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The pricing of green bonds: are financial institutions special?

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Abstract

The financial system plays a major role in the transition to a low-carbon economy. We investigate this issue analyzing the recent developments and challenges in the bond and debt markets. First, we study the pricing of green bonds at issuance. We find a premium when green bonds are issued by supranational institutions and corporates while there is no effect for financial institutions. We also document an effect for external review and repeated access to this market. Second, we investigate lending decisions by banks issuing green bonds. Our results show that these lenders reduce their funding towards more polluting segments of the economy but limited to the amount of loans they granted as lead bank in the deal. This evidence may explain why we do not find a green premium for financial issuers. Yet it also suggests that the banking system may play a much larger role in channeling funds towards low-carbon activities, and thus reducing the environmental risks also for the financial system.

Introduction

The traditional public intervention to correct externalities, notably, in the form of taxes, subsidies and regulation, seems largely insufficient to address the current environmental and climate-related challenges. The sheer magnitude of these problems requires mobilizing a considerable amount of funds. In this area, finance has undoubtedly a key role to play. Among the activities and instruments of sustainable finance, green bonds represent one of the most promising market-based solutions to channel funds to environmentally beneficial projects, as well as to raise awareness of environmental risks. Green bonds are fixed income securities which usually differ from conventional debt instruments only in that they finance environmental or climate-related projects. While volumes in the green bond market have increased rapidly since its inception in 2007, to roughly 20 billion EUR in 2014 and 93 billion in 2018, the market growth potential remains enormous. In this respect, transparency and disclosure are fundamental to align investors' incentives.

It has been stressed that non-pecuniary motives, specifically pro-environmental preferences, motivate investors to hold green assets. If the appetite for certain types of assets enters the utility function of a group of investors in addition to their expectations regarding return and risk, investors' tastes modify equilibrium prices (Fama and French, 2007). A major issue for green-minded investors is to be able to disentangle a genuine commitment on the part of the issuer to use the proceeds in an environmentally friendly way from mere 'greenwashing'. This is all the more important in the absence of a universally accepted definition of green, or, put differently, in the presence of 'many shades of green', as it is the case now. The greenness of the bond, and thus of the underlying project it provides funding for, might be particularly difficult to signal for financial institutions. Laying out the use of proceeds and the global environmental strategy behind the issuance of a green bond allows one to identify specific investment projects in the case of non-financial companies. For financial institutions, resorting to the green debt market often involves engaging also in green lending, instead of investing directly in environmental-friendly projects. In all cases, the disclosure and reporting requirements associated with the issuance of green bonds entail additional costs for the borrowers, which could be compensated by the 'greenium', i.e. the market premium to the price of the bond.

In this paper, we investigate the pricing implications of the green label on the primary market for bond issuances. Using a large sample of bonds issued worldwide from 2007 to 2018, we investigate the determinants of the yield of new bond issuances. Our identification strategy relies on comparing bonds that are similar with respect to a number of relevant features, except for the green label. We find that green bonds are not always issued at a premium compared to ordinary bonds, but with some heterogeneous pattern across different issuers. Specifically, we find a premium for green bonds issued by supranational institutions and corporates, while there is no effect for financial issuers. This evidence is confirmed by the findings in the battery of tests that we run to gain further insights regarding the main determinants of bond yields in the green market. First, we test the impact of certification – a market-based solution to reduce information asymmetries between borrowers and investors based on third-party evaluation of the compliance with some green bond principles. Second, we test whether green bonds issued by repeat issuers are priced differently than those issued by one-time issuers in the green market. Indeed, we find that repeat issuers benefit from an additional premium. We

interpret this as evidence of a reputation effect on the green bond market, at least for non-financial corporates. In the second part of the analysis, we focus on financial institutions and make an attempt to explain the reasons behind the absence of a 'greenium' for financial issuers. We find that institutions that have declared a clear commitment to environmental principles (i.e. those subscribing the United Nations Environment Programme Financial Initiative) issued green bonds at a premium.

We then explore the lending decisions of banks after green bond issuances. To this end, we match syndicated loans data with the bond issuance data. Using information on the sector-country pollution intensity – approximated by the greenhouse gas emissions –, we are able to identify whether lending is redirected towards less polluting activities following a green bond issuance. Our results show that lead banks having issued a green bond reduce their exposure towards more polluting activities. Taken together, our results suggest that the green bond label per se is not enough to raise funding at a lower cost. This is most likely due to the difficulties for the investors to disentangle issuers with a genuine commitment to environmentally friendly projects from mere 'greenwashing'. Indeed, it might be more difficult for some issuers to credibly signal to the market their engagement towards green activities.

Our analysis has a number of policy implications. While the size of the green bond market relative to the whole bond market is still tiny, our findings on the 'greenium' suggest the presence of a market incentive for some categories of green bond issuers. It is not clear whether and to what extent the 'greenium' is able to compensate borrowers for the additional costs associated with obtaining the green label, and can de facto contribute to the development of the green bond market, though. Policy intervention is deemed necessary in order to set up adequate incentives for both the demand and the supply side, and thus ultimately enhance the market of green securities. The role of the financial system is pivotal in this.

Financial institutions are the most active players on the green bond market, based on amount issued so far. Our analysis suggests that activity on the green debt market is an indication of a broader environmental strategy whereby banks reduce lending to more polluting sectors. Thus, both sides of banks' balance sheets, to certain extent, are becoming greener. Ultimately, this implies a changed risk profile of banks' balance sheets, particularly through the direct exposure to environmental and climate-related risks. At micro level, this translate into a lower risk profile in term of direct exposures to environmental and climate-related risks. Moreover, it may also limit negative spillover effects on the overall financial system (see e.g. Battiston et al., 2017). However, an assessment of whether financial institutions are becoming greener at the appropriate pace strictly depends on the prospective scenario one has in mind, notably for the evolution of environmental and climate challenges. Climate change is well recognized as a major challenge to financial stability and the global economy in international fora, such as G20 and the Financial Stability Board. Accordingly, academics and practitioners increasingly advocate regulatory changes that account for these risks, particularly lower capital risk requirements for green assets that can reduce environmental risks. In practice, current micro-prudential rules do not contemplate a role for strictly non-financial risks. However, some central banks and regulators, particularly in emerging markets, are considering the inclusion of an assessment of banks' exposure to green lending in their supervisory framework.

The rest of the paper is organized as follows. After the review of related literature in Section 1, Section 2 gives an institutional overview and a descriptive analysis of the green bond market, with a focus on non-governmental issuers. Section 3 describes the data we use in the pricing analysis. Section 4 introduces our econometric methodology, while Section 5 discusses the results. Section 6 presents the empirical analysis on financial green bond issuers and green lending. Finally, Section 7 offers some conclusions and implications, also for financial stability.

1. Related literature

This paper relates to different strands of the financial literature that consider environmental aspects. A line of research related to this work investigates the environmental profile of a firm in relation to the cost of funding (see, e.g. Sharfman and Fernando, 2008; Chava, 2014). Lower cost of capital has been documented for firms with better environmental risk management indicators (Sharfman and Fernando, 2008) and higher environmental performance, measured by the environmental component of the corporate social responsibility (Ghoul et al., 2011).1 Similarly Chava (2014) finds that investors expect higher returns from stocks of firms with environmental concerns. These evidence may be driven by specific investors preferences (Riedl and Smeets, 2017; Hartzmark and Sussman, 2018; Barber et al., 2018). Environmental risks are priced not only by investors, but also by lenders. Investigating the price and the structure of syndicated loans, Chava (2014) shows that firms with environmental concerns are charged a higher loan spread and receive loans granted by syndicates with fewer banks. Yet, he does not find a positive effect for environmental strengths.

Recently, few papers examine the pricing of green bonds, finding contrasting evidence. In the secondary market, Hachenberg and Schiereck (2018) do not find compelling evidence that green bonds are priced in a significantly different way compared to similar ordinary bonds. Using a matching procedure, Zerbib (2018) finds instead a moderate green bond premium with respect to a counterfactual ordinary bond in a sample that includes 110 large, investment grade green bonds of many categories and currencies. Focusing on a large sample of US municipalities, Karpf and Mandel (2017) document a green bond discount on secondary market yields. After factoring in tax considerations, Baker et al. (2018) find the opposite result in the primary market, notably that green municipal bonds are issued at a premium to otherwise similar ordinary bonds. Using a sample of 640 matched pairs of green and non-green bonds issued on the same day by the same municipality, and with identical maturating and rating, Larcker and Watts (2019) don't find evidence of a premium. The effects of green bond issuance have been further investigated in Tang and Zhang (2018) and Flammer (2018). Tang and Zhang (2018) find a positive stock market reaction and also a greater stock liquidity following green bond issuance. Besides confirming a positive stock market return, Flammer (2018) also shows that both operating performance and environmental performance improve after a green bond issuance. We contribute to this literature investigating the pricing implications of the green

[1] The literature on corporate social responsibility (CSR) is well developed and provide useful insights. Ge and Liu (2015) find that better CSR index is associated with lower cost of new issued bonds. Goss and Roberts (2011) show that CSR has an impact, even though moderate, also on the interest rate of syndicated loans. However environmental related aspects are only one dimension between those considered in CSR performance, which includes, for example, employees relations, human rights and product characteristics.

label on the primary market at issuance for a worldwide sample of bonds, including supranational, financial and non-financial issuers.

Another strand of literature recognizes that some firms are particularly exposed to liability risks including litigation, new technology, and regulation (Hong and Kacperczyk, 2009; Gormeley and Matsa, 2011). This applies as well to firms facing environmental and climate risks which may end up facing larger environmental liabilities and higher risk of bankruptcy.2 Chang et al. (2018) quantify environment liabilities and find that they have implications for firms' capital structure. Similarly, Ginglinger and Moreau (2019) show that physical climate risks are associated with lower leverage. Environmental risks might be an important threat also for the banking sector. Klomp (2014) shows empirically that natural disasters increase the likelihood of banks' default. However, Delis et al. (2018) document that banks charge higher loan rates to fossil fuel firms, which are more exposed to climate risk, only after 2015. With respect to these works, we provide some insights regarding the lending decision of banks that have issued green bonds and complement previous findings on corporate capital structure.

2. Green bonds

2.1. Institutional background

Green bonds are intended to encourage sustainable activities by financing climate-related or environmentally friendly projects. As a relatively new practice in finance, there is no commonly accepted definition of a green bond yet. In practice, some guidance in identifying green bonds is provided by the Green Bond Principles (GBP), voluntary process guidelines put forward by the International Capital Market Association (ICMA).[3] Specifically, this standardized procedure encourages transparency and disclosure by focusing on four main areas, namely the use of proceeds, the process for project evaluation and selection, the management of proceeds, and reporting. Currently, the labeling of a bond as 'green', while reflecting the broad correspondence with the GBP, de facto could be more or less loosely applied by the traditional providers of financial markets data, such as Bloomberg or DCM.

The absence of a commonly agreed definition, as well as of a unique reference framework, has been identified by the European Commission as one of the barriers to the development of the green bond market. In its final report, the EU High-Level Group on Sustainable Finance (EU HLEG, 2018) made several recommendations to promote the development of the green bond market. In particular, as a first step, 'the EU should introduce an official EU Green Bond Standard (EU GBS) and consider an EU Green Bond label or certificate to help the market to develop fully and to maximize its capacity to finance green projects that contribute to wider sustainability objectives.' The formulation of an explicit definition of green bonds based on a common 'sustainability taxonomy' advocated by the EU HLEG would ideally address the uncertainties and areas of concern that may require greater prescription than what is provided by the current voluntary standards. At the same time, it would incorporate the existing best market practice.

[2] Li et al. (2014) find that higher audit fees are charged to firms exposed to higher environmental risks due to the more demanding procedures that auditors have to implement.

[3] https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/

Since the primary objective of the standard is to help raise investment in green projects and activities, transparency is a crucial issue to mitigate information asymmetries on the actual environmental sustainability of the projects financed by the debt issuance. In practice, several organizations have started to provide green labels that indicate conformity to particular definitions of green. In this way, they align the incentives of potential investors who value the sustainability aspects of the financial instruments, and those of the issuers. While certification and external review undoubtedly increase transparency and provide a reputational benefit to the issuers, they come at a cost. Whether and to what extent the market prizes this additional financial effort by issuers become then relevant questions to answer in the light of the need of promoting the development of the green bond market. Inspired by Baker et al. (2018), in our empirical exercise we check if external review, in the form of second party opinion or certification, has a significant impact on the pricing of green bonds on the primary market.[4]

2.2.The green bond market

Since the first green bond issuance in 2007, the market for green bonds has been increasing steadfastly, as Figure 1 shows. The blue bars represent the total value of green bonds, while the red line displays the number of green bonds issued each year from 2007. The value of issuances reached a peak of 93 billion Euros in 2018, with 565 green bonds issued. In relative terms, the market is still quite small in size compared the market for conventional bonds (around 2.42% in 2018).

----------INSERT FIGURE 1 ----------

Figure 2 depicts the breakdown by issuer type for green bonds issued between January 2007 and December 2018. The financial sector accounts for almost half of the total amounts issued (46.30%), while non-financial corporations for another 40%. The rest is issued by international organizations and supranational institutions. Considering non-financial issuers only, utility and energy companies have the lion's share in the market in terms of both number and value of contracts (almost 60 billion Euro and 289 deals cumulated over the period 2007-2018). This is not surprising given the direct impact of these sectors on climate change and the environment. Companies operating in the transportation and real estate sectors are also very active on the market, reaching a cumulative value of 28 billion Euro of borrowed amount. In terms of contract duration, the data shows a prevalence of short (0-5 years) and medium (5-10 years) term maturities, which combined account roughly for 75% percent of the market value, roughly equally split. The rest of the market comprises long-term contracts with a maturity of more than 20 years.

[4] External review is a common term that covers a wide spectrum of services from environmental consultancy to audits on use of proceeds. For our purposes, we can include two different types of external review: i) second party opinion; ii) certification. For the latter, we rely on the certification procedure provided by the Climate Bond Initiative (CBI). The CBI's Climate Bonds Standard establishes sector-specific eligibility criteria to judge an asset's low carbon value and suitability for issuance as a green bond. Assets that meet the CBI standard are then eligible for Climate Bond Certification, after an approved external verification that the bond meets environmental standards and that the issuer has the proper controls and processes in place.

----------INSERT FIGURE 2 ----------

3. Data and summary statistics

Our main data source is Dealogic DCM, which covers data about bond primary markets worldwide (see e.g. Hale and Spiegel, 2012). DCM provides detailed bond issue characteristics at the tranche level, alongside information about the issuer. We select all bond tranches issued by financial and non-financial companies, as well as supranational institutions in the period 2007-2018.[5] We also have qualitative information on the features of the bonds, such as the nature of the project for which the proceeds are used, the reporting, and the name of the external reviewer. Based on the description of the underlying project, DCM allows a classification of the instrument type, notably whether it is a conventional or a green bond. We identify 1,397 green bonds out of 271,312 fixed income securities.[6]

Table 1 shows that the majority of green bond issuances has been made by the corporate sector, with financial corporations having issued the largest cumulative amount so far. This is partially explained by the strong reliance of financial firms on the bond market, on aggregate, compared to the non-financial firms. Looking at the yields, it is apparent that, on average, green bonds have a lower yield at issuance than ordinary bonds issued by the same type of borrowers. Exploiting the qualitative information on external review, we identify a total of 637 bonds that have obtained a second party opinion or are certified by the Climate Bond Initiative (CBI). Interestingly, non-financial firms are more frequently resorting to certification. Table 1 shows that bonds with external review have average lower yields than self-labelled green bonds without review. This is particularly true for financial firms and non-financial firms.

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4. Econometric strategy

To investigate the pricing implications of the green label we use a standard equation for bond yields, as implemented in previous studies (Gu et al., 2017, Gozzi et al., 2015). In particular, we follow Baker et al. (2018) who develop a model of asset pricing with a non-pecuniary clientele in the spirit of Fama and French (2007). In this setup, pro-environment tastes can be accommodated in a straightforward way. Specifically, our econometric model is as follows:

$$Yield_{b,i,t} = \beta_0 + \beta_1 Green_{b,i,t} + \beta_2 \boldsymbol{X}_{b,i,t} + \delta_i + \phi_t + \epsilon_{b,i,t} \quad (1)$$

[5] While also government bodies issue green bond we limit our analysis to financial and non-financial corporations. See Baker et al. (2018) for a study on bond issued by U.S. municipalities.

[6] An alternative database commonly used in the literature is Bloomberg, which also reports green bonds. The Bloomberg dataset includes a similar number of green bonds, but we prefer the DCM dataset due to the better coverage of the main bond characteristics.

where $Yield_{b,i,t}$ refers to the yield at issuance of bond *b* issued by firm *i* in time *t*. $Green_{b,i,t}$ is our main variable of interest, which equals one if a bond is green, and zero otherwise. **X** includes a set of bond characteristics that may affect the yield. Specifically, we control for *callable*, a dummy variable which is equal one if a bond is callable, zero otherwise; *puttable* a dummy variable which is equal one if a bond is puttable, zero otherwise; and *collateralized* a dummy variable which is equal one if a bond has some underlined collateral, zero otherwise. Furthermore, we control for the *currency* of issuance and the purpose of a bond, through the variable *use of proceeds*, distinguishing between general corporate purposes, securitization, refinancing, and any other use. We create decile categories both for the size of the tranche and the total amount borrowed by the issuer on that day. *Maturity* is a categorical variable that distinguishes among short-term (less than five years), medium-term (between five and ten years) and long-term (more than ten years) bonds. We also consider the bond rating, as provided by S&P, Moody's or Fitch, and define eleven categories with 1 assigned to the top rating and 11 to the worst rating (or not rated). Further, *time* fixed effects are introduced to capture global time-varying unobservable factors that might affect the primary bond market in a specific month. We adopt a conservative approach and include the interaction fixed effect *maturity*×*rating*×*time* to account for twists in the yield curve. We control for time-invariant unobservable firm-specific characteristics using an issuer fixed effect, δ_i. Finally, $\epsilon_{b,i,t}$ is the error term.[7] Table 2 reports the summary statistics for the variables used in the bond pricing analysis.

----------INSERT TABLE 2----------

5. Results

5.1. Main results

Table 3 reports our baseline results. Column (1) displays the results for the full sample comprising all categories of borrowers. The coefficient of the variable of interest is negative, suggesting that green bonds sell for a moderate premium over ordinary bonds. However, the effect is not identified with precision in the full sample. This might be due to the heterogeneity in the way different types of issuers – particularly financial and non-financial borrowers – access the bond market, and are ultimately evaluated by investors. We account for such heterogeneity by running separate regressions for the different categories of issuers in our sample, namely supranational institutions, financial and non-financial corporations. The results are reported in columns (2)-(4) of Table 3. The coefficient estimates vary significantly across issuer types. First, we find that only green bonds issued by supranational institutions (column (2) of Table 3) and non-financial corporations (column (4)) sell for a premium compared to ordinary bonds. While statistically significant, the yield gap for supranational institutions (80 basis points) is almost four times larger in magnitude than that for non-financial corporations. By contrast, we do not find a statistically significant yield difference for green bonds issued by financial institutions (column (3) of Table 3). Thus, the 'greenium' does not seem to be there for all categories of issuers. One possible reason

[7] According to Petersen (2009), OLS estimates in panel data can be biased because of residuals correlations. We use cluster standard error at the issuer level.

is that while non-financial companies may signal the greenness of the projects for which the bond proceeds are used in a more transparent way, this may be more difficult for financial institutions. Indeed, if investors have preferences for green products, asymmetric information on the greenness of the underlying projects is crucial for preferences to affect market prices.[8]

----------INSERT TABLE 3 ----------

We shed light on this issue in two alternative ways. First, we test whether external review has an impact on the offering yield. If external review acts as a signaling device for bonds that actually have environmental or climate-related benefits, we expect certified bonds to sell for a premium compared not only to conventional bonds but also to non- green securities. Operationally, we augment the baseline model with a dummy variable (*External review*) that takes the value of one for green bonds that are CBI-certified or have obtained a second party opinion, and zero for self-labelled green securities. Table 4 reports the results for the full sample and for the sub-samples for homogeneous issuer types. The review dummy does not affect the average bond yield in the full sample (column (1)). The sample splitting exercise sheds light on the drivers of these findings. First, due to lack of observations, we are not able to identify the effect of external review on the issues of supranational institutions (column (2)). Second, we find again a marked difference between financial and non-financial corporate bonds. The coefficient of the review dummy is not significantly different from zero for financial green bonds (column (3). By contrast, as expected, it is negative for bonds issued by non-financial corporations (column (4)), where it is statistically significant al 5%. At almost 70 basis points, the estimated impact of certification is sizable, particularly if compared with the effect of the self-reported green label (17 bps). Interestingly, this latter is not estimated with precision in the augmented model. Alternatively, we consider repeated debt issues on the green bond market as a way to provide information benefits to investors. Accordingly, we augment our baseline model with the dummy variable *Experienced green*, which is equal one if the issuer has already placed a green bond, and zero otherwise. If multiple green bond issuances give investors an increasing engagement with borrowers' business, then we would expect returning issuers to benefit from a correspondingly larger 'greenium' than first-time bond sellers. The results of the augmented model are reported in Table 5. In the full sample, the coefficient of the dummy for returning issuers is negative and statistically significant at 10% (see column (1)). The magnitude of the effect is around 44 bps. Again, the breakdown by issuer categories reveals some heterogeneity in the effects of greenness. In particular, supranational and financial institutions that have already resorted to the green bond market do not benefit from a 'greenium' on their subsequent issuances (see columns (2) and (3)). By contrast, this is the case for non-financial corporations (column (4)). The negative yield gap with respect to one-time issuers is around 35 bps. One explanation could be that issuers placing more than one green bond are able to better signal their greenness over time. The build-up of a reputation and/or a better ability to screen borrowers on the part of investors might

[8] Riedl and Smeets (2017) show that individual investors are willing to give up financial performance in order to invest in accordance with their preferences. They investigate social responsible investments but it is likely that these results may apply as well to green products following the increasing concerns for global warming.

indeed explain the premium we find in favor of returning non-financial issuers. From the borrowers' perspective, the premium associated with multiple issuances might be justified by the additional disclosure costs that returning to the green bond market entail for borrowers.

----------INSERT TABLE 4 ----------

----------INSERT TABLE 5 ----------

5.2.Robustness analysis

In this section we provide a battery of robustness tests for our baseline regression model in equation (1). A first set of results is reported in Table 6. In panel A, we investigate whether the country of the issuer matters for the existence and the magnitude of the 'greenium', ceteris paribus. In particular, we distinguish between emerging and developed countries, for the full sample of all borrowers as well as for the sub-samples of homogeneous issuer types. All in all, the estimates suggest that the results of the baseline model are mainly driven by supranational and non-financial issuers located in developed economies.[9] In Panel B of Table 6 we check the effect of the currency denomination on the offering yield of the bond. Previous literature has found that bonds denominated in local currency tend to have a tighter credit spread because they hold a lower exchange risk than bonds issued in foreign currencies, ceteris paribus (Ehlers and Packer, 2017; Nanayakkara and Colombage, 2018). To test for this, we create a dummy variable (labeled Local) equal to one if the bond is denominated in local currency, and zero otherwise. While the effects of the local currency dummy are borderline statistically significant only in the full sample with all issuers, the results for the green label are not quantitatively different from those in the baseline model in Table 3.

As a further robustness check, we adopt a different definition of the dependent variable. So far, our left hand variable has been the offering yield of the bond in the primary market. Such yield reflects the risk premium that issuers pay to investors to raise funds. Following previous studies (Jang, 2008; Ge and Liu, 2015; Shi, 2003; Wang and Zhang, 2009), we alternatively measure the dependent variable as the difference between the bond yield at issuance and a sovereign bond yield with comparable maturity, issued in the same country as our reference security.[10] This allows us to filter the bond credit risk from the associated sovereign risk. In other words, the yield spread is a direct and accurate measure of issuers' incremental cost of a bond over a comparable risk-free government bond. In addition, by taking the difference between the returns, we also control for the effect of economy-wide information. Constrained by the thickness of sovereign bonds markets, we perform this robustness analysis only for OECD countries. Overall, we cover 70% of our initial sample of bond issuances. The first two columns in Table 7 report the results. For the sake of comparison, columns (3) and (4) display the estimates of the baseline model

[9] We do not need to control for country fixed effects (or industry fixed effects) as there are absorbed by specification the issuer fixed effects that we include in our baseline specification.

[10] We match our sample with the sovereign bonds dataset downloaded by Dealogic DCM. We used the propensity score matching algorithm to find comparable Treasury bonds. Once selected the country of the issuer we define the set of associated sovereign bonds and successively we run the algorithm in order to find the closer sovereign bonds, computing the distance based on Issuance date and time to maturity.

with the offering yield as the dependent variable on the sub-sample of issuers located in OECD countries. The results for the yield spread are in line with those for the baseline model. In particular, we find a non-negligible and statistically significant green bond premium in favor of non-financial corporate issues compared to conventional bonds.

----------INSERT TABLE 6 ----------

----------INSERT TABLE 7 ----------

5.3.Green bonds and financial institutions

The analysis in the previous sections suggests that there are significant differences in how the market prizes the green label across types of issuer. In particular, while we find a significant 'greenium' for non-financial corporations, there is no evidence of a similar price advantage for green bonds issued by financial institutions, ceteris paribus. This might stem from the very nature of the type of business. Non-financial corporations normally issue green bonds to finance environmental or climate-related projects. As such, they can easily detail the activities that the bond proceeds are earmarked to finance, and further commit to report details during the lifetime of the bond. While the link with green projects is immediate for non-financial corporations, this is not necessarily the case for financial institutions, whose alignment with environmental/climate principles might be more difficult to signal to the market. Alternatively, activity on the green bond market might be motivated by the informational advantage that can be obtained therein and used in future underwriting procedures. In general, mitigation the information asymmetry on the use of funds to rule out greenwashing might be more difficult for financial issuers. As an indirect way to test for the importance of signaling greenness, we consider membership in the United Nations Environment Programme Finance Initiative (UNEP FI) as a proxy for banks' attitude toward environmental and climate change issues. The United Nations Environment Programme Finance Initiative (UNEP FI) is a global partnership between the United Nations and the financial sector, established with the aim to encourage the better implementation of sustainability principles at all levels of operations in financial institutions.[11] We define a dummy variable (labelled *Environmentally friendly*) taking the value one from the year onward in which a bank signed the initiative, and zero otherwise. Then, we augment our baseline specification with this variable dummy and its interaction with the dummy *Green*. Provided membership in the UNEP FI correctly signals a business strategy aligned with environmental objectives, we expect a negative coefficient for the interaction term. The results are reported in Table 8.

Indeed, we find that green bonds issued by financial institutions affiliated to the UNEP FI benefit from a price advantage compared to financial issuers that have not subscribed to it.

----------INSERT TABLE 8 ----------

[11] Over 200 members (banks, insurers, and fund managers) have joined the initiative. Data are taken from http://www.unepfi.org/members/

6. Financial issuers and green lending

The analysis on green bond pricing has documented that, while a significant amount of green bonds are issued by financial institutions, there is no evidence of a pricing advantage of financial green bonds compared to ordinary bonds, ceteris paribus. We contend that this might be due to the inherent difficulties of linking directly the proceeds of the bond with specific green projects. Likely, the link is only indirect whenever the green bond funding finds a correspondence in a green portfolio on the asset side of banks' balance sheets. In theory, green lending itself could act as a signal of commitment to environmental-friendly activities, and thus translate in a pricing premium in the presence of strong enough pro-environmental preferences on the demand side. In this section, we investigate the lending behavior of financial institutions that have been issuers on the green bond market. Specifically, we test whether those financial institutions shift their lending towards less polluting activities after issuing a green bond. To this end, we combine the data on green bond issuances with loan-level data from syndicated loans and aggregate data on sectoral pollution intensity. In an ideal setting, we would like to observe the projects that are financed by each loan, and eventually to associate the funding raised with the green bonds to the corresponding green loan on the asset side of banks' balance sheets. Unfortunately, we face significant data constraints. First, we do not have data at the project level to precisely trace the use of funds. Second, while some information on green loans is currently available, the data is scant and, more importantly, the classification of loans as green is not based on commonly accepted standards. With this constraints in mind, we believe our analysis is nonetheless informative in that it provides some insights about the role of the banking sector in funding green activities. While the green bond market is playing an important role in financing green projects, a significant number of firms, particularly in Europe, does not have access to the bond market but relies mainly on the banking sector as a source of external funding.

6.1. Data

We use syndicated loans from DealScan.[12] The data allows us to clearly identify the borrower and lenders at origination, as well as the main characteristics of the loan. To start with, we consider the sample of loans extended to European companies in the period 2007-2018.[13] We retrieve 37,488 syndicated loans. We include only loans with full information on the size of the deal, the nationality of borrowers involved and some other basic deal characteristics. In a syndicated loan usually more than one bank provides funding. The lead arrangers set the terms of the deal and a preliminary agreement is signed. After the due diligence, the lead arrangers recruit other participant lenders to provide part of the funds. Finally, the loan contract is signed. To identify the lead bank in each loan, we follow previous literature (see, e.g. Ivachina 2009, Acharya et al. 2017) and consider the definitions suggested by Standard &

[12] While syndicated lending is only a fraction of banks' total lending, it is commonly used to evaluate bank lending policies and their impact on the real economy (e.g., Chodorow-Reich, 2013; Acharya et al., 2018).

13 We consider companies located in the countries for which Eurostat provide greenhouse gas emission data, namely EU member states, EFTA countries and candidate countries.

Poor's, which for the European loan market are 'mandated lead arranger', 'mandated arranger', or 'bookrunner'. Having identified the lead lenders and the other deal participants, we use the information about the deal structure to fill in those loan shares that are missing.[14] This procedure allows us to compute for each deal the lending amount of each bank. Then, we manually match the lenders in the sample of loans with the financial institutions issuing bonds. We are left with 34,852 loan contracts, corresponding to 222 unique banks. By merging these two datasets we can identify the banks that have issued green bonds and, at the same time, observe their pre- and post-issuance lending behavior. Accordingly, we define the dummy variable *Green_issuer,* which is equal to one from the time *t* when a bank that has issued a green bond onwards, and zero otherwise.

As a measure of the 'greenness' of the activities against which we evaluate banks' lending behavior, we use data on greenhouse gas – that is CO2 plus other air pollutants expressed in CO2 equivalent –emissions. Hence, de facto we focus on the climate change aspect of environmental-related issues. The data, obtained from Eurostat, contains information on greenhouse gas emissions at annual frequency, broken down by country and 64 industry (NACE Rev. 2 activity).[15] We consider air emission intensities expressed as the ratio between greenhouse gasses and a measure of economic activity, expressed in terms of output or value added. Emission intensities are in kilograms per euro and larger values are associated with more polluting activities. We merge these data with the loan data using the information on the industry and the country of the borrower company. As a final step, for each bank, we aggregate the lending volumes extended to each industry-country pair in all periods.

6.2.Econometric specification

To investigate whether banks prefer to lend to less polluting industry-country pairs after the issuance of a green bond, we use the following regression:

$$Y_{bjct} = \alpha + \beta Green\_issuer_{bt} + \lambda \text{Emission\_intensities}_{jct} + \gamma Green\_issuer_{bt} * \text{Emission\_intensities}_{jct} + u_{bjct}, \quad (2)$$

The dependent variable (Y_{bjct}) is the total loan volume that industry *j* in country *c* attains from bank *b* in period *t* (expressed in logarithms).[16] $Green\_issuer$ is a dummy variable that equals one from the time *t* the bank *b* has issued a green bond onwards, and zero otherwise. *Emission intensities* is the ratio between greenhouse gasses and the output for a specific industry *j* in country *c* in period *t*. The parameter λ captures how the emission intensities of a specific industry-country affect the amount of lending. The parameter of interest, γ, provides an indication of the lending activities of banks after having issued a green bond in relation to the pollution intensity. A negative

[14] Specifically, we follow the approach of Chodorow-Reich (2013). We take the average of the actual loan shares for lead and participant banks for all deals with the same syndicated structure (number of lead and participant banks). Then, we impute this information when the loan shares are missing to those loans with the same structure.

[15] To the best of our knowledge, this is the most disaggregated level to which green gasses emissions are available. Alternative dataset provide data at country level only (i.e. Germanwatch, Worldbank).

[16] Alternatively, we use as dependent variable an indicator for whether the lender serves as participant in the syndicated loan. Our specification is similar to the one proposed by Giannetti and Saidi (2017).

coefficient estimate would indicate that banks increase their lending towards those industry-country polluting less.

The specification includes also a full battery of fixed effects defined by the pairwise interactions for *bank*×*industry*, *bank*×*country*, and *bank*×*year*. The former two sets of fixed effects capture the specialization or proximity of a bank to a specific industry or country. The bank-year fixed effects saturate the regressions from other supply factors. We address concerns related to demand factors using *industry*×*country*, *country*×*year* and *industry*×*year* fixed effects. Our empirical strategy is similar to the one proposed by Giannetti and Saidi (2018). They investigate whether lenders provide larger loans to industries in distress using a specification at bank-industry-year level. We have a richer setup since we can exploit also variability at the country level. Thus, we can include a wider set of interaction terms to control for any factor that might lead to a spurious correlation between the interaction term and bank lending.

Summary statistics of our main variables are displayed in Table 9. We limit the sample to bank-industry-country (*bjc*) with non-zero loans in at least two years. We end up with 35% of the observations are associated with positive loans. The variable green issuer is equal to one for only 15% of the observations (51 banks in our matched sample issued at least one green bond in the period 2007-2018). Emission intensities are on average equal to 0.63 Kg per euro, but with a significant variation across both industries and countries.

----------INSERT TABLE 9 ----------

6.3.Results

We report our main results in Table 10. Columns (1) and (2) refer to the full sample while in columns (3) and (4) we exclude domestic lending, defined as the lending of bank *b* to a borrower headquartered in the same country *c* of the lender. The models in odd-numbered columns include bank, industry, country and year fixed effects, while in the even-numbered columns we include the interaction fixed effects discussed above, which control for demand and supply confounding factors that might potentially threaten identification. The results for our baseline model with the (logs of) the loan size as the dependent variable are reported in panel A of Table 10. In all specifications, the negative coefficient estimated for the variable *Emission_intensities* suggests that larger emission intensities are associated with a lower amount of lending. Importantly, also the interaction term between *Green_issuer* and *Emission_intensities* is negative and statistically significant in all models.[17] This means that an increase in emission intensities yields a relatively larger reduction of lending volumes by banks that have issued green bonds. While the nature of our data prevents us from drawing conclusions on the specific use of green bond proceeds to finance less polluting projects, we can nonetheless conclude that financial green bond issuers are committed to sustain less polluting activities. In terms of magnitude, the specification in column (2) implies that a one standard-deviation increase in the emission intensities yields a 10% reduction of lending volumes by banks active on the green bond market. The effect carries over

[17] In columns (2) and (4) the dummy *Green_issuer* drops due to multicollinearity.

when domestic loans are excluded from the sample (columns (3) and (4)). In panel B we use the average amount granted to industry *j* in country *c* by bank *b*, instead of total loan volumes, as our dependent variable. The results are not quantitatively different from those in panel A, suggesting that the effect in the baseline specification is not driven by a limited number of large deals. We further explore whether the negative impact of emissions on lending persists also at the extensive margin. In panel C the dependent variable is a dummy variable that takes the value of one if bank *b* has extended any loan to industry *j* in country *c* in period *t*, and zero otherwise. The interaction term between *Green_issuer* and *Emission_intensities* is still negative and statistically significant. Thus, not only the amount of the loans, but the very same decision to lend to sectors and countries with relatively high levels of greenhouse gas emissions change after the emission of a green bond. These findings suggest that, after having issued a green bond, banks lower their lending towards more polluting activities. These evidence complement previous results showing that firms with larger environmental risks have lower leverage level (Chang et al., 2018; Ginglinger and Moreau, 2019).

----------INSERT TABLE 10 ----------

In Table 11 we provide additional robustness tests for our lending model. In panel A, we redefine the dependent variable so as to comprise the total amount granted by bank *b* independently of its role in the syndicate, i.e. when acting as a simple participant and not necessarily as the lead bank. The first two columns report the results for the full sample, with alternative sets of fixed effects. The results in columns (3) and (4) refer to the sub-sample of loan contracts extended to foreign borrowers. Interestingly, while our baseline results carry over for both samples with the set of bank, country, industry and year dummies, introducing interaction fixed effects makes the negative coefficient of our variable of interest statistically insignificant. This implies that banks do not change their overall lending decisions based on the degree of greenness of the borrowing sector after having issued a green bond. A reason for that might be found in the fact that banks participate in syndicated loans because of motivations other than the pure lending decision, for instance to establish or maintain a relationship with other syndicate members (Sufi, 2007). The result also suggests some caution in interpreting the results for the lead banks. In panel B, we replicate the baseline regression using a different definition of emission intensities computed as the ratio of gas emissions over value added. The results are in line with those in the baseline model. As an additional robustness check, in panel C we exclude public sector bodies and financial institutions from the pool of borrowers, as these sectors are commonly excluded in evaluating bank lending policies. In panel D we exclude loans granted to finance mergers and acquisitions. In this way we rule out the possibility that our results are only driven by borrowers in need of extra-funding. All the results are qualitatively similar to our baseline findings.

Finally, in panel E we add as controls the variable *Leverage* defined as the median of the ratio of debt over total assets for industry *j* in country *c* and time *t*. In this way, we aim to capture any structural difference in the borrowing propensity which could be a confounding factor in our specification. We calculate the leverage using firm-level information from the Orbis dataset compiled by Bureau van Dijk. We first compute the

leverage ratio at the firm level using unconsolidated balance sheets, then we calculate the median value for each industry-country-time. The variable is statistically significant at 10% level in column 1 but loses significance when we add a more stringent series of fixed effects (column 2). Importantly, our main results are still confirmed.

----------INSERT TABLE 11 ----------

7. Conclusions

Green bonds are a major market-based solution to channel funds into environment friendly activities and projects. While relatively new, the market is developing steadfastly. In this paper we investigate the pricing implications of the green label at issuance for non-governmental borrowers. Moreover, we test whether external review and repeat issuance have further impacts on equilibrium prices. We find that, after controlling for relevant characteristics of the debt instruments, green bonds issued by supranational institutions and non-financial corporates indeed benefit from a premium compared to ordinary bonds. This suggests that companies with high environmental performance benefit from a lower cost of debt. Furthermore, we find that certified green bonds benefit from a larger premium compared to self-labelled green bonds. This corroborates the prior that external review is indeed important in this emerging market. While we cannot explicitly elicit investors' preferences for environment friendly investment from these findings, this is likely the channel at play in our setting. We test indirectly for the trust channel by checking whether there is a premium in favor of repeat issuers. Indeed, we find that repeat issuers benefit from an additional premium compared to one-time green borrowers, which we take as evidence of a reputation effect on the green bond market.

While financial institutions issue a significant amount of green bonds, there is no evidence that they benefit from a pricing advantage with respect their ordinary bond instruments, ceteris paribus. We contend that this might be due to the inherent difficulties of linking directly the issuance of a bond with specific green projects. Motivated by the heterogeneity in the effect of the green label on securities issued by different types of corporate issuers, in the second part of the paper we investigate the lending behavior of banks after having issued debt on the green bond market. Specifically, we investigate whether financial institutions shift their syndicated lending towards less polluting activities after issuing a green bond. We find evidence that financial green bond issuers sustain less polluting activities, in that they reduce their lending to sectors with larger emission intensities. Thus, our analysis highlights that both sides of banks' balance sheets are becoming to some extent greener. Ultimately, this implies a changed risk profile of banks' balance sheets, particularly through the direct and indirect exposure to environmental and climate-related risks. While climate change is well recognised as a major challenge to financial stability and the global economy in international fora, such as G20 and the Financial Stability Board, it is still under discussion how micro- and macro-prudential supervision should account for these risks, particularly lower capital risk requirements for green assets. Such

regulatory changes would clearly have spillover effects on the green bond market. Future research might address these issues.

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Figures

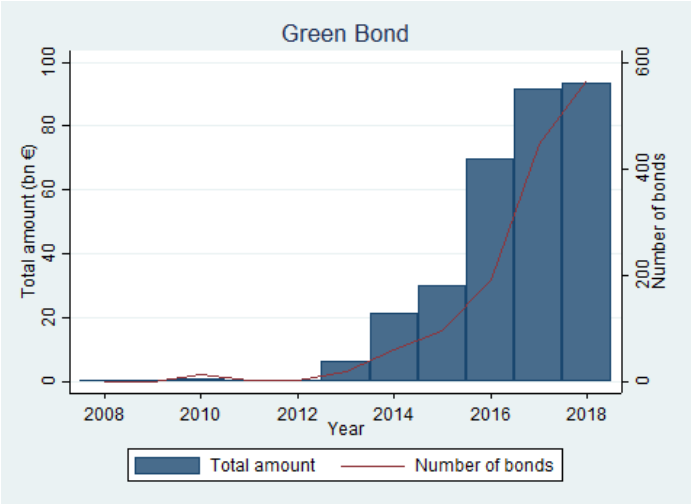

Figure 1 The Green Bond Market. The figure reports the total amount of Green Bonds issued (blue bars) yearly, billions of Euros. The red line represents the number of green bonds issued from 2007 until end of December 2018. The data source is Dealogic DCM.

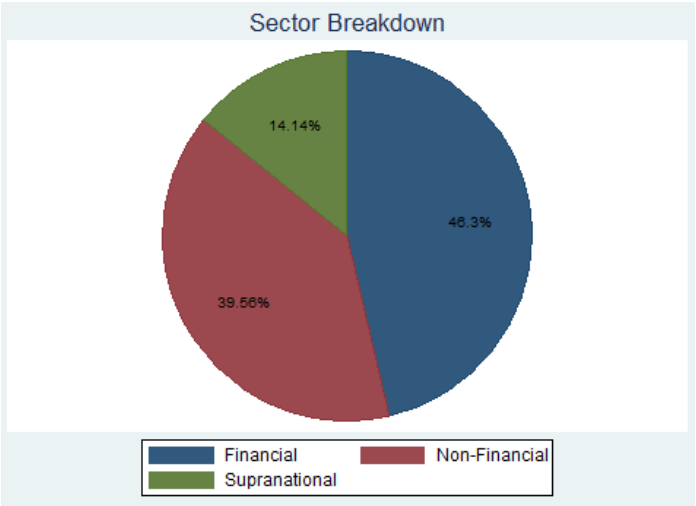

Figure 2 Green Bond market breakdown by issuer type. The figure shows the green bond market composition by issuer type. The data source is Dealogic DCM.

Tables

Table 1 Type of bonds. The table shows the numbers of bonds (tranches), the amount (in billions of euro), and the average yield at issue (in basis point) by type of issuer. Panel A compares green and ordinary bonds. Panel B compares CBI and Non-CBI bonds. A bond is classified as green if it reported as such in DCM, ordinary otherwise. A bond is classified as CBI if the bond notes include information regarding the second party providing the external review.

Panel A.

Issuer	**Green**			**Ordinary**		
	Number	Amount	Average yield	Number	Amount	Average yield
Supranational institutions	228	44.44	3.52	7478	1430.80	5.19
Financial firms	538	145.55	3.02	169061	23961.65	3.18
Non financial firms	631	124.36	3.62	93376	19587.93	4.73
Total	1397	314.36	3.37	269915	44980.38	3.77

Panel B.

Issuer	**Certified**			**Non-Certified**		
	Number	Amount	Average yield	Number	Amount	Average yield
Supranational institutions	84	14	4.27	144	31	3.09
Financial firms	250	66	2.92	288	79	3.11
Non financial firms	303	67	3.04	328	57	4.15
Total	637	147	3.15	760	167	3.55

Table 2 Summary statistics. The table shows the summary statistics for the overall sample. Yield is the bond yield at issue (in basis point). Green is a dummy variable equal to one if a bond is classified as green. External review is a dummy variable equal to one if a green bond has a second party opinion or is CBI-certified, zero otherwise. Callable is a dummy variable equal to one if the bond is callable by issuer, Puttable is a dummy variable equal to one if the bond is puttable by issuer, Collateralized is a dummy variable equal to one if the bond is backed by a collateral, Amount is the amount of the tranche in millions of euros, years to maturity is the number of years of the bond to maturity, rating is a categorical variable indicating with low values top ratings (i.e. AAA) and high values lower ratings (i.e. BBB-) or no ratings.

	N	Mean	Median	St. Dev.	P. 1	P. 99
Yield	271312	3.7702	3.3700	2.5090	0.0500	12.0900
Green	271312	0.0051	0.0000	0.0716	0.0000	0.0000
External review	271312	0.0007	0.0000	0.0266	0.0000	0.0000
Callable	271312	0.3715	0.0000	0.4832	0.0000	1.0000
Puttable	271312	0.0687	0.0000	0.2529	0.0000	1.0000
Collateralized	271312	0.1656	0.0000	0.3718	0.0000	1.0000
Amount (Ml€)	271312	166.94	45.2580	353.42	0.6861	1630.21
Years to Maturity	271312	7.5556	5.0000	7.6287	0.5000	39.8300
Rating	271312	5.8809	5.0000	4.2202	1.0000	11.0000

Table 3 Offering yield regression. The table presents the OLS regression results of offering yield on the green bond indicator. The dependent variable is the bond yield at issue. **Green** is a dummy variable equal to one if a bond is classified as green. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, , **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond, **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or no rated), **Time** is time (month) fixed effect, Maturity×Rating×Time is the interaction term, **Issuer** is the fixed effect for the company issuing the bond. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)
	All	Supranational	Financial	Non-financial
Green	-0.2866	-0.8046***	0.1001	-0.2156**
	(0.178)	(0.149)	(0.312)	(0.108)
Callable	0.2518***	-0.4640***	0.2741***	0.2253***
	(0.083)	(0.106)	(0.100)	(0.034)
Puttable	0.1207***	0.0861	-0.0548	0.0542*
	(0.044)	(0.219)	(0.158)	(0.030)
Collateralized	0.3298***		0.2949***	0.0766
	(0.065)		(0.074)	(0.075)
Use of proceeds				
General Corporate Purposes	0.0294	0.2241	0.0353	0.1233***
	(0.051)	(0.288)	(0.085)	(0.044)
Securitisation	-0.3633***		-0.0801	-0.6990***
	(0.140)		(0.147)	(0.142)
Refinancing	-0.0435	0.0386	0.1770*	-0.0892**
	(0.048)	(0.664)	(0.099)	(0.044)
Constant	3.5876***	5.0464***	2.9697***	4.5865***
	(0.057)	(0.282)	(0.092)	(0.044)
Observations	266,724	7,391	168,594	89,902
R-squared	0.7296	0.4767	0.7176	0.8056
Adjusted R-squared	0.714	0.436	0.707	0.775
Bond size cat FE	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes

Table 4 Offering yield regression. The table presents the OLS regression results of offering yield on the green bond indicator. The dependent variable is the bond yield at issue. **Green** is a dummy variable equal to one if a bond is classified as green. **External review** is a dummy variable equal to one if a green bond has second party opinion or is certified by the Climate Bond Initiative, zero otherwise. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, , **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond, **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or no rated), **Time** is time (month) fixed effect, **Maturity×Rating×Time** is their interaction, **Issuer** is the fixed effect for the company issuing the bond. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)
	All	Supranational	Financial	Non-financial
Green	-0.3037	-1.0255***	0.0456	-0.0049
	(0.232)	(0.102)	(0.198)	(0.143)
External review	0.0380	0.5740	0.1137	-0.4374**
	(0.278)	(0.496)	(0.339)	(0.179)
Callable	0.2518***	-0.4643***	0.2741***	0.2252***
	(0.083)	(0.106)	(0.100)	(0.034)
Puttable	0.1207***	0.0892	-0.0548	0.0539*
	(0.044)	(0.219)	(0.158)	(0.030)
Collateralized	0.3298***		0.2949***	0.0761
	(0.065)		(0.074)	(0.075)
Use of proceeds:				
General Corporate Purposes	0.0294	0.2124	0.0356	0.1237***
	(0.051)	(0.278)	(0.085)	(0.044)
Securitisation	-0.3633***		-0.0797	-0.6997***
	(0.140)		(0.147)	(0.142)
Refinancing	-0.0435	0.0081	0.1773*	-0.0884**
	(0.048)	(0.665)	(0.099)	(0.044)
Constant	3.5876***	5.0582***	2.9694***	4.5862***
	(0.057)	(0.270)	(0.093)	(0.044)
Observations	266,724	7,391	168,594	89,902
R-squared	0.7296	0.4769	0.7176	0.8056
Adjusted R-squared	0.714	0.436	0.707	0.775
Bond size cat FE	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes

Table 5 Offering yield regression. The table presents the OLS regression results of offering yield on the green bond indicator. The dependent variable is the bond yield at issue. **Green** is a dummy variable equal to one if a bond is classified as green. **Experienced green** is a dummy variable equal to one if the issuer is not issuing a green bond for the first time, zero otherwise. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, , **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond, **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or no rated), **Time** is time (month) fixed effect, **Maturity×Rating×Time** is their interaction, **Issuer** is the fixed effect for the company issuing the bond. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1) All	(2) Supranational	(3) Financial	(4) Non-financial
Green	-0.0285	-1.3087*	-0.1062	-0.0808
	(0.108)	(0.722)	(0.122)	(0.126)
Experienced green	-0.4415*	0.5180	0.3679	-0.3501**
	(0.240)	(0.765)	(0.410)	(0.147)
Callable	0.2518***	-0.4639***	0.2741***	0.2260***
	(0.083)	(0.106)	(0.100)	(0.034)
Puttable	0.1205***	0.0867	-0.0544	0.0542*
	(0.044)	(0.218)	(0.158)	(0.030)
Collateralized	0.3293***		0.2955***	0.0770
	(0.065)		(0.073)	(0.075)
Use of proceeds:				
General Corporate Purposes	0.0290	0.2265	0.0359	0.1235***
	(0.051)	(0.288)	(0.085)	(0.044)
Securitisation	-0.3634***		-0.0797	-0.6985***
	(0.140)		(0.147)	(0.142)
Refinancing	-0.0433	0.0362	0.1780*	-0.0887**
	(0.048)	(0.665)	(0.099)	(0.044)
Constant	3.5878***	5.0442***	2.9690***	4.5858***
	(0.057)	(0.282)	(0.093)	(0.044)
Observations	266,724	7,391	168,594	89,902
R-squared	0.7296	0.4767	0.7176	0.8056
Adjusted R-squared	0.714	0.435	0.707	0.775
Bond size cat FE	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes

Table 6 Offering yield: robustness I. The table presents the OLS regression results of offering yield on the green bond indicator. . The dependent variable is the bond yield at issue. **Green** is a dummy variable equal to one if a bond is classified as green. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond, **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or not rated), **Time** is time (month) fixed effect, **Maturity×Rating×Time** is their interaction, **Issuer** is the fixed effect for the company issuing the bond. In panel A we distinguish between developed and emerging countries. In panel B the model includes an additional control **Local** which is a dummy variable if the bond is denominated in local currency. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Panel A. Developing vs emerging countries

VARIABLES	(1) All Developed	(2) All Emerging	(3) Supranational Developed	(4) Supranational Emerging	(5) Financial Developed	(6) Financial Emerging	(7) Non-Financial Developed	(8) Non-Financial Emerging
Green	-0.4788**	0.2061*	-0.7794***	-1.3167***	-0.0209	0.0943	-0.4228***	0.1552
	(0.235)	(0.119)	(0.181)	(0.119)	(0.485)	(0.139)	(0.132)	(0.106)
Callable	0.2382**	0.3964***	-0.5040***	-0.0513	0.2665**	0.2909***	0.2136***	0.2286***
	(0.095)	(0.059)	(0.097)	(0.196)	(0.106)	(0.106)	(0.039)	(0.059)
Puttable	0.2380***	0.0717**	0.0991		-0.3134	-0.0027	0.1831***	0.0694**
	(0.082)	(0.036)	(0.234)		(0.273)	(0.092)	(0.047)	(0.034)
Collateralized	0.2838***	0.1371			0.1655**	0.3467***	0.1805**	-0.0481
	(0.079)	(0.085)			(0.079)	(0.115)	(0.078)	(0.108)
Use of proceeds:								
General Corporate Purposes	-0.1305*	0.1732***	0.2512	-0.7347	0.0527	-0.4621***	-0.1749***	0.3879***
	(0.068)	(0.050)	(0.301)	(0.611)	(0.101)	(0.110)	(0.062)	(0.052)
Securitisation	-0.4481***	0.3565**			0.0599	-0.4048*	-1.1170***	0.4886*
	(0.151)	(0.161)			(0.157)	(0.220)	(0.149)	(0.261)
Refinancing	-0.0740	-0.1699***	-0.4428	1.0423	0.1507	-0.2482*	-0.1951***	-0.0324
	(0.061)	(0.045)	(0.301)	(0.779)	(0.111)	(0.144)	(0.057)	(0.044)
Constant	3.2692***	5.5269***	5.1078***	5.3832***	2.7424***	5.6020***	4.0613***	5.6801***
	(0.077)	(0.044)	(0.294)	(0.612)	(0.111)	(0.102)	(0.064)	(0.042)
Observations	216,769	48,992	6,490	780	152,529	15,146	56,978	32,073
R-squared	0.6767	0.7945	0.4816	0.6352	0.6647	0.8634	0.8145	0.7808
Adjusted R-squared	0.662	0.760	0.438	0.449	0.653	0.839	0.783	0.740
Bond size cat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Local Currency

	(1) All	(2) Supranational	(3) Financial	(4) Non-financial
Green	-0.2832	-0.8008***	0.0994	-0.2136**
	(0.176)	(0.153)	(0.312)	(0.108)
Local	-0.1854*	-0.1278	0.0315	-0.1224
	(0.104)	(0.207)	(0.092)	(0.093)
Callable	0.2525***	-0.4705***	0.2738***	0.2245***
	(0.083)	(0.105)	(0.100)	(0.034)
Puttable	0.1131***	0.1287	-0.0540	0.0517*
	(0.044)	(0.198)	(0.157)	(0.030)
Collateralized	0.3295***		0.2948***	0.0716
	(0.064)		(0.074)	(0.075)
Use of proceeds:				
General Corporate Purposes	0.0201	0.2292	0.0378	0.1205***
	(0.049)	(0.291)	(0.083)	(0.043)
Securitisation	-0.3713***		-0.0790	-0.7016***

	(0.140)		(0.147)	(0.142)
Refinancing	-0.0465	0.0715	0.1768*	-0.0902**
Constant	3.7427***	5.0598***	2.9423***	4.6906***
	(0.101)	(0.269)	(0.103)	(0.084)
Observations	266,724	7,391	168,594	89,902
R-squared	0.7299	0.4768	0.7176	0.8057
Adjusted R-squared	0.714	0.436	0.707	0.775
Bond size cat FE	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes

Table 7 Yield spread: robustness II OECD countries. The table presents OLS regression results of yield spread and offering yield spread for the sub-sample of issuers located in OECD countries. and The dependent variable is the yield spread (columns (1) and (2)), measured as the difference between the bond yield at issuance and a similar Treasury bond issued by the same country and comparable maturity, and the bond yield at issue (columns (3) and (4)). **Green** is a dummy variable equal to one if a bond is classified as green. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond,. **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or not rated), **Time** is time (month) fixed effect, **Maturity×Rating×Time** is their interaction, **Issuer** is the fixed effect for the company issuing the bond. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)
	Yield spread		Offering yield	
VARIABLES	Financial	Non-financial	Financial	Non-financial
Green	0.3179	-0.3413**	-0.0596	-0.5750***
	(0.437)	(0.157)	(0.474)	(0.104)
Callable	0.3525***	0.2298***	0.3212***	0.1696***
	(0.071)	(0.047)	(0.068)	(0.041)
Puttable	0.3075	0.2332***	0.3621*	0.1737***
	(0.257)	(0.054)	(0.202)	(0.046)
Collateralized	0.2314***	0.1075	0.1517**	0.0730
	(0.077)	(0.076)	(0.067)	(0.071)
Use of proceeds:				
General Corporate Purposes	0.2396	-0.2596***	0.0661	-0.3342***
	(0.160)	(0.067)	(0.146)	(0.061)
Securitisation	0.1987	-1.2612***	0.2287	-1.3358***
	(0.195)	(0.159)	(0.206)	(0.145)
Refinancing	0.4454*	-0.3448***	0.1475	-0.3662***
	(0.229)	(0.052)	(0.213)	(0.049)
			2.6036***	4.2728***
Constant	0.3685**	2.5186***	(0.149)	(0.061)
	(0.164)	(0.063)		
Observations	116,105	34,673	135,552	43,339
R-squared	0.4980	0.7210	0.6769	0.8165
Adjusted R-squared	0.477	0.651	0.664	0.776
Bond size cat FE	Yes	Yes	Yes	Yes
Issue size cat FE	Yes	Yes	Yes	Yes
Currency FE	Yes	Yes	Yes	Yes
Maturity×Rating×Time FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes

Table 8 Offering yield: financial institutions. The table presents the OLS regression results of offering yield on the green bond indicator for the sub-sample of financial institutions. The dependent variable is the bond yield at issue. **Green** is a dummy variable equal to one if a bond is classified as green. **Environmentally friendly** is a dummy variable equal to one from the year onward in which a bank signed the United Nations Environment Programme Finance Initiative. All specifications include a set of bond fixed effects. **Callable** is a dummy variable equal to one if the bond is callable by issuer, **Puttable** is a dummy variable equal to one if the bond is puttable by issuer, **Collateralized** is a dummy variable equal to one if the bond is backed by a collateral, **Use of proceeds** is a categorical variable capturing the purpose of the issuance refinancing, general corporate purpose, securitization and others (which is the baseline), **Bond size category** is a categorical variable based on the decile of the bond amount, **Issue size category** is a categorical variable based on the decile of the bonds issued by that issuer on that day, **Currency** refers to the currency of the bond. **Maturity** is a categorical variable based on the maturity of the bond (0-5 y, 5-10y, and >10y), **Rating** is a categorical variable based on the agencies' ratings with 1 assigned to the top rating and 11 to the worst rating (or no rated), **Time** is time (month) fixed effect, **Maturity×Rating×Time** is their interaction, **Issuer** is the fixed effect for the company issuing the bond. Robust standard errors, clustered at issuer level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1) Financial
Green	0.3977
	(0.386)
Environmentally friendly	0.1696
	(0.217)
Green × Environmentally friendly	-1.0020**
	(0.450)
Callable	0.2741***
	(0.100)
Puttable	-0.0563
	(0.158)
Collateralized	0.2944***
	(0.074)
Use of proceeds:	
General Corporate Purposes	0.0317
	(0.083)
Securitisation	-0.0827
	(0.146)
Refinancing	0.1731*
	(0.097)
Constant	2.9447***
	(0.105)
Observations	168,594
R-squared	0.7177
Adjusted R-squared	0.707
Bond size cat FE	Yes
Issue size cat FE	Yes
Currency FE	Yes
Maturity×Rating×Time FE	Yes
Issuer FE	Yes

Table 9. Green issuer and lending decisions. The table shows the summary statistics for the sample of bank lending. The unit of observation is the bank-country-industry-year level, based on the sample of all completed syndicated loans from 2007 to 2018 granted to industry-country (*jc*) for which bank *b* served as lead arranger in year *t*. The sample is limited to bank-industry-country (*bjc*) with non-zero loans in at least two years. **Amount** is the logarithm of the total amount granted to industry-country (*jc*) for which bank *b* served as lead arranger in year *t*, plus one. **Average amount** is the logarithm of the average amount granted to industry-country (*jc*) for which bank *b* served as lead arranger in year *t*, plus one. **Any loan** is a dummy variable which takes value one if any loans were granted to industry-country *jc* by bank *b* in period *t*, zero otherwise. **Green issuer** is a dummy variable which takes value one from the time *t* the bank *b* has issued a green bond onwards, zero otherwise. **Emission intensities** is the ratio between greenhouse gasses and the output for a specific industry *j* in country *c* in period *t*. **Emission intensities 2** is the ratio between greenhouse gasses and the value added for a specific industry *j* in country *c* in period *t*. The unit of measure is kilograms per Euro.

	N	Mean	Median	St. Dev.	P. 1	P. 99
Amount	69180	3.3092	0.0000	4.4904	0.0000	11.8679
Average amount	69180	3.0225	0.0000	4.1017	0.0000	10.9739
Any loan	69180	0.3589	0.0000	0.4797	0.0000	1.0000
Green issuer	69180	0.1504	0.0000	0.3575	0.0000	1.0000
Emission intensities	65455	0.6381	0.0498	1.5643	0.0000	7.6062
Emission intensities 2	65380	0.2074	0.0231	0.4905	0.0000	2.6389

Table 10. Green issuer and lending decisions. The table presents the OLS regression results of lending decisions on green issuers varying by emission intensities. The unit of observation is the bank-country-industry-year level, based on the sample of all completed syndicated loans from 2007 to 2018 granted to industry-country (*jc*) for which bank *b* served as lead arranger in year *t*. The sample is limited to bank-industry-country (*bjc*) with non-zero loans in at least two years. In all panels, models 1-2 include all observations independently on the country, while models 3-4 we limited the sample of those observations for which the borrower country is different from the bank country. In models 1 and 3 we control for bank, country, NACE and year fixed effects. In models 2 and 4 we control for bank-NACE, bank-country, bank-year, country-year, country-NACE and NACE-year fixed effects. In panel A the dependent is the total amount in log plus one. In panel B the dependent variable is the average size of loans granted to industry-country *jc* by bank *b* in period *t*. In panel C the dependent variable is a dummy variable which takes value one if any loans were granted to industry-industry *jc* by bank *b* in period *t*, zero otherwise. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	All		Excluding domestic	
Panel A: Amount				
	(1)	(2)	(3)	(4)
Green issuer	0.2958		0.3793*	
	(0.186)		(0.205)	
Emission intensities	-0.0714**	-0.1105*	-0.0842***	-0.0189
	(0.028)	(0.061)	(0.029)	(0.056)
Green issuer* Emission intensities	-0.1254***	-0.0686**	-0.1383***	-0.1846***
	(0.030)	(0.034)	(0.038)	(0.032)
Observations	65,021	64,715	49,875	49,470
R-squared	0.1118	0.3367	0.1093	0.2693
Adjusted R-squared	0.108	0.266	0.105	0.196
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel B: Average				
	(1)	(2)	(3)	(4)
Green issuer	0.2575		0.3385*	
	(0.165)		(0.184)	
Emission intensities	-0.0691***	-0.1112*	-0.0797***	-0.1778***
	(0.025)	(0.056)	(0.028)	(0.063)
Green issuer* Emission intensities	-0.1083***	-0.0647**	-0.1227***	-0.0892**
	(0.027)	(0.031)	(0.034)	(0.036)
Observations	65,021	64,715	49,875	49,457
R-squared	0.1020	0.3100	0.1019	0.2979
Adjusted R-squared	0.0985	0.237	0.0976	0.216
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel C: Any loan				
	(1)	(2)	(3)	(4)
Green issuer	0.0292		0.0398*	
	(0.019)		(0.021)	
Emission intensities	-0.0055**	-0.0102	-0.0066**	-0.0179**
	(0.003)	(0.007)	(0.003)	(0.007)
Green issuer* Emission intensities	-0.0128***	-0.0077**	-0.0144***	-0.0103**
	(0.003)	(0.004)	(0.004)	(0.004)
Observations	65,021	64,715	49,875	49,457
R-squared	0.0982	0.3059	0.0966	0.2898

Adjusted R-squared	0.0946	0.232	0.0923	0.207
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes

Table 11. Green issuer and lending decisions: robustness. The table presents the OLS regression results of lending decisions on green issuers varying by emission intensities. The unit of observation is the bank-country-industry-year level, based on the sample of all completed syndicated loans from 2007 to 2018 granted to industry-country (*jc*) for which bank *b* served as lead arranger in year *t*. The sample is limited to bank-industry-country (*bjc*) with non-zero loans in at least two years. In all panels, models 1-2 include all observations independently on the country, while models 3-4 we limited the sample of those observations for which the borrower country is different from the bank country. In models 1 and 3 we control for bank, country, NACE and year fixed effects. In models 2 and 4 we control for bank-NACE, bank-country, bank-year, country-year, country-NACE and NACE-year fixed effects. In panel A the dependent variable is the total amount granted to industry-country *jc* by bank *b*, independently on the role in the deal in period *t*. In panel B emission intensities2 is the ratio between green gasses and value added. In panel C we drop observations for public-service and financial services industries (respectively NACE O and F). In panel D we exclude in the initial sample those loans classified in term of main purpose as "LBO", "MBO", "Merger", "Project financing" or "Takeover". In panel E Leverage is the median ratio between debt and total assets for industry-country *jc* at time *t*. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	All		Excluding domestic	
Panel A: Any role				
	(1)	(2)	(3)	(4)
Green issuer	0.2585		0.3296*	
	(0.168)		(0.185)	
Emission intensities	-0.0524**	0.0030	-0.0604**	-0.0394
	(0.021)	(0.048)	(0.024)	(0.047)
Green issuer* Emission intensities	-0.1133***	-0.0233	-0.1221***	-0.0449
	(0.029)	(0.027)	(0.034)	(0.030)
Observations	85,751	85,594	67,640	67,434
R-squared	0.1014	0.3391	0.0996	0.3168
Adjusted R-squared	0.0983	0.274	0.0960	0.244
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel B: Different Emission intensities definition				
	(1)	(2)	(3)	(4)
Green issuer	0.2873		0.3654*	
	(0.186)		(0.205)	
Emission intensities2	-0.1853*	-1.2575***	-0.2513***	-1.5160***
	(0.102)	(0.281)	(0.096)	(0.320)
Green issuer* Emission intensities2	-0.3264***	-0.1829*	-0.3327***	-0.2006*
	(0.098)	(0.095)	(0.124)	(0.116)
Observations	64,949	64,635	49,815	49,397
R-squared	0.1118	0.3368	0.1093	0.3159
Adjusted R-squared	0.108	0.267	0.105	0.236
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel C: Excluding public-service and financial services industries				
	(1)	(2)	(3)	(4)
Green issuer	0.2901		0.3734*	
	(0.189)		(0.210)	
Emission intensities	-0.0711**	-0.1014*	-0.0861***	-0.1808***
	(0.028)	(0.060)	(0.030)	(0.067)
Green issuer* Emission intensities	-0.1304***	-0.0675**	-0.1422***	-0.0922**
	(0.031)	(0.034)	(0.039)	(0.040)

Observations	62,310	62,007	47,901	47,482
R-squared	0.1147	0.3396	0.1130	0.3207
Adjusted R-squared	0.111	0.268	0.109	0.240
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel D: Excluding M&A loans				
	(1)	(2)	(3)	(4)
Green issuer	0.2557		0.3318*	
	(0.173)		(0.193)	
Emission intensities	-0.0785***	-0.0321	-0.0781**	-0.0641
	(0.030)	(0.059)	(0.031)	(0.073)
Green issuer* Emission intensities	-0.1159***	-0.0873**	-0.1313***	-0.1088**
	(0.033)	(0.039)	(0.040)	(0.045)
Observations	58,546	58,222	44,774	44,402
R-squared	0.1201	0.3413	0.1195	0.3257
Adjusted R-squared	0.116	0.268	0.115	0.241
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes
Panel E: Additional control (Leverage)				
	(1)	(2)	(3)	(4)
Green issuer	0.2940		0.3785*	
	(0.186)		(0.205)	
Emission intensities	-0.0700**	-0.1093*	-0.0836***	-0.1917***
	(0.028)	(0.061)	(0.029)	(0.068)
Green issuer* Emission intensities	-0.1249***	-0.0684**	-0.1376***	-0.0954**
	(0.030)	(0.034)	(0.038)	(0.040)
Leverage	0.2602*	0.1288	0.1545	-0.1077
	(0.150)	(0.202)	(0.165)	(0.247)
Observations	64,970	64,664	49,839	49,421
R-squared	0.1117	0.3367	0.1091	0.3156
Adjusted R-squared	0.108	0.266	0.105	0.236
Bank FE	Yes	No	Yes	No
Country FE	Yes	No	Yes	No
NACE FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No
Bank-NACE FE	No	Yes	No	Yes
Bank-Country FE	No	Yes	No	Yes
Bank-Year FE	No	Yes	No	Yes
Country-Year FE	No	Yes	No	Yes
Country-NACE FE	No	Yes	No	Yes
NACE-Year FE	No	Yes	No	Yes

Appendix

Table 12. Emission intensities by country: summary statistics. Summary statistics of emission intensities defined as green gasses emissions in Kg. over output by country.

Country	Mean	St. Dev.	P. 1	P. 99
AT	0.6270	0.9222	0.0009	3.6320
BE	0.6079	1.0456	0.0037	3.7926
BG	1.0071	2.8863	0.0009	10.2058
CH	0.1257	0.3208	0.0039	1.6933
CY	0.6726	1.7162	0.0023	10.2058
CZ	1.5666	3.2685	0.0061	10.0129
DE	0.7360	1.6902	0.0038	7.2590
DK	0.6697	1.9471	0.0036	10.2058
EE	2.6934	4.5003	0.0044	10.2058
ES	0.6155	1.2256	0.0005	5.0946
FI	0.8161	1.6356	0.0001	6.4097
FR	0.3587	0.8800	0.0018	3.2734
GB	0.6189	1.5491	0.0000	7.8811
GR	0.6964	1.9290	0.0001	10.2058
HR	0.7028	1.2967	0.0025	6.3143
HU	2.0642	2.6062	0.0570	8.5625
IE	0.6643	1.6740	0.0008	8.3937
IS	0.1088	0.5068	0.0021	3.8774
IT	0.6135	1.4152	0.0006	5.9694
LT	0.9903	1.7181	0.0042	4.9588
LU	0.0916	0.4246	0.0000	0.4735
LV	0.2528	0.9458	0.0050	4.5547
MT	0.0040	0.0007	0.0035	0.0058
NL	0.7153	1.6767	0.0052	7.9187
NO	0.4591	0.8339	0.0000	3.2592
PL	2.0241	3.1831	0.0180	10.2058
PT	1.2786	2.0778	0.0007	7.5096
RO	1.9389	2.6136	0.0155	10.2058
RS	0.0592	0.0712	0.0209	0.4516
SE	0.4153	1.0227	0.0018	5.7084
SI	0.3807	1.3905	0.0000	7.7436
SK	1.9644	2.8958	0.0166	10.2058
TR	1.2407	2.9056	0.0000	10.2058

Table 13. Emission intensities by industry: summary statistics. Summary statistics of emission intensities defined as green gasses emissions in Kg. over output by industry. We use the most level of disaggregation provided by Eurostat.

NACE	Mean	St. Dev.	P. 1	P. 99
A01	3.5204	1.8384	1.0954	10.2058
A02	0.1383	0.1067	0.0000	0.3409
A03	0.8574	0.7325	0.0062	2.5022
B	1.0250	1.1623	0.0946	4.9845
C10-C12	0.2217	0.0955	0.0706	0.4079
C13-C15	0.1829	0.0956	0.0272	0.4735
C16	0.2053	0.1900	0.0319	0.8748
C17	0.7081	0.3909	0.2334	1.6025
C18	0.0793	0.0122	0.0509	0.1044
C19	5.4094	2.5729	0.0000	10.2058
C20	1.2256	0.8808	0.1205	4.8446
C21	0.0938	0.2201	0.0034	1.1546
C22	0.1048	0.0741	0.0071	0.3363
C23	2.9758	1.2131	1.2865	5.6611
C24	2.9791	1.8262	0.2163	9.6014
C25	0.0687	0.0610	0.0269	0.1994
C26	0.0227	0.0163	0.0001	0.0629
C27	0.0615	0.0404	0.0000	0.1663
C28	0.0484	0.0335	0.0030	0.1587
C29	0.0743	0.0483	0.0146	0.2196
C30	0.0479	0.0263	0.0070	0.1137
C31-C32	0.0614	0.0474	0.0041	0.1818
D	4.9411	3.0569	0.0139	10.2058
E36	0.1812	0.1955	0.0000	0.8361
E37-E39	2.0385	0.8404	0.6190	3.5266
F	0.1100	0.1175	0.0069	0.6558
G45	0.0787	0.0752	0.0089	0.4571
G46	0.0563	0.0434	0.0000	0.2299
G47	0.0510	0.0312	0.0019	0.1619
H49	0.6645	0.3490	0.2378	1.8374
H50	2.9121	2.2654	0.1980	10.2058
H51	4.2839	1.3176	0.0530	6.8690
H52	0.0765	0.0833	0.0001	0.2529
H53	0.0896	0.0525	0.0115	0.2411
I	0.0587	0.0276	0.0097	0.1214
J58	0.0181	0.0179	0.0014	0.0767
J59-J60	0.0162	0.0077	0.0036	0.0300
J61	0.0146	0.0155	0.0000	0.0968
J62-J63	0.0116	0.0084	0.0032	0.0320
K64	0.0127	0.0194	0.0001	0.1058
K65	0.0061	0.0068	0.0000	0.0238
K66	0.0084	0.0097	0.0000	0.0400
L	0.0087	0.0157	0.0004	0.0728
M69-M70	0.0111	0.0074	0.0000	0.0431
M71	0.0164	0.0090	0.0000	0.0564
M73	0.0169	0.0073	0.0069	0.0346
M74-M75	0.0453	0.2482	0.0000	0.4239
N77	0.0806	0.1044	0.0016	0.7578
N78	0.0162	0.0260	0.0000	0.1066
N79	0.0237	0.0431	0.0000	0.2037
N80-N82	0.0351	0.0258	0.0000	0.0906
O	0.0371	0.0225	0.0023	0.1082
P	0.0248	0.0118	0.0005	0.0504
Q86	0.0267	0.0166	0.0018	0.0857
Q87-Q88	0.0407	0.0132	0.0114	0.0684
R90-R92	0.0334	0.0276	0.0061	0.1039
R93	0.0959	0.0640	0.0185	0.3249
S94	0.0722	0.0578	0.0169	0.2136
S95	0.0413	0.0036	0.0343	0.0484
S96	0.0514	0.0177	0.0144	0.0792

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