Does ESG reporting impact the cost of debt? Evidence from ESG mandates around the world

Quentin Moreau[a], Georgios Sermpinis[b], Serafeim Tsoukas[b] and Chen Yang[b]

[a]Hong Kong University of Science and Technology, Hong Kong
[b]University of Glasgow, Adam Smith Business School, UK

February 28, 2025

Abstract

Using the staggered implementation of mandatory ESG reporting around the world, we find that ESG reporting has a significant negative impact on the cost of bond financing. We find that mandatory ESG reporting decreases bond yield spreads by reducing information asymmetry and catering to institutional investors' preferences for ESG disclosure. Overall, our results suggest that mandatory ESG reporting helps firms obtain cheaper financing.

Keywords: ESG reporting; Cost of debt; Information Asymmetry; Clientele effects; Bank lending relationship

1 Introduction

Environmental, social, and governance (ESG) considerations have become increasingly important for businesses around the world due to growing globalization and social advocacy efforts. Over the past decade, there has been a great deal of interest on the consequences of mandatory ESG disclosure, but little attention has been devoted to the impact on firms' cost of debt (see, for example, Christensen et al. 2021). This paper attempts to fill this gap in the literature by investigating the impact of ESG disclosure mandates on the cost of raising bonds around the world. We pay special attention to the channels through which firms may achieve a reduction in the issuance costs by exploring the role of information asymmetry, clientele effects and previous bank relationships.

The early literature on ESG disclosures recognizes that the availability and quality of firm-level ESG disclosures are often difficult to establish because there is no commonly accepted measurement framework (Downar et al. 2021). In addition, voluntary disclosures are often affected by self-selection and endogeneity problems (Manchiraju & Rajgopal 2017). In response to these concerns, several countries have initiated mandatory ESG disclosure regulations to force firms to properly disclose information on ESG issues in traditional financial disclosures or in specialized standalone reports. The mandate of regulations increases firms' transparency of climate information and thereby drives a willingness to be responsible and accountable (Krueger et al. 2024). The upshot is that mandatory ESG disclosure rules can be considered as "shocks" to the supply of ESG information because they enable firms to better assess the climate risk, which can lead to hiring of specialised staff for the

development of environmental and sustainable strategies.

Despite the growing body of research on mandatory ESG disclosures, whether any mandatory ESG disclosure requirements are associated with real beneficial outcomes regarding firms' outcomes remains largely mixed. For instance, Downar et al. (2021) use a carbon disclosure in the United Kingdom and show that ESG reporting mandate can reduce pollution with no adverse effect on financial performance. On the contrary, Chen et al. (2018) find that an ESG disclosure mandate in China generated positive environmental externalities at the expense of shareholders. Therefore, focusing on one single ESG reporting mandate may limit the external validity of the findings. Against this backdrop, several recent studies use international samples to analyze the consequences of the staggered adoption of ESG reporting around the world. On the one hand, Gibbons (2024) shows that ESG mandates lead to an increased reliance on external equity and innovative output, as ESG reporting attracts long-term investors. Krueger et al. (2024) find a positive effect of ESG disclosure mandates on firm-level stock liquidity, due to reduced information asymmetry. Moreover, Wang (2023) document that ESG disclosure regulations create transmission effects through bank lending networks: banks increase their ESG monitoring of borrowers following the implementation of the disclosure mandate. Therefore, the ultimate effect of ESG disclosures and the exact channel through which ESG regulations affect firms' financial outcomes is not entirely clear.

In this paper, we propose a novel analysis of the effect of mandatory disclosures on financing costs. ESG disclosure mandates should affect firms' cost of capital, as long as they impact expected risk or return. Theoretically, ESG disclosure mandates

may have benefits such as decreasing firms' exposure to long-term risks or improving profit levels. However, ESG disclosure mandates could also adversely affect financial performance as they may force firms to deviate from the profit-maximizing behavior.[1] Whether ESG reporting mandates are beneficial or detrimental to firms' financing costs is therefore an empirical question. We focus our analysis on corporate bonds, rather than equities, motivated by the following considerations. First, although equity and bonds are both contingent claims on the same future returns, bond prices offer simpler forward-looking functions of cash flows that accrue to the holder than equity prices. It is therefore more straightforward to consider the external finance premium for securities than for equities because corporate credit spreads offer a direct measure of credit risk and consequently borrowing costs (Kaviani et al. 2020). Second, Eckbo et al. (2007) report that bond offerings are three times more frequent than equity offerings and that the average bond offering is three times larger than the average equity offering. Third, as noted by Christensen et al. (2021), while several studies analyze the impact of ESG *activities* on debt markets (see e.g., Sharfman & Fernando 2008, Chava 2014), the impact of ESG reporting mandates on the cost of debt is relatively understudied.

Our analysis is based on a unique and rich sample of corporate bonds issued worldwide. To measure credit spreads, firm-level accounting ratios and country-level regulatory shocks to ESG disclosure, we use three complementary data sources:

[1]This argument is at the core of the recent anti-ESG movement. For instance, Texas lawmakers have banned public pension funds from using ESG criteria in investment decisions, arguing that ESG activities could decrease financial returns. See https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/texas-anti-esg-bill-moves-forward-as-state-pension-fund-warns-of-6b-loss-75178957

Bloomberg, Worldscope, and the database on ESG reporting mandates compiled by Krueger et al. (2024) and originally from "Carrots & Sticks". Specifically, we use panel data between 2004Q1 and 2023Q4 in quarterly frequency to analyze the firm-level credit spreads to the introduction of mandatory ESG policies. We study how well a shock to ESG reporting helps firms achieve lower spreads during the post-shock period and thus provide new evidence on how the external finance premium, in terms of corporate spreads, responds to ESG mandates around the world.

Empirically, we carry out a staggered difference-in-differences analysis to estimate how the policy shift affected firms' cost of obtaining bond financing. Our dataset spans the pre-policy period and post-policy period around the world. We divide firms into two groups: treated and control. The former group includes firms operating in economies that enacted mandatory disclosures. The latter group includes firms in economies that did not introduce ESG mandates. The identifying assumption for this research design is that treated and control groups would have behaved similarly in the absence of the policy change.[2]

We conjecture that the mandatory disclosure of ESG could affect the cost of obtaining external finance from the bond market through three possible channels: (1) it could improve the information provided to investors to gauge firms' risk, thereby improving information quality and reducing the cost of financing, (the information asymmetry channel), (2) it could attract investors who have ESG preferences, therefore reducing the cost of financing (the clientele channel), and (3) it could affect

[2]Gibbons (2024) uses a wide range of country-level variables to assess whether the adoption of ESG reporting mandates is correlated with country-level trends. He does not find any country-level variable significantly predicting the adoption of such mandates, thereby giving credit to our identifying assumption.

firms with previous banking relationships (the bank relationship channel). Our results show that bond spreads decrease with the introduction of the mandates. Moreover, our results suggest that firms command lower spreads, especially if they face a higher degree of information asymmetry, lending support to the information asymmetry channel. Finally, bond spreads are more sensitive to institutional investors and to relationship borrowers. These results give credit to the clientele and the relationship channel.

The remainder of this paper is structured as follows. In Section 2, provide the background of the literature and develop the research hypotheses. In Section 3, we present the data for our empirical analysis along with summary statistics. In Section 4, we show the econometric modeling strategy. In Section 5, we report the econometric results and we subject the models to various robustness tests and, finally, in Section 6, we provide concluding remarks.

2 Related literature and hypothesis development

2.1 Mandatory disclosures and the cost of borrowing

Recent decades have seen an increase in ESG disclosures for both financial and non-financial firms (Wang 2023). Much of the literature largely focuses on ESG reporting in voluntary settings.[3] These studies generally explore the factors influencing voluntary ESG reporting decisions, revealing that firms disclose their ESG activities to signal future financial performance, improve the ESG information environment and

[3]See Christensen et al. (2021) for a detailed review on the key determinants of voluntary CSR reporting.

reduce their cost of capital (Tsang et al. 2023).

However, voluntary changes in ESG disclosure are plagued by self-selection issues. For instance, the decision to engage in ESG activities and report on them could be driven by firms' private cost-benefit evaluations, often unobservable, making it difficult to disentangle their effects on the cost of capital (Gibbons 2024, Dang et al. 2024). In addition, institutional investors often find ESG data less useful in their investment decision making. Specifically, they complain about the availability, consistency and quality of firm-level ESG disclosures, arguing that current reports are insufficient to make informed investment decisions (Ilhan et al. 2023, Krueger et al. 2024). Therefore, attention has shifted to the adoption of national mandatory disclosure regulations, which require listed firms to provide detailed disclosures covering environmental, social and governance matters.

Empirical evaluation of the association between ESG disclosure regulations and reporting quality has been the subject of a nascent line of research. By compiling a cross-country dataset with regulatory shocks to E&S disclosure, Gibbons (2024) documents that reporting E&S information relates to increased investment from institutional owners and has material effects on firms' investment and financing decisions. The author's results show that E&S disclosure regulations increase disclosure quality, alleviating information frictions between shareholders and managers, hence providing material effects on investors and firm decision-making. In addition, Krueger et al. (2024) generate a novel and comprehensive dataset on mandatory ESG disclosures around the world to analyze the stock liquidity effects of such disclosure requirements. Their key result is that mandatory ESG disclosure has beneficial capital

market effects by improving stock liquidity.

Although the above studies find that ESG disclosure mandates create transmission effects on firms' financial performance and stock liquidity, it is also important to understand how investors react to climate risk and ESG changes and assess the effects of disclosure on the cost of financing. Seltzer et al. (2019) argue that regulation is an important channel through which climate and other types of environmental risk are embedded in security prices. The authors find lower credit ratings (and higher yield spreads) for low-environmental score firms and high-emission firms, especially if they operate in US states where environmental regulations are enforced more stringently. Moving to the equity market, ElGhoul et al. (2011) find that corporate social responsibility allows to obtain cheaper equity financing. Dang et al. (2024) offer empirical evidence regarding the impact of mandatory ESG disclosures on the cost of equity capital. The authors use a global dataset in the spirit of Gibbons (2024) and show a substantial reduction in the cost of equity by an average of 50 basis points due to ESG disclosure mandates.

An important component in firms' choice between alternative modes of finance is the corporate bond market. The cost of obtaining external financing from the bond market, often referred to as the external finance premium, is typically approximated by the spread between risky and risk-free debt (Campbell & Taksler 2003). This premium is inversely related to firms' net worth, and to macroeconomic conditions, resulting in countercyclical fluctuations in the cost of external financing (Bernanke et al. 1999). The attention given so far to the role of ESG disclosures on stock performance stands in sharp contrast to the scant evidence about bond financing. However,

enhanced ESG disclosure strengthens firms' relationships with various stakeholders, improving monitoring mechanisms and reducing agency costs. This, in turn, leads to lower credit risk and ultimately reduces borrowing costs (Diamond & Verrecchia 1991, Houston & Shan 2021).[4] In summary, we argue that, following the disclosure, investors are likely to reward firms that operate in countries that have enacted mandatory disclosures compared to firms headquartered in countries that have not adopted such mandates. Based on this discussion, we define the first testable hypothesis as follows:

Hypothesis 1: Firms operating in countries that have enacted ESG mandatory disclosures face lower bond spreads relative to firms operating in countries that have not adopted such disclosures.

2.2 The information asymmetry channel

We conjecture that disclosure of ESG could affect the cost of obtaining external finance from the bond market through different channels. With respect to the information channel, there is a large literature (see e.g., Christensen et al. 2017, Chen et al. 2018, Jouvenot & Krueger 2020, Rauter 2022, Fiechter & Lehmann 2022), which suggests that disclosure regulations impose public pressure on firms, inducing them to improve their related performance. Provision of ESG information helps investors simplify the assessment of ESG risk, particularly those with explicit ESG preferences, allowing them to identify firms aligned with their criteria (Christensen

[4]In addition, several studies also show that CSR *activities* reduce firm risk (see, e.g., Bae et al. 2011, Attig et al. 2013, Albuquerque et al. 2019).

et al. 2021).

Substantial theoretical and empirical evidence provides evidence that various segments of the institutional investor population employ differing investment strategies regarding ESG risks, including climate risks (see, for example, Dyck et al. 2019, Ilhan et al. 2023, Pástor et al. 2021, Goldstein et al. 2024). From a theoretical capital structure perspective, the pecking order theory (Myers & Majluf 1984) suggests that both debt and equity offering prices are negatively affected by information asymmetry. However, as equity holders are the residual claimants, they are comparatively more affected by information asymmetry, compared to debt holders. As a consequence, a reduction in information asymmetry should increase bond prices, but comparatively less so than equity prices.

Krueger et al. (2024) note that the reduction of information asymmetry and the enhancement of ESG disclosure mitigates adverse selection and improves market liquidity. In turn, more liquid markets reduce the costs of issue for firms, and lower the cost of entering and exiting the market for investors. Moreover, Roy et al. (2022) find that mandated CSR firms experience greater stock market liquidity and CSR spending compared to non-CSR firms. These effects arise as mandatory CSR expenditures reduce information asymmetry. Finally, firm value increases following individual mandatory disclosure regulations (Ioannou & Serafeim 2017), primarily due to a reduction in information asymmetry.

Obtaining and disclosing ESG achievements is very relevant for firms' cost of financing. Cheng et al. (2014) suggest that firms with strong ESG performance experience fewer capital constraints due to reduced agency problems and lower in-

formation asymmetry. Goss & Roberts (2011) find that firms engaging in positive ESG activities benefit from a reduction of 7 to 18 basis points (bps) in borrowing costs compared to those with negative ESG practices. Moreover, Asimakopoulos et al. (2023) show that ESG ratings help firms mitigate the asymmetric information gap, lower their leverage and restructure their debt. Based on the above discussion, we argue that mandatory disclosure of ESG could improve the information provided to investors to gauge firms' risk, thereby improving information quality and reducing the cost of financing. Hence, we stipulate our second testable hypothesis as follows:

Hypothesis 2: Following the mandatory ESG disclosures, firms that are relatively constrained on the financial markets face lower bond spreads compared to their counterparts.

2.3 The clientele channel

The literature establishes the role of investor preferences in financial decisions. Going back to Miller & Modigliani (1961), dividend clienteles could form based on investor characteristics. Other studies focus on the differences in investment preferences among different investors, proposing explanations for possible demographic characteristics such as age and income clienteles or retail dividend clienteles (Graham & Kumar 2006, Chen et al. 2019). More recently, there is evidence that institutional investors consider aspects of firms' ESG profiles when making investment (e.g., Ilhan et al. 2023) and portfolio decisions (Starks et al. 2023).

For instance, investment from particular groups of institutional investors with

lower portfolio turnover, can motivate managers to enhance investments in innovation (Aghion et al. 2013). Similarly, previous research demonstrates that investors with preferences for environmental and social (E&S) factors influence firms' E&S policies (Dyck et al. 2019). In fact, investors may have different preferences for CSR activities (Fama & French 2007, Friedman & Heinle 2016). Christensen et al. (2021) highlight this mechanism, noting that these preferences give rise to investor clientele or shareholder base effects, which can impact firms' CSR activities.[5]

Therefore, disclosing ESG information is likely to attract investors, who have a stronger desire for ESG. That is, the information contained in the disclosure may not be financially material to all investors to assess firms' financial risks or to monitor managers, but primarily to those with non-financial objectives (Gibbons 2024). In fact, regarding the clientele channel, Gibbons (2024) argue that E&S disclosure has significant real effects on firms' real decisions by attracting investment from institutional investors who have E&S preferences and longer-term investment horizons. Therefore, if the E&S disclosure mandates attract a subset of institutional investors with specific preferences for E&S information, then the material effects on the firm could occur solely through a clientele effect rather than a change in information leading to an overall decrease in information asymmetry and adverse selection costs for investors.

Our study is motivated by this literature and seeks to examine whether institutional investors experience lower bond spreads following the mandates. We postulate

[5]However, the empirical evidence of a direct link between institutional ownership and ESG performance remains mixed. Starks et al. (2017) find that institutionals prefer high-ESG stocks because of a different evaluation of what ESG implies for long-term returns and a better ability to profit in the long run.

that ESG reporting mandates should attract investments from institutional investors. The influx of institutional investors may be more pronounced when firms start from a low initial level of institutional ownership. Consequently, we anticipate that the effect of ESG mandates is stronger for with a low level of institutional ownership in the pre-mandate period. Our next hypothesis is as follows.

Hypothesis 3: The effect of the mandatory disclosure is stronger for firms with low institutional ownership in the pre-mandate period.

2.4 The bank-relationship channel

Finally, a possible explanation for the reduction in bond spreads after the mandate is related to previous bank relationships. That is, ESG mandates may influence bond spreads indirectly through bank relationships. Bank-firm relationship lending facilitates screening and monitoring because the bank accumulates inter temporal firm-specific information from repeated interactions with the firm, which adds value (Diamond 1984, Allen 1990, Winton 1995). Relationship lending is a key mechanism to mitigate moral-hazard and adverse-selection problems in loan contracting (Boot 2000). Moreover, a number of studies show a decline in collateral requirements as the lending relationship progresses (Berger & Udell 1995, Degryse et al. 2021).

As mentioned, ESG mandatory disclosures increase the transparency and reliability of firms, reducing adverse selection and consequently the cost of borrowing. We argue that once banks create relationship lending, the effect of mandate regulations is more pronounced for relationship borrowers. In other words, ESG mandates

may reduce firm risk, and consequently, the cost of borrowing. However, this effect strengthens once firms establish bank relationships. Following this discussion, we formulate our next hypothesis.

Hypothesis 4: The negative association between ESG mandatory disclosures and bond spreads is more potent for relationship borrowers.

3 Data and descriptive statistics

To test the hypotheses, we first collect bond information from the Datastream Worldscope database. This database contains information about the yields, issue dates, denomination, duration, currency and the maturity in the bonds measured. We focus on all corporate bonds issued around the world over the period 2004Q1 to 2023Q4. We collect accounting data from the Datastream Worldscope database. The matching of the bonds with the accounting data was made feasible using BUPCECD (Bond Ultimate Parent Company Datastream Equity Code) codes. We also hand-match firms in the two datasets using company names following a process that is common in the literature to merge firm with transaction level data (e.g., Almeida et al. 2017, Acharya et al. 2018, Mizen et al. 2021).[6]

We gather ESG disclosure factors, stock market information and country-level macroeconomic variables from Bloomberg To mitigate potential selection bias, our analysis includes additional countries that do not enact ESG disclosure mandates,

[6]In the Appendix, we formally define all variables in the empirical analysis and provide the data sources.

serving as control countries. We collect and macroeconomic and environmental data at the country level from the World Bank. Following normal selection criteria used in the literature, we exclude companies that did not have complete records on our explanatory variables and firm-quarters with negative sales. In addition, we drop firms with less than $10 million in total assets and those operating in the financial or utility sectors. Finally, we require firms to have at least three observations before the mandatory disclosure regulation. To control for the potential influence of outliers, we winsorize the regression variables at 1% and 99% levels. Our combined sample contains data for 24,052 bonds issued by 2,774 firms that traded between 2003Q1 and 2023Q4, across 57 countries.

We follow Krueger et al. (2024) to determine the effective years of mandatory ESG disclosure at the country level.[7] The dataset includes information about the effective years, implementation mechanisms, and approaches of mandatory ESG disclosure regulations from 33 countries around the world. To ensure that we do not omit ESG information, we search online for additional mandatory ESG disclosures.

Table 1 provides preliminary analysis of our sample. The bond spread ranges from 0.6% in the lower quartile of the distribution to 2.4% in the upper quartile with an average of 1.9%. Moreover, 27.3% of the firm-years receive operate in a country that enacts a mandatory ESG disclosure. With respect to firm-level characteristics, the average firm displays a ratio of tangible assets to total assets 31.8%, leverage ratio of 13.98% and the cash to assets ratio ranges equals 8.2%. Firms in the sample

[7]The dataset compiled by Krueger et al. (2024) is primarily sourced from the Carrots and Sticks project, the Global Reporting Initiative (GRI), and the Sustainable Stock Exchanges (SSE). To ensure that we do not omit ESG information, we search online for additional mandatory ESG disclosures.

spend an average of 1.5% and of assets on investments in R&D and the average dividend to assets is 2%. Finally, the average firm has a Tobin's Q of 1.36 and an ESG score of 62.8 in the 0-100 range.

4 Empirical strategy

4.1 Baseline model

We first estimate how bond spreads change around mandatory ESG disclosures. To do so, we employ a staggered difference-in-difference approach using the mandatory ESG disclosure regulations as exogenous shocks. The merits of our staggered difference-in-difference design in research problems such as ours is well-established in the related literature (Gibbons 2024, Krueger et al. 2024). Specifically, it omits the potential bias from confounding omitted variables through the inclusion of the fixed effects and allows issuing firms to be part of both the control and the treated groups at different time points. We generate estimates of the effect of the mandatory ESG disclosure regulations on the spread of corporate bonds issued by firms operating in countries where ESG disclosure is mandatory against their counterparts in countries where ESG disclosure is not mandatory over the same period. Our baseline model is the following:

$$Y_{f,b,c,t} = \alpha + \beta_1 \text{Mandatory ESG Discl.}_{f,c,t} + \delta X_{f,c,t-1} + FE + \varepsilon_{f,b,c,t} \tag{1}$$

where f indexes firm, b indexes bond, c indexes country, and t indexes time. $Y_{f,b,c,t}$

is the bond spread, measured as the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency (see, for instance, Campbell & Taksler 2003, Kaviani et al. 2020, Caramichael & Rapp 2024). In those cases where there is no corresponding government bond, we construct the equivalent government bond and estimate its yield using a simple linear interpolation method. $Mandatory\ ESG\ Discl._{f,c,t}$ is a dummy variable that takes the value of 1 if the firm is headquartered in a country that adopted a mandatory environmental, social or governance law; otherwise, it takes the value of 0. Hence, firms in countries with mandatory disclosure belong to the treatment group and the remaining firms to the control group. The coefficient of interest in equation (1) is β_1, which measures the difference in bond spreads between treated and control firms in the post-mandatory disclosure period.

To estimate the effect of mandatory ESG disclosure, $X_{f,c,t-1}$ is a vector that contains firm- and country-level control variables that capture financial, risk characteristics and aggregate economic development, which could affect firms' cost of debt capital as suggested by previous empirical literature on the determinants of credit spread and capital structure (see, for instance, Asimakopoulos et al. 2023, Campbell & Taksler 2003, Helwege et al. 2014, Kaviani et al. 2020). All variables are lagged by one period to mitigate potential endogeneity concerns. Specifically, we employ the following firm-specific characteristics: size, Return on Assets (ROA), collateral, leverage, cash, dividends, Tobin's Q, R&D, and their ESG score.[8] Country-level controls include GDP and its growth, rule of law, unemployment, political stabil-

[8]To facilitate measurement, all variables are converted into US dollars.

ity, corruption, environmental performance, tax, renewable energy and government efficiency.

The model includes additional controls as follows: firm fixed effects to account for unobserved firm heterogeneity, time fixed effects to account for macroeconomic trends, as well as bond fixed effects to control for bond-specific omitted factors. In some specifications we include time×industry fixed effects to control for time-varying industry characteristics. We double-cluster the standard errors, $\epsilon_{f,b,c,t}$, at the bond quarter level to account for potential serial correlation in the error terms.

Our identification strategy relies on the assumption that, in the period before the introduction of mandates, bond spreads did not differ systematically across treated and control firms (parallel-trends assumption). To address this issue, we provide a simple visual account of the evolution of firms' bond spreads around the introduction of a disclosure mandate. Specifically, as in Autor (2003) we plot the series of coefficients and corresponding 95% confidence intervals from estimating regressions analogous to equation 1, in which we replace $Mandatory\ ESG\ Discl._{f,c,t}$ with a sequence of time dummies spanning our entire estimation period. These dummy variables take a value of 1 in the respective year and a value of 0 for all other quarters. We group together years that are three or more years before ($t \leq -3$) or after ($t \geq +3$) the introduction of a mandate. The graph shows a continuous drop in the bond spreads after the mandate. There is some limited evidence of anticipation given the increase in spreads in $t = -2$, but in $t - 3$ and before the effect is statistically (and economically) insignificant. Krueger et al. (2024) note a similar pattern for the effect of mandates on firms' stock market illiquidity.

4.2 Potential mechanisms for the link between bond spreads and mandatory disclosures

Our baseline analysis establishes an association between the cost of issuing bonds and the introduction of ESG mandates. In this subsection, we examine three potential channels that might explain this relationship: the information channel, the clientele-catering channel, and the green-bond channel.

In order to examine whether, following the mandatory disclosure, bond spreads differ for firms that are associated with the higher and lower degrees of information asymmetry, we augment equation 1 with a variable that captures financial constraint. Our model is:

$$Y_{f,b,c,t} = \alpha + \beta_1 \text{Mandatory ESG Discl.}_{f,c,t} \times \text{Unrated/Junk}_{f,t} + \beta_2 \text{Mandatory ESG Discl.}_{f,c,t} + \delta X_{f,c,t-1} + FE + \varepsilon_{f,b,c,t} \quad (2)$$

where $Unrated/Junk_{f,t}$ is a dummy variable, which takes value 1 for firms have debt outstanding but without a bond rating and for firms with bonds whose ratings are below the investment grade threshold, and 0 otherwise. Similar approaches to define financial constraints using credit ratings are used by Almeida & Campello (2007) and Campello et al. (2010). The sign and significance of the interaction term will reveal whether firms more (less) likely to be financially constrained face differential spreads in the post-mandate period. To support H2, we should observe negative and significant coefficients for both β_1 and the double interaction term

β_2. This would imply that bond spreads and mandatory disclosures are negatively related, but more so for firms that suffer from greater information asymmetry.

At the next stage we aim to assess whether a clientele effect exists, i.e., if the taste for ESG information of some investors may influence the relationship between ESG reporting mandates and bond spreads. We estimate the following equation:

$$Y_{f,b,c,t} = \alpha + \beta_1 \text{Mandatory ESG Discl.}_{f,c,t} \times \text{LowIO/LowIOCountry}_f + \beta_2 \text{Mandatory ESG Discl.}_{f,c,t} + \delta X_{f,c,t-1} + FE + \varepsilon_{f,b,c,t} \quad (3)$$

where $LowIO/LowIOCountry_f$ is a dummy variable, which takes value 1 for firms that have equity institutional ownership in the bottom quartile for any of the four quarters preceding the ESG mandate implementation, and 0 otherwise. Quartiles are defined within each quarter for *Low IO*, and within each quarter-country for *Low IO Country*. We build on Gibbons (2024), who argues that firms with low institutional ownership prior to the ESG reporting mandates are more affected by clientele effects, as their initially low level of institutional ownership leaves room for a larger influx of institutional owners post-mandate.[9] To support H3, we would expect to observe negative and significant coefficients for both β_1 and the double interaction term β_2. In other words, mandatory disclosures should exert a negative impact on the cost of borrowing from the bond markets, especially for firms that are more prone to larger clientele effects.

[9]We use equity institutional ownership, as we do not have access to bond ownership data.

Finally, we take into account the differential effect of relationship lending on bond spreads in the post-mandate period. Formally, we test the following model:

$$Y_{f,b,c,t} = \alpha + \beta_1 \text{Mandatory ESG Discl.}_{f,c,t} \times \text{Rel Bor}_{f,t} + \beta_2 \text{Mandatory ESG Discl.}_{f,c,t} + \beta_3 \text{Rel Bor}_{f,t} + \delta X_{f,c,t-1} + FE + \varepsilon_{f,b,c,t} \quad (4)$$

where *Rel Bor* is a measure of relationship strength that equals 1 if a bank lends to the same borrower in the last five years before the present loan, and zero otherwise (Bharath et al. 2009). To support H4, we should observe negative coefficients for both β_1 and β_2. This would imply that bond spreads and ESG mandatory disclosures are negatively related, but more so for relationship borrowers.

5 Results

5.1 Mandatory disclosure and bond spreads

We start our investigation with a basic model of bond spread determination. Table 2 shows the results of estimating equation 1. We test the first hypothesis: firms operating in countries that have introduced ESG mandates, are more likely to command lower spreads. The estimation results in the subsequent columns include different fixed effects that strengthen our identification. We report coefficient estimates and t-statistics, with standard errors clustered by bond and quarter. The general finding is that ESG disclosures negatively and significantly affect bond spreads, both

statistically and economically.

The impact of mandatory ESG disclosure is substantial on bond spreads, as demonstrated by the negative coefficient on the $Mandatory\ ESG\ Discl._{f,c,t}$ term in column 1. That is, following the disclosure, firms face lower bond spreads compared to those that do not operate in counties that have enacted mandatory disclosures. The finding shows qualitatively and quantitatively significant effects. Based on the estimates in column 1, treated firms' bond spreads decrease by 0.49 percent after the policy change. In the following columns of table 2, we rerun the same regressions and find that the main results persist, if not becoming larger in magnitude, even after controlling for firm-level characteristics, bond, industry and time-varying shocks that could affect firms in the treated and control groups differently. Our findings provide strong support for H1 and are valuable in light of previous studies, which show that firms with higher environmental scores command lower rates on their bank loans (Chava 2014) and lower bond spreads (Seltzer et al. 2019). We document that firms that issue bonds after ESG mandates are more likely to face lower risks and this is mirrored on their cost of bond financing.

Judging from the signs of the estimated coefficients on the control variables, we find that an increase in firm size, profitability, collateral, cash holdings and Tobin's Q, which are signs of strong balance sheets, reduce the cost of bond financing. In addition, higher ESG scores attract higher spreads, which is consistent with the notion that ESG activities may be a symptom of agency costs.

To sum up, the baseline specifications suggest that bond spreads decrease with the introduction of ESG mandates. We point out, however, that the baseline model

may ignore important heterogeneities. In the next sections, we test the robustness of our main findings and dive deeper into the channels through which mandatory disclosure of ESG could affect the cost of obtaining external funding from the bond markets.

5.1.1 Robustness tests

In Table 3, we present four additional robustness tests for the results in Table 2. We first remove the US and Japan from the sample because these countries dominate the bond data and their markets may be fundamentally different from the remaining economies. In column 1 we report the regressions with a smaller sample after dropping the US and Japan. In column 2, to avoid concerns regarding the role of various macro-economic indicators, we add various country-level control variables. Next, consistent with previous research (see, e.g., Fauver et al., 2017 and Dang et al., 2023), we restrict the sample of firms within treatment countries to a window around the introduction of the disclosure. Specifically, in column 3 we use 5 years prior to and 5 years following the effective year of mandatory ESG disclosure. This approach aims at mitigating the impact of confounding factors over an extended window. For countries in the control group, we adopt the full sample window. In column 5, we repeat this exercise using 3 years before and after the introduction of the disclosure. Our findings are robust to all the above modifications.

In order to further alleviate any concerns about our identification strategy and provide an extra layer of robustness on our main findings , we repeat our main exercise with a different method, the Causal Forest (CF). CF is a nonparametric

machine learning causal inference method based on one of the most popular machine learning algorithms, the Random Forest. In CF the dataset is split so that the difference across splits is maximized between the outcome and the treatment variable. The main difference between the CF and the staggered DiD approach, applied in the previous section, is that the former can identify which subgroups experience different treatment effects, while DiD provides the average treatment effect across the whole population. In other words, in our setting, the CF estimates the conditional average treatment effect of each bond under study, while the staggered DiD estimates the average treatment effect of the whole group. Thus, CF provides a detailed view on how the heterogeneity varies within our bonds. In addition, CF can handle large complex datasets better and identify itself the most relevant factors, unlike staggered DiD, which relies on pre-selected specifications Figure 2 plots the conditional average effect of all bonds under study and the red vertical line the average treatment effect. We note that the average treatment effect is still negative and close to the ones obtained by the staggered DiD.

5.2 The information asymmetry channel

We now turn to our H2, relating ESG disclosures to asymmetric information. The results of estimating equation 2 are in Table 4. Each column of the table corresponds to one of the alternative indicators that underlies the characterization of financial constraints. For instance, column 1 presents the results exploring firms without a credit rating ($Unrated$), while column 2 explores firms with sub-investment grade ratings ($Junk$). In both models we interact the dummy variables for financial constraints

(*Unrated*, *Junk*)) with the mandatory disclosure variable (*Mandatory ESG Discl.*) to gauge the change in bond spreads for different groups of firms in the post-mandate period.

According to the results reported in column 1, the coefficient on mandatory disclosures is negative and highly significant. Following the mandates, firms experience a reduction in their bond spreads by 5.5 percentage points. When we observe the interaction term between mandates and unrated firms (*Mandatory ESG Discl.* × *Unrated*), it is negative and significant at the 10% level. Hence, the reduction in bond spreads is magnified by 12.8 percentage points for unrated firms. To further corroborate our findings, we use a different indicator of financing constraints, namely whether firms' ratings are categorized as junk (or below investment grade). Columns 2 shows, once again, that the effect of mandates on the cost of borrowing from the bond markets remains negative and statically significant. Importantly, the effect is amplified for firms with low-quality credit ratings.

In summary, we document that firms' bond spreads have a different response to ESG mandates, when considering the degree of asymmetric information, as measured by credit ratings. These results offer support to H2 because firms that suffer from higher information asymmetry benefit the most from the introduction of the mandates. In other words, unrated firms or those that achieve below-investment-grade ratings, lack transparency and availability of public information that can in influence the cost of borrowing. For these firms, revelation of ESG information is more important compared to their counterparts that have track record and do not experience difficulties in accessing external finance.

5.3 The clientele channel

In this sub-section, we focus on how institutional investors' preferences for ESG information could affect the relationship between mandatory ESG disclosures and the cost of bond financing. If institutional investors have a preference for firms with more nonfinancial disclosure, they may be prone to invest in securities affected by ESG disclosure mandates. This inflow of institutional investors should be larger for securities with a low ex ante level of institutional ownership, cf. Gibbons (2024). Therefore, we distinguish between two types of firms, namely those that have higher (lower) ex-ante levels of institutional ownership. We expect that the effect of ESG reporting mandates on bond spreads should be magnified for firms with lower institutional ownership prior to the mandate. In Table 5, we present the estimates of equation 4. To begin with column 1, we focus on the sign and significance of the double-interaction term ($Mandatory\ ESG\ Discl. \times Low\ IO$). We find that firms with equity institutional ownership in the bottom quartile of the distribution in the pre-mandate period face a stronger reduction in spreads after the ESG mandate implementation. In other words, the negative and significant coefficient shows that this group of firms reduce their bond spreads by 3.2 percentage points after the introduction of the mandate. In column 2 of Table 5, we check the robustness of this finding by generating another dummy variable, which takes value 1 for firms that have equity institutional ownership in the bottom quartile for any of the four quarters preceding the ESG mandate implementation, and 0 otherwise. Here, quartiles are defined within each country-quarter, instead of within each quarter as in column 1. We observe qualitatively and quantitatively similar results.

Overall, we find that firms with low ex ante institutional ownership enjoy a stronger reduction in their bond spreads after the implementation of ESG mandates. These results lend support to H3.

5.4 The bank-relationship channel

We investigate how firms' access to the syndicated loan market affects the relationship between the cost of borrowing from the bond market and ESG disclosure. Therefore, we estimate equation (4) and report the results in Table 6. Column 1 shows that the coefficient on mandatory disclosures (*Mandatory ESG Discl.*) is negative and statistically significant: treated firms reduce their spreads after the introduction of the mandate. The double interaction term (*Mandatory ESG Discl.* $\times$ *Rel Bor*) shows a statistically significant and negative coefficient, consistent with H4. The results show qualitatively and quantitatively significant effects. In the remaining specifications reported in columns 2 to 4, we find that the main results persists even after defining relationship borrowers in different ways. We conclude that our findings provide strong support for the bank relationship channel.

6 Conclusion

ESG reporting may affect firms' risk and return levels, which in turn can influence firms' cost of capital. However, whether ESG reporting increases or decreases financing costs is theoretically unclear, as arguments can be made in both directions. In this study, we leverage the staggered implementation of ESG reporting mandates

to analyze whether ESG disclosure influences firms' cost of capital. Using a large international sample of corporate bonds, we find that ESG disclosure has helped firms decrease their cost of financing. Importantly, our results hold after controlling for ESG ratings and various country-level characteristics that could have confounded the effect. Our findings suggest that both a reduction in information asymmetry and clientele effect (i.e., a preference of some investors for securities with ESG attributes) drive the results. The effects are also stronger for firms with preexisting bank lending relationships. Overall, our study should provide valuable information to regulators and policymakers considering the implementation of an ESG reporting mandate in their jurisdiction. Compared to relying on voluntary ESG disclosure or a unique ESG reporting mandate, we believe that our empirical design allows us to provide more comprehensive and generalizable insights. However, we would also like to have one word of caution. As with any empirical study, our results may to some extent depend on our sample period. Notably, the clientele effect may weaken in the future, as the world faces a growing anti-ESG movement and several large investors such as Blackrock now tone down their ESG preferences.

References

Acharya, V., Eisert, T., Eufinger, C. & Hirsch, C. (2018), 'Real effects of the sovereign debt crisis in Europe: Evidence from syndicated loans', *The Review of Financial Studies* **31**(8), 2855–2896.
URL: *https://EconPapers.repec.org/RePEc:oup:rfinst:v:31:y:2018:i:8:p:2855-2896.*

Aghion, P., Reenen, J. V. & Zingales, L. (2013), 'Innovation and institutional ownership', *American Economic Review* **103**(1), 277–304.
URL: *https://doi.10.1257/aer.103.1.277*

Albuquerque, Koskinen & Zhang (2019), 'Corporate social responsibility and firm risk: Theory and empirical evidence', *Management Science* **65**, 4451–4469.
URL: *https://doi.org/10.1287/mnsc.2018.3099*

Allen, F. (1990), 'The market for information and the origin of financial intermediation', *Journal of Financial Intermediation* **1**(1), 3–30.

Almeida, H. & Campello, M. (2007), 'Financial constraints, asset tangibility, and corporate investment', *The Review of Financial Studies* **20**(5), 1429–1460.
URL: *https://doi.org/10.1093/rfs/hhm019*

Almeida, H., Cunha, I., Ferreira, M. A. & Restrepo, F. (2017), 'The real effects of credit ratings: The sovereign ceiling channel', *Journal of Finance* **72**(1), 249–290.
URL: *https://ideas.repec.org/a/bla/jfinan/v72y2017i1p249-290.html*

Asimakopoulos, P., Asimakopoulos, S. & Li, X. (2023), 'The role of environmental, social, and governance rating on corporate debt structure', *Journal of Corporate Finance* **83**, 102488.
URL: *https://www.sciencedirect.com/science/article/pii/S0929119923001372*

Attig, Ghoul, E., Guedhami & Suh (2013), 'Corporate social responsibility and credit ratings', *Journal of Business Ethics* **117**, 679–694.
URL: *https://doi.org/10.1007/s10551-013-1714-2*

Autor, D. (2003), 'Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing', *Journal of Labor Economics* **2**, 1–42.

Bae, Kang & Wang (2011), 'Employee treatment and firm leverage: A test of the stakeholder theory of capital structure', *Journal of Financial Economics* **100**, 130–153.
URL: *https://doi.org/10.1016/j.jfineco.2010.10.019*

Berger, A. & Udell, G. (1995), 'Relationship lending and lines of credit in small firm finance', *The Journal of Business* **68**(3), 351–81.
URL: *https://EconPapers.repec.org/RePEc:ucp:jnlbus:v:68:y:1995:i:3:p:351-81*

Bernanke, B., Gertler, M. & Gilchrist, S. (1999), The financial accelerator in a quantitative business cycle framework, *in* J. Taylor & M. Woodford, eds, 'Handbook of Macroeconomics', Vol. 1C, Elsevier Science, North Holland.

Bharath, S., Dahiya, S., Saunders, A. & Srinivasan, A. (2009), 'Lending relationships and loan contract terms', *Journal of Financial Intermediation* **24**(4), 1141–1203.

Boot, A. (2000), 'Relationship banking: what do we know?', *Journal of Financial Intermediation* **9**, 7–25.

Campbell, J. & Taksler, G. (2003), 'Equity volatility and corporate bond yields', *The Journal of Finance* **58**(6), 2321–2350.

Campello, M., Graham, J. R. & Harvey, C. R. (2010), 'The real effects of financial constraints: Evidence from a financial crisis', *Journal of Financial Economics* **97**(3), 470–487.
URL: *https://www.sciencedirect.com/science/article/pii/S0304405X10000413*

Caramichael, J. & Rapp, A. (2024), 'The green corporate bond issuance premium', *Journal of Banking and Finance* **162**, 107126.

Chava (2014), 'Environmental externalities and cost of capital', *Management Science* **60**, 2223–2247.
URL: *https://doi.org/10.1287/mnsc.2013.1863*

Chen, X., Huang, J.-Z., Sun, Z., Yao, T. & Yu, T. (2019), 'Liquidity premium in the eye of the beholder: An analysis of the clientele effect in the corporate bond market', *Management Science* **66**(2), 932–957.
URL: *https://doi.org/10.1287/mnsc.2018.3179*

Chen, Y.-C., Hung, M. & Wang, Y. (2018), 'The effect of mandatory csr disclosure on firm profitability and social externalities: Evidence from China', *Journal of Accounting and Economics* **65**, 169–190.

Cheng, B., Ioannou, I. & Serafeim, G. (2014), 'Corporate social responsibility and access to finance', *Strategic Management Journal* **35**(1), 1–23.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1002/smj.2131*

Christensen, H., Floyd, E., Liu, L. & Maffet, M. (2017), 'The real effects of mandated information on social responsibility in financial reports: Evidence from mine-safety records', *Journal of Accounting and Economics* **64**, 284–304.

Christensen, H., Hail, L. & Leuz, C. (2021), 'Mandatory CSR and sustainability reporting: Economic analysis and literature review', *Review of Accounting Studies* **26**, 1178–1248.

Dang, T., Do, D., Ho, T. & Truong, C. (2024), 'From mandate to market across the globe: The impact of mandatory ESG disclosure on the cost of equity capital'.
URL: *https://papers.ssrn.com/sol3/papers.cfm?abstract$_i$d* = 4420160

Degryse, H., Karapetyan, A. & Karmakar, S. (2021), 'To ask or not to ask? bank capital requirements and loan collateralization', *Journal of Financial Economics* **142**(1), 239–260.
URL: *https://www.sciencedirect.com/science/article/pii/S0304405X21001999*

Diamond, D. & Verrecchia, R. (1991), 'Disclosure, liquidity, and the cost of capital', *The Journal of Finance* **46**(4), 1325–1359.

Diamond, D. W. (1984), 'Financial intermediation and delegated monitoring', *The Review of Economic Studies* **51**(3), 393–414.

Downar, B., Ernstberger, J., Reichelstein, S., Schwenen, S. & Zaklan, A. (2021), 'The impact of carbon disclosure mandates on emissions and financial operating performance', *Review of Accounting Studies* **26**, 1137–1175.

Dyck, A., Lins, K. V., Roth, L. & Wagner, H. F. (2019), 'Do institutional investors drive corporate social responsibility? International evidence', *Journal of Financial Economics* **131**(3), 693–714.

Eckbo, Masulis & Norli (2007), 'Security offerings', *Handbook of Empirical Corporate Finance* pp. 233–373.
URL: *https://doi.org/10.1016/B978-0-444-53265-7.50020-2*

ElGhoul, Guedhami, Kwok & Mishra (2011), 'Does corporate social responsibility affect the cost of capital?', *Journal of Banking and Finance* **35**, 2388–2406.
URL: *https://doi.org/10.1016/j.jbankfin.2011.02.007*

Fama, E. F. & French, K. R. (2007), 'Disagreement, tastes, and asset prices', *Journal of Financial Economics* **83**(3), 667–689.
URL: *https://www.sciencedirect.com/science/article/pii/S0304405X06001954*

Fiechter, P.and Hitz, J.-M. & Lehmann, N. (2022), 'Real effects of a widespread CSR reporting mandate: Evidence from the european union's CSR directive', *Journal of Accounting Research* **60**, 1499–1549.

Friedman, H. & Heinle, M. (2016), 'Taste, information, and asset prices: implications for the valuation of CSR', *Review of Accounting Studies* **21**, 740–767.
URL: *https://doi.org/10.1007/s11142-016-9359-x*

Gibbons, B. (2024), 'The financially material effects of mandatory nonfinancial disclosure', *Journal of Accounting Research* **62**(5), 1711–1754.

Goldstein, I., Kopytov, A., Lin, S. & Xiang, H. (2024), 'On ESG investing:heterogeneous preferences, information, and asset prices'.
URL: *https://finance.wharton.upenn.edu/ itayg/Files/esgtrading.pdf*

Goss, A. & Roberts, G. S. (2011), 'The impact of corporate social responsibility on the cost of bank loans', *Journal of Banking Finance* **35**(7), 1794–1810.
URL: *https://www.sciencedirect.com/science/article/pii/S0378426610004498*

Graham, J. & Kumar, A. (2006), 'Do dividend clienteles exist? Evidence on dividend preferences of retail investors', *The Journal of Finance* **61**(3), 1305–1336.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6261.2006.00873.x*

Helwege, J., Huang, J. & Wang, Y. (2014), 'Liquidity effects in corporate bond spreads', *Journal of Banking Finance* **45**, 105–116.

Houston, J. F. & Shan, H. (2021), 'Corporate ESG profiles and banking relationships', *The Review of Financial Studies* **35**(7), 3373–3417.

Ilhan, E., Krueger, P., Sautner, Z. & Starks, L. (2023), 'Climate risk disclosure and institutional investors', *The Review of Financial Studies* **36**(7), 2617–2650.

Ioannou, I. & Serafeim, G. (2017), 'The consequences of mandatory corporate sustainability reporting'.
URL: *https://ssrn.com/abstract=1799589*

Jouvenot, V. & Krueger, P. (2020), Reduction in corporate greenhouse gas emissions under prescriptive disclosure requirements, Working paper series, University of Geneva.

Kaviani, M. S., Kryzanowski, L., Maleki, H. & Savor, P. (2020), 'Policy uncertainty and corporate credit spreads', *Journal of Financial Economics* **138**, 838–865.

Krueger, P., Sautner, Z., Tang, D. & Zhong, R. (2024), 'The effects of mandatory ESG disclosure around the world', *Journal of Accounting Research* **62**(5), 1795–1847.

Manchiraju, H. & Rajgopal, S. (2017), 'Does corporate social responsibility (csr) create shareholder value? evidence from the indian companies act 2013', *Journal of Accounting Research* **55**(5), 1257–1300.

Miller, M. & Modigliani, F. (1961), 'Dividend policy, growth, and the valuation of shares', *The Journal of Business* **34**.
URL: *https://EconPapers.repec.org/RePEc:ucp:jnlbus:v:34:y:1961:p:411*

Mizen, P., Packer, F., Remolona, E. & Tsoukas, S. (2021), 'Original sin in corporate finance: New evidence from asian bond issuers in onshore and offshore markets', *Journal of International Money and Finance* **119**, 102489.
URL: *https://www.sciencedirect.com/science/article/pii/S0261560621001406*

Myers, S. & Majluf, N. (1984), 'Corporate financing and investment decisions when firms have information investors do not have', *Journal of Financial Economics* **131**, 187–221.

Pástor, L., Stambaugh, R. & Taylor, L. (2021), 'Sustainable investing in equilibrium', *Journal of Financial Economics* **142**(2), 550–571.

Rauter, T. (2022), 'The effect of mandatory extraction payment disclosures on corporate payment and investment policies abroad', *Journal of Accounting Research* **58**, 1075–1116.

Roy, P. P., Rao, S. & Zhu, M. (2022), 'Mandatory CSR expenditure and stock market liquidity', *Journal of Corporate Finance* **72**, 102158.

Seltzer, L., Starks, L. & Zhu, Q. (2019), Climate regulatory risk and corporate bonds, Working Paper Series No. 29994, National Bureau of Economic Research.

Sharfman & Fernando (2008), 'Environmental risk management and the cost of capital', *Strategic Management Journal* **29**, 569–592.
URL: *https://doi.org/10.1002/smj.678*

Starks, L. T., Venkat, P. & Zhu, Q. (2017), 'Corporate ESG profiles and investor horizons'.
URL: *https://ssrn.com/abstract=3049943 or http://dx.doi.org/10.2139/ssrn.3049943*

Starks, L. T., Venkat, P. & Zhu, Q. (2023), 'Corporate ESG profiles and investor horizons'.
URL: *https://ssrn.com/abstract=3049943*

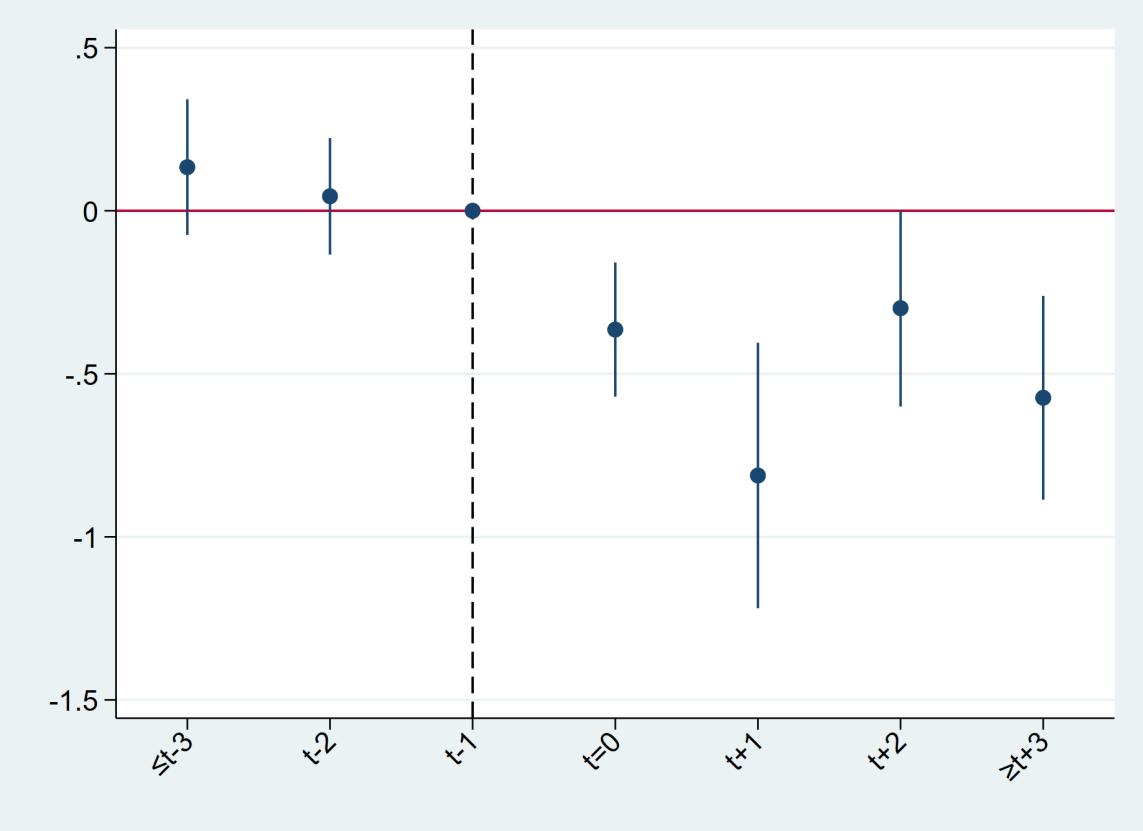
Tsang, A., Frost, T. & Cao, H. (2023), 'Environmental, social, and governance (ESG) disclosure: A literature review', *The British Accounting Review* **55**(1), 101149.

Wang, L. (2023), 'Transmission effects of ESG disclosure regulations through bank lending networks', *Journal of Accounting Research* **61**(3), 935–978.

Winton, A. (1995), 'Delegated monitoring and bank structure in a finite economy', *Journal of Financial Intermediation* **4**(2), 158–187.

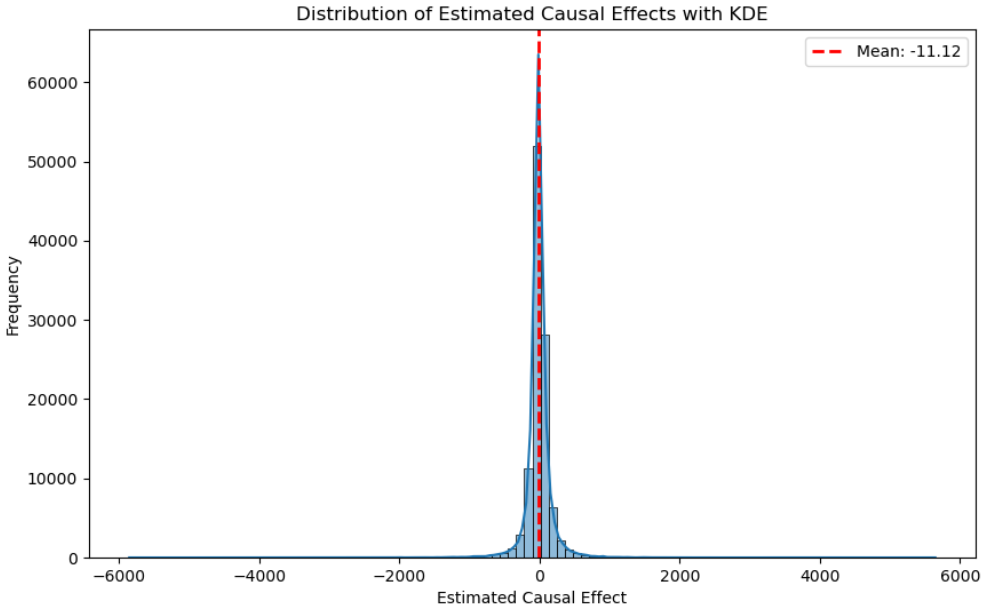
A Figures and tables

Figure 1: Mandatory ESG disclosure and bond spreads: Parallel trends



The figure illustrates event time effects of mandatory ESG disclosure on bond spreads. The lower and upper bounds of the box correspond to the 25th and 75th percentiles, respectively, while the median is indicated by the line within the box.

Figure 2: This figure



B Variable definitions

Table 8: Variable definitions and sources

	A. Dependent variable and main explanatory variable	
Bond Spread	The difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency expressed in percentage.	Worldscope
Mandatory ESG Disclosure	A dummy variable that is equal to 1 from the first year in which a country introduced mandatory ESG disclosure, and 0 otherwise.	Kruger et al. (2024)
	B. Control variables	
Firm Size	The natural logarithm of a firm's total assets, in USD.	Worldscope
ROA	The ratio of net income divided by total assets, both in the reporting currency.	Worldscope
Tangible	The ratio of property, plant, and equipment divided by total assets, both in the reporting currency.	Worldscope
Leverage	The ratio of total debt divided by common equity, calculated as the sum of long-term debt and short-term debt divided by common equity, all in the reporting currency.	Worldscope
Cash Holding	The ratio of cash and cash equivalents divided by total assets, both in the reporting currency.	Worldscope
Dividend	The ratio of the total common and preferred dividends paid to shareholders divided by total assets, both in the reporting currency.	Worldscope
Tobin's Q	The ratio of market value divided by total assets, both in the reporting currency. The market value of a firm is calculated as the sum of market capitalization and total debt.	Worldscope
R&D	The ratio of research and development costs divided by total assets, both in the reporting currency. Missing values of R&D are replaced with zero.	Worldscope
ESG Score	The natural logarithm of ESG score. The ESG score is calculated as the average of Refinitiv's Environment Pillar Score and Refinitiv's Social Pillar Score.	Worldscope

C. Country-level variables

GDP	GDP per capita calculated as the gross domestic product divided by mid-year population count.	World Bank/OECD
GDP Growth	The annual percentage change in gross domestic product divided by mid-year population count.	World Bank/OECD
Rule of Law	Perceptions of the extent to which agents have confidence in and abide by the rules of society and the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Bank
Unemployment	The share of the labor force that is without work but available for and seeking employment	World Bank/ International Labour Organization
Political Stability	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. This measure gives the country's score in terms of an aggregate indicator.	World Bank
Corruption Control	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	World Bank
Environment Performance	The total metric tons of carbon dioxide emissions from the burning of fossil fuels and the manufacture of cement per capita.	World Bank/ Carbon Dioxide Information Analysis Center
Tax	Compulsory transfers to the central government for public purposes scaled by annual gross domestic product.	World Bank/ International Monetary Fund/ OECD
Renewable Energy	The share of energy consumed in the country from sources that do not produce carbon dioxide during generation (including nuclear).	World Bank
Government Efficiency	The sum of the squared seat shares of all parties in the government.	World Bank/ Inter-American Development Bank

Table 1: Summary statistics

	N	Mean	St.D.	P25	Median	P75
A. Bond-specific variables						
Bond Spread (%)	373,402	2.098	5.435	0.606	1.319	2.367
B. Firm-specific variables						
Mandatory ESG Discl.	373,402	0.270	0.444	0.000	0.000	1.000
Firm Size (in USD)	373,402	17.200	1.457	16.240	17.247	18.199
ROA	373,402	0.037	0.067	0.012	0.035	0.066
Tangible	373,402	0.320	0.233	0.119	0.280	0.459
Leverage	373,402	1.392	3.009	0.572	1.043	1.837
Cash Holding	373,402	0.081	0.071	0.029	0.062	0.112
Dividend	373,402	0.021	0.022	0.005	0.014	0.028
Tobin's Q	373,402	1.372	1.071	0.723	0.995	1.601
R&D	373,402	0.015	0.027	0.000	0.002	0.016
ESG Score	373,402	4.032	0.546	3.917	4.235	4.376
C. Country-specific variables						
GDP	428712	10.614	0.675	10.487	10.901	10.996
GDP growth	428712	1.535	2.897	0.93	1.6	2.46
Rule of Law	353599	1.329	0.570	1.36	1.51	1.61
Unemployment	416990	5.087	2.008	3.65	4.55	6.17
Political Stability	353599	0.421	0.499	0.03	0.42	0.85
Corruption Control	428712	1.124	0.627	1.02	1.29	1.46
Environmental Performance	417533	15.504	14.756	5.25	5.7	24.72
Tax	348219	13.204	4.701	10.34	11.44	13.22
Renewable Energy	303227	12.18	9.277	8.45	10.12	12.6
Government Efficiency	353599	1.365	0.428	1.34	1.47	1.57

The table provides basic descriptive statistics. Panel A reports summary statistics for the bond-specific variables. Panel B reports summary statistics for the firm-specific variables. Panel C reports summary statistics for the country-specific variables. The sample consists of bond-quarter observations from 55 countries between 2004Q1 and 2023Q4. See online appendix B for precise definitions of all the variables.

Table 2: Mandatory ESG Disclosure and Bond Spreads

	$Bond\ Spread_t(\%)$		
	(1)	(2)	(3)
$Mandatory\ ESG\ Discl._t$	-0.490***	-0.574***	-0.615***
	(-4.038)	(-4.600)	(-4.752)
$Firm\ Size_{t-1}$		-0.973***	-1.030***
		(-6.426)	(-6.702)
ROA_{t-1}		-7.297***	-6.317***
		(-7.676)	(-7.162)
$Tangible_{t-1}$		-0.048	-0.239
		(-0.066)	(-0.339)
$Leverage_{t-1}$		-0.010	-0.015
		(-1.016)	(-1.362)
$Cash\ Holding_{t-1}$		-3.024***	-2.441***
		(-3.937)	(-3.650)
$Dividend_{t-1}$		-5.066**	-5.506**
		(-2.303)	(-2.267)
$Tobin's\ Q_{t-1}$		-0.230***	-0.190***
		(-3.331)	(-2.725)
$R\&D_{t-1}$		-0.900	-1.752
		(-0.278)	(-0.564)
$ESG\ Score_{t-1}$		0.538***	0.418**
		(3.179)	(2.560)
Constant	2.227***	17.795***	19.221***
	(68.505)	(6.797)	(7.212)
Bond FEs	Yes	Yes	Yes
Firm FEs	Yes	Yes	No
Quarter FEs	Yes	Yes	No
Industry-Quarter FEs	No	No	Yes
Observations	372,641	372,641	372,355
Adjusted R-squared	0.637	0.651	0.692

Notes: This table presents OLS regressions to investigate the impact of mandatory ESG disclosure on bond spreads. The dependent variable is the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency, expressed in percentage. *Mandatory ESG Discl* equals 1 f the firm is headquartered in a country that adopted a mandatory environmental, social or governance law, and 0 otherwise. All independent variables are lagged by one time-period. We include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Robust t-statistics are in the parentheses. Standard errors are clustered at the bond and quarter level. The *,** and *** marks denote the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 3: Mandatory ESG Disclosure and Bond Spreads–Robustness tests

	$Bond\ Spread_t(\%)$			
	(1)	(2)	(3)	(4)
$Mandatory\ ESG\ Discl._t$	-0.511***	-0.629***	-0.596***	-0.480***
	(-4.251)	(-4.123)	(-4.865)	(-4.839)
$Firm\ Size_{t-1}$	-2.089***	-1.055***	-0.908***	-0.906***
	(-7.161)	(-6.044)	(-5.562)	(-5.460)
ROA_{t-1}	-11.558***	-6.483***	-7.082***	-7.214***
	(-7.798)	(-4.752)	(-7.447)	(-7.383)
$Tangible_{t-1}$	-2.811***	0.438	0.273	0.420
	(-2.631)	(0.404)	(0.332)	(0.501)
$Leverage_{t-1}$	0.000	-0.015	0.004	0.002
	(0.000)	(-1.075)	(0.316)	(0.186)
$Cash\ Holding_{t-1}$	-9.923***	-0.695	-3.066***	-3.152***
	(-8.497)	(-1.019)	(-3.553)	(-3.521)
$Dividend_{t-1}$	-0.943	-6.578**	-6.423**	-7.162**
	(-0.553)	(-2.081)	(-2.300)	(-2.337)
$Tobin's\ Q_{t-1}$	-0.043	-0.336***	-0.244***	-0.236***
	(-0.448)	(-3.068)	(-3.723)	(-3.538)
$R\&D_{t-1}$	-27.975***	-2.487	0.115	0.354
	(-4.740)	(-0.652)	(0.035)	(0.103)
$ESG\ Score_{t-1}$	0.534***	0.689***	0.662***	0.690***
	(2.789)	(2.970)	(3.261)	(3.241)
Constant	38.554***	47.930**	15.918***	15.744***
	(7.766)	(2.488)	(5.817)	(5.646)
Sample	Excl. US & JP	Full	[-5, 5]	[-3, 3]
Country-level Controls	No	Yes	No	No
Bond FEs	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Quarter FEs	Yes	Yes	Yes	Yes
Observations	154,401	221,453	297,970	285,938
Adjusted R-squared	0.717	0.667	0.696	0.694

Notes: This table presents robustness tests for the estimation results of the specification in column (2) of Table 2. The dependent variable is the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency, expressed in percentage. *Mandatory ESG Discl* equals 1 f the firm is headquartered in a country that adopted a mandatory environmental, social or governance law, and 0 otherwise. Column (1) excludes firms headquartered in the US and Japan. Column (2) includes country-level control variables. Columns (3) and (4) present results using a 5-year and a 3-year window around the ESG disclosure, respectively. All independent variables are lagged by one time-period. We include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Robust t-statistics are in the parentheses. Standard errors are clustered at the bond and quarter level. The *,** and *** marks denote the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4: The information asymmetry channel

	$Bond\ Spread_t$(%)	
	(1)	(2)
$Mandatory\ ESG\ Discl._t$	-0.550***	-0.547***
	(-4.45)	(-4.33)
$Mandatory\ ESG\ Discl._t \times \text{Unrated}_{f,t}$	-1.287*	—
	(-1.96)	
$Mandatory\ ESG\ Discl._t \times Junk\ Bond_{f,t}$	—	-0.572*
		(-1.67)
$Firm\ Size_{t-1}$	-0.973***	-0.973***
	(-6.43)	(-6.43)
ROA_{t-1}	-7.294***	-7.294***
	(-7.67)	(-7.67)
$Tangible_{t-1}$	-0.050	-0.049
	(-0.07)	(-0.07)
$Leverage_{t-1}$	-0.010	-0.010
	(-1.02)	(-1.02)
$Cash\ Holding_{t-1}$	-3.027***	-3.025***
	(-3.94)	(-3.94)
$Dividend_{t-1}$	-5.071**	-5.074**
	(-2.31)	(-2.31)
$Tobin's\ Q_{t-1}$	-0.230***	-0.230***
	(-3.33)	(-3.34)
$R\&D_{t-1}$	-0.901	-0.892
	(-0.28)	(-0.28)
$ESG\ Score_{t-1}$	0.537***	0.537***
	(3.18)	(3.18)
Constant	17.797***	17.802***
	(6.80)	(6.80)
Bond FEs	Yes	Yes
Firm FEs	Yes	Yes
Quarter FEs	Yes	Yes
Observations	372,641	372,641
Adjusted R-squared	0.689	0.689

Notes: This table presents OLS regressions to investigate the impact of mandatory ESG disclosure on bond spreads. The dependent variable is the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency, expressed in percentage. *Unrated* is a dummy variable, which takes value 1 for firms that have debt outstanding but without a bond rating, and 0 otherwise. *Junk Bond* is a dummy variable, which takes the value 1 for firms with bonds whose ratings are below the investment grade threshold, and 0 otherwise. All independent variables are lagged by one time-period. We include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Robust t-statistics are in the parentheses. Standard errors are clustered at the bond and quarter level. The *,** and *** marks denote the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: The clientele channel

	$Bond\ Spread_t(\%)$	
	(1)	(2)
$Mandatory\ ESG\ Discl._t$	-0.423**	-0.496***
	(-2.545)	(-3.530)
$Mandatory\ ESG\ Discl._t \times (Low\ IO)$	-0.325**	—
	(-2.087)	
$Mandatory\ ESG\ Discl._t \times (Low\ IO\ country)$	—	-0.336**
		(-2.432)
$Firm\ Size_{t-1}$	-0.972***	-0.972***
	(-6.422)	(-6.425)
ROA_{t-1}	-7.294***	-7.293***
	(-7.673)	(-7.670)
$Tangible_{t-1}$	-0.0491	-0.0562
	(-0.0682)	(-0.0779)
$Leverage_{t-1}$	-0.0102	-0.0101
	(-1.018)	(-1.012)
$Cash\ Holding_{t-1}$	-3.017***	-3.027***
	(-3.925)	(-3.943)
$Dividend_{t-1}$	-5.114**	-5.079**
	(-2.321)	(-2.310)
$Tobin's\ Q_{t-1}$	-0.231***	-0.230***
	(-3.337)	(-3.332)
$R\&D_{t-1}$	-0.868	-0.934
	(-0.267)	(-0.287)
$ESG\ Score_{t-1}$	0.538***	0.537***
	(3.181)	(3.177)
Constant	17.75***	17.78***
	(6.783)	(6.794)
Bond FEs	Yes	Yes
Firm FEs	Yes	Yes
Quarter FEs	Yes	Yes
Observations	372,641	372,641
Adjusted R-squared	0.690	0.690

Notes: This table presents OLS regressions to investigate the impact of mandatory ESG disclosure on bond spreads. The dependent variable is the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency, expressed in percentage. *Low IO* is a dummy variable, which takes value 1 for firms that have equity institutional ownership in the bottom quartile for any of the four quarters preceding the ESG mandate implementation, and 0 otherwise. Quartiles are defined within each quarter. *Low IO country* is a dummy variable, which takes value 1 for firms that have equity institutional ownership in the bottom quartile for any of the four quarters preceding the ESG mandate implementation, and 0 otherwise. Quartiles are defined within each country-quarter. All independent variables are lagged by one time-period. We include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Robust t-statistics are in the parentheses. Standard errors are clustered at the bond and quarter level. The *,** and *** marks denote the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: The bank-relationship channel

	$Bond\ Spread_t(\%)$			
	(1)	(2)	(3)	(4)
$Mandatory\ ESG\ Discl._t$	-0.426***	-0.426***	-0.431***	-0.431***
	(-3.204)	(-3.203)	(-3.200)	(-3.201)
REL Dummy (8y)	0.741***			
	(2.650)			
$Mandatory\ ESG\ Discl._t \times REL\ Dummy(8y)$	-0.711**			
	(-2.069)			
REL Dummy (10y)		0.718**		
		(2.637)		
$Mandatory\ ESG\ Discl._t \times REL\ Dummy(10y)$		-0.691**		
		(-2.078)		
Num. of REL (8y)			0.491***	
			(2.962)	
$Mandatory\ ESG\ Discl._t \times Num.\ REL(8y)$			-0.511***	
			(-2.794)	
Num. of REL (10y)				0.469***
				(2.939)
$Mandatory\ ESG\ Discl._t \times Num.\ REL(10y)$				-0.490***
				(-2.760)
Control Variables	Yes	Yes	Yes	Yes
Bond FEs	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Observations	115,786	115,786	115,786	115,786
Adjusted R-squared	0.655	0.655	0.655	0.655

Notes: This table presents OLS regressions to investigate the impact of related lending on bond spreads. The dependent variable is the difference between the yield to maturity of a corporate bond and that of a government bond with the same maturity and currency, expressed in percentage. All independent variables are lagged by one time-period. We include fixed effects as noted in the lower part of the table to control for different levels of unobserved heterogeneity. Robust t-statistics are in the parentheses. Standard errors are clustered at the bond and quarter level. The *,** and *** marks denote the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Parallel Trend

	$Bond\ Spread_t(\%)$
	(1)
T-3 and Before	0.134
	(1.280)
T-2	0.044
	(0.494)
T	-0.364***
	(-3.525)
T+1	-0.812***
	(-3.970)
T+2	-0.299*
	(-1.971)
T+3 and After	-0.574***
	(-3.653)
$Firm\ Size_{t-1}$	-0.975***
	(-6.427)
ROA_{t-1}	-7.308***
	(-7.682)
$Tangible_{t-1}$	-0.033
	(-0.046)
$Leverage_{t-1}$	-0.010
	(-1.009)
$Cash\ Holding_{t-1}$	-3.004***
	(-3.915)
$Dividend_{t-1}$	-5.027**
	(-2.277)
$Tobin's\ Q_{t-1}$	-0.232***
	(-3.347)
$R\&D_{t-1}$	-0.946
	(-0.293)
$ESG\ Score_{t-1}$	0.533***
	(3.157)
Constant	17.741***
	(6.797)
Bond FEs	Yes
Firm FEs	Yes
Quarter FEs	Yes
Observations	372,641
Adjusted R-squared	0.690

T-statistics are in brackets. *** p < 0.01, ** p < 0.05, * p < 0.1.