CENTRE FOR RESPONSIBLE BANKING & FINANCE
CRBF

University of St Andrews
School of Management

WORKING PAPERS IN RESPONSIBLE BANKING & FINANCE

Financing Green Transition

By *Angela Gallo and Min Park*

Abstract: Using a novel loan-level approach to identifying green financing, we study nonbanks' financing of the transition to a low-carbon economy. We show that, after the Paris Agreement, nonbanks' demand for sustainable investments extend to the syndicated lending market and leads to an increase in the origination of green loans. Banks cater to the demand for the institutional tranche of green loans within the secondary market and are more likely to co-finance green loans with nonbanks in the primary market. Moreover, exploring the motives behind nonbanks' demand for green loans, we find a reversal effect after the US government signalled its lower commitment to the climate treaty, suggesting that regulatory transition risk is the main driver at play. We also find that nonbanks' demand for green loans is directed towards private firms and that it drives down loan spreads and fosters a more lenient approach to loan covenants. Overall, we provide evidence that nonbanks' private lending activities play a key role in supporting low-carbon energy transition.

WP Nº 24-006

1st Quarter 2024

University of St Andrews
Scotland's first university
600 YEARS
1413 – 2013

Financing Green Transition *

Angela Gallo† and Min Park‡

September 5, 2023

Abstract

Using a novel loan-level approach to identifying green financing, we study nonbanks' financing of the transition to a low-carbon economy. We show that, after the Paris Agreement, nonbanks' demand for sustainable investments extend to the syndicated lending market and leads to an increase in the origination of green loans. Banks cater to the demand for the institutional tranche of green loans within the secondary market and are more likely to co-finance green loans with nonbanks in the primary market. Moreover, exploring the motives behind nonbanks' demand for green loans, we find a reversal effect after the US government signalled its lower commitment to the climate treaty, suggesting that regulatory transition risk is the main driver at play. We also find that nonbanks' demand for green loans is directed towards private firms and that it drives down loan spreads and fosters a more lenient approach to loan covenants. Overall, we provide evidence that nonbanks' private lending activities play a key role in supporting low-carbon energy transition.

JEL classification: G21, G23, G30, Q50

Keywords: Climate change; Green transition; Nonbank financial intermediaries; NBFI; Corporate lending

*Acknowledgments. We are grateful to Murillo Campello, Daniel Ferreira, Miguel Ferreira, Mariassunta Giannetti, Moqi Groen-Xu, Aneel Keshwani, Maria-Teresa Marchica, Charlotte Ostergaard, Francesc Rodriguez-Tous, and Victoria Vanasco. We are also thankful for the helpful comments received from the participants of Bristol Brownbag Seminar, IBEFA Melbourne 2023, 2023 Annual Workshop on Applied Economics (AWAE), and 2023 JRF European Symposium at Bocconi University Milan. All errors remain our own. Declarations of interest: none.

†Senior Lecturer in Finance, Bayes Business School (formerly Cass). Email: angela.gallo.1@city.ac.uk

‡Senior Lecturer in Finance, University of Bristol Business School. Email: min.park@bristol.ac.uk

1 Introduction

The current level of sustainable investments falls significantly short of the financing needed to deliver decarbonization and to meet the targets set by the Paris Agreement (PA). According to the World Economic Forum, future investment in nature-based solutions needs to increase fourfold by 2050, equating to annual investment of over $536 billion.[1] To achieve this, different approaches and solutions have been discussed, with a focus on the critical role played by banks. Banks serve as the main financiers for most companies, including those in need of green transition, and especially for private firms with limited access to financial markets. Given their specialization in screening and monitoring, banks are well suited to financing the risky and innovative projects involved in green transitions. Under the pressure of the PA, banks have started to adopt greener lending standards, as documented by Degryse et al. (2022), Delis et al. (2019), and Fatica et al. (2021). Moreover, they have joined numerous initiatives, such as Net Zero Banking Alliance and the Science-Based Targets initiative (SBTi), signalling their active commitment to financing the transition to a low-carbon economy (Kacperczyk and Peydro, 2021). However, two barriers limit the role of banks in this process. First, banks alone lack the balance sheet capacity to close the investment gap. Second, they are heavily invested in the brown economy, which reduces their incentives and abilities to speed up the financing of the transition. In contrast to banks, nonbank investors have fewer at-risk legacy positions in the brown economy and therefore may be less exposed to asset overhang problems, as described in Degryse et al. (2022), meaning they can more flexibly adjust their investment portfolios than banks. For this reason, nonbanks could be potential facilitators of the transition that the economy needs to achieve.

Whether nonbanks can play a role in green lending is part of the current debate on climate finance. One of the key trends in financial intermediation over the last decade has been the growth of the Non-Bank Financial Intermediaries (NBFI or nonbanks) sector, which encompasses insurance companies, pension funds, mutual funds, and private equity. Since the Global Financial Crisis in 2008, the overall growth in financial assets can be almost entirely traced to these nonbank financial entities, accounting for 48.3% of total global financial assets (FSB, 2021). Consequently, nonbanks' investment in green lending could enable the financing of the

[1] https://www.weforum.org/press/2022/01/g20-countries-can-help-close-climate-finance-gap-by-investing-in-nature-based-solutions/

green transition by tapping into the ever-growing market-based funding, thereby reducing the pressure on banks. However, lending requires experience in resolving informational problems, an area where banks have better expertise, while nonbanks are better trained in arm's-length arrangements of market transactions (Boot and Thakor, 2010).

In light of these respective strengths and weaknesses of banks and nonbanks, this paper studies the potential complementarity between banks and nonbanks in relation to the common goal of financing a green transition in the corporate lending market, i.e., it explores whether banks' expertise in borrower screening and monitoring, combined with nonbanks' substantial financing capacity, can collectively contribute to reducing the considerable investment gap required to achieve the goals of the PA.

To this end, we provide empirical evidence on the role of nonbanks in green financing in the context of the syndicated corporate lending market. This market offers an ideal setting in which nonbanks are well-established participants and their investment is considered integral to the market's ability to function. We adopt a novel loan-level approach to identify green financing based on the textual analysis of the loan purpose, capturing green transition financing. We find that, after the Paris Agreement, the surge in the origination of green loans can be partially attributed to the demand from nonbanks for the institutional loan tranche within green loans. We also find that green lending is supported by nonbanks' direct lending in the syndication of institutional tranches. Examining the motives driving nonbanks' demand for tranches of green loans, we find evidence that concerns over changes in regulations, rather than concerns over climate risk, are key factors. We find that nonbanks are hesitant to invest in green loans after US policy changes that signalled opposition to the Paris Agreement but that their demand increases again after the 2020 presidential election, which marked a change of government and increased expectations of pro-climate change policy. Notably, we find that the demand among nonbanks is directed primarily towards private firms, with limited access to green financing on financial markets. Nonbanks' participation also has implications for the pricing of the loans, as the investors' high demand for green loans reduces the spreads on institutional loan tranches and the covenants on the syndicated loans that contain institutional tranches.

In performing our tests, we employ a set of fixed effects to ensure our analysis captures the nonbanks' response to the Paris Agreements rather than other factors. All our estimates are obtained by controlling for borrowers' demand by including either interactions of borrower industry and quarter-time fixed effects (Khwaja and Mian, 2008) or interactions of borrower industry, borrower country, and quarter-time fixed effects (Acharya et al., 2018; Degryse et al., 2019). We also control for banks' tendency to originate a specific type of loan either using lender fixed effects or interactions of lender and quarter-time fixed effects. Then, in our stricter specification, we use lender-time and country-industry-time fixed effects.

Empirically, our approach involves gauging the likelihood of originating a green loan as a function of nonbanks' investment within a syndicate arranged by the same lead arranger in a given quarter to borrowers in the same industry and borrower-country. From an identification standpoint, this approach accounts for changes in the origination of the loans (green vs non-green) that could correlates with lead arrangers' characteristics (preferences for green activities, green expertise, policy-induced changes in green lending, balance sheets' capacity, brown legacy). It also accounts for industry- and country-specific time-invariant features that can influence lending-borrowing activities.

Our empirical analysis relies on the textual analysis of DealScan data, through which we determine whether a specific loan is used to finance green transition. Our loan-level approach has the advantage that the identification is granular compared to measures relying on greenness at the firm level. Furthermore, it captures the intention of firms to adopt greener practices rather than focusing solely on firms that are already environmentally conscious-a common occurrence with firm-level greenness metrics. Finally, we circumvent the use of firm-level ESG-scores, which have proven controversial in term of their reliability.

Our identification method hinges on the textual analysis of loan purpose remarks within the DealScan database. This database requires banks to report not only their lending activities but also their loan purposes. Loan purposes are reported using keyword definitions of the use of

funds, such as refinancing or LBO, but banks often add loan purpose remarks to provide more details on the intended use of the funds. We exploit this valuable qualitative information provided in the remarks to help us determine whether a loan should be categorized as green financing. Importantly, loan purpose remarks provide detailed information on the use of funds that are not part of a bank's environmental disclosure, thus mitigating concerns of green-washing.[2] We test the validity of our measures by demonstrating their correlation with economic transition indicators outlined in the IMF Climate Change Dashboards, particularly with the quantity of clean energy generated from renewables. We also test our results' robustness to the self-reporting bias, ultimately finding no change.

We contribute to the existing literature in several respects. First, we extend the literature on sustainable investing, which thus far has largely focused on institutional investors' interest in green securities. We enhance this perspective by exploring the participation of institutional investors in lending markets. Moreover, recent work has tended to look at institutional investors and market responses to the increasing awareness of climate risks, but we expand the scope of this by considering the partnership they form with banks. Previous evidence indicates that climate-related political events such as the PA caused a dramatic shift in institutional investors' demand for green investment, such as green stocks and bonds as well carbon-intensive firms (Ramelli et al., 2021; Seltzer et al., 2022; Bolton and Kacperczyk, 2021). We provide evidence that nonbank lenders divert their interests towards green investments also in the corporate lending market, potentially as a result of the limited options available regarding publicly traded green assets, such as green bonds and stocks. In addition, we present findings that demonstrate how nonbank lenders are channeling their attention towards green investments within the syndicated loan market. This is manifested through an increased involvement both in the primary and secondary markets for institutional loan tranches. Given their primary focus on private firms, we underscore their pivotal role in supporting the transition of businesses that might have more constrained access to resources.

Secondly, we contribute to the literature on green bank lending by adopting a novel loan-level

[2] An example of a green purpose remark is "Proceeds will back the construction of two wind power projects named Alta Wind VII and Alta Wind IX. They will be built in Tehachapi, California. The two projects will produce 300mw of wind energy combined."

approach to identifying green loans. The approach in this paper is ESG-score free and less likely to be driven by greenwashing, which until now have been the two main concerns in the literature. The proposed approach also has the advantage of identifying green loans granted to non-green firms for green purposes, which accounts for the majority of borrowers. Consequently, this approach provides a better gauge of green financing in comparison to the prevailing company-level approach, which frequently neglects the financing purpose and instead concentrates solely on whether green firms secure funding.

Thirdly, we also document the extent to which banks rely on nonbanks to originate green loans, thus adding to the understanding of the role played by nonbanks in credit markets (for an overview of this role, see Aldasoro et al. (2022)). The increasing relevance of nonbanks in private lending for non-financial firms, and in credit supply activities in general, is documented with respect to several markets (see Irani et al. (2021) for corporate loans, Gopal and Schnabl (2022) for small business lending, and Buchak et al. (2018) for mortgage lending). More recently, Chernenko et al. (2022) documents their growing role as direct lenders, especially to smaller, younger, less profitable, and more R&D-intensive firms; Elliott et al. (2021) emphasizes their role as shock absorbers in the US monetary policy tightening spillovers; and Aramonte et al. (2022) discuss the potential risks they pose to financial stability. In this paper, we show how nonbanks contribute to closing the financing gap in the economy, particularly in the face of climate change. This is crucial because banks alone may not have sufficient capacity to cope with such demands.

The remainder of this paper is structured as follows. Section 2 describes our empirical strategy, the definitions of nonbanks and nonbanks' investment in syndicated loans, the identification of green financing, and our methodology. Section 3 reports and discusses our main results regarding nonbank lenders' participation and the effect on loan conditions. Section 4 presents the additional analyses on reverse treatments and private firms. Finally, Section 5 presents our conclusion.

2 Empirical Strategy

In this section, we look at loans issued to major corporate borrowers by prominent US and European banks. The first part of this analysis comprises several key identification steps: identifying nonbanks and their participation in the primary and secondary market for syndicated loans; identifying green financing at the loan level, rather than at the firm level, based on the textual analysis of loan purpose remarks and validation of the novel measure[3]; and identifying a shock to nonbanks' preference towards sustainable investments.

2.1 Identifying Banks and Nonbanks in Syndicated Lending

Nonbanks have started to play an increasingly important role in the syndicated loan market, with their investor base experiencing substantial growth over the last decade, as documented by Aldasoro et al. (2022). DealScan contains information on syndicated loan tranches linked to each loan deal. It provides information on loan conditions such as loan amount, maturity, spread, and use of covenants. The majority of the loans under study are structured into multiple tranches and are syndicated to accommodate two types of primary syndicate lenders: banks and nonbanks. Nonbanks are so-called institutional investors and are typically classified into private equity funds, structured finance vehicles, hedge funds, mutual funds, and insurance companies.

When both types of lendersâbanks and nonbanksâare involved, a syndicated loan typically contains a Term Loan A (Term A), an amortizing tranche that is allocated among banks, and a Term Loan B (Term B), which serves as the institutional loan tranche intended to satisfy nonbanks' demand within the secondary loan market, as described in Gallo and Park (2022). As reported by (Blickle et al., 2020), in most cases, Term B tranches are immediately sold to investors. Therefore, the presence of an institutional loan tranche is a natural proxy of nonbanks' investment in a syndicated loan. Another proxy for nonbanks' participation is their direct lending in the primary market of the loansâthat is, they participate as members of the loan syndicate during the loan's origination stage. While the sale of Term B tranches to nonbanks in the secondary market is an institutional understanding, the participation of nonbanks

[3]ESG-scores and carbon emissions are commonly used firm-level proxies, often criticized for punctuality and only available for a small sample of firms due to their focus on public firms (less than X% of the syndicated lending market)

in the syndication of the institutional tranche in the primary market is directly observed through DealScan. Nonbanks' investment in the primary market as lenders ensures more direct control over the trading of a loan in the secondary market, rendering it a stronger signal of nonbanks' intent to invest in a specific loan.

In identifying bank and nonbank lenders in the syndicated loan market, we first limit our observations to lead arranger-loan level and exclude participating lenders, a practice aligned with the existing literature (for example, Benmelech et al. (2012); Gopalan et al. (2011)). Lead arrangers of loan deals play a major role in the screening of borrowers, approval of loans, and negotiation of loan terms; hence, there is a general consensus that loan characteristics, including the structure of the loan, are influenced by lead arrangers (Gopalan et al., 2011).

Next, we use the recorded institution type of the lender in the DealScan dataset. For each lender in a loan syndication, multiple institution types are provided, listed in alphabetical order. We define lenders as banks if their recorded types include "Bank", "Thrift" or "S&L" as their types.[4]. Among those that are unclassified by this variable, if the institution's name contains "bank," we code them as a bank following Elliott et al. (2021). All other types of lenders are considered nonbanks in the analysis. The majority of nonbanks include "Mutual Fund," "Institutional Investor," "Private Equity," "Insurance Company," and other types of finance companies. Ultimately, we classify almost 90 lenders as nonbanks out of a total of 270 unique lenders in the regression sample, which constitutes 33.3% of all lenders. This is comparable to the findings of Aldasoro et al. (2022), who categorized around 39% of lenders as nonbanks.

After identifying nonbanks, we clean our dataset to ensure that we are including loans that would attract nonbanks' investment. To do this, we begin by including syndicated loans that contain at least one tranche of Term A or Term B and exclude the loans that only contain revolving tranches (credit lines). Second, we limit our sample to those loans whose lead arrangers operate in the US or Europe, as these regions have well developed secondary loan markets for institutional tranches of syndicated loans. We require a loan to have a size above the minimum size of a loan that contains an institutional tranche. This means that we identify the size of

[4]For example, "US Bank" or "European Bank"

the smallest loan that contains Term B and use this amount as a lower-bound size threshold for our sample. We do this because small syndicated loans are less likely to attract investments from nonbanks. In this process, we drop 6.56% of the sample, leaving us with a final sample of 11,854 lender-loan level observations. Within this sample, nonbanks' investment accounts for 6.89% of the observations, of which 5.3% corresponds to direct lending to institutional tranches. This demonstrates that nonbanks command a significant presence in the primary loan market, particularly in cases where banks act as lead arrangers.

2.2 Identifying Green Financing with Textual Analysis

Most studies on green lending typically identify green loans by assessing the environmental credentials of borrowing firms, often utilizing firm-level proxies such as ESG scores or carbon emissions. This methodology hinges on the assumption that any lending granted to a green firm is used for green causes. Our approach distinguishes itself from this in that we identify green loans based on a textual analysis of the "Loan Purpose Remark" variable in DealScan, which describes the specific use of loan proceeds. When the loan purpose description explicitly indicates that the funds are allocated for green initiatives, we classify the loan as a green loan. This methodology offers a more nuanced and precise means of identifying green loans compared to the prevalent firm-level proxy approach.

To identify corporate activities and investments linked to climate actions, we follow Li (2010) by building a dictionary of vocabulary that captures those assets, activities, and projects that are considered green transition efforts towards more Paris-compliant businesses. To formulate this dictionary, we use a compilation of keywords provided by the Climate Bonds Initiative's Climate Bonds Taxonomy [5], which is widely used by investors "to determine whether assets and projects underlying an investment are eligible for green or climate finance." Notably, this document serves as a key resource for investors, providing a common definition of green finance across global markets. All keywords in the "Paris Agreement compliant asset (compatible with a 1.5C degree decarbonisation trajectory)" table in this document are used to build our dictionary of green lending.

[5] Available at https://www.climatebonds.net/standard/taxonomy

Most of the terms included in our dictionary are related to energy ("solar", "wind"), transport ("electric", "hydrogen"), and waste and pollution control ("recyclable", "reusable"). The full list of keywords is reported in Table A.1 in the Appendix. We exclude the use of words such as "esg" and "ethical" as they are too vague to specify the use of proceeds. Moreover, we classify loans as green when their loan purpose remark contains at least one "green" keyword. [6] We then sift through all the purpose remarks identified as green to refine the variable by correcting mis-identification cases (Type II error).[7] However, there remains the potential for Type I errors, which refer to when green loans are not correctly identified as green because their purpose remarks are missing our keywords. Thus, to ensure the precision of our classification of green loans, we adopt two distinct approaches. First, we randomly select three sub-samples of loans (200 loans), manually check whether they are cases of missed green loans, and confirm that in all sub-samples our coding of green loans is accurate. Second, we seek external validation using economic transition indicators from the IMG Climate Change Dashboard. As most of our green loans finance renewable projects, we should find a positive and significant relationship between the number of green lending instances and such indicators at the country level: the more green lending, the more energy transition. The IMG indicators measure the amount of electricity generated by renewables as well as the installed capacity of renewable energy within each country, thus providing a direct gauge of the scale of transition towards renewable energy. Table A.2 presents such evidence at the country level, illustrating that the number of green loans we identify is positively correlated with the electricity generated by renewable energy and the overall installed capacity of renewable energy.

[6] Examples of loan purpose remarks in DealScan are: "Credit backs the acquisition of a 1.19 GW portfolio of renewable operating assets inclusive of 7 wind projects and a 50% interest of 3 solar projects located across the 10 states of Nevada, Iowa, North Dakota, Illinois, Michigan, Arizona, Washington, Oregon, New Mexico and Minnesota.", "Credit provides long-term, non-recourse financing for the 30 MW Mckenzie solar project, that will be located in Sacramento County, California. The project has already begun construction and cod is expected by December 2012", "Credit funds a 69 MW wind energy project in Oahu, Hawaii.", "Credit backs co.'s purchase of 11 hydroelectric facilities, one storage reservoir, and related assets from PPL Montana, a wholly-owned subsidiary of PPL corporation. The transaction will be funded with debt securities, equity, and available cash.", "Proceeds will support the construction of a 65 MWDC/50 MWAC luning photovoltaic solar energy in Mineral County, Nevada."

[7] For example, those cases where a company name mentioned in the remark simply includes green keywords, while the loan itself is not necessarily used for the stated green purpose. Furthermore, we take measures to rectify instances where our green vocabulary appears in the remarks without truly indicating green loans. This could arise due to company names or other unrelated reasons. Some examples of such words are as follows: unwind, anhydrous, windows, Wind Point Partners, Tailwind, Windoor, Highground, Windjammer, Windsor

Our approach to identifying greenness at the loan level has several advantages. First, our measure is not based on ESG ratings/scores, which have been demonstrated to be susceptible to noise (as highlighted by, among others, Berg et al. (2022)). Second, it captures green financing regardless of whether they were granted to green firms or non-green firms thereby including any type of firms' efforts to become greener, rather than focusing only on already-green firms, for example by using high ESG scores. Third, it uses banks' disclosure of loan-level information, which is distinct from their environmental disclosure communications to investors, making it better insulated from banks' greenwashing attempts. Fourth, it covers a larger sample of firms, including private firms, which is important because, while ESG scores and carbon emissions data are typically available for public firms, they have not been easily accessible for private firms. These advantages are significant because, after the Paris Agreement, investors' demand for green assets increased substantially and started to extend beyond public firms to include private firms, which rely more on the banking system for green financing than public firms because they lack access to alternative forms of green finance (e.g., issuance of green bonds). Finally, there is evidence of a discrepancy between banks' environmental disclosure and their green lending activities, as shown in Giannetti et al. (2023). Our identification of green lending is not biased by such banks' greenwashing-related disclosure.

One concern for our measure, however, is the possibility that green reporting by lending banks could increase following the Paris Agreement (PA) due to heightened attention to the topic and banks' attempts to emphasize their green initiatives. It is worth noting that the reporting in DealScan does not form part of banks' environmental disclosure activities, making it less likely that banks would utilize individual loan purpose remarks to advertise their green financing activities. To address this concern, we investigate whether any discernible upward trend exists in purpose remark reporting that might indicate such behavior by banks.

In doing so, we find that loan purpose remarks were reported for 51.3% of the sample before the PA, compared to 43.3% post-PA. Moreover, the reporting frequency did not increase, indicating a reduced possibility that it was misused by lead arrangers with different intentions after the PA. Second, the reporting of green loans rose from 1.16% of the sample in the pre-PA

period to 2.94% post-PA. We are unable to disentangle to what extent this is a genuine increase in green financing and to what extent the increased reporting for green loans stems from lead arrangers' intention to portray their lending as green. However, our dictionary only includes specific green keywords (e.g., solar, wind, electric) rather than generic green words (e.g., ESG), as the loan remarks indicate fairly specific use of funds, leaving little space for ambiguity.

Another concern is banks' self-selection into reporting. A deal purpose remark is available for 47.3% of the sample, of which 4.8% are identified as green. Banks (and loans) reporting on their loan remarks might be different from non-reporting banks. To address this issue, we re-ran our baseline tests only for the sub-sample of loans for which the reporting is available.

Table 1 presents the distribution of the green and non-green loans over time. We identify 269 green loans over the period 2012-2019, equal to 2.27% of the sample. In terms of types of green loans, the largest group relates to "solar" and "wind", followed by "electric". The time trend reveals, as expected, an increase in both the absolute number and share of green loans after the Paris Agreement. Despite this upward trajectory, the proportion of green loans remains relatively modest. However, it is important to note that this proportion is akin to the share of green bond issuance, which is reported to encompass approximately 3% of global bond issuance (Syzdykov and Masse, 2019). Moreover, we only capture loans that are related to activities that are fully Paris-compliant ("super green").

Table 2, presents the loan characteristics and difference-in-means tests between green and non-green loans across two panels: the total sample (Panel A) and a subset of loans featuring an institutional loan tranche (Panel B). On average, green and non-green loans are similarly sized but green loans have significant lower spreads (-41bp). They tend to have longer maturity and a lower number of lending institutions in the syndicate. Additionally, green loans display a reduced likelihood of being collateralized or containing covenants. In the sub-sample of loans with nonbank investment, we find that green loans tend to have larger monetary values but are charged a lower spread on average. While no significant differences emerge in terms of maturity or the number of lenders (averaging around 6), both green and non-green loans exhibit similar

characteristics regarding covenants. However, green loans are less likely to be secured by collateral. This preliminary evidence points to the nuanced characteristics of green loans and their potential implications within the broader financial landscape.

2.3 Differences-in-Differences: The Paris Agreement

To establish a causal relationship between the demand for sustainable investments by nonbanks and the origination of green loans by banks, we exploit a pivotal event that has shifted investors' preferences toward green financing: the Paris Agreement (PA). According to Degryse et al. (2022), the Paris Agreement greatly influenced investors' perceptions of climate change and its related risks. It increased governmental commitments to environmentally responsible transitions, thereby shaping expectations about the financial sector's role in funding the climate transition. On one hand, it substantiated the impact that climate risks could have on investors' portfolio companies (physical, technological, and regulatory risks). On the other hand, the Agreement signalled the need for more stringent environmental regulations to induce firms and investors to increase investments in green transition.

Previous studies indicate that investors react to political events related to firms' climate strategies. Ramelli et al. (2021) provide evidence that political events that focus on firms' climate strategies mobilize investors to shift their behavior. Seltzer et al. (2022) show that, after the PA, investors started to re-evaluate their portfolios of bonds to take into consideration their climate risk exposure. Bolton and Kacperczyk (2021) document that, as environmental concerns grow, investors are increasingly asking for a premium on stocks when firms are highly exposed to environmental risks. Other works have focused on the reasons why investors respond to the political initiatives around climate risk by adopting more climate-friendly strategies. They suggest both pecuniary and non-pecuniary motives. For example, the notion of "doing well by doing good" proposed by Benabou and Tirole (2010) strongly suggests pecuniary motives are at play, while the survey-based evidence of Krueger et al. (2020) indicates more mixed motivations such as fear of reputational loss and financial implications for portfolio firms (e.g., stranded assets, change in regulation).[8] From the perspective of banks, prior research indicates that the Paris

[8]See Krueger et al. (2020) for an overview of the main findings in the literature.

Agreement exerted an impact on lending practices. Notably, banks began to factor in carbon risk when setting prices (Delis et al. (2019)) and grant more favorable loan terms to green firms (Degryse et al. (2022)). Shifting to the borrower side, Ginglinger and Moreau (2019) show that firms facing greater physical climate risk reduced their leverage after the Paris Agreement.

Following the literature, we identify the Paris Agreement as a shock that resulted in an upsurge in nonbanks' demand for green financing. In the syndicated loan market, such effects are reflected by a higher prevalence of loans with institutional tranches after the PA. This is attributable to the fact that these loan structures cater to the increased demand for green investments from nonbanks. To test this hypothesis, we conduct differences-in-differences (DID) analyses, comparing changes in the share of green loans that accompany investments from nonbanks versus the share of green loans funded solely by banks before and after the Paris Agreement. We restrict our sample to loans that originated between 2012 and 2019. To address the concern that the Agreement also had an impact on banks' motivation to originate green financing, all our tests employ lender-time, borrower-industry, and borrower-country fixed effects. This is to account for the growing demand for green investments in general and the impact of the Paris Agreement on banks' behavior, as well as nonbanks', as documented in the recent literature (among others, Degryse et al. (2022) and Delis et al. (2019)). The fixed effects also enable us to account for borrowers' industry- and country-specific factors such as regulations and macro conditions.

Before conducting our main DID analysis, we explore the trend in the origination of green loans as compared to non-green loans within the sample of loans that include institutional tranches. To corroborate our hypothesis, we expect the number of green loans to increase more rapidly than the number of non-green loans after the Paris Agreement in December 2015. The numbers of loans in each group are scaled to 100 for the most recent year, 2019, for graphical comparison. As shown in the graph, for most of the sample period, the two groups of loans follow a parallel trend, broadly speaking.[9] However, with the Paris Agreement shock, which shifted in-

[9]The only unexpected aspect of the graph would be the large number of green loans in 2012 relative to non-green loans in the same year. This is related to the US's wind energy production tax credit (PTC), which was due to expire in 2012. Leading up to the expiration of the tax benefit of transitioning to wind energy, there were significantly increased investments into this type of energy among the US firms. Given that our identification of green loans includes wind energy transition, the number of green loans that we identify in 2012 is influenced by

vestor demand for green financing in December 2015, the trends in the two loan categories begin to diverge. Green loan origination surges while non-green loan origination diminishes. Notably, a pronounced increase is evident from 2014 to 2015, predating the actual shock. Given that a strong increase is displayed from 2014 to 2015 despite the shock being end of 2015, it appears that there was some level of anticipation effect that created the increased demand shortly before the actual shock. In the subsequent years, although the two graphs follow similar increasing or decreasing trends once more, it appears that the relative increase in green loans brought about by the PA remains stable in the sample.

Table 3 presents the characteristics of loans with institutional tranches, our proxy of nonbanks investment, as well as loans without such tranches, across the time periods before and after the Paris Agreement. Panel A includes all loans in our sample and shows that loans with institutional tranches experience a larger increase in dollar amount (31%) after the PA compared to other loans (4.6%). Panel B, which limits the sample to green loans, shows that this difference is strongly driven by green loans, as indicated by a three-fold increase among green loans with institutional tranches. The average spread is higher for loans with institutional tranches compared to other loans, although both types do not see significant change before and after the PA as in Panel A. However, notably, green loans undergo a reduction in spread after the PA, regardless of nonbank investments, as in Panel B. Loans with institutional tranches have on average longer maturity, are more often secured with collateral, and contain higher covenants compared to loans funded solely by banks. In terms of time trend, covenants tend to decrease for all loans after the PA but substantially more so for green loans. Overall, this preliminary evidence suggests that nonbanks' investment in green lending after the PA is associated with a larger dollar amount granted and a lower spread, although the spread is still double that in loans solely funded by banks and covenants tend to remain higher than other loans.

this policy. For example, among all wind-related green loans issued in our US loan sample, 11.6% were issued in 2012, after which the percentage fell to 4.2% in 2013 and 5.6% in 2014. Given that 90% of the sample consists of US borrowers, their influence in the summary statistics appears to be non-trivial.

2.4 Baseline Regressions

We investigate the role of nonbanks' demand for sustainable investment in facilitating the origination of green financing in the syndicated loan market. Our empirical approach uses the significant shift in investors' preference for sustainable investment resulting from the PA, which has created a higher demand for "green purpose" institutional tranches relative to brown or neutral loan tranches in the syndicated loan market. Consequently, we test whether banks arranging syndicated loans are more likely to structure green loans with an institutional tranche after the Paris Agreement to cater to this demand by nonbanks. In this section, we introduce the main regression models to test this hypothesis.

We first verify whether green financing increases after the Paris Agreement, which is our main assumption for the subsequent analyses. We test this using the following pre-post analysis:

$$Green_{i,b,l,t} = \alpha + \beta \cdot Post\text{-}PA + FE + X_i + \varepsilon_{i,b,l,t} \tag{1}$$

The outcome variable $Green_{i,b,l,t}$ is a binary indicator of whether a loan deal i given to a borrower b by a lead arranger l originated in quarter t constitutes green lending. Green lending, which is identified based on the textual analysis of the loan purpose remark, is equal to 1 if the debt financing is specifically used for some form of green transition such as the construction or acquisition of wind farms or solar power facilities or the financing of hydroelectric generating facilities, and 0 otherwise. The explanatory variable of interest, $Post\text{-}ParisAgreement$ (often shortened to $Post\text{-}PA$) is equal to 1 for post-Paris Agreement (after Dec 12th, 2015), and 0 otherwise. Thus, β captures whether the likelihood of green lending changes post-Paris Agreement. FE stands for various fixed effects included in the model: lender fixed effects to control for the lender-specific decision to lend, borrowers' industry and country fixed effect to control for industry- and country-specific time-invariant features that can influence lending-borrowing activities. Depending on the model, lender-time fixed effects replace lender fixed effects to control for the lender-quarter-specific effects. Establishing the fact that the number of green loans significantly increases after the Paris Agreement validates our methodology of identifying green lending, first by showing that our measure is in line with previous evidence and secondly by

showing that the time trend of our measure shares that of the general financial market, which experienced increased interest in green financing after the Paris Agreement.

We then continue to test our main hypothesis that banks are more likely to include institutional tranches in loans that carry green purposes after the Paris Agreement. To do this, we construct the following differences-in-differences (DID) model by augmenting the previous model with an interaction term between *Post-ParisAgreement* and an indicator of whether an institutional loan tranche is included in a loan, *Institutional Tranche*.

$$Green_{i,b,l,t} = \alpha + \beta PostParisAgreement \cdot InstitutionalTranche_i + FE + X_i + \varepsilon_{i,b,l,t} \quad (2)$$

$Institutional\ Tranche_i$ is equal to 1 if a loan i contains Term Loan B that is designed to be either invested by or sold to institutional investors. Because the majority of Term B tranches are sold to institutional investors soon after origination, the originator of the loan has an incentive to cater to institutional investors' preferences regarding the characteristics of loans, i.e., if a green loan is likely to attract greater interest from buyers of loans, originators are likely to design those loans with Term B as green financing more frequently. As a result, β measures whether the likelihood of originating a green loan is higher when the loan contains the type of tranches that are more likely to be sold to nonbank lenders post-PA. Therefore, lender-time (quarter), borrower country, and borrower industry fixed effects and combinations of these fixed effects are included.

In the next step, we replace $Institutional\ Tranche_i$ with $Nonbank\ Direct\ lending_i$, which indicates whether a nonbank lender is directly participating in loan syndicates as a provider of finance. While nonbank institutional investors most often act as buyers of institutional tranches (Term B) in the secondary market for corporate loans (Blickle et al., 2020), they can also directly get involved with corporate loans in the primary market by joining lending syndications. Direct lending not only provides an additional avenue for investing in assets with preferred attributes, such as green loans, but also inherently grants nonbanks greater control over loan conditions and secondary market trading. $Nonbank\ Directlending_i$ is equal to 1 if any of the participating lenders in a loan deal is a nonbank. When interacting with the *Post-PA* indicator, this variable

assesses whether nonbank direct lending in syndicated loans influences the probability of originating a green loan following the Paris Agreement.

3 Results

3.1 Nonbanks' Investment in Green Financing

In this section, we present the results concerning nonbanks' investment in green bank lending. We begin with the findings from the pre-post analysis outlined in equation (1), which tests the key assumption that the corporate lending market reacted to the Paris Agreement by increasing green lending. Our results indicate that a significant surge in green financing originated in the syndicated loan market after the Paris Agreement, which is consistent with previous studies. Additionally, this outcome also validates our innovative approach for identifying green loans, as it demonstrates that our measure is responsive to the broader sentiments within the financial market, akin to other established measures.

Insert Tables 4 here

The results are reported in Table 4 column (1), where the coefficient for *Post-Paris Agreement* is positive and significant. The likelihood that banks would originate a green loan in the syndicated loan market goes up significantly by 0.5% after controlling for lender, borrower-industry, and -country fixed effects. Green loans form, on average, 1.43% of the sample across the years in the pre-Paris Agreement period; thus, the coefficient represents an almost 30% increase from the pre- to the post-period.

In our analysis, we are primarily interested in investigating whether this increase in green financing is partially facilitated by nonbanks' demand for sustainable investments in the corporate loan market. Within this scope, we run the DID baseline model in equation 2. In columns (2)-(5) of Table 4, the coefficient of the interaction term *Post-PA X Inst.Tranche* is positive and significant at 1% or 5% depending on the model, indicating that banks are more likely to structure green syndicated loans in such a way that they contain institutional tranches after the Paris Agreementâin other words, they attract nonbanks' investments. In the pre-Paris

Agreement period, 0.6% of loans with institutional tranches used to be green loans, meaning the 0.8% increase in column (5) represents more than double in the post-period, indicating a faster increase than in the pooled sample. Interestingly, the coefficient for *Institutional Tranche* is negative and significant, indicating that before the PA, banks were less likely to originate green loans with institutional tranches. This suggests limited interest in green financing among nonbanks before the Paris Agreement, which in turn proves how dramatically the PA has changed nonbanks' appetite for green assets. All our estimates are obtained while controlling for borrowers' demand by including either interactions of borrower industry and quarter-time fixed effects (Khwaja and Mian, 2008) or interactions of borrower industry, borrower country, and quarter-time fixed effects (Acharya et al., 2018; Degryse et al., 2019). We also control for banks' tendency to originate a specific type of loan either using lender fixed effects or interactions of lender and quarter-time fixed effects.

3.2 Nonbank Direct Lending in Green Financing

In line with the analysis on the institutional tranches pertaining to nonbanks' secondary market investment in corporate loans, we test the hypothesis that banks are more likely to originate green loans if nonbanks participate in syndicated loans as direct lenders (primary market participation) after the Paris Agreement. We find that this type of nonbank direct investment also increases green financing. This indicates that, regardless of the specific mode of nonbank investment, nonbanks' demand for green assets accelerates the origination of green loans in the corporate lending market.

Insert Tables 5 here

The results are presented in Table 5 in which we replace the *Institutional Tranche* with *Nonbank Direct Lending*. Its interaction with *Post-PA* is the main explanatory variable. The results with varying sets of fixed effects consistently show that nonbanks' direct lending significantly increases the likelihood of green loan origination after the Paris Agreement. Before the Paris Agreement, 0.89% of the loans with nonbank direct investment were green loans; thus, the 0.6% increase in column (4) implies an increase of over 60% in the likelihood that loans with nonbank direct investment would be green lending after the shock. These results are in line with the main

findings and show that nonbanks' demand for green financing in their scope of direct lending significantly increases green loan origination as well.

3.3 Robustness Test: Addressing Reporting Self-selection Bias

Our approach to identifying green financing relies on conducting a textual analysis of loan purpose remarks, which succinctly delineate the primary utilization of loan funds. Purpose remarks are recorded on a voluntary disclosure basis by lenders, meaning there is a risk of self-selection bias in our sample. For example, lenders may have an incentive to report the purpose remark for certain types of loans. By limiting the loan sample to those that reported this variable, we remove the potential confounding effects that are caused by lenders' differential decision to report or not to report the variable. We repeat the analyses in Table 4 by limiting the loan sample to those that reported the "Purpose Remark" variable on DealScan and present the results in the Appendix Table A.3.

Insert Tables A.3 and A.4 here

The results are consistent with the main findings. After excluding the loans that did not report their purpose, we find that banks are more likely to originate green loans that cater to nonbanks' demand for institutional tranches. In Table A.4, we repeat the primary market participation analysis as in Table 5 by limiting the sample to only the loans that reported their purpose remarks, and in doing so produce results that are consistent with those in Table 5.

3.4 Falsification Test: Using a Placebo Shock

To test the robustness of our findings, we present results from the main analysis (Equations (2) using a placebo shock, i.e., by moving the Paris Agreement to four years prior to its actual date. The placebo test assumes that the Paris Agreement was announced on December 12, 2011 instead of December 12, 2015. The design of the test is similar to that used by Degryse et al. (2022). The purpose of this robustness test is to show that our main finding-an increase in green lending facilitated by nonbanks' investment after the PA-indeed stems from a shift in investors' preferences toward green financing, which subsequently prompted a heightened demand

for green assets. Through the absence of statistically significant outcomes in a proximate yet distinct sample period, this test helps substantiate that our findings are not a result of a mere temporal trend within the recent decade, characterized by increased nonbank participation in corporate lending. Instead, it is due to the significant shift in nonbanks' perspective on green financing that followed the Paris Agreement.

The sample period of the falsification test is four years prior to the main analysis period (2008-2015 with a placebo shock set on December 12, 2011). We verify that there is no significant event on or around this date that would have influenced the perception of global warming, green transition, or green financing.

Insert Tables 6 here

The analysis repeats the regressions in Tables 4 using the new sample period and the placebo shock, the results of which are presented in Table 6. Unlike when we use the Paris Agreement as a shock, there is no significant increase in green financing with nonbanks' investment after a placebo shock. The coefficient of the interaction term is in fact negative, though insignificant, in most models. This suggests that it was not the case that nonbanks were simply increasing their interests for green financing over time. If anything, the trend appears to be weakly negative for the period before the Paris Agreement. This proves that our finding successfully captures nonbanks' demand for sustainable investment after the PA.

4 Additional Analyses

4.1 Reverse Treatment: US climate policy changes around the Paris Agreement (US Sample)

In this section, we explore the motives driving the demand for green assets in the syndicate lending market. Iin similar vein to Ramelli et al. (2021), we use US climate policy changes to investigate whether the demand is driven by concerns regarding potential new regulations that would penalize investors for holding brown/carbon-intensive firms (transition risk) or whether it is the result of investors' awareness of climate change issues. First, we run an additional test

that is based on a reverse treatment of the Paris Agreement: the Trump administration's appointment of an anti-climate change professional as the leader of the Environmental Protection Agency (EPA). While Trump's election has been used in previous studies, the first event which materially conveyed a strong message regarding the direct effect of the US's new environmental policy actions was this appointment (Ramelli et al., 2021), followed later by the US withdrawal from the Paris Agreement. We also test a subsequent reversal of this shock, using the presidential election in 2020 during which the incoming president vowed to rejoin the Climate Treaty and reversed the prior administration's executive orders.

We posit that, if the reason behind nonbanks' increased investment into green lending after the PA is motivated by investors' genuine concern regarding the need for green transition, we should expect such an increasing trend in green lending to be unaffected by the US government's announcement of anti-climate change appointments. However, if the reason for increasing green lending was simply based on the transition risk concerning potential regulatory disadvantages for brown investments, we should expect the appetite for green assets to diminish after the EPA head appointment signalled that such regulatory disadvantages are not imminent. We limit the sample to the US loan deals arranged by US lead arrangers for US borrowers, where the treatment (i.e., the anti-climate change shock) is effective. We also limit the sample period to the post-Paris Agreement period to avoid confounding effects created from pre-post difference resulting from the PA. The sample therefore runs from December 2015 to December 2018, which is approximately 1.5 years before and 1.5 years after the EPA appointment on 7 November, 2016.

Insert Tables 7 here

Panel A of Table 7 presents the results. The differences-in-differences analysis resulting from the interaction term between *Anti-climate change* and *Institutional Tranche* shows that nonbanks no longer facilitate the origination of green loans after the reverse policy shock. The coefficients are negative and significant, implying that there is a clear reversal in the effect. While this result emphasizes the robustness of the main findings that the Paris Agreement was effective in inducing institutional investors to invest more in green financing, it also demonstrates that the nonbanks' interests were rather transient and primarily motivated by the presence of regulatory and transition risks rather than intrinsic interests in financing green transition projects.

A related analysis is designed around the US presidential election on 7 November 2020, which brought about a change in government leadership and subsequently an announcement by the US government to renew their commitment to the climate agreement. This event offers a second reverse treatment in the US setting and an opportunity for another robustness test. We anticipate that this event will further substantiate the mechanisms observed in connection with the Paris Agreement, thus lending support to the transition risk motive underlying nonbanks' demand for green assets. Panel B of Table 7 presents the results. The sample period ranges from 2019 to 2022 and *Pro-climate change* is equal to 1 for the period after 7 November, 2020, which corresponds to two years before and two years after the event. The remaining regression models are analogous to those in Panel A, the interaction term between *Pro-climate change* and *Institutional Tranche* being the main explanatory variable. We find evidence that nonbanks' interest in green lending returns is positive following the change in government. Overall, the results show how swiftly nonbanks shift their investment strategies according to the perceived climate-related regulatory agenda of the government. This also reiterates the critical significance of a government's stance on climate change and its willingness to enact regulations within the broader discourse on climate change.

4.2 Nonbanks' Investment in Green Financing: Private vs Public Firms

Public and private firms navigate distinct sets of financing alternatives within the financial landscape. Public firms enjoy a wider range of financing opportunities, such as public debt issuance and secondary equity offerings, which private firms do not have access to. This array of options extends to financing their environmentally sustainable projects; for instance, public firms have the additional avenue of issuing green bonds. In contrast, private borrowers are expected to rely more heavily on bank financing for green transition. Therefore, the syndicated loan market is one among the narrower range of investment options available for institutional investors if they were to invest in private firms' green financing. From the perspective of investors, investments into the green financing of private firms enables the diversification of their portfolio of green assets that are predominately occupied by public firms' issuances. A potential counterargument

would be that green financing is still in its nascent stage and is likely to be provided to public firms that are more transparent and financially stable.

We test whether nonbanks' investment in green financing differs between private firm borrowers and public firm borrowersâthat is, do nonbanks invest more funds in private firms or public firms. While evidence of nonbanks' investment into public firms' green financing would be more intuitively understandable, evidence of nonbanks' investments into private firms' green transition would reveal a key role that nonbanks play in supporting the transition of firms that are more financially constrained. The syndicated lending market offers a good setting for testing these conflicting hypotheses, as private firms account for the majority of borrowers. Within our sample, 13.3% of loans are granted to public borrowers, while 86.7% are issued to private borrowers.

Insert Tables 8 here

To test the conflicting hypotheses, in Table 8 we split the sample according to the borrowers' status as private and public firms and run the baseline DID regressions. As shown in columns (1) and (3), which correspond to the sample of public borrowers, and columns (2) and (4), which correspond to the sample of private borrowers, we find opposite effects. Nonbanks' investment in syndicated loans via institutional tranches leads to a higher level of green financing only in the private firm sample (0.006*** in column (4)), while the effect is negative in the public firm sample (-0.014*** in column (3)). The Chow-test also shows that the coefficients from two regressions are significantly different from each other in columns (3) and (4) (p-value=0.000), which confirms that nonbanks' investment is particularly critical for private firm borrowers' access to green financing.

4.3 Pricing of Nonbanks' Investment in Green Lending

In this section, we focus on the impact of the Paris Agreement on the pricing of the institutional loan tranche. Our aim is to substantiate our argument that the Agreement not only spurred an augmented demand for green assets among institutional investors but also facilitated the origination of green loans in conjunction with nonbanks' investments. We anticipate that, post

the Agreement, institutional tranches of green loans will command lower charges compared to their non-green counterparts. This hypothesis aligns with by Ivashina and Sun (2011), who establish that robust institutional investor demand for corporate loans exerts downward pressure on loan spreads for institutional tranches. An alternative hypothesis driven by banks' increased supply of green loans predicts the opposite effects on spreads. After the PA, banks experience the challenges of having to expand their green lending under limited balance sheet capacity, thereby increasing the need for nonbanks' participation in lending. One way to attract nonbanks' investment would be to charge higher spreads in institutional tranches, meaning banks would increase the spread on institutional tranches of green loans compared to non-green loans. This argument is similar to that of Lim et al. (2014), who shows that when loans are originated at times when it is difficult for banks to expand their balance sheet capacity (e.g., when they have a lack of capital), the lead arranger of a loan must increase the spread to attract nonbank institutional investors. We test these hypotheses and present the outcomes in Table 9.

Insert Tables 9 here

In Panel A, where the sample consists of loans with institutional tranches, we find that, on average, institutional tranches of green loans demand higher spreads than similar tranches of non-green loans. However, the spread experiences a notable reduction subsequent to the Paris Agreement, as evidenced by the -73 basis point change in column (4). This outcome lends credence to the hypothesis highlighting the role of demand pressure stemming from nonbanks' investments in green lending.

Loan pricing decisions are complemented by decisions regarding covenants, which are often used as a proxy for the ex-post monitoring of loans. Previous literature has argued that loans that are securitized or sold to the secondary market tend to have loose covenants (Wang and Xia (2014)). Similarly, we hypothesize that the demand pressure from nonbanks for green loans should lead to a reduction in the monitoring of the loan. In panel B of Table 9, it can be seen that green loans with institutional tranche have, on average, the same number of covenants as non-green loans. However, after the Paris Agreement, green loans are subjected to comparatively less stringent covenantsâthat is, they are subjected to less ex-post monitoring. The results are robust to a wide set of fixed effects, including stricter models with lender-time and country-

industry-time fixed effects.

5 Conclusion

The Paris Agreement brought about dramatic changes in many economic agents' activities. The existing literature on sustainable investing has chronicled market reactions and varied financial portfolio adjustments, with banks and institutional investors recalibrating their asset choices in anticipation of shifts in investor preferences and regulatory frameworks. Within this context, we focused on nonbank financial intermediaries and their role in financing of green transition. As the Paris Agreement is expected to increase nonbanks' demand for green assets, we tested whether this demand facilitates the increase in the origination of green financing. We investigate this role of nonbanks in the corporate lending market, where their participation in both the primary and secondary market is well established and considered an integral part of the market. Based on a clean identification of green financing, we find that the demand for green assets by nonbanks increases the origination of green loans by banks after the Paris Agreement. Notably, when we test for the US policy changes that signalled opposition to the Paris Agreement, nonbanks' demand was no longer sustained. This suggests that their motive for engaging in green investments is primarily driven by expectations of more stringent regulations on non-green financing rather than an awareness of climate risk. Intriguingly, our results are particularly pronounced for private firms, which generally contend with more constrained avenues for financing their green initiatives. In a market replete with limited green investment opportunities, the institutional tranches of syndicated loans extended to private firms provide nonbanks a canvas for diversifying their portfolio, counterbalanced by the green assets predominantly offered by public firms. This growing demand among nonbanks has exerted pressure on the pricing of the institutional tranche, lowering the spreads, as well as the covenants on the green loans.

References

Acharya, V. V., Eisert, T., Eufinger, C., & Hirsch, C. (2018). Real effects of the sovereign debt crisis in Europe: Evidence from syndicated loans. The Review of Financial Studies, 31(8), 2855-2896.

Aldasoro, I., Doerr, S., & Zhou, H. (2022). Non-bank lenders in the syndicated loan market. BIS Quarterly Review.

Aramonte, S., Schrimpf P., & Shin H. (2022). Non-bank Financial Intermediaries and Financial Stability, CEPR Press Discussion Paper No. 16962.

Berg, F., Koelbel, J. F., & Rigobon, R. (2019). Aggregate confusion: The divergence of ESG ratings. Forthcoming Review of Finance.

Benabou, R., & Tirole, J., (2010). Individual and Corporate Social Responsibility. Economica, 77(30), 1-19.

Benmelech, E., Dlugosz, J., & Ivashina, V. (2012). Securitization without adverse selection: The case of CLOs. Journal of Financial Economics, 106(1), 91-113.

Blickle, K., Fleckenstein, Q., Hillenbrand, S., & Saunders, A. (2020). The myth of the lead arranger's share. FRB of New York Staff Report, 922.

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk?. Journal of financial economics, 142(2), 517-549.

Bradley, M. & Roberts, M.R. (2015). The structure and pricing of corporate debt covenants. The Quarterly Journal of Finance, 5(02), 1550001.

Buchak, G., Matvos, G., Piskorski, T., Seru, A. (2018). Fintech, regulatory arbitrage, and the rise of shadow banks. Journal of Financial Economics, 130(3), 453-483.

Chernenko, S., Erel, I., & Prilmeier, R. (2022). Why do firms borrow directly from non-banks?. The Review of Financial Studies, 35(11), 4902-4947.

Degryse, H., Goncharenko, R., Theunisz, C., & Vadasz, T. (2021). When green meets green. Available at SSRN 3724237.

Degryse, H., Roukny, T., & Tielens, J. (2021). Asset Overhang and Technological Change. CEPR Discussion Paper Series DP 17507

Degryse, H., De Jonghe, O., Jakovljevic, S., Mulier, K., & Schepens, G. (2019). Identifying credit supply shocks with bank-firm data: Methods and applications. Journal of Financial Intermediation, 40, 100813.

Delis, M.D., De Greiff, K. & Ongena, S., (2019). Being stranded with fossil fuel reserves? Climate policy risk and the pricing of bank loans. EBRD Working Paper, 231.

European Banking Authority (2022). Developing a Framework for Sustainable Securitisation. EBA/REP/2022/06.

Elliott, D., Meisenzahl, R., & Peydro, J. L. (2021). Nonbank lenders as global shock absorbers evidence from US monetary policy spillovers. working paper, Imperial College London.

Fatica S., Panzica, R., & Rancan M. (2021). The pricing of green bonds: Are financial institutions special?, Journal of Financial Stability, 54.

Gallo, A., & Park, M. (2022). CLO (Collateralized Loan Obligation) Market and Corporate Lending. Journal of Money, Credit and Banking. https://doi.org/10.1111/jmcb.12941

Giannetti, M., Jasova, M., Loumioti, M., & Mendicino, C. (2023). "Glossy Green" Banks: The Disconnect Between Environmental Disclosures and Lending Activities.

Ginglinger, E., & Moreau, Q. (2019). Climate risk and capital structure. UniversitÃ© Paris-Dauphine Research Paper, (3327185).

Gopal M. & Schnabl P. (2022). The Rise of Finance Companies and FinTech Lenders in Small Business Lending. The Review of Financial Studies, 35(11), 4859-4901.

Gopalan, R., Nanda, V. & Yerramilli, V., 2011. Does poor performance damage the reputation of financial intermediaries? Evidence from the loan syndication market. The Journal of Finance, 66(6), pp.2083-2120.

Irani, R. M., Iyer, R., Meisenzahl, R. R., & Peydro, J. L. (2021). The rise of shadow banking: Evidence from capital regulation. The Review of Financial Studies, 34(5), 2181-2235.

Ivashina, V., & Sun, Z. (2011) Institutional demand pressure and the cost of corporate loans. Journal of Financial Economics, 99(3) 500-522.

Kacperczyk, M. T., & Peydro, J. L. (2021). Carbon Emissions and the Bank-Lending Channel. CEPR Discussion Paper No. DP16778.

Krueger, P., Sautner, Z., & Starks, L.T. (2020). The Importance of Climate Risks for Institutional Investors. The Review of Financial Studies, 33(3), 1067-1111.

Khwaja, A. I., & Mian, A. (2008). Tracing the impact of bank liquidity shocks: Evidence from an emerging market. American Economic Review, 98(4), 1413-1442.

Li, F. (2010) Textual analysis of corporate disclosure. A survey of the literature. Journal of Accounting Literature, 29, 143-165.

Lim, J., Minton, B. A., & Weisbach, M.S. (2014) Syndicated loan spreads and the composition of the syndicate. Journal of Financial Economics, 111(1), 45-69.

Ramelli S., Wagner A.F., Zeckhauser, R.J. & Ziegler, A. (2021). Investor Rewards to Climate Responsibility: Stock-Price Responses to the Opposite Shocks of the 2016 and 2020 U.S. Elections. Review of Corporate Finance Studies, Oxford University Press, 10(4),748-787.

Seltzer, L., Starks, L.T. & Zhu, Q. (2022) Climate Regulatory Risks and Corporate Bonds. Nanyang Business School Research Paper No. 20-05, FRB of New York Staff Report No. 1014.

Syzdykov, Y., & Masse, J. M. (2019). Emerging market green bonds report 2019: Momentum builds as nascent markets grow. Amundi Asset Management (Amundi) & International Finance Corporation (IFC).

Wang , Y., & Xia, H. (2014) Do Lenders Still Monitor When They Can Securitize Loans ?. The Review of Financial Studies, 27(8), 2354-2391.

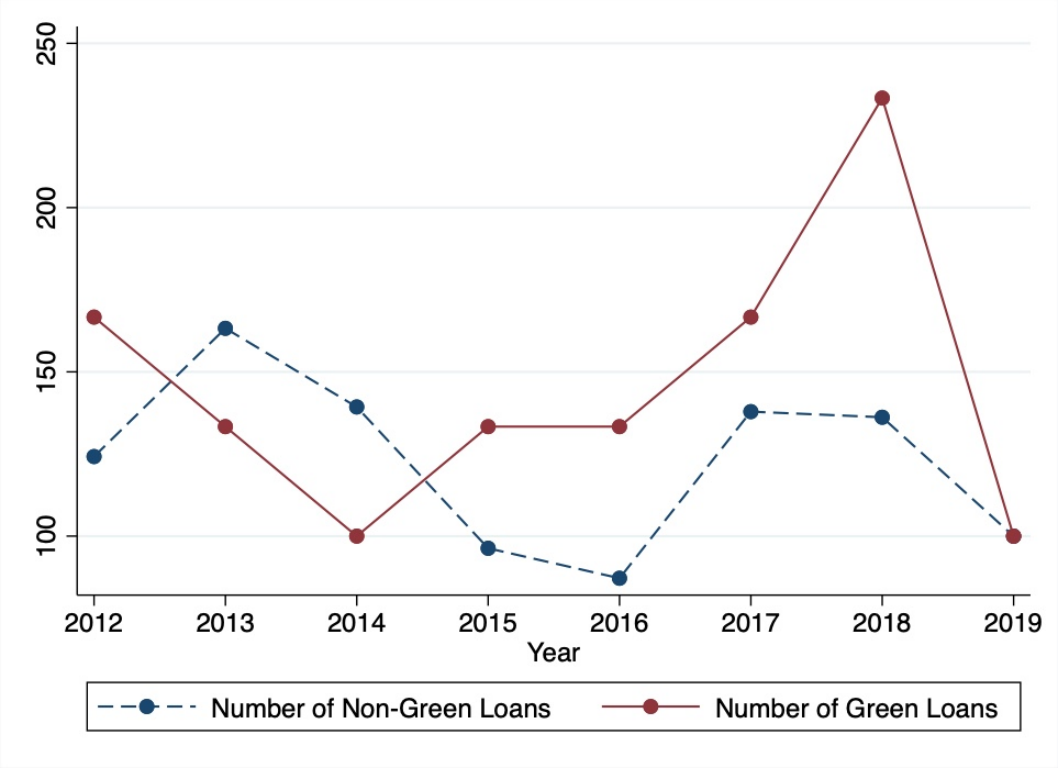

Figure 1: *The graph shows the time-trend in numbers of green loans and non-green loans among new originations with institutional tranches around the Paris Agreement. The identification of green loans is based on the textual analysis of the "Loan purpose remarks" in DealScan. The Paris Agreement was adopted as a legally international treaty on climate change on December 12, 2015 and entered into force on November 4, 2016. The numbers of loans are scaled to 100 in 2019. Number of green loans in 2012 is affected by the the wind energy production tax credit (PTC) expected to expire in US.*

Table 1: Time Trend of Green and non-Green Lending

All Sample	2012	2013	2014	2015	2016	2017	2018	2019	N or %
No of Loans	1411	1518	1673	1406	1395	1508	1553	1390	11854
No of Non-Green Purpose Loans	1399	1510	1638	1361	1366	1474	1495	1342	11585
No of Green Purpose Loans	12	8	35	45	29	34	58	48	269
as % to all loans	0.85%	0.53%	2.09%	3.20%	2.08%	2.25%	3.73%	3.45%	2.27%
by "green" keywords (selection):									
“Solar”	0	1	18	16	15	23	18	26	0.98%
“Wind”	7	1	4	19	11	5	19	17	0.70%
“Electric”	2	5	9	10	4	6	12	5	0.44%
“Photovoltaic”	0	0	1	0	1	4	7	1	0.11%
“Hydro”	0	1	0	0	1	4	0	0	0.05%
“Renewables”	0	0	0	1	0	1	3	1	0.05%
Sub-sample: Private Firms	2012	2013	2014	2015	2016	2017	2018	2019	N or %
No of Loans	1156	1212	1352	1095	1176	1274	1265	1186	9716
No of Non-Green Purpose Loans	1144	1207	1327	1054	1147	1241	1210	1138	9468
No of Green Purpose Loans	12	5	25	41	29	33	55	48	248
as % to all loans	1.04%	0.41%	1.84%	3.74%	2.46%	2.59%	4.35%	4.05%	2.55%
by "green" keywords (selection):									
“Solar”	0	1	13	14	15	23	18	26	1.13%
“Wind”	7	1	4	18	11	5	19	17	0.84%
“Electric”	2	2	3	10	4	6	10	5	0.43%
“Photovoltaic”	0	0	1 0	1	4	7	1	0	0.14%
“Hydro”	0	0	0	0	1	3	0	4	0.08%
“Renewables”	0	0	0	1	0	1	3	1	0.06%

This table reports yearly statistics of green and non-green loans for the sample period. Number of loans is the count of each type of loans while percentage is yearly proportion of each type of loan in the year's sample. Statistics are also provided for the most frequent keywords. Notice that a loan can have more than one "green" keyword in the loan purpose remarks in DealScan. Green Keywords from Climate Bonds Initiative Taxonomy are listed in the Appendix.

Table 2: Loan Characteristics and Difference-in-means Test

Panel A: All Sample					
	Non-Green Loans		*Green Loans*		
	Mean	St Dev	Mean	St Dev	Diff. test
Loan Amount	793.6037	1910.167	602.2972	1037.2	191.31
Spread	354.284	172.2085	313.0323	183.1	41.25**
Maturity	71.545	30.232	88.436	56.896	-16.89***
N of Lenders	6.357	6.162	4.821	3.401	1.54***
Secured	0.506	0.500	0.164	0.371	0.34***
Covenants	0.150	0.357	0.052	0.222	0.10***
Panel B: Loans With Institutional Tranche					
	Non-Green Loans		*Green Loans*		
	Mean	St Dev	Mean	St Dev	Diff. test
Loan Amount	993.3604	1305.052	2088.355	1797.283	-1094.99***
Spread	444.2149	146.2327	393.4707	137.4467	50.74**
Maturity	85.12667	22.10344	89.00947	10.88222	-3.88
N of Lenders	6.472731	6.173289	7.378378	3.63892	-0.91
Secured	0.97	0.14	0.91	0.27	0.06**
Covenants	0.17	0.38	0.081	0.27	0.10

This table reports summary statistics for the sample of loans in the analyses. The sample excludes syndicated loans that contain revolving tranches only. Panel A presents the summary for all loans and Panel B presents the summary a subgroup of loans that contain institutional tranche, Term B. In each panel, green loans and non-green loans are compared for the following characteristics: loan amount which is total loan size (sum of all tranches in a loan), spread which is average of spreads of tranches in a loan deal, maturity which is number of months from loan start to end date, number of lenders, secured which is 1 if a loan is collateralized and 0 otherwise, and covenants which is strictness of loan covenant measured according to Bradley and Roberts (2015). T-test results are presented in the final column that show whether the values are statistically different between green and non-green loans.

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

Table 3: Bank and NonBank Lending around the Paris Agreement (PA)

Panel A: All Loans	With Nonbank Investment (Loans with Inst. Tranche)		Bank Lending only (Without Inst. Tranche)	
	Pre PA	Post PA	Pre PA	Post PA
Loan Amount	869.23	1138.77	648.21	678.12
Avg. Spread (bp)	452.00	435.28	297.02	284.20
Maturity	86.67	83.62	68.69	59.35
Concentration	6.67	6.29	6.83	5.65
Secured	0.98	0.98	0.22	0.21
Covenants	0.23	0.12	0.18	0.08
Panel B: Green Loans	With Nonbank Investment (Loans with Inst. Tranche)		Bank Lending only (Without Inst. Tranche)	
	Pre PA	Post PA	Pre PA	Post PA
Loan Amount	839.27	2848.66	593.93	256.07
Avg. Spread (bp)	505.35	318.87	347.83	176.26
Maturity	84.68	91.26	100.37	82.92
Concentration	5.28	8.654	6.04	3.63
Secured	0.92	0.915	0.06	0.03
Covenants	0.14	0.04	0.10	0.01

This table compares summary statistics for syndicated loan sample with and without institutional tranche, Term B. Panel A presents all sample summary statistics, while Panel B and Panel C restricts the sample to green purpose loans and loans with nonbank participation in Term B, respectively. In each panel, loans with and without Term B are compared for the following characteristics: loan amount which is total loan size (sum of all tranches in a loan), spread which is average of spreads of tranches in a loan deal, maturity which is number of months from loan start to end date, number of lenders, secured which is 1 if a loan is collateralized and 0 otherwise, and covenants which is strictness of loan covenant measured according to Bradley and Roberts (2015).

Table 4: Nonbanks' Investment in Green Financing

	Prob(Green Purpose Loans)				
	(1)	(2)	(3)	(4)	(5)
Post-Paris Agreement	0.005***				
	(0.000)				
Institutional Tranche (Term B)		-0.002*	-0.009***	-0.006***	-0.006***
		(0.001)	(0.001)	(0.001)	(0.000)
Post-PA X Inst.Tranche		0.003***	0.008**	0.008***	0.008***
		(0.001)	(0.003)	(0.001)	(0.001)
Lender FE	Y	Y	N	N	N
Lender-Time FE	-	N	Y	Y	Y
Industry FE	Y	N	Y	N	N
Industry-Time FE	-	Y	N	Y	N
Country FE	Y	N	Y	N	N
Country-Time FE	-	Y	N	Y	N
Country-Industry-Time FE	-	N	N	N	Y
Observations	11854	11854	11854	11854	11854
Adjusted R^2	0.306	0.342	0.378	0.399	0.398

This table reports the regression results of Equation (1) in column (1) and Equation (2) in columns (2)-(5). The sample consists of all syndicated loans originated between 2012 and 2019 except revolving-only loans. The explanatory variable is $Post - ParisAgreement$ in columns (1), which is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0 otherwise. In columns (2)-(5), the main explanatory variable is the interaction term between $Post - ParisAgreement$ and *Institutional Tranche* which is equal to 1 if the loan contains Term B tranche and 0 otherwise. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Nonbank Direct Lending in Green Financing

	Prob(Green Purpose Loans)			
	(1)	(2)	(3)	(4)
Nonbank Direct Lending	-0.000*	0.000	-0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.000)
Post-PA X Nonbank Direct Lending	0.001***	0.010***	0.007***	0.006***
	(0.000)	(0.001)	(0.001)	(0.001)
Lender FE	Y	N	N	N
Lender-Time FE	N	Y	Y	Y
Industry FE	N	Y	N	N
Industry-Time FE	Y	N	Y	N
Country FE	N	Y	N	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	N	N	Y
Observations	11854	11854	11854	11854
Adjusted R^2	0.342	0.378	0.399	0.398

This table reports the regression results of Equation Equation (2). The sample consists of all syndicated loan deals originated between 2012 and 2019 except revolving-only loans. The main explanatory variable is the interaction term between $Post - PA$, which is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0 otherwise, and *Nonbank Direct Lending*, which is equal to 1 if a nonbank lender directly participates in a loan deal. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Falsification Test using a Placebo Shock

	Prob(Green Purpose Loan)			
	(1)	(2)	(3)	(4)
Institutional Tranche	-0.017***	-0.015***	-0.017***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.000)
Placebo Shock X Inst.Tranche	-0.003	-0.003	-0.005	-0.004**
	(0.003)	(0.002)	(0.003)	(0.001)
Lender FE	Y	N	N	N
Lender-Time FE	N	Y	Y	Y
Industry FE	N	Y	N	N
Industry-Time FE	Y	N	Y	N
Country FE	N	Y	N	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	N	N	Y
Observations	11540	11057	10989	10928
Adjusted R^2	0.412	0.429	0.500	0.504

This table replicates the analysis in Table 4 using a different sample period. The sample consists of all syndicated loans originated between 2008 and 2015, instead of 2012 and 2019, excluding revolving-only loans. The main explanatory variable is the interaction term between *PlaceboShock* and *Institutional Tranche*. *PlaceboShock* is equal to 1 for the period after December 12, 2011, which is a placebo shock created by moving the Paris Agreement 4 years prior to the actual date. *Institutional Tranche* is equal to 1 if the loan contains Term B tranche and 0 otherwise. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green purpose loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Reverse Treatment: US climate policy changes around the Paris Agreement (US Sample)

Panel A: Anti-climate change shock Republican EPA leader appointment			
	Prob(Green Purpose Loan)		
	(1)	(2)	(3)
Institutional Tranche	0.005	0.013	0.013
	(0.009)	(0.011)	(0.011)
Anti-climate change X Inst.Tranche	-0.007	-0.027**	-0.022*
	(0.009)	(0.012)	(0.013)
Lender FE	Y	N	N
Lender-Time FE	N	Y	Y
Industry FE	N	Y	N
Industry-Time FE	Y	N	Y
Observations	2594	2594	2594
Adjusted R^2	0.307	0.320	0.354
Panel B: Pro-climate change shock Democrat's win in presidential election			
	Prob(Green Purpose Loan)		
	(1)	(2)	(3)
Institutional Tranche	-0.010**	-0.013**	-0.011**
	(0.004)	(0.006)	(0.005)
Pro-climate change X Inst.Tranche	0.011**	0.020***	0.013**
	(0.005)	(0.007)	(0.006)
Lender FE	Y	N	N
Lender-Time FE	N	Y	Y
Industry FE	N	Y	N
Industry-Time FE	Y	N	Y
Observations	9473	9473	9473
Adjusted R^2	0.420	0.400	0.481

This table reports the regression results of Equations (2) based on the US government's appointment of an anti-climate change action EPA leader (Panel A) and the US's change of government which turned itself back to pro-climate change action position in 2020 (Panel B). In Panel A, the sample consists of all syndicated loan deals originated in the US between December 2015 and December 2018 except revolving-only loans. The main explanatory variable is the interaction term between *Post* and *Institutional Tranche*. *Post* is equal to 1 for the period after 7 November 2016, which is the date that the US government appointed an EPA leader who is against climate change actions. *Institutional Tranche* is equal to 1 if the loan contains Term B tranche and 0 otherwise. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. In Panel B, the sample consists of all syndicated loans originated in the US between 2019 and 2022 except revolving-only loans. *Post* is equal to 1 for the period after 7 November 2020, which is the election date that the US government had a new president who is pro-climate change actions and regulations. The rest of the regression models are analogous to those in Panel A. Various combinations of lender, borrower industry and time fixed effects are included. Standard errors are clustered by lenders. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: NonBanks' Investment in Green Lending: Public vs Private Firms

	Prob(Green Purpose Loan)			
	Public	Private	Public	Private
	(1)	(2)	(3)	(4)
Institutional Tranche	0.006	-0.008***	0.005	-0.009***
	(0.003)	(0.001)	(0.003)	(0.000)
Post-PA X Inst.Tranche	-0.015***	0.007***	-0.014***	0.006***
	(0.003)	(0.002)	(0.003)	(0.002)
Lender-Time FE	Y	Y	Y	Y
Industry-Time FE	Y	N	Y	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	Y	N	Y
Diff. in coefficients (*p-value*)	0.193		0.000	
Observations	1505	9756	1505	9567
Adjusted R^2	0.359	0.434	0.386	0.433

This table replicates the analyses in Table 4 columns (4) and (5) for a split sample of public and private firm borrowers. Columns (1) and (2) report the results for public firm borrowers and columns (3) and (4) for private firm borrowers. The sample consists of all syndicated loans originated between 2012 and 2019 except revolving-only loans. The explanatory variable is $Post - PA$ in columns (1), which is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0 otherwise. The main explanatory variable is the interaction term between $Post - PA$ and *Institutional Tranche* which is equal to 1 if the laon contains Term B tranche and 0 otherwise. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Pricing and Covenants for Nonbanks' Investment in Green Lending

Panel A: Loans with Inst. Tranches				
	Spread in Institutional Tranche			
	(1)	(2)	(3)	(4)
Green Lending	103.394***	78.068***	41.698***	46.918***
	(3.175)	(1.586)	(6.272)	(7.860)
Post-PA X Green	-135.155***	-116.696***	-66.548***	-73.628***
	(4.546)	(2.793)	(6.720)	(6.494)
Lender FE	Y	N	N	N
Lender-Time FE	N	Y	Y	Y
Industry FE	N	Y	N	N
Industry-Time FE	Y	N	Y	N
Country FE	N	Y	N	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	N	N	Y
Observations	3733	3733	3733	3733
Adjusted R^2	0.365	0.285	0.351	0.353
Panel B: Loans with Inst. Tranches				
	Covenant Index			
	(1)	(2)	(3)	(4)
Green Lending	-0.133***	0.006	-0.036	-0.008
	(0.008)	(0.012)	(0.042)	(0.022)
Post-PA X Green	-0.259***	-0.325***	-0.306***	-0.335***
	(0.017)	(0.032)	(0.027)	(0.022)
Lender FE	Y	N	N	N
Lender-Time FE	N	Y	Y	Y
Industry FE	N	Y	N	N
Industry-Time FE	Y	N	Y	N
Country FE	N	Y	N	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	N	N	Y
Observations	3834	3834	3834	3834
Adjusted R^2	0.179	0.099	0.170	0.177

This table reports the regression results on post-PA loan conditions of green purpose loans that carry institutional tranches. In Panel A, the dependent variable is spread in basis point charged on institutional tranches. In Panel B, the dependent variable is covenant strictness index that is between 0 and 6 constructed by counting the number of financial covenants included in a loan deal following Bradley and Roberts (2015). In all regressions, the following control variables are included whose results are not tabulated: loan amount that is log-transformed total size of loan and maturity that is log-transformed number of months between start and end of a loan deal. The main explanatory variable is the interaction term between $Post - PA$ that is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0, otherwise, and $Green$ that is equal to 1 if the loan is green purpose loan and 0, otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix A

Table A.1: Green Keywords Dictionary

Include words:	ecolo	solar	wind	environment	environmental
	environmentally	global warming	climate	pollution	sustainable
	sustainability	clean energy	photovoltaic	pv cells	csp dishes
	inverters	transformers	electric	electricity	turbines
	geotheramal	ghp	heat pump	emissions	bioenergy
	biofuel	biomass	biogas	biorefinery	cogeneration
	sustainable	energy efficiency	hydro	hydropower	hydrogen
	hydroelectric	run of river	impoundment	pumped storage	carbon cooling
	tidal	ocean thermals	decarbonisation	electrified	hybrid vehicles
	ghg	drought	flood	rainwater	recycling
	wastewater	ecological	forest	erosion	evotranspiration
	wetland	recyclable	reusable	landfill	re-use
	composting	social			
Exclude words:	unwind	anhydrous	windows	kokusai electric corp	wind point partners
	tailwind	windoor	highground	windjammer	windstream
	windsor	social	esg	ethical	

This table lists the "green" keywords extracted from the Climate Bonds Taxomomy issued by the Climate Bonds Initiative, available at https://www.climatebonds.net/standard/taxonomy. The scope of this document is to provide support to investors in identifying assets or activities that are complaint with the Paris-Agreement goal. This list consists of the dictionary used in the textual analysis of "Loan Purpose Remark" reported on DealScan for each syndicated loan. The analysis identifies as green loans whose loan purpose remark contains at least one of the green keyword.

Table A.2: Validation tests: Green Loans and Economic Transition Indicators (Renewable)

	(1) Green Loans	(2) Share of Green Loans	(3) Green Loans	(4) Share of Green Loans
Electricity Installed Capacity Gigawatt-hours (GWh)	0.029***			
	(0.004)			
Share of Electricity Installed Capacity		0.436**		
		(0.165)		
Electricity Generation Gigawatt-hours (GWh)			0.009***	
			(0.001)	
Share of Electricity Generation				0.209
				(0.127)
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	53	53	53	53
Adjusted R^2	0.849	0.045	0.831	0.040

This table reports the results of the analyses between green loans identified using textual analysis on the "deal purpose remark" in DealScan and indicators of economic transition. Variables are collapsed at the country level. Dependent variables are i. the number of green loans identified for each country (columns 1 and 3); ii. the share of green loans over total green loans in a given year (columns 2 and 4). Most of our green loans finance renewable projects, we therefore validate our identification of green loans with electricity installed and generated by renewable. This information is contained in the Economic Transition Indicators available on IMF Climate Change Dashboard, sourced from International Renewable Energy Agency (IRENA) (2022), Renewable Energy Statistics 2022. Electricity generation and electricity installed capacity from renewables cover 10 technologies (including bioenergy, geothermal, hydropower, marine energy, solar energy, wind energy). In columns 1 and 3, we use the economic transition indicators in Gigawatt-hours per country. In columns 2 and 4, we scale the indicators for the amount installed or generated globally. Borrower country and year fixed effects are included. Standard errors are clustered by borrower country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Nonbanks' Investment in Green Financing: Sub-sample of Loans Reporting "Loan Purpose Remark" in DealScan

	Prob(Green Purpose Loan)				
	(1)	(2)	(3)	(4)	(5)
Post-Paris Agreement	0.013***				
	(0.001)				
Institutional Tranche		-0.017***	-0.028***	-0.026***	-0.025***
		(0.003)	(0.003)	(0.003)	(0.002)
Post-PA X Inst.Tranche		0.003	0.017*	0.017***	0.018***
		(0.003)	(0.008)	(0.004)	(0.003)
Lender FE	Y	Y	N	N	N
Lender-Time FE	-	N	Y	Y	Y
Industry FE	Y	N	Y	N	N
Industry-Time FE	-	Y	N	Y	N
Country FE	Y	N	Y	N	N
Country-Time FE	-	Y	N	Y	N
Country-Industry-Time FE	-	N	N	N	Y
Observations	5171	5171	5171	5171	5171
Adjusted R^2	0.447	0.478	0.506	0.521	0.520

This table replicates the analysis in Table 4 using the sample restricted to those syndicated loan deals that report purpose remark. The explanatory variable is $Post - PA$ in columns (1), which is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0 otherwise. In columns (2)-(5), the main explanatory variable is the interaction term between $Post - PA$ and *Institutional Tranche* which is equal to 1 if the loan contains Term B tranche and 0 otherwise. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Nonbank Direct Lending in Green Purpose Loans: Sub-sample of Loans Reporting 'Purpose Remark' in DealScan

	Prob(Green Purpose Loan)			
	(1)	(2)	(3)	(4)
Nonbank in Direct Lending	-0.007***	0.003	-0.007**	-0.005***
	(0.001)	(0.004)	(0.002)	(0.002)
Post-PA X Nonbank Direct Lending	0.012***	0.017***	0.008**	0.006**
	(0.001)	(0.005)	(0.003)	(0.003)
Lender FE	Y	N	N	N
Lender-Time FE	N	Y	Y	Y
Industry FE	N	Y	N	N
Industry-Time FE	Y	N	Y	N
Country FE	N	Y	N	N
Country-Time FE	Y	N	Y	N
Country-Industry-Time FE	N	N	N	Y
Observations	5171	5171	5171	5171
Adjusted R^2	0.477	0.504	0.519	0.518

This table replicates the analysis in Table 5 using the sample restricted to those syndicated loan deals that report purpose remark. The main explanatory variable is the interaction term between $Post - PA$, which is equal to 1 for the period after the Paris Agreement (December 12, 2015) and 0 otherwise, and *Nonbank Direct Lending*, which is equal to 1 if a nonbank lender directly participates in a loan deal. The dependent variable is a binary variable that indicates whether the loan is green-purpose lending that is equal to 1 for green loans and 0 otherwise. Different combinations of lender, borrower industry, borrower country and time fixed effects are included. Standard errors are clustered by borrower-country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The Centre for Responsible Banking & Finance
CRBF Working Paper Series
School of Management, University of St Andrews
The Gateway, North Haugh,
St Andrews, Fife,
KY16 9RJ.
Scotland, United Kingdom
https://crbf.wp.st-andrews.ac.uk/

Recent CRBF Working papers published in this Series

First Quarter | 2024

24-005 **Pejman Abedifar, Hossein Doustali, Steven Ongena:** Marketplace Lending: A Resilient Alternative in the Face of Natural Disasters?

24-004 **Sapnoti K. Eswar, Michael F. Ferguson, Jayoung Yoon:** The Second Mover Advantage: R&D and Absorptive Capacity.

24-003 **Panagiota Papadimitri, Ansgar Wohlschlegel:** Informational Lobbying and Regulatory Enforcement: Theory and Application.

24-002 **Qiao Peng, Donal McKillop, Barry Quinn, Kailong Liu:** Modelling and Predicting Failure in US Credit Unions.

24-001 **José M. Liñares-Zegarra, John O.S. Wilson:** Access to Finance for UK Social Enterprises.

Fourth Quarter | 2023

23-020 **José M. Liñares-Zegarra, John O.S. Wilson:** The Impact of Brexit on the Internationalisation, Innovation and Turnover of UK SMEs: Implications for the UK's Industrial Strategy and the 'Levelling Up' Agenda.

23-019 **Oğuzhan Çepni, Ahmet Şensoy, Muhammed Hasan Yılmaz:** Climate Change Exposure and Cost of Equity.

23-018 **Ahmed Aboud, Niccolò Nirino, Giota Papadimitri:** Tax Avoidance and Sustainable Development Goal Disclosure: A Cross Country Analysis.

23-017 **Alfred Duncan, Charles Nolan:** Adam Smith and the Bankers: Retrospect and Prospect.