.

6. Conclusion

The global green bond market has been growing, and understanding the consequences of corporate green bond issuances is imperative for the development of green finance. This study explores the impact of corporate green bond issuances on equity analyst earnings forecasts. We show evidence that a firm's issuance of its first green bond reduces its average analyst forecast error in subsequent years. The relationship between green bond issuance and analyst forecast accuracy is particularly stronger for firms in countries with greater societal demand for corporate environmental responsibility and weaker disclosure requirements.

The issuances of green bonds influence the precision of analyst forecasts primarily through mechanisms of novel information disclosure, reinforced monitoring, and strategic allocation of analyst efforts. We find evidence that the positive impact of green bond issuance is more pronounced for firms that make their green bond disclosure accessible to investors. Additionally, after the issuance of the first green bond, issuers attract increased attention from analysts, media, and institutional investors, leading to enhanced scrutiny. This paper highlights a positive effect of issuing corporate green bonds on corporate information environments and adds to the literature exploring the impacts of corporate green bonds.

[24] The sample period of Internet Appendix Table IA10 contains the trading days within two years before and after the first green bond issuance. The sample consists of green bond issuers only. The trading volume measures are scaled by total assets.

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Appendix A. Variable Definitions

Variable	Definition	Source
Analyst Forecasts		
AFE	Analyst forecast error. The absolute value of the difference between the actual annual EPS for a firm and the median of the last estimates by analysts following a firm before the earnings announcement scaled by the firm's beginning-of-year share price (in percentage).	I/B/E/S, Worldscope
AFD	Analyst forecast dispersion. The standard deviation of analyst annual earnings estimates scaled by beginning-of-year share price (in percentage).	I/B/E/S, Worldscope
Horizon	The number of days from analyst forecast date to earnings announcement being forecasted date and averaged over all analysts following a firm.	I/B/E/S
Bundled	A dummy variable that equals to one when more than 25% (the sample median) of analysts following a firm releases earnings forecasts for multiple companies on the day of the focal firm's forecast issuance, and zero otherwise.	I/B/E/S
Decision Rank	The logarithm value of one plus the cumulative number of same-day forecasts made prior to the firm's forecast release, averaged across all analysts covering the firm.	I/B/E/S
Forecast Bias	Analyst forecast bias. The difference between actual annual EPS and the consensus forecast, scaled by beginning-of-year share price (in percentage).	I/B/E/S, Worldscope
Green Bond Issuances		
GB Issuer	A dummy variable that indicates whether a firm is a green bond issuer.	Environmental Finance, Bloomberg, LSEG Refinitiv
After GB Issuance	A dummy variable that equals one if a firm has issued its first green bond and zero if a firm has not yet issued a green bond.	Environmental Finance, Bloomberg, LSEG Refinitiv
Large Volume Issuance	A dummy variable that indicates whether the volume of the initial green bond issuance exceeds the average green bond issuance volume, and zero otherwise.	Environmental Finance, Bloomberg, LSEG Refinitiv
Pure Play	A dummy variable that equals one when green revenue accounts for over 90% of a firm's total revenue, and zero otherwise.	LSEG Refinitiv
Green Bond Disclosures		
Disclosures Publicly Available	A binary variable that equals one if an issuer's green bond disclosure documents are accessible via search engines, and zero otherwise.	Hand collected
Disclosures Available on Official Websites	A binary variable indicating whether a green bond issuer posts their green bond disclosure files on official websites.	Hand collected
Pre-issuance Disclosures Available	A binary variable that equals one if a firm publishes pre-issuance green bond disclosures, and zero otherwise.	Hand collected

Appendix A. Variable Definitions – Continued

Variable	Definition	Source
Analyst and Media Coverage		
Analyst coverage	The number of unique analysts issuing estimates for a firm in a fiscal year.	I/B/E/S
News coverage	The logged number of news articles related to a firm in a year.	RavenPack
Business news coverage	The logged number of business news articles related to a firm.	RavenPack
Control Variables		
Size	Total assets of a firm in US dollars.	Worldscope
Leverage	The ratio of total debt to total assets.	Worldscope
M/B ratio	Market-to-book ratio. Calculated as market capitalization divided by book value of equity.	Worldscope
ROA	Return on assets. Calculated as the net income divided by total assets.	Worldscope
Capex	Capital expenditure scaled by total assets.	Worldscope
PPE	Property, plant, and equipment scaled by total assets.	Worldscope
RD	Research and development expense scaled by total assets. Coded as 0 if missing.	Worldscope
Sales growth	Sales growth rate over a fiscal year.	Worldscope
Excess yearly return	Compounded 12-month stock return less the 12-month compounded return of a value weighted index of consisting of listed firms in a firm's home country.	Worldscope
Stock issuance	A dummy variable indicating whether a firm has issued equity in a fiscal year	Worldscope
Bid-ask spread	Yearly median value of the daily bid-ask spreads of a firm, calculated as the difference between the daily closing bid price and ask price divided by the midpoint. Coded as missing if the bid-ask spread is greater than one, less than zero, or the number of observations is less than 120 in a year.	LSEG Refinitiv
GDP per capita	GDP per capita (in thousands of US dollars) of the country where the firm is headquartered.	World Bank
Other Variables		
Restatements	A dummy variable that equals to one if a firm experiences one or more financial restatements.	Worldscope
Guidance count	The number of management EPS forecasts issued in a fiscal year.	Capital IQ
Abnormal Accruals	Error term from regressing accruals on their economic drivers following Jones (1991).	Worldscope
EPS announcement delay	The number of days between fiscal year end and EPS announcement date.	Worldscope, I/B/E/S
Earnings Volatility	the standard deviation of earnings before extraordinary items (scaled by total assets) for the most recent five years, multiplied by a factor of 100.	Worldscope

Appendix B. Cases of Green Bond Mentioned in Earnings Call and Analyst Reports

Case 1: Xylem Inc Q2 2020 Earnings Call (July 30, 2020)

Xylem Inc is an American water technology firm During Xylem Inc's Q2 2020 earnings call, an analyst raised a question regarding the basic understanding of green bonds. The CEO explained the characteristics of green bonds. The CFO then elaborated that their sustainability goals are independently verified by third parties and emphasized the substantial oversubscription and favorable pricing for green bonds.

Question from Scott Reed Davis - CEO & Research Analyst at Melius Research

*"Anyway, I have a couple of questions if you entertain me a little bit. The first one is just, Patrick, can you help me understand what a **green bond** is? I mean what's -- other than it sounds good. And I know, obviously, optics matter, too. But what does it mean? Just leave it at that."*

Answer from Patrick K. Decker - CEO of Xylem Inc

"Yes. I'll kick it off, and then Mark can go through a little bit more of the granularity. But effectively, it's a financing structure that is tied to certain KPIs that we have to deliver on in order to be able to achieve that financing. And it really is tied to our sustainability goals and metrics as a company. But Mark, if you want to get there?"

Answer from E. Mark Rajkowski - CFO of Xylem Inc

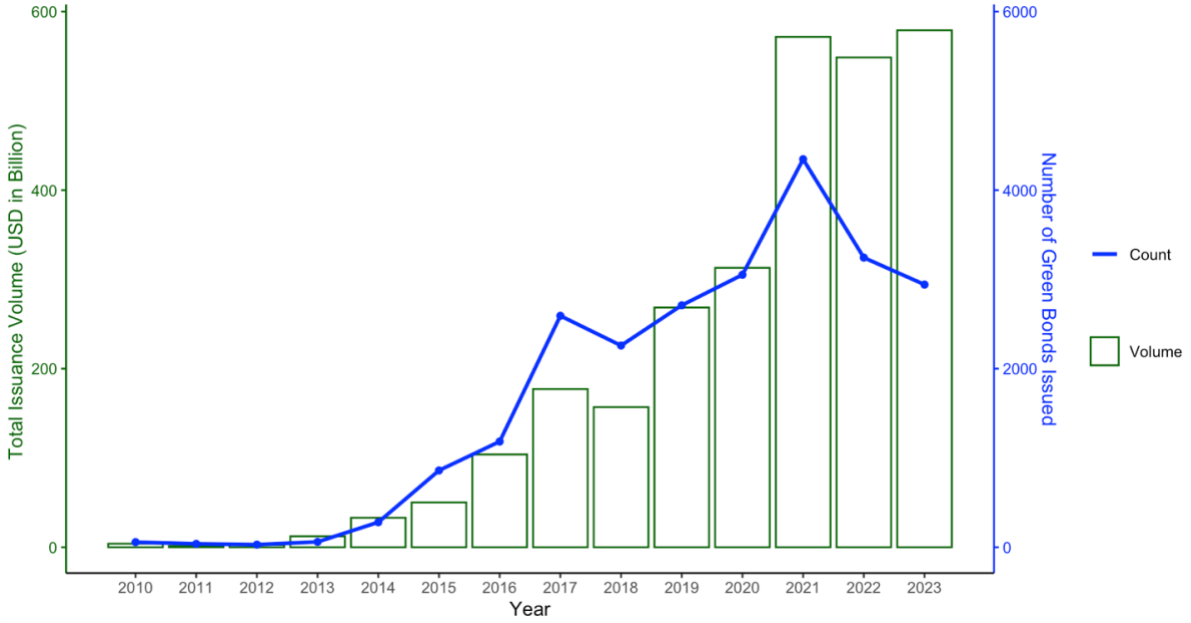
"That's right, Patrick. Our 2025 goals. And the way it works is, as we achieve those goals, we get credit. Those goals are audited, that performance is audited by Sustainalytics. And -- but it's interesting. In addition to the benefit on the rate, what was fascinating was the amount of demand that we got from investors who are focused on sustainable missions. And the offering was 5x oversubscribed in those small parts to the fact that we had almost 50% of those investors as focused on sustainable mission. So not only do we have an opportunity by executing against our very important sustainability goals to drive the rate down, but it was very helpful from a pricing perspective."

Case 2: RBC Capital Markets' Analyst Research Report on Verizon (August 27, 2021)

Verizon is an American telecommunication company. The equity analyst report by RBC Capital Markets cited details from the green bond impact report, highlighting the allocation of green bond proceeds and their project outcomes.

*"Verizon issued its **Green Bond Impact Report**, outlining the full allocation of the nearly $1B of net proceeds from its second green bond. Management commented: "To date, we have issued $2B in green bonds that support the transition to a greener grid and help us achieve our ambitious goal of net zero emissions in our operations by 2035." Verizon has fully allocated the net proceeds of its second green bond entirely to virtual power purchase agreements for renewable energy projects. These projects are for approximately 1 GW of new renewable energy generating capacity across seven states, of which about 83% is solar energy generating capacity and 17% is wind energy generating capacity."*

Panel A. Global green bond issuances by year



Panel B. Green bond issuances around the world

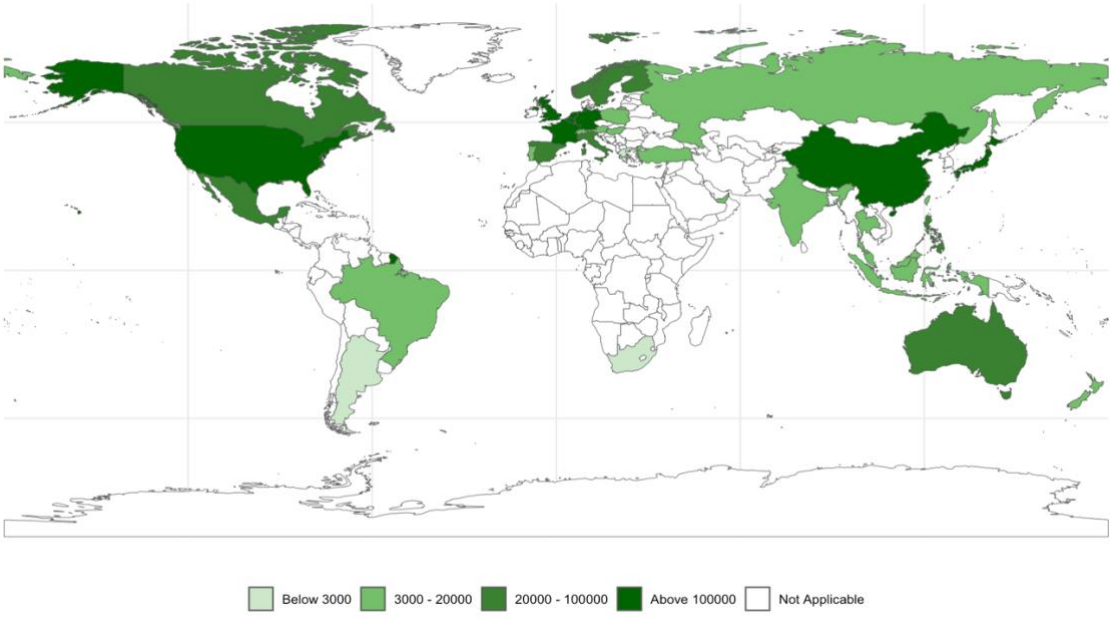


Figure 1. Global Green Bond Issuances

Panel A of this figure displays the annual number of green bond issuances (blue line) and the volume of green bond issuances in billions of USD (green bars) from 2010 through 2023 around the globe. Panel B of this figure presents the volume of green bond issuances in millions of USD from 2010 through 2023 in the 40 countries covered in the sample. Darker colors indicate greater green bond issuance volume.

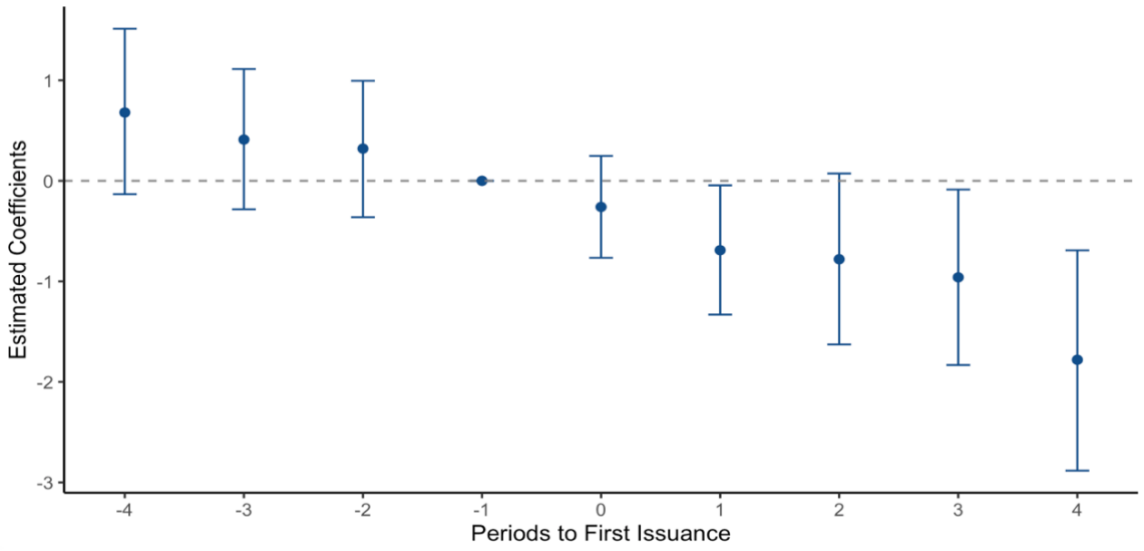


Figure 2. Analyst Forecast Error Around Corporate Green Bond Issuances
This figure plots the estimated coefficients and the 95% confidence intervals for the baseline regression that explores the impact of the first green bond issuance on analyst forecast error. We replace the independent variable in Equation (1) with the year relative to the first green bond issuance and take year t-1 as the benchmark year. The horizontal axis represents the relative year to the first green bond. The sample covers the period of 2010 - 2022. Standard errors are clustered by industry.

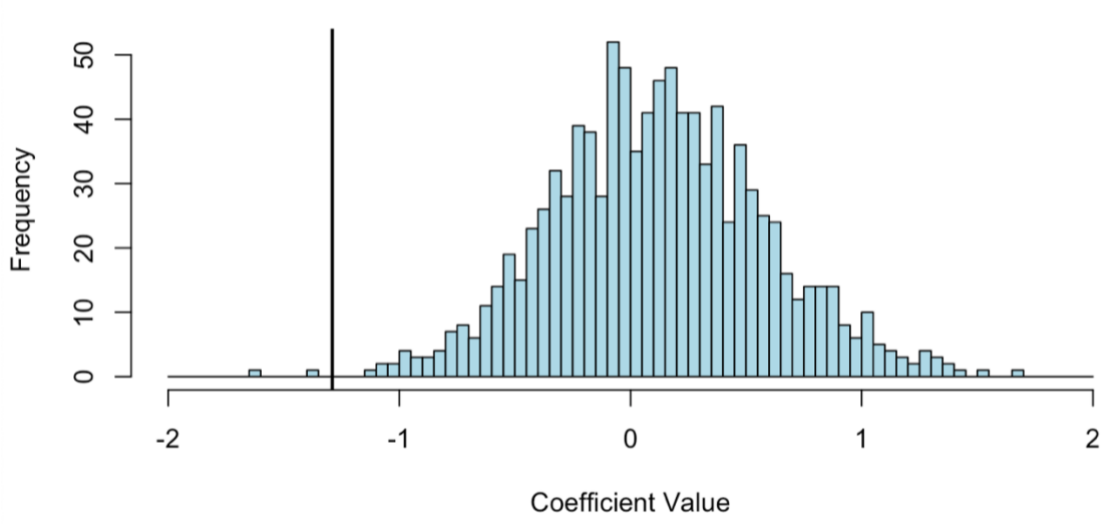


Figure 3. Coefficient Distributions of Placebo Tests
This figure shows histograms of the regression coefficients of a binary variable indicating bond issuance from 1000 placebo runs where we substitute green bond issuers with 703 conventional bond issuers randomly drawn from the sample of non-green bond issuers. The solid black vertical line represents the estimated coefficient from the regression specification in Equation (1) with analyst forecast error as the dependent variable.

Table 1. Summary Statistics

This table reports the summary statistics of the key variables used in the regression analyses. The sample covers public firms from 40 countries with available analyst forecast data. Panel A reports the number of listed green bond issuers and the number of listed conventional bond issuers by country. Panel B reports summary statistics of the main variables. Panel C reports the mean and standard deviation of main variables for green bond issuers and conventional bond issuers separately. The sample comprises firm-year observations from 2010 to 2022. Definitions of variables are in Appendix A. Continuous variables are winsorized at the 1% and 99% percentiles.

Panel A. Country breakdown

	#Corporate GB Issuers	#Corporate Bond Issuers	#GB Issuers with Analyst Forecasts	#Bond Issuers with Analyst Forecasts
Argentina	2	13	2	9
Australia	7	59	7	57
Austria	13	23	5	22
Belgium	11	32	7	31
Brazil	18	122	8	99
Canada	20	221	17	195
China	147	1098	116	959
Denmark	7	16	7	16
Finland	12	38	7	34
France	28	134	25	131
Germany	25	121	16	106
Greece	4	15	3	14
Hong Kong	19	104	17	90
Hungary	4	9	3	7
India	14	340	11	294
Indonesia	6	65	3	57
Israel	2	37	2	30
Italy	21	89	15	74
Japan	187	645	139	606
Korea (South)	58	815	54	576
Malaysia	1	130	1	117
Mexico	6	42	3	42
Netherlands	10	36	7	31
New Zealand	8	25	8	25
Norway	31	97	25	82
Philippines	6	38	4	34
Poland	4	72	4	58
Portugal	3	17	1	15
Russian Federation	2	61	2	54
Singapore	7	73	5	64
South Africa	8	38	6	38
Spain	13	46	13	46
Sweden	51	94	33	84
Switzerland	12	62	10	57
Taiwan	17	454	16	372
Thailand	13	116	9	94
Turkey	11	60	9	52
United Arab Emirates	5	14	5	12
United Kingdom	21	35	6	32
United States	89	1241	72	1130
Total	923	6747	703	5846

Table 1. (continued)

Panel B. Summary statistics of main variables						
	N	Mean	Std. Dev.	p5	Median	p95
Analyst count	51280	10.23	7.86	1	8	27
AFE	51280	4.35	10.82	0.07	1.29	17.36
AFD	43181	14.79	55.84	0.02	1.16	59.05
After GB issuance	51280	0.03	0.18	0	0	0
GB issuer	51280	0.14	0.35	0	0	1
Log(Size)	51280	21.92	1.83	18.91	21.86	25.29
Leverage	51280	0.3	0.2	0.02	0.28	0.62
M/B ratio	51280	2.49	4.04	0.46	1.59	7.57
ROA	51280	0.03	0.11	-0.07	0.03	0.13
GDP per capita	51280	0.04	0.02	0	0.04	0.07
Capex	51280	0.04	0.05	0	0.03	0.14
PPE	51280	0.3	0.26	0	0.24	0.82
RD	51280	0.02	0.04	0	0	0.08
Excess yearly return	51280	-0.05	0.45	-0.63	-0.11	0.66
Stock issuance	51280	0.12	0.33	0	0	1
Sales growth	51280	0.04	0.36	-0.3	0.06	0.38
Horizon	51280	103.55	46.54	40.12	97.25	189
Bid-ask spread	51280	0.35	0.67	0.02	0.18	1.23

Panel C. Summary statistics for green bond issuers and conventional bond issuers						
	Green bond issuers			Conventional bond issuers		
	N	Mean	SD	N	Mean	SD
Analyst count	7146	13.19	8.5	44134	9.76	7.65
AFE	7146	3.07	7.27	44134	4.55	11.28
AFD	6524	7.09	27.56	37038	16.14	59.34
After GB issuance	7146	0.24	0.43	44134	0	0
Log(Size)	7146	23.41	1.55	44134	21.68	1.76
Leverage	7146	0.33	0.18	44134	0.29	0.2
M/B ratio	7146	1.83	3.09	44134	2.6	4.16
ROA	7146	0.03	0.05	44134	0.03	0.11
GDP per capita	7146	0.04	0.02	44134	0.04	0.02
Capex	7146	0.04	0.05	44134	0.04	0.05
PPE	7146	0.33	0.31	44134	0.29	0.25
RD	7146	0.01	0.02	44134	0.02	0.05
Excess yearly return	7146	-0.07	0.36	44134	-0.05	0.47
Stock issuance	7146	0.07	0.25	44134	0.13	0.34
Sales growth	7146	0.04	0.25	44134	0.04	0.38
Horizon	7146	104.2	41.42	44134	103.44	47.31
Bid-ask spread	7146	0.29	0.47	44134	0.36	0.69

Table 2. Green Bond Issuance and Analyst Forecasts

This table presents the impacts of the green bond issuances on financial analyst earnings forecast accuracy. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Definitions of variables are in Appendix A. The sample comprises firm-year observations from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error	Forecast Error
	(1)	(2)
After GB Issuance	-1.41***	-1.29***
	(-5.42)	(-5.40)
Log(size)		-0.77***
		(-2.87)
Leverage		4.45***
		(4.69)
M/B		-0.03*
		(-1.71)
ROA		-28.10***
		(-4.22)
GDP per capita		-0.05***
		(-2.83)
Capex		-15.77***
		(-4.39)
PPE		3.97***
		(3.19)
R&D		-22.80***
		(-3.40)
Excess Yearly Return		-2.79***
		(-13.91)
Stock Issuance		-0.18
		(-0.81)
Sales Growth		-1.93***
		(-4.27)
Analyst Count		-0.18***
		(-7.37)
Horizon		0.29
		(0.53)
Bid-Ask Spread		1.96***
		(5.32)
Constant	YES	YES
Firm FE and year FE	YES	YES
Observations	51280	51280
Adj. R2	0.25	0.34

Table 3. Robustness of the Impact of Green Bond Issuance

This table presents the robustness results regarding the impacts of the green bond issuances on analyst earnings forecast accuracy. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Panel A includes estimation results of using green bond announcement dates as the treatment dates, a control group consisting of all listed firms including non-bond issuers, and a sample that excludes banks. Panel B reports estimation results of applying alternative calculation methods to the dependent variable. Panel C reports the results with alternative regression designs. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Announcement dates an alternative samples			
	Announcement Dates	Alternative Control Group	Excluding Banks
	Forecast Error	Forecast Error	Forecast Error
	(1)	(2)	(3)
After GB Announcement	-1.27***		
	(-5.36)		
After GB Issuance		-1.05***	-1.33***
		(-4.69)	(-4.75)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	51280	133771	45203
Adj. R2	0.34	0.38	0.34

Panel B. Alternative analyst forecast measures			
	Three-period Average	Logged Values	Alternative Measures
	Forecast Error	Logged Forecast Error	Forecast Error
	(1)	(2)	(3)
After GB Issuance	-0.97**	-0.07**	-15.05**
	(-2.41)	(-2.20)	(-2.56)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Dependent variable scaled by	Stock price	Stock price	Actual EPS
Observations	37679	51280	51225
Adj. R2	0.52	0.48	0.15

Table 3. (continued)

Panel C. Alternative regression designs			
	M-Estimator	Country-Year FE	Industry-Year FE
	Forecast Error	Forecast Error	Forecast Error
	(1)	(2)	(3)
After GB Issuance	-0.35***	-1.38***	-1.02***
	(-3.85)	(-5.99)	(-4.01)
Controls	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	NO	NO
Country-year FE	NO	YES	NO
Industry-year FE	NO	NO	YES
Observations	51280	51280	50588
Adj. R2	0.41	0.35	0.35

Table 4. Synthetic Matching

This table presents the synthetic matching results examining the impacts of the green bond issuances on analyst earnings forecast accuracy in samples containing green bond issuers and their synthetic control units. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals to one if the firm has issued its first green bond. The synthetic control units are weighted averages of the conventional bond issuers. The table below presents the regression estimation results with the matched sample consisting of 580 green bond issuers and 580 corresponding synthetic control units. Definitions of variables are in Appendix A. The sample comprises firm-year observations from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)
After GB Issuance	-0.71**	-0.72***
	(-2.05)	(-2.67)
Log(size)		-0.04
		(-0.11)
Leverage		3.46**
		(2.16)
M/B		0.02
		(0.68)
ROA		-35.45***
		(-4.10)
GDP per capita		-0.05***
		(-3.23)
Capex		-6.44*
		(-1.76)
PPE		2.79**
		(2.03)
R&D		16.70
		(0.98)
Excess Yearly Return		-2.75***
		(-6.83)
Stock Issuance		0.56
		(1.14)
Sales Growth		-1.19*
		(-1.87)
Analyst Count		-0.06
		(-1.49)
Horizon		-2.09***
		(-3.29)
Bid-Ask Spread		0.13
		(0.22)
Constant	YES	YES
Firm FE and year FE	YES	YES
Observations	12525	12291
Adj. R2	0.22	0.30

Table 5. Instrumental Variable: Underwriter Green Bond History

This table presents the instrumental variable estimation results examining the impacts of the green bond issuances on analyst earnings forecast accuracy. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. The instrument variable is the logged cumulative number of green bonds underwritten by the investment banks that have previously served as bond underwriters for the firms (*Log cumulative GB managed*). Definitions of variables are in Appendix A. The sample comprises firm-year observations from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	After GB Issuance	Forecast Error
	(1) First Stage	(2) Second Stage
Log Cumulative GB Managed	0.042***	
	(7.53)	
After GB Issuance		-4.30**
		(-2.46)
Log(size)	-0.001	-0.86**
	(-0.10)	(-2.48)
Leverage	-0.02	5.36***
	(-1.37)	(3.97)
M/B	0.001	-0.02
	(1.43)	(-0.90)
ROA	-0.03*	-41.74***
	(-1.81)	(-5.16)
GDP per capita	-0.01***	-0.06***
	(-7.55)	(-2.95)
Capex	0.18***	-13.34***
	(2.94)	(-2.60)
PPE	-0.02	3.03*
	(-0.85)	(1.76)
R&D	0.11	-28.34**
	(1.38)	(-2.44)
Excess Yearly Return	-0.002	-2.74***
	(-0.87)	(-9.98)
Stock Issuance	0.001	0.10
	(0.17)	(0.30)
Sales Growth	0.003*	-2.23***
	(1.72)	(-4.17)
Analyst Count	-0.001	-0.18***
	(-0.69)	(-5.34)
Horizon	-0.012	-0.09
	(-1.16)	(-0.13)
Bid-Ask Spread	-0.01***	3.07***
	(-2.83)	(3.93)
Constant	YES	YES
Firm FE and year FE	YES	YES
First stage Cragg-Donald F statistic	1180.3 (p = 0.00)	
Observations	31745	31745
Adj. R2	0.51	0.13

Table 6. Country-Industry Heterogeneity in Green Bond Issuance Impacts

This table illustrates estimation results in subsamples for firms located in different countries and industries. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. In columns (1) – (2) of Panel A, we run regressions in subsamples of firms based on their country's SBTi participation rate. In columns (3) – (4) of Panel A, we conduct regressions in subsamples that divide firms based on whether a firm operates in industries where at least one environmental factor is defined as financially material by SASB. In Panel B, we run tests on subsamples consisting of firms from countries with different levels of regulatory emphasis on information transparency, proxied by disclosure requirements indices. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A. SBTi participation and environmental materiality

	Forecast Error (1)	Forecast Error (2)	Forecast Error (3)	Forecast Error (4)
	High SBTi Participation	Low SBTi Participation	Env Materiality	No Env Materiality
After GB Issuance	-1.74***	-0.53	-1.47***	-0.51**
	(-5.37)	(-1.21)	(-4.28)	(-2.31)
Controls	YES	YES	YES	YES
Test for the difference between coefficients of *After GB Issuance*	F = 4.22, p = 0.04**		F = 5.61, p = 0.02**	
Firm FE and year FE	YES	YES	YES	YES
Observations	25923	25357	35901	15379
Adj. R2	0.33	0.37	0.35	0.34

Panel B. Regulatory emphasis on information transparency

	Forecast Error (1)	Forecast Error (2)
	Strong Disclosure Requirements	Weak Disclosure Requirements
After GB Issuance	-0.67**	-2.42***
	(-1.99)	(-4.31)
Controls	YES	YES
Test for the difference between coefficients of *After GB Issuance*	F = 7.20, p = 0.01***	
Firm FE and year FE	YES	YES
Observations	19009	6751
Adj. R-squared	0.37	0.36

Table 7. Green Bond Volume and Pure Play Issuers

This table contains regression results of analyses on green bond issuance characteristics. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. The sample for columns (1) and (2) contains green bond issuers, and the sample used in column (3) contains bond issuers with available green revenue data. *Large Volume Issuance* indicates whether the volume of the initial green bond issuance exceeds the average issuance volume. *Pure Play* denotes whether a firm's green revenue exceeds 90% of their total revenue. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1) OLS	Forecast Error (2) OLS	Forecast Error (3) OLS
GB Issuance Volume	-0.001**		
	(-2.45)		
After GB Issuance		-0.25	-1.11***
		(-0.91)	(-4.43)
*Large Volume Issuance * After GB Issuance*		-0.73**	
		(-2.25)	
*Pure play * After GB Issuance*			-1.39**
			(-2.08)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	7146	7146	40915
Adj. R2	0.28	0.28	0.30

Table 8. Analyst Forecast Dispersion

This table examines the impact of green bond issuances on the level of disagreement among analysts. The dependent variable in this table is analyst forecast dispersion (*AFD*), standard deviation of analysts' earnings estimates, scaled by share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Dispersion (1)	Logged Forecast Dispersion (2)
After GB Issuance	-5.75*** (-5.03)	-0.11*** (-5.15)
Controls	YES	YES
Firm FE and year FE	YES	YES
Observations	43181	7146
Adj. R-squared	0.48	0.28

Table 9. Information Accessibility

This table illustrates the regression results for issuers with different levels of green bond information accessibility. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *Disclosures Publicly Available* equals one if an issuer's green bond disclosure documents are accessible via search engines, and zero otherwise. *Disclosures Available on Official Websites* is a binary variable indicating whether a green bond issuer posts their green bond disclosure files on official websites. *Pre-issuance Disclosures Available* is a variable that equals one if a firm publishes pre-issuance green bond disclosures, and zero otherwise. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Columns (1) – (3) use a sample containing green bond issuers. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)	Forecast Error (3)
Disclosures Publicly Available * *After GB Issuance*	-0.83** (-2.19)		
Disclosures Available on Official Websites * *After GB Issuance*		-1.13** (-1.98)	
Pre-issuance Disclosures Available * *After GB Issuance*			-0.98** (-2.20)
After GB Issuance	0.07 (0.22)	0.36 (0.7)	0.11 (0.3)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	7146	7146	7146
Adj. R-squared	0.28	0.28	0.28

Table 10. Analyst, Media, and Institutional Attention

This table illustrates estimation results exploring the change in analyst and institutional investor attention after the issuance of the first corporate green bond. The dependent variables are the number of unique analysts that follow a firm (*Analyst Count*), a binary variable indicating whether a firm is covered by at least one analyst (*Analyst Coverage*), the logged number of news articles related to a firm (*News Coverage*), and the logged number of business news articles related to a firm (*Business News Coverage*). *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Definitions of variables are in Appendix A. The sample comprises firm-year observations from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Analyst Coverage	Analyst Count	News Coverage	Business News Coverage	Inst Ownership
	(1) Logit	(2) Poisson	(3) OLS	(4) OLS	(5) OLS
After GB Issuance	1.11***	0.02*	0.15**	0.15**	1.24***
	(3.06)	(1.65)	(2.15)	(2.10)	(3.40)
Controls	YES	YES	YES	YES	YES
Firm FE and year FE	YES	YES	YES	YES	YES
Observations	33,426	50227	11514	11514	50365
Adj./Pseudo R2	0.33	0.53	0.77	0.76	0.93

Table 11. Earnings Stability

This table illustrates the estimation results exploring the change earnings volatility after the issuance of the first corporate green bond. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. The table presents the analyses where the dependent variables are earnings volatility and the logged value of earnings volatility. Earnings volatility is proxied by the standard deviation of earnings before extraordinary items for the most recent five years, multiplied by a factor of 100. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Earnings Volatility (1) OLS	Logged Earnings Volatility (2) OLS
After GB Issuance	-0.26** (-2.02)	-0.06*** (-2.95)
Controls	YES	YES
Firm FE and year FE	YES	YES
Observations	48455	48455
Adj. R2	0.70	0.86

Table 12. Analyst Effort Allocation

This table presents estimation results examining how the impact of green bond issuances varies with analyst characteristics. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. *Revisions per Analyst* is the number of total forecast revisions received by a firm divided by the total number of analysts covering the firm. *Bundled* is a dummy variable that takes the value of one when more than 25% (the sample median) of analysts following the firm issue earnings forecast simultaneously for multiple firms on the day of focal firm's forecast issuance. *Decision Rank* is the logarithm value of the cumulative number of forecasts an analyst has made on the same day preceding a firm's forecast release, averaged across all analysts covering the firm. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Revisions per Analyst	Forecast Error	Forecast Error
	(1)	(2)	(3)
After GB Issuance	1.25***	-1.86***	-1.76***
	(9.35)	(-5.60)	(-5.31)
*After GB Issuance * Bundled*		0.58**	
		(2.06)	
Bundled		0.10	
		(0.97)	
*After GB Issuance * Decision Rank*			1.03**
			(2.20)
Decision Rank			0.42*
			(1.71)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	51280	34189	34189
Adj. R-squared	0.44	0.34	0.34

Internet Appendix for
"The Effects of Green Bonds on Analyst Forecasts around the World"

Appendix IA. Additional Figures and Tables

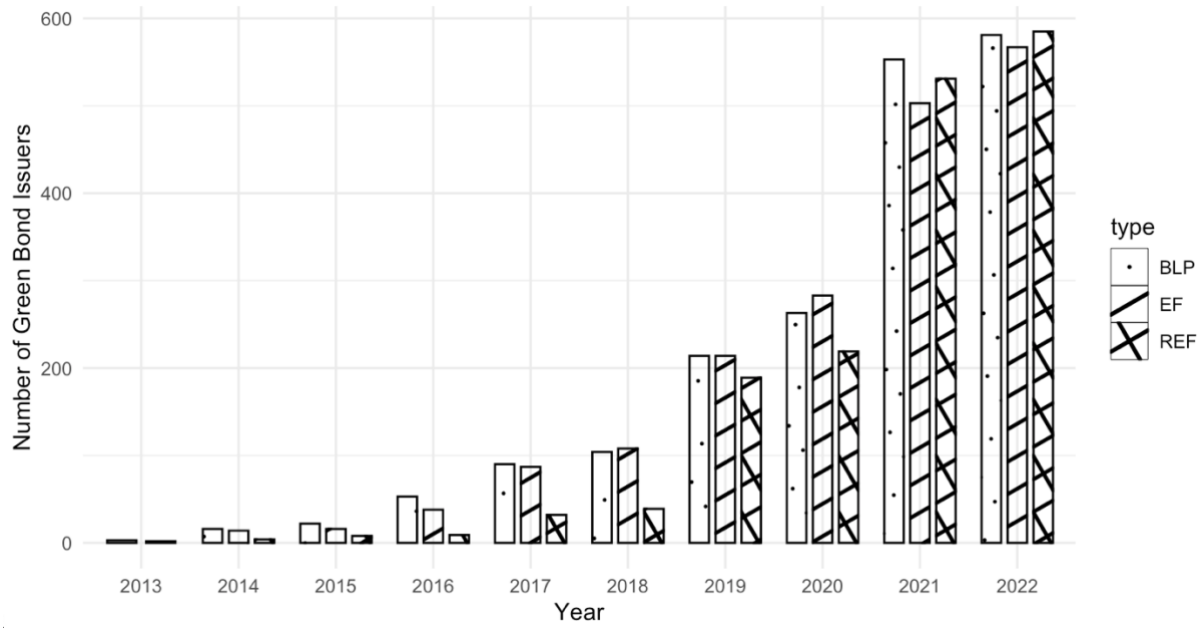


Figure IA1. Green Bonds Issued by Listed Companies in Three Data Sources
This figure indicates the number of green bonds issued by listed companies in the green bond issuance datasets provided by Bloomberg, Environmental Finance, and LSEG Refinitiv. The number of green bonds is sorted by year, and each bar pattern represents a data source.

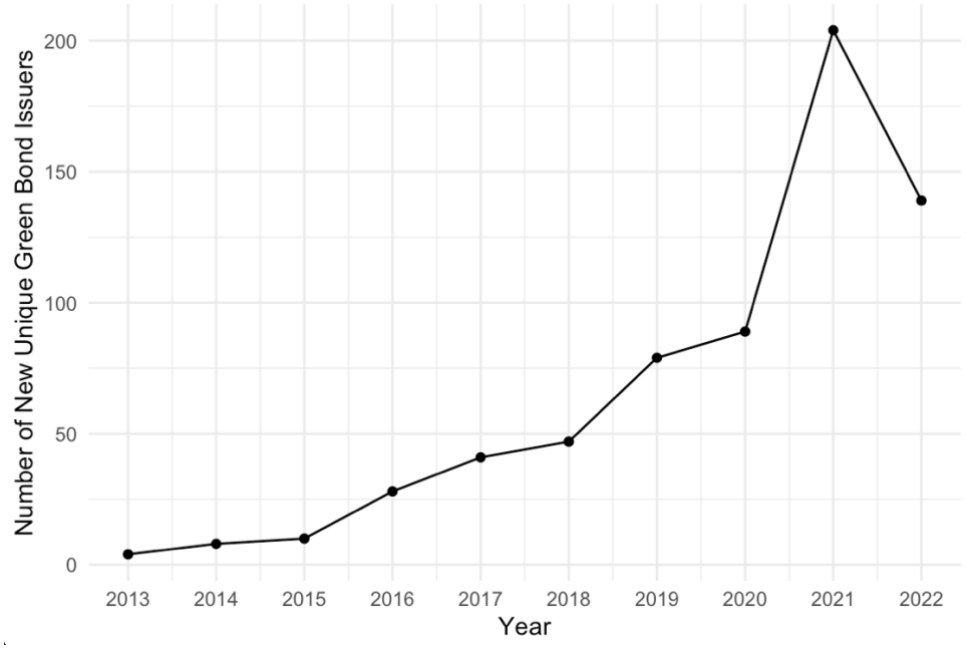


Figure IA2. New Unique Green Bond Issuers
This figure plots the number of new unique listed green bond issuers that enter the corporate green bond market each year from 2013 to 2022. The green bond data are gathered from Environmental Finance, Bloomberg, and Refinitiv.

Panel A. Number of Green Bond Issuances

Panel B. Green Bond Issuance Volume

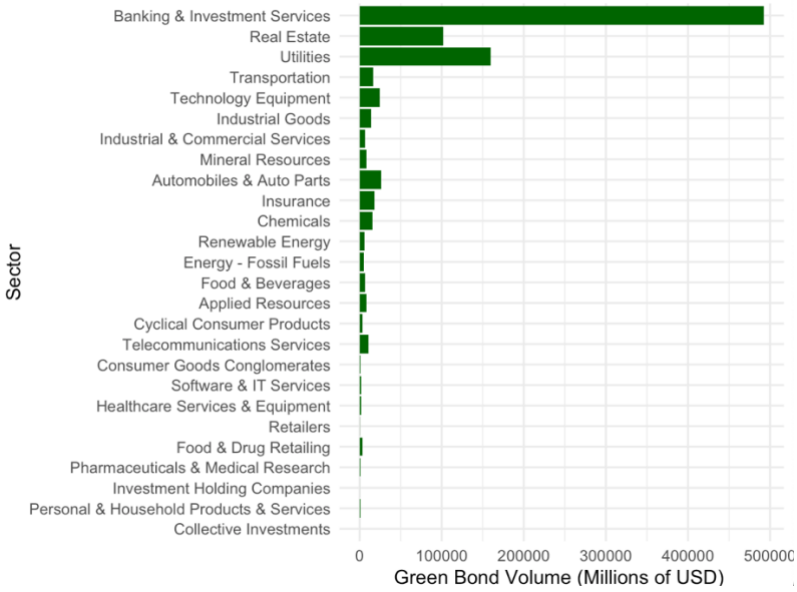


Figure IA3. Green Bond Issuance by Industry Sectors
This figure draws the number of green bonds issued (Panel A) and the total volume of green bonds issued (Panel B) by industry. The two panels cover green bonds issued by firms in the sample of this paper only.

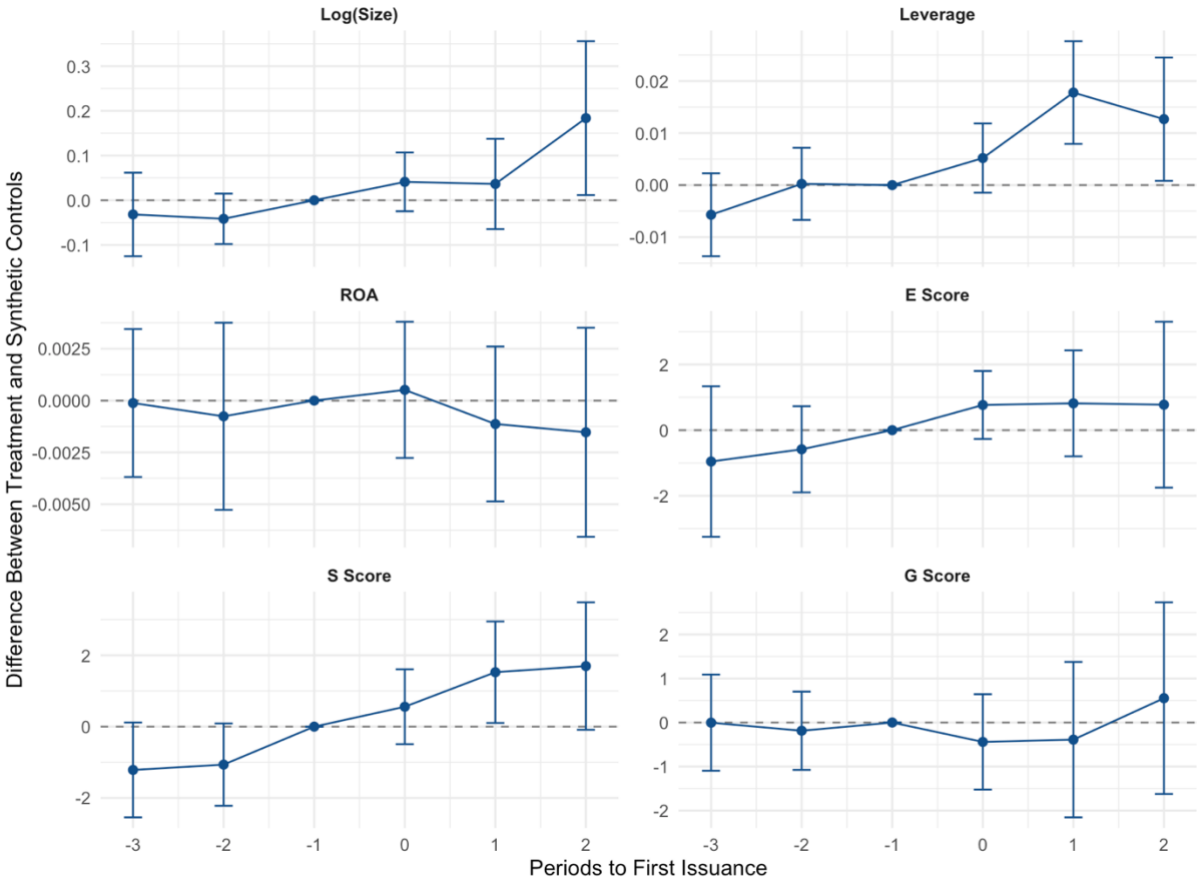


Figure IA4. Temporal Trends: Green Bond Issuers and Synthetic Controls
This figure includes panels presenting the estimated differences between green bond issuers and their corresponding synthetic control units across key firm characteristics used in the construction of these controls. The horizontal axis represents time relative to first green bond issuance, while the vertical axis stands for point estimates of differences with their associated confidence intervals. The estimates of the differences between the issuers and control units are derived from the coefficients of the interactions between treatment status and year-relative-to-issuance indicator variables, with the pre-issuance period as the reference period and specific firm characteristics as dependent variables in each panel.

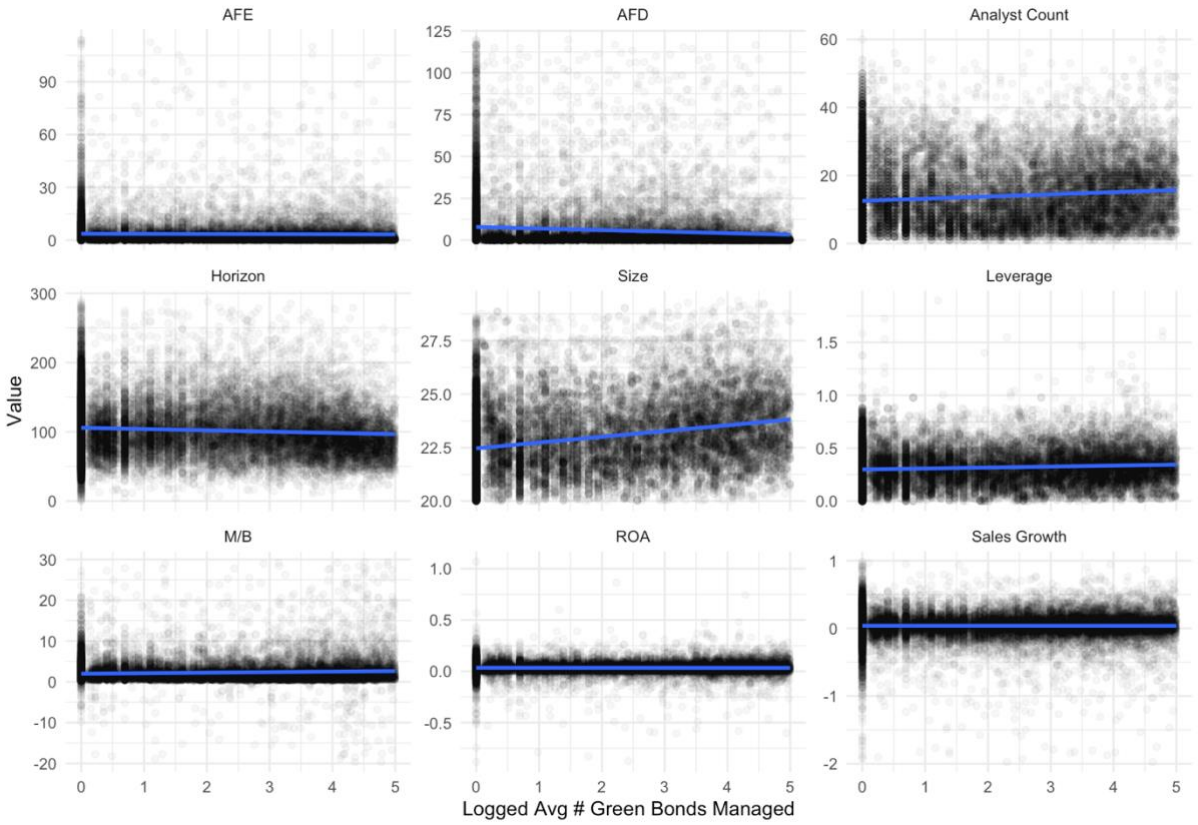


Figure IA5. Underwriter Green Bond Expertise and Firm Characteristics
This figure presents scatter plots visualizing the relationship between various firm characteristics (y-axis) and the logged average number of green bonds managed by underwriters that a firm worked with (x-axis, instrumental variable). Each plot includes a blue solid line representing the OLS fitted line from regressing the firm characteristics on the instrumental variable.

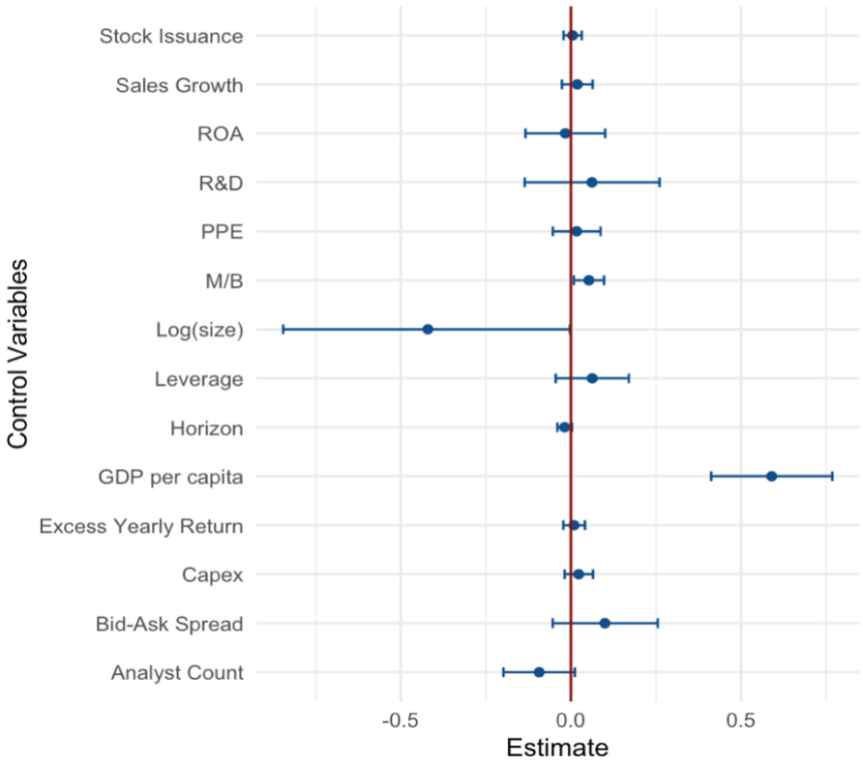


Figure IA6. Balance Test for Green Bond Issuance Volume
This figure draws the coefficient estimates and 95% confidence bands from regressing the green bond issuance volume on each control variable separately. All specifications include year fixed effects and firm fixed effects. The dependent and independent variables of interest are standardized.

Table IA1. Green Bond Issuers Sample Selection
This table reports the selection procedures of corporate green bond issuers in our final sample.

Sample Selection Process	
Number of unique corporate green bond issuers from Environmental Finance, Bloomberg, and Refinitiv from 2010 to 2022	3295
Procedures:	
(1) Removing private firms	971
(2) Removing firms not covered by Worldscope	941
(3) Removing firms not covered by I/B/E/S	703

Table IA2. Green Bond Issuance Impacts by Analyst Coverage Level

This table presents estimation results for subsamples of firms, differentiated by whether their analyst coverage is below or above the median level. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)
	Low Analyst Coverage	High Analyst Coverage
After GB Issuance	-1.20** (-2.49)	-1.00*** (-4.10)
Controls	YES	YES
Test for the difference between coefficients of *After GB Issuance*	F = 0.12, p = 0.73	
Firm FE and year FE	YES	YES
Observations	23949	26695
Adj. R-squared	0.36	0.33

Table IA3. Alternative Difference-in-Differences Estimators

This table provides estimations of the effect of green bond issuances on analyst earnings forecast accuracy using four alternative staggered DiD estimators. The alternative estimators follow Sun and Abraham (2021), Callaway and Sant'Anna (2021), Borusyak, Jaravel, and Spiess (2024) and De Chaisemartin and D'Haultfeuille (2020). We additionally modify our baseline specifications into a stacked difference-in-differences design. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. All regressions include firm-level, year-level fixed effects, and control variables. Stacked regressions incorporate firm-stack fixed effects and year-stack fixed effects. Continuous variables are winsorized at the 1% and 99% percentiles. Standard errors are clustered at the industry level.

	Sun and Abraham	Callaway and Sant'Anna	Borusyak, Jaravel, and Spiess	DeChaisemartin and D'Haultfeuille	Stacked Regressions
	(1)	(2)	(3)	(4)	(5)
Point Estimate	-1.20	-0.74	-1.42	-0.73	-0.89
Standard Error	0.18	0.34	0.24	0.21	0.25
Lower Bound 95% CI	-1.81	-1.41	-1.89	-1.15	-1.39
Upper Bound 95% CI	-0.59	-0.08	-0.93	-0.31	-0.40

Table IA4. Legal Origin and EU Regulation on Green Bond Issuance Impacts

This table illustrates estimation results in subsamples for firms located in countries with different law systems. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. In columns (1) – (4) of Panel A, we split the sample into subsamples based on the legal systems of the countries where the firms reside. In Panel B, we divide the firms in our sample based on whether they are from a country in the European Union. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A. Legal origins

	Forecast Error (1)	Forecast Error (2)	Forecast Error (3)	Forecast Error (4)
	Non-English Legal Origin	English Legal Origin	French & German Legal Origin	Scandinavian Legal Origin
After GB Issuance	-1.31***	-1.34***	-1.08***	-2.12**
	(-5.22)	(-3.99)	(-3.29)	(-2.15)
Controls	YES	YES	YES	YES
Test for the difference between coefficients of *After GB Issuance*	F = 0.14, p = 0.71		F = 1.19, p = 0.28	
Firm FE and year FE	YES	YES	YES	YES
Observations	30517	20763	28556	1961
Adj. R-squared	0.35	0.36	0.35	0.43

Panel B. EU and non-EU issuers

	Forecast Error (1)	Forecast Error (2)
	EU Issuers	Non-EU Issuers
After GB Issuance	-2.32***	-0.89***
	(-4.55)	(-3.46)
Controls	YES	YES
Test for the difference between coefficients of *After GB Issuance*	F = 1.43, p = 0.23	
Firm FE and year FE	YES	YES
Observations	6370	44910
Adj. R2	0.39	0.40

Table IA5. Parents and Sister Firms of Green Bond Issuers

This table contains regression results of analyses on the changes in analyst earnings forecast accuracy of the parent companies and firms that share the same ultimate parent as the green bond issuers (sister firms). The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. In specifications (1) through (3), the sample contains all non-green bond issuers, including both conventional bond issuers and non-conventional bond issuing public firms. In column (1), the independent variable is *After Subsidiary Issuance*, which stands for whether any one of the subsidiaries of a firm has issued a green bond. In column (2), the dependent variable is *After Immediate Subsidiary Issuance*, which equals one if any one of the immediate subsidiaries has issued a green bond. In column (3), the independent variable, *After Sister Firm Issuance*, stands for whether any one of the sister firms of a company has issued a green bond. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)	Forecast Error (3)
	Ultimate Parents of Issuers	Immediate Parents of Issuers	Sister Firms of Issuers
After Subsidiary Issuance	-0.58		
	(-1.23)		
After Immediate Subsidiary Issuance		-0.85**	
		(-1.98)	
After Sister Firm Issuance			-0.88*
			(-1.73)
Controls	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	126505	126505	126505
Adj. R-squared	0.38	0.38	0.38

Table IA6. Conventional Bond Issuances from Non-Green Bond Issuers

This table presents the results examining the impact of conventional bond issuances on analyst earnings forecast accuracy. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After Conventional Issuance* is a binary variable indicating whether a non-green bond issuer has issued a conventional bond. Definitions of variables are in Appendix A. The sample excludes green bond issuers from the baseline sample. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error	Logged Forecast Error
	(1)	(2)
After Conventional Issuance	0.34	0.03
	(1.33)	(1.31)
Controls	YES	YES
Firm FE and year FE	YES	YES
Observations	44134	44134
Adj. R-squared	0.34	0.48

Table IA7. Green Bond Issuance and Analyst Forecasts in Non-Energy Sector

This table presents subsample analyses results examining the impact of green bond issuances on analyst forecast accuracy. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Column (1) presents results from a subsample excluding U.S. energy sector firms, while column (2) reports results from a subsample excluding energy sector firms across all countries in the sample. Definitions of variables are in Appendix A. The sample excludes green bond issuers from the baseline sample. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)
	Excluding U.S. Energy Firms	Excluding Global Energy Firms
After GB Issuance	-1.26*** (-5.46)	-1.16*** (-5.34)
Controls	YES	YES
Firm FE and year FE	YES	YES
Observations	50065	46485
Adj. R-squared	0.34	0.33

Table IA8. Subsequent and Matured Green Bonds

This table summarizes the results examining changes in analyst earnings forecast accuracy after subsequent green bond issuances and after the maturity of all green bonds issued by a firm. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After Subsequent Issuance* is an indicator that identifies whether a firm has issued a second green bond following the issuance of its first green bond. *After GB Matured* is a binary variable signifying whether all of an issuer's green bonds have matured, with no outstanding green bonds remaining. Definitions of variables are in Appendix A. The sample contains green bond issuers. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Forecast Error (1)	Forecast Error (2)
After Subsequent Issuance	-0.11	
	(-0.27)	
After GB Matured		2.98
		(0.98)
Controls	YES	YES
Firm FE and year FE	YES	YES
Observations	7146	7116
Adj. R-squared	0.28	0.28

Table IA9. Financial Reporting Quality and Internal Control Practices

This table illustrates the estimation results exploring the change in financial reporting quality and internal control practices after the issuance of the first corporate green bond. The dependent variable, analyst forecast error (*AFE*), is the percentage deviation of actual EPS from analysts' consensus estimate, relative to share price. *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Panel A includes regression estimations showing the impact of green bond issuances on the chance of restatements, the number of earnings guidance provided, and EPS announcement delay. Panel B presents regression results taking abnormal accruals as the dependent variable. Definitions of variables are in Appendix A. The sample period is from 2010 to 2022. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

Panel A. Restatements, guidance, and EPS announcements

	Restatements	Guidance Count	EPS Announcement Delay
	(1) Logit	(2) Poisson	(3) Poisson
After GB Issuance	-0.44*	0.10**	-0.021*
	(-1.92)	(2.05)	(-1.71)
Constant	YES	YES	YES
Firm FE and year FE	YES	YES	YES
Observations	13135	38303	51262
Adj./Pseudo R2	0.13	0.37	0.49

Panel B. Abnormal accruals

	Abnormal Accruals	Abnormal Accruals
	(1) OLS	(2) OLS
After GB Issuance	-0.02**	-0.001*
	(-2.01)	(-1.74)
Controls	YES	YES
Firm FE and year FE	YES	YES
Abnormal Accrual Calculation Grouped By	Industry	Firms
Observations	38992	40098
Adj. R2	0.91	0.35

Table IA10. Stock Trading Volume

This table presents the tests exploring the change in the total trading volume and institutional trading volume of the green bond issuers in the equity market. The dependent variables are the median daily total trading volume and median daily trading volume from institutional investors. Each issuer's trading volumes are scaled by total assets (in thousands). *After GB Issuance* is a dummy variable that equals one if the firm has issued its first green bond. Definitions of variables are in Appendix A. The sample contains green bond issuers. The sample period covers the trading days two years before and after the issuance of a firm's first green bond. Standard errors are clustered at the industry level. Continuous variables are winsorized at the 1% and 99% percentiles. ∗, ∗∗, and ∗∗∗ denote significance at the 10%, 5%, and 1% level, respectively.

	Total Trading Volume	Institutional Trading Volume
	(1)	(2)
After GB Issuance	0.07**	0.05**
	(2.38)	(2.32)
Controls	YES	YES
Firm FE and Year-month FE	YES	YES
Observations	30275	30275
Adj. R-squared	0.82	0.82