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When Green Meets Green*

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Abstract

What is the impact of environmental consciousness (i.e., being green) as borrower and as lender on loan rates? We investigate this question employing an international sample of syndicated loans over the period 2011-2019. We find that green firms borrow at a significantly lower spread, especially when the lender consortium can also be classified as green, i.e., when "green-meets-green". Further tests reveal that the impact of "green-meets-green" became significant and large negative only after the acceptance of the Paris Agreement in December 2015. We argue that this is evidence for lenders responding to policy events which affect environmental attitudes.

Keywords: Paris Agreement, Green Firms, Green Banks, Bank Lending

JEL Classification: A13, G21, Q51, Q58

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1 Introduction

Climate change might be threatening the future of the globe. Extreme weather conditions have attracted policymakers' interest and urged the need to take action to mitigate or dampen the impact of climate change. The UN climate change Paris conference in December 2015 put forward a limit of 1.5 °C increase in average global temperatures relative to those prevailing before the Industrial Revolution. The way to reach this objective is by drastically cutting the exhaust of carbon or CO_2 emissions which leads to the increase in global temperatures. The question arises as to how finance can contribute to reaching these reduced CO_2 emissions, and how such a change in mindset stemming from market discipline could affect bank business models and financial stability. In this paper, we study how environmental consciousness (i.e., being green) displayed by banks as well as borrower firms affects the pricing of bank credit.

In particular, we examine the relationship between the banks' and firms' environmental attitudes and the pricing of debt, i.e., loan credit spreads. First, we are interested in whether firms that are environmentally conscious (i.e., green firms) borrow at different terms than otherwise similar firms.[1] Second, we examine whether environmentally responsible banks (i.e., green banks) lend at different terms than otherwise similar banks. Bank's greenness can be viewed as an additional constraint on its operations which may raise the cost of lending. However, if green banks themselves could obtain cheaper funding then this could lower the cost of lending. Third, we are interested if green banks lend to green firms at lower rates than to non-green firms, to which we refer as the green-meets-green effect. Since the terms of loans are contractually determined by both borrowers and lenders, the environmental attitude of the loan-granting bank is likely to play a pivotal role in whether the firm's greenness indeed affects the price of the loan. We thus conjecture that green banks (as opposed to non-green banks) provide cheaper loans to green firms than to non-green ones.

Furthermore, we examine whether the Paris Agreement, which was reached on December 12, 2015, affected the relationship between the banks' and firms' environmental attitude and the

[1] Note that we use "green firm" as a term for a firm that displays environmental attitude. Such a firm, however, does not necessarily persuade green/sustainable projects only.

loan credit spreads.[2] Much of the difficulties in managing climate-related risks are attributed to the highly uncertain real impacts of climate change, and the endogenous nature of future policy shocks (see for example Batten et al. (2016), Campiglio et al. (2018)). For example, regime shifts in public policy could lead to strengthened environmental regulation and political pressure, which potentially harm firms who do not anticipate the possibility of such shocks. As the expectation of a regulatory shift increases, so does the environmental attitude of firms in equilibrium.[3] In such an uncertain environment - prone to sudden equilibrium shifts - there is particularly strong emphasis on public events that could coordinate expectations and behavior of economic agents. The Paris Agreement, as the world's first comprehensive climate agreement, can be viewed as an example of such an event. Our research taps into the very nature of this endogeneity issue by investigating how important policy actions, such as the ratification of the Paris Agreement, shifted lenders' behavior. We hypothesize that events that raise public awareness of climate-related risks and increase the soft commitment of policy-makers to stricter enforcement of climate policy shift the "default" perception of these risks by investors, therefore materially change the causal impact of disclosures. To our knowledge, there is no study investigating the causal impact of these events on the cost of debt financing and banks' behavior.

To answer our research questions, first, we construct plausible proxies for the lender and borrower green attitudes. We then employ these proxies to analyze the price information of syndicated loans using the LPC DealScan database. Our proxy for borrower's greenness relies on voluntary reporting in the Carbon Disclosure Project (CDP), an investor-oriented non-profit initiative designed to facilitate and standardize disclosure of a firm's environmental impact. Although the potential effect of such a voluntary disclosure is far from trivial, we believe that

[2]The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC). The agreement's language was negotiated by representatives of 196 state parties at the 21st Conference of the Parties of the UNFCCC on 12 December 2015. The goal of the agreement is to keep the increase in global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the increase to 1.5 °C, acknowledging this would substantially dampen the risks associated with of climate change. These goals are to be achieved by a substantial reduction of emissions to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases" in the second half of the 21st century as well as to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development."

[3]This interplay of attitudes between government and market actors could lead to multiple equilibria, as described in Batten et al. (2016).

responding to CDP's annual questionnaire is a plausible proxy to capture firms' environmental consciousness.[4] In particular, we hypothesize that firms that report to CDP have better in-house capabilities in measuring and managing the inherent risks of the green transition of the economy, which is appreciated by lenders in the form of lower loan spreads.

We proxy the bank's green attitude by its membership in the United Nations' Environment Program Finance Initiative (UNEP FI), which aims "*to mobilize private sector finance for sustainable development*"[5]. Since its inception in 1991 more than 160 banks have joined the Initiative. We hypothesize that this attitude is materialized in the data in the form of further price impact on loans where 'green-meets-green'. Fatica et al. (2019) finds that signatory banks of UNEP FI are able to issue green bonds with a premium, because they are more clearly able to signal their environmental attitudes in lending. This provides external support to the use of UNEP FI membership as our proxy.

We document a statistically and economically significant negative coefficient on our green borrower proxy, a positive coefficient on our green bank proxy, and a negative coefficient on the interaction term ('green-meets-green' impact) for the period 2011-2019. In particular, our results suggest that on average over the entire sample green firms pay about 11-14 bps less for a loan than non-green firms, that green banks charge 32-38 bps more for a loan than non-green banks, and that green banks charge 33-36 bps less when lending to green firms. The results are qualitatively robust to the inclusion of controls as well as variants of the exact specification of the proxy variables.

In further tests, we attempt to better isolate the source of the green-meet-green effect. First, splitting the sample in before and after the Paris Agreement, we find that the interaction term on "green-meets-green" is insignificant prior to the Paris Agreement, but statistically significant and negative after the Agreement. In particular, our estimation based on the sub-sample after the Paris Agreement suggests that green firms pay about 7-9 bps less for a loan than non-green

[4]On the one hand, truthful disclosure of a certain source of the business risk of which investors were initially unaware might be directly interpreted as bad news (Lee et al. (2015)), lowering prices and raising loan spreads. On the other hand, higher voluntary disclosure might signal the management's ability and willingness to proactively measure its exposure and tackle the risks arising from low-carbon transition (Jung et al. (2018), Kleimeier and Viehs (2018)). Voluntary disclosure of carbon or CO_2 emissions may signal that firms are better than some others (Verrecchia (1983)).

[5]https://www.unepfi.org

firms, that green banks charge approximately 52 bps more for a loan than non-green banks, and that green banks charge 60-69 bps less when lending to green firms. We further confirm this with a three-way interaction regression-specification. These findings confirm our hypothesis that green attitudes of lenders are indeed reflected in pricing conditions in a significant way, and this was largely influenced by the adoption of the Paris Agreement. We consider this a positive externality of the Paris Agreement; while improving access to debt was not an explicit aim of the Accord, the increased attention on environmental factors resulted in a measurable impact on the loan conditions for debt financing.

Our paper contributes primarily to the literature on the relation between the environmental attitude of firms and their cost of funding. In general, this literature provides empirical evidence that firms that are perceived as more environmentally conscious enjoy a lower cost of capital. This evidence may be driven by specific investors' preferences (Chava (2014), Riedl and Smeets (2017), Hartzmark and Sussman (2018),) or by risk considerations (Sharfman and Fernando (2008), Kleimeier and Viehs (2018), Krueger et al. (2020)). With regard to bank lending, Chava (2014) documents that firms with environmental concerns pay a higher loan spread and receive loans granted by syndicates with fewer banks, and argues that the higher cost of capital is not driven exclusively by heightened default risk. In a closely related paper to ours, Kleimeier and Viehs (2018) provide empirical evidence of a significant and negative relation between voluntary disclosure of CO_2 emissions and loan spreads for informationally opaque borrowers. We contribute to this strand of the literature by investigating preferences from both firms' and banks' perspectives. In particular, we show that the reduction in the cost of loans to green firms is larger when the loan-granting bank is green as well. Moreover, we show that this relationship is primarily driven by the period after the announcement of the Paris Agreement.

The positive green-meets-green effect in our paper is related to some recent studies which emphasize that the "receivers' attitudes" are important for social and environmental responsibility efforts to have a material impact. For example, Houston and Shan (2020) document that similarity in environmental attitudes matters for lending decisions, as banks are more likely to lend to borrowers with similar (high) ESG-scores. Kim et al. (2014) find that lending conditions improve when there is similarity in ethical domain across borrower and lender. In Hauptmann

(2017), strong sustainability score leads to lower credit spreads but only when borrowing from a bank with strong sustainability score. These findings are supportive to the idea that in-house expertise on the lender's side is a prerequisite to interpret the soft information in borrowers' disclosures about their environmental activity.

More generally, our paper contributes to a rapidly expanding literature on green finance. A number of studies in this field have focused on carbon-intensive assets or "brown assets." De Haas and Popov (2019) explore the role of financial structure in shaping the relation between economic growth and carbon emissions. Delis et al. (2020) examine the impact of climate policy risk on the pricing of bank loans by studying the change in loan rates to "brown firms" before and after the Paris Agreement. Our paper instead relates closer to the literature which studies transition risk in the context of "green assets", i.e. sustainable projects (e.g. Sharfman and Fernando (2008), Chava (2014), Fatica et al. (2019)).

The remainder of our paper is organized as follows. Section 2 states research questions. Section 3 presents data and summary statistics. Section 4 presents the empirical analysis and results. Section 5 offers extensive robustness checks. Finally, Section 6 concludes.

2 Research Questions

It has by now become somewhat of a cliche that environmental considerations and climate risk management should form an integral part of firms' operational decisions. Surprisingly, much less is known about how these efforts are valued by investors and in particular, whether or not it is reflected in equilibrium market prices. To begin with, climate risk is characterized by an enormous level of uncertainty making any objective assessment and valuation rather difficult (Barnett et al. (2020)). Moreover, if investors are not concerned about climate risk, there is no apparent reason why they would factor in such risk in the first place. For example, consider a firm that borrows from a bank. Suppose that the firm is green—that is, it exhibits environmental attitude. Naturally, whether the bank will factor in the firm's green status when granting the loan should depend on the bank's own environmental attitude. If the bank does not attach any value to the firm's greenness, then it will treat it in the same way as a non-green firm when granting a loan. Likewise, if the bank values the firm's greenness it should offer it a loan with better terms (i.e., at a lower rate).

Our first research question is whether firm's greenness allows it to obtain a loan at more preferential terms than non-green firms. As we discuss above, it is not immediately clear that green firms should earn such a greenium if banks do not attach any value to that. Moreover, it is not obvious that the information disclosed by environmentally conscious firms necessarily lowers the spread, even when banks are listening. One can imagine that directing lenders' attention to the firm's carbon emission and to its exposure to climate risk even increases the loan spread as banks, who necessarily are subject to asymmetric information and limited attention, assess the overall riskiness of the loan. We put forward two arguments to support our hypothesis that this is not the case. First, answering the CDP-questionnaire requires costly effort by the firm, and it is plausible to assume that responding firms indeed are better informed about their exposure to climate risks. As better information leads to better decision making, we can reasonably expect that reporting firms indeed manage these risks better, which will lead to lower loan spread. This is also consistent with CDP's mission, which "aims to make environmental reporting and risk management a business norm"[6]. Our second argument is more nuanced: suppose that indeed 'bad' reporting would lead to penalty pricing. However, responding to CDP questionnaire is entirely voluntary - a true or perceived penalty for bad reporting would quickly lead to adverse selection and market unraveling, so that only "good" firms (i.e. firms with moderate or well-managed climate risk exposure) end up reporting, justifying lower loan spreads.

Our second research question is how bank's green status affects the loan rates they grant. By channeling credit to firms banks play an important role in deciding which projects would receive funding and which would not. Green banks are by definition more concerned about the environmental consequence of their lending. Therefore, the bank's greenness can be viewed as an additional constraint on its operations which is likely to raise the cost of lending. Moreover, green banks are more likely to price in the climate risk, which would also result in higher spreads if those banks price it differently than non-green banks. On the other hand, it is also possible that green banks can obtain cheaper funding themselves, which would lower the cost of lending

[6] https://en.wikipedia.org/wiki/Carbon_Disclosure_Project

(Fatica et al. (2019)), so the overall impact of bank greenness remains an empirical question.

In our third research question, we examine whether green firms borrow at lower rates from green banks than non-green firms. We conjecture that when green banks lend to green firms (i.e., when "green meets green") they charge lower rates than when they lend to non-green firms (as opposed to when non-green banks do the same). Since green banks aim to internalize the potential negative environmental impact of their operations it is natural to expect that these banks would reward green firms by offering them better lending conditions than those to brown firms. The underlying assumption is that green banks have greater sensitivity to environmental considerations, which they reflect in their business decisions. We are oblivious to why these considerations enter into the decision function of banks: it could be genuine corporate social responsibility (CSR) concern, better in-house capacity to analyze and understand climate-related risks, or most likely a self-reinforcing combination of these factors.

Finally, we examine the effect of the Paris Agreement, accepted on December 12, 2015, and signed in May 2016, on the green-meet-green effect. The Paris Agreement was accompanied by enormous publicity and directed further attention on sustainability and climate transition risk. We argue that the Paris Agreement has reinforced lenders' existing attitudes, so we hypothesize the increase of the (absolute) impact of the 'green-meets-green effect'. In 2019 UNEP FI members launched the Principles for Responsible Banking Framework, with the explicit aim to "*transform the banking industry to enable it to play a leading role in achieving [goals of] the Paris Climate Agreement*". We interpret this as an explicit commitment by member banks to reflect the firms' environmental attitudes in loan granting decisions, supporting our hypothesis. More importantly, the Paris Agreement may also have shifted the default perception of climate transition risks by banks. On the short term, the risk for creditors is not climate change per se, but changes in public policy which hurt non-green businesses. We hypothesize that this increases cost of lending, unless the ability to manage transition risk is signalled through environmental disclosures.

3 Data

To investigate our research questions, we construct a comprehensive database by compiling the data from the Carbon Disclosure Project (CDP) survey, the United Nations Environment Programme, Finance Initiative (UNEP FI), Thomson Reuters' LPC DealScan, and Compustat Global and Compustat North-America.

We use the Carbon Disclosure Project (CDP) survey to identify a firm as being green.[7] In particular, a firm is identified as being green if it voluntarily responds to the survey. Since 2008, CDP annually collects self-reported information about firms' carbon emissions and other environmental information, such as governance and investments related to climate-related issues within the organization. CDP targets publicly listed companies that can answer the survey either partly, completely, or decline to participate. Our CDP sample at hand covers the period between 2010-2018 during which the CDP collected environmental data on about 6000 publicly listed firms worldwide. Respondents stand to benefit from disclosure for at least three reasons.[8] First, firms may decide to report their carbon footprint in order to enhance their Environmental, Social, and Governance (ESG) performance. Second, respondents may increase the likelihood of attracting investor funds since some investors, the so-called signatories, pay for CDP's corporate disclosure information to make sustainable investment decisions. Third, disclosing environmental performance allows firms to keep track of environmental opportunities and to benchmark against their peers. Hence, firms that respond to this questionnaire, either partly or completely, are classified as green since they measure, manage, and disclose their climate impact. Detailed information about the construction of the proxy is provided in Table A1 in the Appendix.

We identify a bank as being green if it is a member of the United Nations Environment Programme Finance Initiative (UNEP FI) (e.g., Delis et al. (2020)). Data on the UNEP FI member banks and signature dates are hand-collected from the official website.[9] UNEP FI is a partnership between the United Nations Environment Programme and the global financial

[7] Other studies that employ a similar approach include Kleimeier and Viehs (2018) and Ben-David et al. (2020)
[8] https://www.cdp.net/en/companies-discloser (accessed on November 15, 2019).
[9] http://www.unepfi.org/members/banking/ (accessed on September 6, 2019).

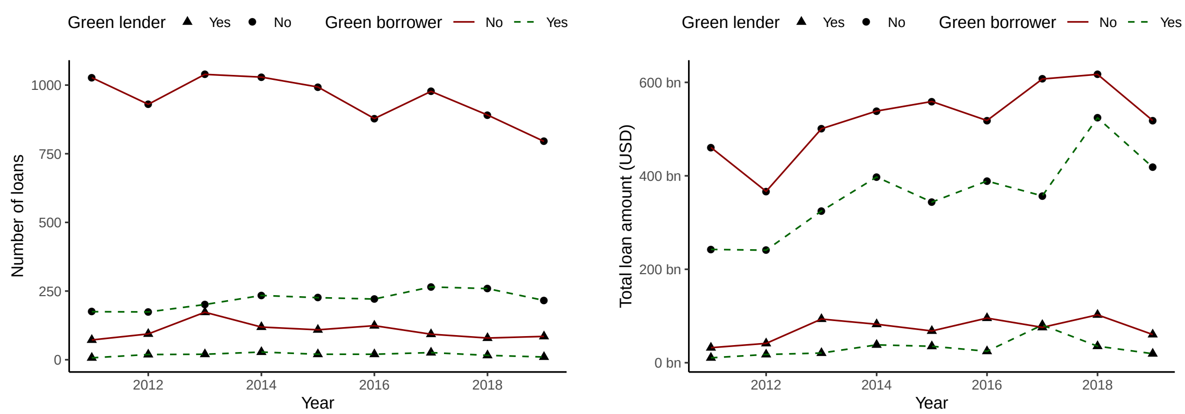
sector which was created to catalyze private sector finance towards sustainable development. From 1991 onwards, about 160 leading banks have joined this initiative. By stating their adherence, banks align their business strategy to the United Nations' Principles of Responsible Banking which provides a framework for sustainable banking. Hence, this membership proxies for a bank's attitude towards climate change.

Next, we collect loan-level data from Thomson Reuters' LPC DealScan database. DealScan contains data on bilateral and syndicated loans to firms worldwide, including loan amounts, interest rates, and non-price loan characteristics such as maturity and covenants, starting from 1988 to date. The detailed borrower information and broad country coverage provide an ideal backdrop to investigate loan terms in a cross-country setting. Syndicated lending is characterized by multiple lender types: lead arranger(s) and participant lenders. While the lead arranger establishes and maintains the relationship with the borrower, the participant lenders rely upon the information memorandum provided by the lead arranger and maintain an arm's length relationship with the borrower (Sufi (2007)). As such, the loan pricing decisions in syndicated loans are taken by the lead arranger. However, it is possible that a given loan facility consists of multiple lead arrangers. Therefore, it is important to note that in defining the green lender, we take into account the "greenness" of all lead arrangers in the loan syndicate. More information about the definition of lead arranger and the construction of the green lender variables are provided in Table A1 in the Appendix.

To examine whether green firms borrow at different terms than other firms and, in particular, when borrowing from green banks, we merge both the CDP database and the UNEP FI database with DealScan. For the former merge, we are able to identify 5,626 green firms active in DealScan using the ISINs reported in the CDP database. For the latter merge, we conduct a fuzzy name-matching algorithm in order to identify green lenders in DealScan. Specifically, we identify 120 green lenders active during the period 2011-2019. To reduce the risk of selection bias, we restrict our DealScan sample to consider only loans to publicly listed firms. Our sample is further restricted to loans with available data on loan spreads, the so-called all-in-spread-drawn (AISD). This variable constitutes our main outcome variable and measures the spread in basis points charged on a loan facility over the London Interbank Offering Rate (LIBOR) plus additional fees for each dollar drawn down. The remaining DealScan sample consists of approximately 70,000 loan facilities granted over the period 2011-2019 to 21,466 different financial and non-financial companies.

Finally, we obtain data on borrower and lender fundamentals from Compustat Global and Compustat North-America. To that end we match the firms and lead arrangers in our DealScan sample to those in Compustat Global and Compustat North-America using the software package introduced by Cohen et al. (2018). Detailed definitions of all variables are provided in Table A1 in the Appendix. After matching the sample to Compustat, we are left with approximately 12,000 loan facilities out of which 10,000 to non-financial corporate companies. While the linking between DealScan and Compustat is successful for about 50% of the facilities, the large drop in sample size is mainly due to missing data points in the Compustat database. Everything combined, approximately 2,200 facilities are granted to 322 green organizations, 1100 facilities are granted by green syndicates, resulting in 166 green-meets-green facilities. Figure 1 depicts our sample over time.

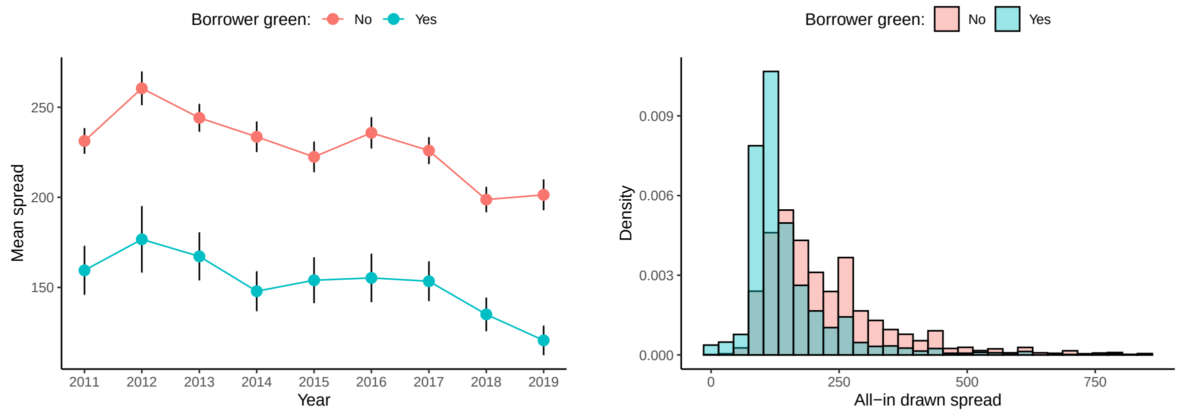
Figure 1: Loans to green firms by green banks over time.



The figure shows the evolution of green firms and green borrowers over time in our final sample, with the number of loan facilities on the left and the total amount on the right. We use our dummy proxy to identify green banks (i.e. the syndicate is classified as green when the majority of participants is green).

Figure 2 illustrates the mean spread over time (left) and the overall sample distribution (right) of our main dependent variable (All-in-drawn-spread) for the final Compustat-matched sample. Both indicate large unconditional green-effect, which we investigate further below.

Figure 2: All-in drawn spread, green vs. brown loans.



Summary Statistics

The summary statistics for our variables are provided in Table 1. Panel A summarizes the descriptives of the variables defined at the facility-level in which the unit of observation is the loan facility – pool of lead arrangers. Our left-hand variable, the all-in-spread-drawn, which is right-winsorized by year at the 1% level to deal with spurious outliers, falls within the range of 1 to 875 basis points with an average value of 214 bps. This is in line with other studies such as Kleimeier and Viehs (2018) and Delis et al. (2020) that report average spreads of, respectively, 256.36 and 280.66 bps. All loan facilities have at least 1 and maximum of 31 lead arrangers, with an average of 1.1[10]. The firm and lender-level controls are annual. With regard to the borrower fundamentals, firm size is measured by log(total assets) with a mean of 8.11, which is equivalent to 3327M$. Log Total Assets is left-winsorized by year at the 1% level to limit the impact of spurious extreme values. With regard to lender fundamentals, for our facility-level regressions the average is taken across the pool of lead arrangers in case the facility comprises multiple lead arrangers. The average size of the lead arrangers is 14.20, which is equivalent to 1469B$.

The bottom part of the panel provides summary statistics of the all-in-spread-drawn for the employed green borrower and lender proxies in our final matched sample. $FGreen^*$ is our modified green borrower indicator which equals 1 for loans given to firms that either disclosed

[10] 96% of the facilities have one single lead arranger.

information to CDP the year before loan origination or that did so before and after loan origination but missed the survey at $t-1$. [11]. The table reveals that 2137 loans are classified as green according to this definition and the mean AISD equals 151bps. $FGreen$ refers to our unaltered green borrower proxy that captures whether the firm disclosed information to CDP in the year before loan origination. This variable encompasses more within-firm variation and therefore will be used in specifications including firm fixed effects. The table shows that 2030 loans are classified as green and the mean AISD is 149bps. Concerning our green lender proxies, we construct two such measures. First, $BGreen$ is a dummy variable that equals 1 when the majority of lead arrangers is considered as green, i.e., member of UNEPFI the year before loan origination, and 0 otherwise. The table shows that 1114 facilities are granted by green syndicates and the mean AISD is 307.83bps. Our second green lender proxy, $BGreen(pct)$ is a continuous one which captures the fraction of green banks among the pool of lead arrangers. The table reports the descriptives of this variable and shows that green syndicates on average consists of 70% green lead arrangers. This shows that green lenders mainly tend to arrange loan facilities with other green lenders.

We report summary statistics of the facility-lead arranger level data in Panel B of Table 1. To construct this data, we decompose our facility-level observations into facility - lead arranger level observations. That is, the unit of observation here is the individual lead arranger rather than the pool of lead arrangers. This data allows us to define our green lender proxy at the individual bank-level and include lender fixed effects in the regression specifications. The advantage is twofold: not only can we now estimate the change in spread at which a bank lends after becoming green, but also are we able to control for unobserved cross-sectional differences between lenders by examining the loan spreads across green and non-green firms within the same bank. As can be seen from the table, the average concentration, measured by the number of lead arrangers participating in the syndicate, is higher than in Panel A. While the mean

[11] We note that even those firms that otherwise regularly report to CDP often miss a year in reporting. We, thus, were facing a choice whether to still consider such firms following these "missed" years green or brown. We, however, believe that some temporary alternation in reporting does not reflect the true overall environmental attitudes. We classify a firm as green if the firm has reported to CDP prior to the loan origination date, but hasn't completely stopped reporting following that date. For example, if a firm misses $(t-1)$ but starts reporting again in t or even $t+1$, we consider this firm as green at time t.

concentration was 1.1 lead arrangers in the facility-level data, it is 1.65 lead arrangers at the facility-lead arranger level. The increase in average concentration is due to the decomposing the data into facility-lead arranger level data. To give an example, loan facilities with x amount of lead arrangers are duplicated x number of times in the data thereby putting more weights on facilities with high syndicate concentration. The summary statistics of the variables are nevertheless similar to those in Panel A.

The bottom part of Panel B reports the all-in-spread-drawn for the employed green borrower and lender proxies, in the final Compustat-matched sample. We observe that the mean aisd across the two green borrower proxies is the same as before with an average AISD of approximately 152 bps for green firms. Our green lender proxy is now defined at the lead arranger-level and is denoted by $BGreen^*$. The table shows that 1453 observations involve a green lender and the mean AISD is 301bps.

4 Results

4.1 Do Green Firms Borrow at Lower Credit Spreads from Banks than Non-Green Firms?

To reconcile findings in the previous literature (Chava (2014); Jung et al. (2018); Jin et al. (2018); Kleimeier and Viehs (2018)), we first examine whether green firms borrow from banks at different rates than non-green firms. To that end, we estimate the following regression:

$$AISD_{i,b,t} = \alpha + FE_{t,i,b} + \beta_1 FGreen^*_{i,t-1} + \gamma' X_{i,b,t-1} + \epsilon_{i,b,t}. \quad (1)$$

The dependent variable $AISD_{i,b,t}$ denotes the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. $FGreen^*_{i,t-1}$ is a dummy variable which equals 1 for loans given to firms that either disclosed information to CDP the year before loan origination or that did so before and after loan origination but missed the survey at $t-1$[12]. $X_{i,b,t-1}$

[12]Because we lose within-variation due to our modification in $FGreen^*$, we employ our unmodified proxy $FGreen$ which only considers whether the firm disclosed information to CDP at $t-1$ in specifications including firm fixed effects.

denotes the vector of loan-, firm-, and lender-level controls. The firm-level controls are one-year lagged. At the loan-level, we control for loan amount, loan maturity, syndicate concentration, non-bank lead arranger participation as well as loan type and loan purpose dummies.[13] At the firm-level, we control for industry type measured by the two-digit Standard Industrial Classification (SIC) level, profitability as measured by return-on-assets, leverage and firm size (total assets). At the lender-level, we control for profitability, capital ratio, and size. In the case of multiple lead arrangers, the average is taken across all lead arrangers of loan facility i. Depending on specification, $FE_{t,i,b}$ may include various fixed effects such as time-, lender-, industry-, country-, firm-fixed effects. By including year and borrower's country fixed effects we control for intertemporal differences between years and unobserved cross-sectional differences between countries which might affect the cost of debt. Replacing the industry and country fixed effects by firm fixed effects, for example, allows us to control for unobserved differences between borrowers and examine the loan spreads received by the same firm after becoming green.

The coefficient of interest is β_1, which reflects whether green firms enjoy more (negative β_1) or less (positive β_1) favourable terms on bank credit. That is, it measures the so-called "greenium," which is defined as the difference in average spreads between loans to green firms and similar loans to non-green firms active in the same industry and country, and originated in the same year.

Table 2 reports the result of estimating equation (1). Across the different cross-sectional specifications reported in columns 1-3, we find a statistically significant and negative coefficient on our green borrower proxy, $FGreen$, indicating that firms that disclose climate-related information to CDP pay significantly lower spreads on their loans than non-disclosing firms. This answers our first research question as well as confirms previous findings by Jung et al. (2018) and Kleimeier and Viehs (2018).[14] To be specific, after controlling for time, country, loan, firm and lender characteristics, the observed effect shows that green firms on average obtain a discount of about 12 basis points on their loan spreads relative to other similar non-green firms.[15] To

[13] We control for non-bank lead arranger participation as Lim et al. (2014) show that facilities originated by non-bank institutional investors have higher spreads than otherwise identical bank-only facilities.

[14] Studying the period 2009-2016, Kleimeier and Viehs (2018) find that the difference in loan spread between disclosing and non-disclosing firms amounts to -7.7 % and Jung et al. (2018) report a discount of 5 bps.

[15] To rule out that the change in coefficients is driven by a change in sample composition, we ran the same

some extent, this result is intuitive as it is well understood that information asymmetry is an important determinant of loan spreads (e.g., Diamond and Verrecchia (1991)). Specifically, disclosure is likely to mitigate ex-ante adverse selection and ex-post moral hazard problems thereby reducing borrowing costs. This finding adds to prior literature by showing that climate-related disclosure, irrespective of the content provided, yields a lower spread on bank loans.

Column 4 of Table 2 reports the results of estimating equation (1) with firm fixed effects. Due to the adjustment made for the CDP respondents that "missed" a survey year which is explained in footnote 11, $FGreen^*$ only exhibits limited within-firm variation. As this is exactly the variation we aim to exploit in this specification, we replace the dummy $FGreen^*_{i,t-1}$ in equation (1) with the dummy $FGreen_{i,t-1}$, which refers to our unaltered green borrower proxy that captures whether the firm disclosed information to CDP in the year before loan origination. Column 4 reports that the estimated coefficient on $FGreen$ is statistically indistinguishable from zero, however.[16]

In Table 3, we re-estimate equation (1) at the facility-lead arranger level rather than facility-level. That is, we decompose our facility-level observations into facility - lead arranger observations which allows us to include lender fixed effects. The results reported in Table 3 are in accordance with the previous findings: while we observe a statistically significant and negative coefficient on $FGreen^*$ in the cross-sectional setting displayed in column 1, the effect drops in columns 2 and 4 after including firm fixed effects. Interestingly in column 3, when identification is achieved by comparing loan rates of green and non-green firms from the same bank, the greenium is estimated at 17.57 bps. This reveals that lenders, on average, offer more favourable rates to green firms than non-green firms. Given that the mean of all-in-spread-drawn is 218.27 bps, the discount of 17.57 bps is economically significant.

In Table 4 we investigate whether the ratification of the Paris Climate Agreement shifted lenders' perceptions with respect to climate-related disclosures by examining the greenium re-

specifications again while keeping the sample constant. These unreported results show a similar decrease in $FGreen$ after including firm-level controls.

[16]Conducting a sample split which divides the data into firms borrowing from green lenders and those borrowing from non-green lenders reveals that this average estimate covers up for two opposite forces. That is to say, while green lenders offer a large significant discount to disclosing firms, non-green lenders set a higher spread for similar borrowers resulting in an average of zero.

ceived by disclosing firms in the period before and after the Paris Agreement. Specifically, we classify all loans with loan origination date preceding December 12, 2015, the agreement date of the Paris Accord, as 'Before'-sample, while all other loans constitute the 'After'-sample. The results remain quantitatively and qualitatively unchanged compared to previous findings as well as across the 'Before' and 'After' periods, indicating that there is no material change in the greenium caused by the Paris Agreement.

4.2 Do Green Banks Charge Different Loan Rates Than Their Non-Green Counterparts?

To examine whether green banks lend at different rates than non-green banks, we estimate the following regression:

$$AISD_{i,b,t} = \alpha + FE_{t,i,b} + \beta_1 BGreen_{b,t-1} + \gamma' X_{i,b,t-1} + \epsilon_{i,b,t}. \tag{2}$$

where, in addition to previously defined variables, we include our green lender proxy $BGreen_{b,t-1}$, which is a dummy variable that equals 1 when the majority of lead arrangers is considered as green, i.e., member of UNEPFI the year before loan origination, and 0 otherwise. As before, $FE_{t,i,b}$ may include various fixed effects such as time-, lender-, industry-, country- or firm-fixed effects depending on the specification. $X_{i,b,t-1}$ denotes the vector of loan-, firm- and lender-level controls. Detailed definitions of all variables are provided in Table A1 in the Appendix. The main coefficient of interest is β_1, which captures whether green banks lend at lower ($\beta_1 < 0$) or higher ($\beta_1 > 0$) rates than their non-green counterparts.

Table 5 reports the result of estimating equation (2). We find a statistically significant and positive coefficient on our green lender proxy ($BGreen$), the magnitude of which decreases upon including lender-level controls.[17] This result fields our second research question as it indicates that green lenders, on average, charge a 32 bps higher loan rate than their non-green counterparts. After controlling for unobserved heterogeneity between borrowers in column 4,

[17] To rule out that the changes in coefficients are driven by a change in sample composition, we ran the same specifications again while keeping the sample constant. These unreported results show a similar decrease in $BGreen$ after including lender-level controls.

the estimated premium slightly reduces to 22.95 bps. This is, however, economically significant given that the mean of all-in-spread-drawn is 214.12 bps. In Table A2 in the Appendix we study whether the results are robust to the employed lender proxy. In particular, we consider the continuous variable $BGreen(pct)$, which captures the fraction of green banks among the pool of lead arrangers, instead of $BGreen$ in equation (2). The estimated coefficients are in keeping with previous findings.

In order to be able to include lender fixed effects, we decompose our facility-level data into facility-lead arranger level data in which $AISD_{i,b,t}$ denotes the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. Put differently, b then includes each individual lead arranger, rather than the aggregated pool of lead arrangers. Hence, we replace $BGreen_{b,t-1}$ in equation (2) by $BGreen^{*}_{b,t-1}$ which indicates that the lead arranger b is a member of UNEPFI. The advantage is twofold: not only can we now estimate the difference in spread at which a bank lends after becoming green, but also are we able to control for unobserved cross-sectional differences between banks by examining the loan spreads across green and non-green firms within the same bank. Table 6 reports the result of estimating equation (2) at the facility-lead arranger level. The results in column 1 and 2 are similar to previous results as is shown by the statistically significant and positive coefficients on $BGreen^{*}$. To be specific, column 2 reveals that the same firm pays 18 bps more on their loans when borrowing from a green lead arranger compared to obtaining a similar loan from a non-green lead. However, after including lender fixed effects in column 3, the estimated coefficient becomes negative which indicates that the same bank charges lower rates after adopting sustainable lending practices proposed by UNEPFI. To some extent, this finding reveals that banks change their pool of borrowers after becoming green, namely towards green firms.[18] This is also reflected in column 4 as our green lender proxy gets omitted because the same bank does not lend to the same firm after becoming green.

In Table 7 we investigate whether the ratification of the Paris Climate Agreement had an impact on the loan rates at which green-banks lend using a sample split. Specifically, we

[18] We conduct a sample split to examine which population drives this result: always brown firms, always green firms or brown-green-switchers. Turns out, this average coefficient mainly captures the large negative discounts granted to green firms.

classify all loans with loan origination date preceding December 12, 2015, the agreement date of the Paris Accord, as 'Before'-sample, while all other loans constitute the 'After'-sample. The results in columns 1-2 show that the demanded premium increases further after the Paris Agreement. Specifically, green banks charge 38bps more than their non-green counterparts after the Paris Agreement, while the premium was 25 bps before. This finding leads us to conclude that the Paris Agreement has reinforced green lenders' existing attitudes and stirred them to consider climate risk in their lending decisions which resulted in higher spreads. This effect drops, however, after controlling for unobserved differences between borrowers.[19] We find similar results using our continuous green lender proxy, $BGreen(pct)$, reported in Table A3.

4.3 Green-Meets-Green Effect

Next, we investigate the presence of the "green-meets-green" effect, namely whether green firms obtain lower rates when borrowing from green banks. The "green-meets-green" effect effectively implies that firm's greenness really matters in when the lender itself is green. To that end, we estimate the following baseline regression:

$$\begin{aligned} AISD_{i,b,t} = &\alpha + FE_{t,i,b} + \beta_1 FGreen^*_{i,t-1} + \beta_2 BGreen_{b,t-1} \\ &+ \beta_3 FGreen^*_{i,t-1} \times BGreen_{b,t-1} + \gamma' X_{i,b,t-1} + \epsilon_{i,b,t}, \end{aligned} \tag{3}$$

where, the interaction term $FGreen^*_{i,t-1} \times BGreen_{b,t-1}$ captures the green-meet-green effect. As before, $FE_{t,i,b}$ may include various fixed effects such as time-, lender-, industry-, country- or firm-fixed effect depending on the specification. $X_{i,b,t-1}$ denotes the vector of loan-, firm- and lender-level controls. Detailed definitions of all variables are provided in Table A1 in the Appendix. The main coefficient of interest is β_3, which captures whether green firms borrow from green banks at lower ($\beta_3 < 0$) or higher ($\beta_3 > 0$) rates than from non-green banks.

Table 8 reports the results of estimating equation (3). Consistent with the findings of section 4.1, we find a statistically significant, negative coefficient on $FGreen^*$ when cross-sectionally identified in columns 1-3 of Table 8. The magnitude of the greenium is smaller

[19] Presumably, this drop is due to the limited number of firms that borrower from both a green and a non-green syndicate, namely 184 firms or 791 observations.

than before, however, providing first evidence that the size of the greenium depends on lenders' environmental attitudes (i.e. greenness). Specifically, after controlling for time, country, loan, firm and lender characteristics, the estimated coefficient shows that green firms enjoy on average a 9 bps decrease in loan rates relative to non-green firms, when borrowing from non-green lenders. In contrast, estimating equation (3) with firm fixed effects as displayed in column 4 yields a positive coefficient on $FGreen$ which is slightly significant at the 10% level. Turning to lenders' perspective, we find a statistically significant and positive coefficient on our green lender proxy ($BGreen$), which is consistent with previous findings reported in section 4.2. This shows that loans granted by a green pool of lenders to non-green borrowers cost on average 38bps more than a similar loan provided by 'brown' syndicates. Relating to our third research question, we observe that the reported coefficient on the interaction term ($FGreen^* \times BGreen$) is negative and statistically significant across all specifications. This result provides evidence of a novel "green-meets-green" effect as it shows that the discount that green firms obtain increases further when borrowing from green syndicates. In particular, the estimated coefficient shows that disclosing firms on average pay a lower rate of about 32 bps on their loans when borrowing from green banks relative to other non-disclosing firms obtaining loans from similar green banks. Turning to the the within-firm estimation tabulated in column 4, we find that the 'green-meets-green' effect is in keeping with the cross-sectional findings, although the point estimate is estimated to be almost 13 bps higher. We also consider a variant of equation (4) in which we replace $BGreen$ by $BGreen(pct)$. The latter measures the fraction of green banks among the pool of lead arrangers. The results are reported in Table A4 and are both quantitatively and qualitatively equivalent to those obtained using our dummy proxy.

In Table 9, we decompose the facility-level data into facility-lead arranger level data, meaning that the unit of observation is the facility-lead arranger rather than the facility - pool of lenders. This data allows us to include lender fixed effects and define the green lender proxy at the lead arranger level, which is denoted by $BGreen^*$. Despite earlier evidence to the contrary, the estimated coefficient on $BGreen^*$ appears to be insignificant after including lender fixed effects in column 3. This indicates that the same lender does not penalize 'brown firms' after becoming green. This result is somewhat surprising as it contradicts the cross-sectional evidence. One potential explanation might be the limited number of lenders which change status to green over our sample period. To be specific, only a few dozen lenders joined UNEPFI after 2011, which is the start of our sample period. The parameters of $BGreen^{*}$ with lender fixed effects are identified based on these few observations. Therefore, the cross-sectional parameter is more reliable. The table further shows that the green-meets-green effect is robust to the inclusion of lender fixed effects and, thus, is not driven by unobserved differences between lenders.

All-in-all the analysis demonstrates that green lenders attach more value to increased disclosure and transparency of climate-related risk and, in turn, have different priors regarding firms' exposure to such risk absent disclosure. Hence, they ask (higher) lower loan rates from (non-)disclosing firms.

Finally, we investigate how the ratification of the Paris Agreement shifted lenders' behaviour. To this end, we split our sample into a sample before and a sample after the Paris Agreement and compare the β_3 coefficient in regression equation (3). Specifically, we classify all loans with loan origination date preceding December 12, 2015, the agreement date of the Paris Accord, as 'Before'-sample, while all other loans constitute the 'After'-sample.

Table 10 reports the result of estimating equation (3) for the two sub-samples: before and after the Paris Agreement. The results on the individual effect of our green firm proxy ($FGreen^{*}$) remains quantitatively and qualitatively unchanged compared to previous findings, indicating that there is no material difference caused by the Paris Accord. Concerning our second research question, the results show that green lenders ($BGreen$) charge higher spreads compared to non-green lenders, and this effect is significantly more marked after the Accord. This finding indicates that green lenders penalize 'brown firms', and more so after the Paris Accord. The estimated coefficients on the interaction term ($FGreen^{*} \times BGreen$) reveal that the before-mentioned green-meets-green effect is mainly driven by loans granted after the Paris climate agreement. This result shows that the signaling value of climate-related disclosures changed after the event, and particularly so for green lenders, resulting in lower spreads of about 69 basis points. To a certain extent, this provides evidence of the effectiveness of the Paris Accord in highlighting the importance of disclosure of emissions-reducing strategies and increasing the role of climate change risk awareness in lending decisions.

Columns 3 and 4 report the regression results of the sample split after including firm fixed effects. We replace $FGreen^*$ in equation (3) by $FGreen$ which refers to our simple green borrower proxy that equals 1 for firms that reported to CDP one year before loan origination, and 0 otherwise. As before, we observe that the estimated coefficients on $FGreen$ are insignificant when including firm fixed effects, both before and after the Paris Agreement. This result indicates that disclosing firms do not receive a discount from 'brown lenders' before, nor after the Paris Agreement. One potential argument could be that 'brown' banks do not necessarily observe CDP-reporting and adjust loan rates based on that. On the other hand, assuming that CDP-reporting firms express their climate considerations as well in other sources, such as in company reports and management discussions, banks could also use these to gauge green attitudes if they are truly concerned with the greenness of their loan portfolio. Therefore this finding suggests that non-green or unsustainable banks have lower sensitivity to environmental considerations of their borrowers and hence charge similar spreads regardless of climate-disclosure. The observed effects on the interaction terms, however, exhibit that firms that disclosed climate-related information prior to loan origination benefit from a decreased penalty in the form of a reduced loan rate when borrowing from green banks and particularly so after the Paris Agreement.[20] This finding supports our prior and underpins our main finding, namely that loan spreads granted by green lender to green firms are characterized by a green-meets-green effect of about 65 bps relative to non-green firms. This effect is also economically large given a mean all-in-drawn of 214.12bps: green firms obtain on average 30.36% lower loan rates than non-green firms borrowing from similar green lenders. These findings are robust to the employed lender proxy as shown in Table A5 in the Appendix.

In Table 11, we further investigate whether the results of the sample split are robust to the inclusion of lender fixed effects. To this end, we make use of facility-lead arranger level data in which the unit of observation is the facility - lead arranger. Across the specifications with firm fixed effects, we employ $FGreen$ as our green borrower proxy since this simple version

[20] The question arises whether the green-meets-green discount outweighs the premium charged by green lenders. That is, are green firms obtaining significantly different rates when borrowing from green banks relative to non-green banks? To answer this question we test whether the sum of β_2 and β_3 is significantly different from zero. The findings of this unreported test show that, consistent across the different specifications, the sum of coefficients are only significant after the Paris Climate Agreement, ranging between -17 and -32 bps.

encompasses more within-firm variation than our modified green borrower proxy.[21] Moving straight to the specifications with lender fixed effects reported in columns 5-6, we observe that our green lender proxy, $BGreen^*$ is absorbed in the period before the Paris Agreement and is insignificant after the Paris Agreement. This is due to the fact that there is only limited within-lender variation in this proxy. This because once a bank is a UNEPFI member, it is unlikely to resign, making this proxy time-invariant for those banks that joined before our sample period. The coefficients furthermore show us that not a single bank joined between the period 2011-2015, which is our 'before'-period, causing the proxy to be absorbed by the lender fixed effects. After the Paris Agreement, however, there are a handful of banks that joined UNEPFI and therefore the coefficient can be estimated. The estimated coefficients on the interaction term, $FGreen \times BGreen^*$, are in keeping with previous findings and reveal that the green-meets-green effect is larger for loans granted after the Paris climate agreement.

We further examine the effect of the event using an empirical model with three-way interaction of the following form:

$$\begin{aligned} AISD_{i,b,t} =& \alpha + FE_{t,i,b} + \beta_1 FGreen^*_{i,t-1} + \beta_2 BGreen_{b,t-1} + \beta_3 FGreen^*_{i,t-1} \times BGreen_{b,t-1} \\ &+ \beta_4 Paris_t + \beta_5 FGreen^*_{i,t-1} \times Paris_t + \beta_6 BGreen_{b,t-1} \times Paris_t \\ &+ \beta_7 FGreen^*_{i,t-1} \times BGreen_{b,t-1} \times Paris_t + \gamma' X_{i,b,t-1} + \epsilon_{i,b,t}, \end{aligned} \tag{4}$$

where in addition to previously defined variables, $Paris_t$ is a dummy variable which takes the value of 1 for loans originated after the Paris Agreement, i.e., after December 12, 2015, and 0 otherwise. Again, $FE_{t,i,b}$ may include various fixed effects such as time-, lender-, industry-, country- or firm-fixed effect depending on the specification. As in the previous specification, $X_{i,b,t-1}$ denotes the vector of loan-, firm- and lender-level controls. Detailed definitions of all variables are provided in Table A1 in the Appendix. The coefficient of particular interest is β_7, which captures the change in green firm borrowing conditions that they obtained from green banks following the adoption of the Paris Agreement.

Table 12 reports the result of estimating equation (4). The table shows again that green

[21] See footnote 11.

borrowers receive a discount of about 9 basis points regardless of the climate accord. This finding leads us to conclude that the estimated negative relationship between disclosure and spreads is a robust feature reflecting a reduction in information asymmetries and that splitting the period does not cause this effect to disappear. Moving on to green lenders, we observe again that loans granted by green syndicates are characterized by higher rates than non-green syndicates. Presumably, this persistent evidence might reflect the higher cost inherent to sustainable banks. Examining the 'green-meets-green' effect, we find no statistically significant support of such effect before the Paris Agreement as is reflected by the insignificant negative coefficients on the interaction terms ($FGreen^{*} \times BGreen$). However, as we hypothesized, the 'green-meets-green' effect is especially marked after the announcement of the Paris climate agreement as can be seen by the coefficients on the triple interaction terms in column 3. Specifically, the observed effect shows us that green firms borrowing from green banks enjoy a green-meets-green discount of 50 basis points after the Paris Agreement relative to before. Although this result is in line with what we found by conducting the sample split, it is reassuring to see that the main result also survives when contrasting the green-meets-green effects after the climate accord to the period before. The significance drops after including firm fixed effects in column 4, potentially due to the limited number of observations where the same firm borrows both before and after the Paris Accord from a green lender upon which this identification precisely hinges. In Table A6 we study whether these results are robust to our continuous green lender proxy, $BGreen(pct)$ which captures the fraction of green lead arrangers among all lead arrangers of loan facility i. The table shows that the results are consistent.

Lastly, in Table 13, we employ facility-lead arranger level data which allows us to (i) include lender fixed effects and (ii) define our green lender at the lead arranger level, denoted by $BGreen^{*}$, which reflects whether the lead arranger in question is a member of UNEPFI. We, furthermore, replace $FGreen^{*}$ in equation (4) by our unaltered green borrower proxy, namely $FGreen$ which reflects whether the borrower reported to CDP in the year prior to loan origination. The results tend to be robust to previous findings, except in column 4 the green-meets-green becomes insignificant. This might be due to the restrictions imposed by including both firm- and lender fixed effects causing the number of observations driving the triple interaction identification to plummet.

5 Robustness

This section presents several additional tests. First, we study whether the green-meets-green effect is also present on loans to financial companies by conducting a sample split. Second, we provide a falsification test to strengthen confidence in the idea that loan spreads changed due to the ratification of the Paris climate agreement.

In Table 14 we report the results of estimating the model in equation (3) in columns 1-3 and equation (4) in columns 4-6 for the sub-samples of the borrower type: nonfinancial corporates, financial institutions and both combined. In columns 1-3 we first investigate the green-meets-green effect across different borrower types using the complete sample spanning the period 2011-2019. While column 1 provides the same evidence as section 4.3, column 2 demonstrates that the interplay between CDP-disclosing banks and UNEPFI banks yields a discount, although only slightly significant at the 10% level. This finding indicates that green lenders also value climate-disclosure of other banks and factor in these environmental considerations into their loan rates, while penalizing 'brown' financial borrowers at a similar rate as nonfinancial borrowers which is reflected by the negative coefficient on $BGreen$. The insignificant coefficient on $FGreen$ shows that non-green lenders do not factor in borrowers' green consciousness when the borrower is a financial company. Interestingly, when studying the impact of the Paris Climate Agreement in column 5, we observe no material impact on the green-meets-green between financial companies after the Paris Agreement and nor can we find evidence of a green-meets-green effect in the period before the accord. These findings suggest that the green-meets-green effect is mainly prevalent on loans between environmentally conscious nonfinancial corporate borrowers and like-minded lenders.

We next conduct a falsification test to evaluate the soundness of our estimation on the impact of the Paris climate agreement. If the estimated change in the green-meets-green effect is not caused by the ratification of the accord, then we should be able to replicate similar findings using random signature dates. To verify this, we restrict the sample to the period before the accord effectively took place: 2011-2015. During this period, we should be unable to identify a reduction in loan rates when green-meets-green as there was no such event to align the green attitudes of market participants. In Table 15 we report the results of estimating equation (4) with and without firm fixed effects, where we redefined $Paris$ as $Paris(fake)$ which equals 1 for loans granted after 2013 and 2014 in columns 1-2 and 3-4, respectively; and 0 otherwise. Across the different specifications, we are able to produce similar results on the individual green borrower and green lender proxies. However, there is no evidence of a green-meets-green discount neither before nor after the fake Paris agreement signature dates. A notable exception is column 2, in which we do find a green-meets-green effect before the fake Paris signature date, which seems to convert into a green-meets-green penalty afterwards. Hence, this table shows that there is no change in green-meets-green in the years before the Paris Climate Agreement, offering confidence in our main result.

6 Conclusion

The Paris Agreement of December 2015 put climate change high on the political agenda. Financing this transition is important. De Haas and Popov (2019) shows that countries that rely more on capital markets compared to banks are more forthcoming in financing this transition. In this paper, we focus on banks and ask whether firms' and banks' environmental consciousness is reflected in the spreads of syndicated loans. We further ask whether this environmental consciousness has increased following the Paris Agreement. Answering these questions is important as more favorable spreads may encourage both firms and banks to make this transition possible.

Employing data on syndicated loans over the period 2011-2019, we find that firms showing environmental consciousness (i.e., green firms) enjoy more favorable terms. This is particularly pronounced when they meet banks that also show environmental consciousness (i.e., green banks). This green-meets-green shows particularly relevant after the Paris Agreement reflecting the increased awareness of the importance of the green transition.

Our results thus give hope that also banking systems may make the transition as they are favorably pricing loans to green firms in particular when banks also have a similar environmental consciousness. Putting climate change on the agenda through the Paris Agreement has fostered this attitude.

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Tables

Table 1

Summary Statistics

	Min	Max	Mean	Std.Dev.	Obs
Panel A: Facility-level data					
Loans:					
All-in-Spread-Drawn (AISD)	2.00	875.00	214.12	128.95	11644
Log Loan Amount	6.22	24.62	19.68	1.33	11644
Maturity (months)	1.00	243.00	54.58	18.01	11644
Concentration	1.00	31.00	1.10	0.85	11644
Borrowers:					
Log Total Assets	2.46	13.69	8.11	1.64	11644
Leverage	0.00	34.18	0.04	0.33	11644
ROA	-88.13	5.71	0.01	1.16	11644
Lenders:					
(Avg) Log Total Assets	8.53	18.92	14.20	0.81	11644
(Avg) Tier 1 capital ratio	8.22	21.30	13.10	1.61	11644
(Avg) ROA	-0.08	0.06	0.01	0.004	11644
Green Borrowers:					
AISD $\mid FGreen^{*} = 1$			151.02	95.08	2137
AISD $\mid FGreen = 1$			149.44	92.60	2030
Green Lenders:					
AISD $\mid BGreen = 1$			307.83	169.00	1114
$BGreen(pct) \neq 0$	0.04	1.00	0.69	0.34	2046
Panel B: Facility - Lead arranger level data					
Loans:					
All-in-Spread-Drawn (AISD)	2.00	875.00	218.27	132.33	12719
Log Loan Amount	6.22	24.62	19.71	1.35	12719
Maturity (months)	1.00	243.00	54.76	19.26	12719
Concentration	1.00	31.00	1.65	2.58	12719
Borrowers:					
Log Total Assets	2.46	13.69	8.15	1.63	12719
Leverage	0.00	34.18	0.04	0.32	12719
ROA	-88.13	5.71	0.01	1.14	12719
Lenders:					
Log Total Assets	8.53	18.94	14.19	0.83	12719
Tier 1 capital ratio	7.90	21.30	13.16	1.71	12719
ROA	-0.037	0.057	0.01	0.005	12719
Green Borrowers:					
AISD $\mid FGreen^{*} = 1$			153.25	100.11	2318
AISD $\mid FGreen = 1$			151.91	98.34	2211
Green Lenders:					
AISD $\mid BGreen^{*} = 1$			301.61	168.08	1453

Table 2

Green Firm and Loan Spreads: Facility-Level Data.
This table reports the results of estimating the model in equation (1) at facility level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is $\text{FGreen}_{i,t-1}$, which is a dummy variable which equals 1 for loans given to firms that are classified as green at $t-1$. Firm-level controls are one period lagged and are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
FGreen*	-13.208***	-39.011***	-11.926***	
	(2.852)	(2.276)	(2.783)	
FGreen				3.956
				(4.163)
Loan controls:				
Log Loan Amount	-13.880***	-16.220***	-13.547***	-5.659***
	(1.212)	(.814)	(1.200)	(1.128)
Maturity	.931***	.451***	.873***	.830***
	(.086)	(.068)	(.082)	(.086)
Concentration	3.731**	-1.812***	2.845*	4.394**
	(1.558)	(.241)	(1.497)	(1.871)
Nonbank indicator	85.116***	27.353**	10.287	2.642
	(10.560)	(10.987)	(17.787)	(17.111)
Firm controls:				
Log Total Assets	-14.770***		-15.407***	-11.245***
	(1.084)		(1.082)	(3.300)
Leverage	-9.660**		-10.178**	-12.402
	(4.920)		(4.842)	(25.286)
ROA	-4.497**		-4.705**	-49.554***
	(2.032)		(1.998)	(17.143)
Lender controls:				
(Avg) Total Assets		-7.193***	-8.267***	-5.445*
		(1.010)	(1.589)	(3.297)
(Avg) Tier 1 capital ratio		10.491***	12.471***	4.522***
		(1.184)	(.928)	(1.132)
(Avg) ROA		-22.011	-1168.308***	-432.481
		(14.039)	(276.502)	(350.556)
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4556	.4263	.4696	.7017

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3

Green Firm and Loan Spreads with Lender Fixed Effect: Facility-Lead arranger Level Data.

This table reports the results of estimating the model in equation (1) at facility-lead arranger level. The dependent variable is the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. The main variable of interest is $\text{FGreen}_{i,t-1}$, which is a dummy variable which equals 1 for loans given to firms that are classified as green at $t-1$. Loan, firm and lender controls are defined in Table A1.

	(1) All controls	(2) Firm FE	(3) Lender FE	(4) Both
FGreen*	-14.791***			
	(2.784)			
FGreen		2.756	-17.570***	4.291
		(4.198)	(2.811)	(4.252)
Loan controls:				
Log Loan Amount	-14.320***	-5.686***	-13.877***	-6.432***
	(1.182)	(1.093)	(1.143)	(1.093)
Maturity	.884***	.869***	.813***	.863***
	(.079)	(.080)	(.079)	(.079)
Concentration	.734	2.196***	.756	2.623***
	(.531)	(.774)	(.646)	(.887)
Nonbank indicator	15.535	-.164		
	(17.616)	(15.937)		
Firm controls:				
Log Total Assets	-14.260***	-12.187***	-14.970***	-11.371***
	(1.045)	(3.122)	(1.047)	(3.066)
Leverage	-11.325**	-5.645	-11.137**	-4.194
	(5.206)	(24.615)	(5.289)	(24.588)
ROA	-5.066**	-49.330***	-5.171**	-48.094***
	(2.103)	(17.848)	(2.180)	(16.374)
Lender controls:				
Log Total Assets	-7.758***	-4.185*	36.558***	51.188***
	(1.452)	(2.174)	(8.510)	(10.887)
Tier 1 capital ratio	10.288***	2.458***	-2.444*	-1.724
	(.806)	(.815)	(1.336)	(1.182)
ROA	-1122.380***	-276.594	808.376**	1131.861***
	(257.489)	(287.830)	(399.167)	(367.126)
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Lender FE	No	No	Yes	Yes
Obs	10839	10453	10804	10416
Adj R-squared	.4811	.7203	.5107	.7274

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4

Green Firm and Loan Spreads: The Paris Agreement Sample Split.

This table reports the results of estimating the model in equation (1) at facility level data from the sub-samples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is $\text{FGreen}_{i,t-1}$, which is a dummy variable which equals 1 for loans given to firms that are classified as green at $t-1$. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE	
	(1) Before	(2) After	(3) Before	(4) After
FGreen*	-12.489***	-12.418***		
	(3.947)	(3.714)		
FGreen			6.581	-.448
			(8.443)	(6.762)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Obs	5595	4286	5123	3864
Adj R-squared	.4692	.4826	.7279	.7252

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5

Green Lenders and Loan Spreads: Facility-Level Data.
This table reports the results of estimating the model in equation (2) at the facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is $\text{BGreen}_{b,t-1}$, which is a dummy variable that equals 1 when the majority of lead arrangers is considered as green and 0 otherwise. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
BGreen	59.904***	39.093***	32.389***	22.946***
	(4.220)	(3.948)	(4.842)	(6.700)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4708	.4227	.4723	.7025

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6

Green Lenders and Loan Spreads with Lender Fixed Effects: Facility-Lead arranger Level Data.
This table reports the results of estimating the model in equation (2) at facility-lead arranger level. The dependent variable is the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. The main variable of interest is $\text{BGreen}^*_{b,t-1}$ defined at the facility-lead arranger level, which is a dummy variable that equals 1 when the lead arranger is green and 0 otherwise. Loan, firm and lender controls are defined in Table A1.

	(1) All controls	(2) Firm FE	(3) Lender FE	(4) Both
BGreen*	29.799***	18.262***	-70.962***	absorbed
	(4.218)	(4.579)	(19.152)	
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Lender FE	No	No	Yes	Yes
Obs	10839	10453	10804	10416
Adj R-squared	.4831	.7210	.5091	.7274

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7

Green Lenders and Loan Spreads: Paris Agreement Sample Split.
This table reports the results of estimating the model in equation (2) at the facility-level data from the subsamples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is $\text{BGreen}_{b,t-1}$, which is a dummy variable that equals 1 when the majority of lead arrangers is considered as green and 0 otherwise. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE	
	(1) Before	(2) After	(3) Before	(4) After
BGreen	24.834***	38.340***	23.220**	18.092
	(6.373)	(7.862)	(9.498)	(12.322)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Obs	5595	4286	5123	3864
Adj R-squared	.4704	.4859	.7287	.7256

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8

Green-Meets-Green and Loan Spreads.

This table reports the results of estimating the model in equation (3) at facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the interaction term $\text{FGreen}^*_{i,t-1} \times \text{BGreen}_{b,t-1}$ which captures the green-meet-green effect on loan spread. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas $\text{BGreen}_{b,t-1}$ is a dummy variable that equals 1 when the majority of lead arrangers is considered as green. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
FGreen*	-8.521***	-35.613***	-9.141***	
	(2.846)	(2.320)	(2.800)	
BGreen	65.735***	41.311***	38.068***	32.843***
	(4.725)	(4.366)	(5.411)	(7.807)
FGreen* × BGreen	-38.353***	-20.711***	-32.256***	
	(10.016)	(7.935)	(10.084)	
FGreen				7.398*
				(4.194)
FGreen × BGreen				-45.051***
				(11.933)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4724	.4323	.4736	.7032

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9

Green-Meets-Green and Loan Spreads with Lender Fixed Effects.

This table reports the results of estimating the model in equation (3) at facility-lead arranger level. The dependent variable is the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. The main variable of interest is the interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen}^*_{b,t-1}$ which captures the green-meet-green effect on loan spread. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas $\text{BGreen}^*_{b,t-1}$ is a dummy variable that equals 1 when the lead arranger is green. Loan, firm and lender controls are defined in Table A1.

	(1) All controls	(2) Firm FE	(3) Lender FE	(4) Both
FGreen*	-11.811***			
	(2.797)			
BGreen*	35.059***	25.459***	-21.556	absorbed
	(4.701)	(5.236)	(20.977)	
FGreen* × BGreen*	-30.291***			
	(8.792)			
FGreen		5.728	-14.661***	7.031*
		(4.184)	(2.846)	(4.236)
FGreen × BGreen*		-35.315***	-36.303***	-30.991***
		(8.878)	(9.487)	(9.882)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Lender FE	No	No	Yes	Yes
Obs	10839	10453	10804	10416
Adj R-squared	.4848	.7216	.5114	.7278

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10

Green-Meets-Green and Loan Spreads: Paris Sample Split.
This table reports the results of estimating the model in equation (3) at facility-level data from sub-samples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the interaction term FGreen$^*{}_{i,t-1}$ $\times$ BGreen$_{b,t-1}$ which captures the green-meet-green effect on loan spread. FGreen$^*{}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas BGreen$_{b,t-1}$ is a dummy variable that equals 1 when the majority of lead arrangers is considered as green. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE	
	(1) Before	(2) After	(3) Before	(4) After
FGreen*	-12.261***	-7.086*		
	(3.945)	(3.823)		
BGreen	25.167***	52.735***	32.405***	34.665**
	(7.057)	(8.930)	(10.817)	(14.745)
FGreen* × BGreen	-2.168	-69.476***		
	(14.231)	(11.606)		
FGreen			9.822	7.784
			(8.305)	(7.457)
FGreen × BGreen			-43.356**	-64.896***
			(18.897)	(19.266)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
(Avg) Lender Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Obs	5595	4286	5123	3864
Adj R-squared	.4710	.4901	.7291	.7269

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11

Green-Meets-Green and Loan Spreads with Lender Fixed Effects: The Paris Agreement Sample Split.

This table reports the results of estimating the model in equation (3) at facility-lead arranger level from subsamples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. The main variable of interest is the interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen}^*_{b,t-1}$ which captures the green-meet-green effect on loan spread. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas $\text{BGreen}^*_{b,t-1}$ is a dummy variable that equals 1 when the lead arranger is green. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE		Lender FE		Both	
	(1) Before	(2) After	(3) Before	(4) After	(5) Before	(6) After	(7) Before	(8) After
FGreen*	-14.780***	-9.636***						
	(3.981)	(3.686)						
BGreen*	25.085***	42.003***	27.507***	20.124***	absorbed	8.300	absorbed	absorbed
	(6.398)	(7.026)	(7.454)	(7.395)		(23.213)		
FGreen* × BGreen*	-9.379	-60.256***						
	(12.355)	(9.834)						
FGreen			10.887	5.868	-21.516***	-10.207***	10.188	10.138
			(8.068)	(7.027)	(4.057)	(3.803)	(8.244)	(6.758)
FGreen× BGreen*			-29.377**	-47.478***	-20.299	-65.361***	-30.569**	-43.356***
			(13.021)	(12.276)	(13.182)	(11.726)	(14.900)	(14.095)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Lender FE	No	No	No	No	Yes	Yes	Yes	Yes
Obs	6088	4749	5634	4343	6061	4714	5610	4307
Adj R-squared	.4846	.5070	.7505	.7520	.5213	.5252	.7585	.7547

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12

Green-Meets-Green and the Impact of the Paris Agreement.
This table reports the results of estimating the model in equation (4) at the facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the triple interaction term $\text{FGreen}^*_{i,t-1} \times \text{BGreen}_{b,t-1} \times \text{Paris}_t$, which captures the change in the green-meet-green effect with the adoption of the Paris Agreement. $\text{FGreen}^*_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms. $\text{BGreen}_{b,t-1}$ is a dummy variable that equals 1 when the majority of lead arrangers is considered as green. Paris_t is a dummy variable which takes the value of 1 for loans originated after the Paris Agreement, i.e. after December 12, 2015. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
FGreen*	-9.208**	-36.321***	-9.246***	
	(3.591)	(3.063)	(3.544)	
BGreen	70.282***	53.433***	41.522***	38.337***
	(5.965)	(5.224)	(6.490)	(8.381)
FGreen* × BGreen	-15.561	-15.814	-10.390	
	(14.207)	(10.339)	(14.453)	
Paris	-26.362***	-20.422**	-23.354**	-4.996
	(9.321)	(9.442)	(9.128)	(7.099)
FGreen* × Paris	1.365	1.195	.201	
	(4.444)	(4.233)	(4.392)	
BGreen × Paris	-12.011	-31.591***	-8.907	-14.777
	(9.212)	(7.355)	(9.392)	(10.080)
FGreen* × BGreen × Paris	-54.250***	-15.308	-50.307***	
	(17.768)	(15.353)	(18.178)	
FGreen				8.611*
				(4.705)
FGreen × BGreen				-33.897**
				(14.728)
FGreen × Paris				-2.211
				(3.846)
FGreen × BGreen × Paris				-24.664
				(16.448)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4733	.4338	.4744	.7035

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13

Green-Meets-Green and the Impact of the Paris Agreement with Lender Fixed Effects.

This table reports the results of estimating the model in equation (4) at facility-lead arranger level. The dependent variable is the all-in-spread-drawn of loan facility i, issued by lead arranger b in year t. The main variable of interest is the triple interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen}^{*}_{b,t-1} \times \text{Paris}_t$, which captures the change in the green-meet-green effect with the adoption of the Paris Agreement. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms. $\text{BGreen}^{*}_{b,t-1}$ is a dummy variable that equals 1 when the lead arranger is green. Paris_t is a dummy variable which takes the value of 1 for loans originated after the Paris Agreement, i.e. after December 12, 2015. Loan, firm and lender controls are defined in Table A1.

	(1) All controls	(2) Firm FE	(3) Lender FE	(4) Both
FGreen*	-10.940***			
	(3.590)			
BGreen*	40.608***	32.082***	6.793	absorbed
	(5.878)	(6.323)	(22.377)	
FGreen*× BGreen*	-13.612			
	(12.473)			
Paris	-22.892**	-4.557	-27.535***	-6.169
	(9.257)	(6.979)	(8.951)	(7.167)
FGreen*× Paris	-2.062			
	(4.375)			
BGreen* × Paris	-13.200	-15.375*	-8.105	-1.935
	(8.063)	(7.904)	(9.091)	(8.944)
FGreen*× BGreen* × Paris	-39.701**			
	(15.493)			
FGreen		7.570	-16.837***	6.829
		(4.653)	(3.645)	(4.743)
FGreen × BGreen*		-25.443**	-20.174	-21.886*
		(11.186)	(12.956)	(12.743)
FGreen × Paris		-3.211	4.543	.709
		(3.789)	(4.479)	(3.790)
FGreen × BGreen* × Paris		-23.966*	-37.785**	-20.957
		(13.305)	(15.363)	(14.190)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Lender FE	No	No	Yes	Yes
Obs	10839	10453	10804	10416
Adj R-squared	.4857	.7220	.5119	.7278

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14

Green-Meets-Green and Loan Spreads: Borrower Type Sample Split.
This table reports the results of estimating the model in equation (3) (columns 1-3) and in equation (4) (columns 4-6) at the facility-level data from the sub-samples of the borrower type: non-financial, financial, and both. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable for regressions in columns 1-3 is the interaction term $\text{FGreen}^*{}_{i,t-1} \times \text{BGreen}_{b,t-1}$ which captures the green-meet-green effect on loan spread. The main variable for regressions in columns 4-6 is the triple interaction term $\text{FGreen}^*{}_{i,t-1} \times \text{BGreen}_{b,t-1} \times \text{Paris}_t$, which captures the change in the green-meet-green effect with the adoption of the Paris Agreement. $\text{FGreen}^*{}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms. $\text{BGreen}_{b,t-1}$ is a dummy variable that equals 1 when the majority of lead arrangers is considered as green. Paris_t is a dummy variable which takes the value of 1 for loans originated after the Paris Agreement, i.e. after December 12, 2015. Loan, firm and lender controls are defined in Table A1.

	Complete period			Paris interaction		
	(1) Nonfinancial	(2) Financial	(3) Both	(4) Nonfinancial	(5) Financial	(6) Both
FGreen*	-9.141***	-.417	-9.946***	-9.246***	-4.141	-10.482***
	(2.800)	(5.710)	(2.563)	(3.544)	(7.489)	(3.268)
BGreen	38.068***	35.370***	40.022***	41.522***	51.415***	43.954***
	(5.411)	(13.362)	(5.015)	(6.490)	(18.094)	(6.081)
FGreen*× BGreen	-32.256***	-76.598*	-30.956***	-10.390	-55.143	-9.126
	(10.084)	(42.635)	(9.781)	(14.453)	(85.724)	(14.541)
Paris				-23.354**	12.163	-19.018**
				(9.128)	(16.702)	(8.718)
FGreen*× Paris				.201	7.169	1.155
				(4.392)	(9.789)	(4.029)
BGreen × Paris				-8.907	-39.931*	-10.023
				(9.392)	(23.907)	(8.827)
FGreen*× BGreen × Paris				-50.307***	-28.271	-48.515***
				(18.178)	(86.629)	(17.667)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No
Obs	9886	1752	11644	9886	1752	11644
Adj R-squared	.4736	.3296	.4529	.4744	.3314	.4537

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15

Green-Meets-Green and the Impact of the Paris Agreement: Falsification test

This table reports the results of estimating the model in equation 4 at facility-level data. The sample period consists of the period before the official Paris Climate Agreement i.e. 2011-2015. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable is the triple interaction $\text{FGreen}_{i,t-1} \times \text{BGreen}_{b,t-1} \times \text{Paris(fake)}_t$, which captures the change in the green-meet-green effect with the adoption of the Paris Agreement. In columns 1-2, Paris(fake)_t is a dummy variable which takes the value of 1 for loans originated after 2013. In columns 3-4, is a dummy variable which takes the value of 1 for loans originated after 2014. Loan, firm and lender controls are defined in Table A1.

	Paris 2013		Paris 2014	
	(1)	(2)	(3)	(4)
	All controls	Firm FE	All controls	Firm FE
FGreen*	-14.984***		-13.317***	
	(5.664)		(4.566)	
BGreen	61.421***	58.458***	32.093***	38.911***
	(10.924)	(11.845)	(7.905)	(10.912)
FGreen*× BGreen	-21.362		3.965	
	(29.700)		(19.653)	
FGreen*× Paris(fake)	3.018		1.635	
	(6.148)		(5.624)	
BGreen × Paris(fake)	-46.386***	-45.914***	-1.164	-22.555**
	(12.625)	(10.625)	(11.392)	(10.806)
FGreen*× BGreen × Paris(fake)	23.676		-18.766	
	(32.977)		(27.195)	
FGreen		5.264		6.183
		(8.301)		(7.976)
FGreen × BGreen		-77.081***		-38.253
		(20.279)		(23.384)
FGreen × Paris(fake)		4.924		4.023
		(5.024)		(4.755)
FGreen × BGreen × Paris(fake)		69.434***		22.806
		(22.977)		(25.960)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Obs	6676	6101	6676	6101
Adj R-squared	.4474	.7354	.4455	.7341

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1: Variable definitions and data sources

Variable Name	Definition	Source
All-in-Spread-Drawn	The amount the borrower pays in basis points over LIBOR for each dollar drawn down plus any annual or facility fee paid.	DealScan
FGreen(*)	Green firm proxy; dummy variable indicating that the borrowing firm disclosed information to CDP one year before loan origination (or disclosed both prior and after loan origination and missed the survey at $t-1$).	Carbon Disclosure Project
BGreen(*)	Green lender proxy; (i) dummy variable indicating that the majority of the lead arrangers in the syndicate (in facility-level regressions; (BGreen)) or the lead arranger (in facility-lead arranger level regressions; (BGreen*)) are members of UNEPFI in the previous year (ii) Continuous variable (BGreen(pct)) describing the percentage of UNEPFI members among the lead arrangers of the syndicate.	UNEP FI
Lead arranger	Following Ivashina (2009), we define lead arrangers as (1) the administrative agent of the syndicate, if not available (2) all lenders that act as agent, (mandated or coordinating) arranger, bookrunner, (mandated) lead arranger, lead bank or manager.	DealScan

Table A1 – *Continued*

Variable Name	Definition	Source
Loan controls:		
Loan type	Following Berg et al. (2016), we lump together following loan types: (i) credit lines (i.e. revolver lines, 364-day facilities and limited lines); (ii) term loans (i.e. term loans and delay draw term loan) and (iii) other loan types (e.g. leases, bonds etc.).	DealScan
Loan purpose	Primary purpose of the facility.	DealScan
Facility amount	Natural logarithm of the loan amount in USD committed by the pool of lenders.	DealScan
Maturity	The maturity of the facility in months.	DealScan
Concentration	The number of lead arrangers in the loan syndicate.	DealScan
Nonbank indicator	Following Lim et al. (2014), we define as bank: commercial and investment banks, and as non-banks (all other financial lenders): insurance agents, mutual funds, hedge funds, private equity and other. The indicator is equal to 1 if at least one of the lead arrangers is a nonbank, and 0 otherwise.	Dealscan
Firm controls:		
ROA	Net income (loss) to total assets, one year lagged	Compustat
Leverage	Total liabilities to total equity, one year lagged	Compustat
Total Assets	Natural logarithm of total assets in USD, one year lagged	Compustat

Table A1 – *Continued*

Variable Name	**Definition**	**Source**
Lender controls:		
ROA	Net income (loss) to total assets.	Compustat
T1 Capital Ratio	Tier 1 capital to RWAs.	Compustat
Total Assets	Natural logarithm of total assets in USD.	Compustat

Table A2

Green Lenders and Loan Spreads: Facility-Level Data - Green Lender pct.
This table reports the results of estimating the model in equation (2) at the facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is $\text{BGreen(pct)}_{b,t-1}$, which is a a continuous variable representing the percentage (pct) of green banks among the lead arrangers of loan i. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
BGreen(pct)	63.362***	48.888***	35.686***	28.255***
	(4.342)	(4.680)	(5.025)	(7.048)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4718	.4238	.4728	.7029

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3

Green Lenders and Loan Spreads: Paris Sample Split - Green Lender pct.
This table reports the results of estimating the model in equation (2) at the facility-level data from the subsamples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is BGreen(pct)$_{b,t-1}$, which is a continuous variable representing the percentage (pct) of green banks among the lead arrangers of loan i. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE	
	(1) Before	(2) After	(3) Before	(4) After
BGreen(pct)	28.959***	38.597***	31.948***	18.098
	(6.608)	(8.277)	(10.138)	(13.010)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Obs	5595	4286	5123	3864
Adj R-squared	.4709	.4857	.7292	.7256

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4

Green-Meets-Green and Loan Spreads: Green Lender pct.

This table reports the results of estimating the model in equation (3) at facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen(pct)}_{b,t-1}$ which captures the green-meet-green effect on loan spread. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas $\text{BGreen(pct)}_{b,t-1}$ is a continuous variable representing the percentage (pct) of green banks among the lead arrangers of loan i. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
FGreen*	-8.479***	-34.939***	-9.148***	
	(2.837)	(2.376)	(2.792)	
BGreen(pct)	69.488***	51.301***	41.665***	40.117***
	(4.876)	(5.065)	(5.644)	(8.289)
FGreen* × BGreen(pct)	-39.211***	-23.543***	-32.611***	
	(10.215)	(9.138)	(10.311)	
FGreen				7.679*
				(4.183)
FGreen × BGreen(pct)				-50.752***
				(12.226)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4734	.4335	.4741	.7037

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5

Green-Meets-Green and Loan Spreads: the Paris Agreement Sample Split - Green Lender pct.

This table reports the results of estimating the model in equation (3) at facility-level data from the subsamples before and after the Paris Agreement. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen(pct)}_{b,t-1}$ which captures the green-meet-green effect on loan spread. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms, whereas $\text{BGreen(pct)}_{b,t-1}$ is a continuous variable representing the percentage (pct) of green banks among the lead arrangers of loan i. Loan, firm and lender controls are defined in Table A1.

	All controls		Firm FE	
	(1)	(2)	(3)	(4)
	Before	After	Before	After
FGreen*	-12.316***	-7.098*		
	(3.927)	(3.829)		
BGreen(pct)	29.322***	53.976***	42.619***	37.597**
	(7.342)	(9.520)	(11.662)	(15.677)
FGreen* × BGreen(pct)	-2.061	-69.739***		
	(14.556)	(12.002)		
FGreen			10.016	8.858
			(8.300)	(7.520)
FGreen x BGreen(pct)			-47.472**	-72.153***
			(19.223)	(20.101)
Loan, Firm and Lender controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Obs	5595	4286	5123	3864
Adj R-squared	.4715	.4898	.7297	.7272

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6

Green-Meets-Green and the Impact of the Paris Agreement - Green Lender pct.
This table reports the results of estimating the model in equation (4) at the facility-level data. The dependent variable is the all-in-spread-drawn of loan facility i, issued by the syndicate's lead arranger(s) b in year t. The main variable of interest is the triple interaction term $\text{FGreen}_{i,t-1} \times \text{BGreen(pct)}_{b,t-1} \times \text{Paris}_t$, which captures the change in the green-meet-green effect with the adoption of the Paris Agreement. $\text{FGreen}_{i,t-1}$ is the dummy variable equal to 1 for loans given to green firms. $\text{BGreen}_{b,t-1}$ is a a continuous variable representing the percentage (pct) of green banks among the lead arrangers. Paris_t is a dummy variable which takes the value of 1 for loans originated after the Paris Agreement, i.e. after December 12, 2015. Loan, firm and lender controls are defined in Table A1.

	(1) Firm controls	(2) Lender controls	(3) All	(4) Firm FE
FGreen*	-9.166**	-37.102***	-9.278***	
	(3.574)	(3.182)	(3.528)	
BGreen(pct)	74.849***	64.313***	46.182***	47.268***
	(6.090)	(5.949)	(6.698)	(8.828)
FGreen*× BGreen(pct)	-15.729	-12.019	-10.203	
	(14.461)	(12.418)	(14.744)	
Paris	-25.648***	-19.024**	-22.901**	-4.535
	(9.367)	(9.349)	(9.152)	(7.036)
FGreen*× Paris	1.317	3.900	.196	
	(4.441)	(4.362)	(4.390)	
BGreen(pct)×Paris	-14.380	-34.039***	-11.810	-19.347*
	(9.546)	(8.348)	(9.768)	(10.410)
FGreen*× BGreen(pct) × Paris	-55.215***	-26.335	-50.930***	
	(18.116)	(16.799)	(18.559)	
FGreen				8.871*
				(4.695)
FGreen × BGreen(pct)				-38.563***
				(14.943)
FGreen × Paris				-2.166
				(3.835)
FGreen × BGreen(pct) × Paris				-26.598
				(16.864)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	No	Yes	Yes
(Avg) Lender Controls	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Country FE	Yes	Yes	Yes	No
Firm FE	No	No	No	Yes
Obs	10099	14498	9886	9481
Adj R-squared	.4745	.4351	.4750	.7042

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Editoral

On October 22-23, 2020 the National Bank of Belgium hosted a Conference on "Climate Change: Economic Impact and Challenges for Central Banks and the Financial System".

Papers presented at this conference are made available to a broader audience in the NBB Working Paper Series (www.nbb.be). This version is preliminary and can be revised.

Editor

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