Financed Emissions and Banks' Lending Portfolios*

Elsa Allman[a], Sonali Hazarika[b], Bill Qiao[b], and Alev Yildirim[c]

[a]Banque de France
[b]Zicklin School of Business, Baruch College, CUNY
[c]Queens College School of Business, CUNY

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Abstract

This paper examines how the Paris Agreement affected financed emissions of syndicated loan portfolios for 233 banks across 40 countries from 2010–2023. We distinguish between portfolio decarbonization through divestment from high-emitting borrowers and engagement via post-loan origination monitoring. Banks with high pre-Paris exposure to energy-sector lending significantly reduce financed emissions from newly originated non-relationship loan portfolios by about 20% after Paris. These reductions are concentrated in the energy sector and are driven by decline in the number of new borrowers, and a shift towards lower-emitting new borrowers. We do not find evidence of reductions through post-loan engagement with existing clients.

JEL classification: G20, G21, G23, G30, Q50, Q58

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[1]Climate Finance Expert within the Research Directorate at the French Prudential Supervisory Authority (ACPR) f the French Central Bank (Banque de France), Elsa.Allman@gmail.com; Sonali Hazarika, Zicklin School of Business, Baruch College, CUNY, sonali.hazarika@baruch.cuny.edu; Bill Qiao, Zicklin School of Business, Baruch College, mo.qiao@baruch.cuny.edu; Alev Yildirim, Queens College School of Business, CUNY, alev.yildirim@qc.cuny.edu. We are grateful for the comments and suggestions of Jean-Stéphane Mesonnier, Olivier de Bandt, Cristina Peñasco, Simone Taddeo (discussant), Laétitia Lepetit, Luca Taschini, and seminar and conference participants at the Conference on Empirical Legal Studies, the 3^{rd} Conference on Sustainable Banking & Finance, 2025 Green Finance Research Advances Conference, Baruch College and Queens College. All remaining errors are our own.

1. Introduction

The Paris Agreement represents a global policy shock with direct implications for financial institutions and capital allocation. By committing signatory countries to align financial flows with a low-emissions development pathway, the Agreement increased regulatory scrutiny, reputational pressure, and expectations around climate-aligned finance. Banks play a central role in this process. Through corporate lending —particularly syndicated loans— they provide the majority of external financing to fossil fuel firms and other high-emitting sectors.[1] As a result, banks' lending decisions are a key determinant of whether capital flows become consistent with the Paris Agreement's objective of limiting global warming well below 2°C, and preferably to 1.5°C above pre-industrial levels.

The Agreement potentially altered banks' incentives through several channels. Banks may seek to reduce their exposure to climate-related transition risks (Ehlers, Packer, and De Greiff, 2022; Martini et al., 2024), respond to pressure from regulators and central banks (e.g., D'Orazio and Popoyan, 2019; D'Orazio, 2023; Pasiouras, Rjiba, and Samet, 2025), or mitigate reputational and ESG-related risks (Houston and Shan, 2022). At the same time, decarbonizing lending portfolios may conflict with profit maximization. Lending to fossil fuel firms can command higher spreads (e.g., Demetriades and Politsidis, 2025), and long-standing clients in carbon-intensive sectors may be generating stable revenues. Whether banks have meaningfully reduced the carbon footprint of their lending portfolios following the Paris Agreement therefore remains an open empirical question.

A key feature of bank lending is its reliance on long-term borrower relationships, often spanning decades.[2] These relationships generate franchise value by lowering origination costs and facilitating repeat business (Demsetz, Saidenberg, and Strahan, 1996). They also place

[1] Syndicated loans accounted for 66% of global fossil fuel finance in 2018, followed by bonds (29%) and equity instruments (5%) (Cojoianu et al., 2023; Rickman et al., 2024).

[2] Sharpe (1990); Petersen and Rajan (1994); Berger and Udell (1995); Boot and Thakor (2000); Bolton et al. (2016).

banks in a unique position to screen and monitor borrowers, potentially allowing them to influence firms' transition paths. This creates a fundamental tension. On the one hand, banks face growing pressure to reduce financed emissions. On the other hand, their deep ties to carbon-intensive clients may constrain their willingness to divest. At the same time, these relationships create scope for engagement: Banks can incorporate climate considerations into screening, monitoring, and renegotiation. Distinguishing between these competing channels, divestment versus engagement, is therefore central to understanding how banks respond to climate policy.

This paper fills this gap by examining how banks adjust the carbon footprint of their lending portfolios following the Paris Agreement, focusing on the role of lending relationships. Using syndicated loans data from Dealscan and emissions intensities data from S&P Trucost between 2010–2023, we examine financed emissions associated with banks' newly originated syndicated loans and distinguish between relationship and non-relationship lending to address two main questions. First, do banks reduce financed emissions by reallocating lending away from high-emitting borrowers, particularly in the energy sector (*divestment effect*)? Second, do banks reduce financed emissions through screening and monitoring of borrowers after loan origination (*engagement effect*)? While divestment and engagement have been studied in the context of institutional investors (e.g., Azar et al., 2021; Cohen, Kadach, and Ormazabal, 2023; Atta-Darkua et al., 2023), there is limited evidence on how banks adjust the emissions profile of their lending portfolios, especially when accounting for relationship lending and sectoral heterogeneity.

Our empirical analysis exploits the syndicated loan market, the dominant source of global corporate bank financing and the primary funding channel for fossil fuel firms (Rickman et al., 2024). We construct bank-level measures of financed emissions following the Partnership for Carbon Accounting Financials (PCAF) standard by combining syndicated loan exposures with borrower-level greenhouse gas emissions intensity data. Financed emissions reflect a bank's indirect contribution to global emissions through capital allocation. By focusing on

newly originated loans, we isolate banks' active lending decisions rather than legacy balance-sheet exposures.[3]

To capture heterogeneity in banks' exposure to climate transition risk, we classify banks based on their pre-Paris reliance on energy-sector lending, measured as the ratio of lending amount to energy-sector firms. Banks with above-median energy exposure are classified as *Brown*, while those below the median are classified as *Green*. Using the Paris Agreement as a quasi-natural experiment, we implement a difference-in-differences design comparing the financed emissions of newly originated lending portfolios of *Brown* and *Green* banks before and after Paris. Our final sample comprises 233 banks across 40 countries.

We further exploit heterogeneity across sectors and lending relationships. Given the substantially higher emissions intensity and transition risks of energy-sector firms, we separately analyze energy and non-energy portfolios. We define energy sector borrowers as firms operating in the production and distribution of electricity (i.e. fossil fuel and utilities sectors) identified using the two-digit Standard Industrial Classification (SIC) codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. Within each sector, we distinguish between relationship and non-relationship borrowers, defined based on whether a borrower has obtained a loan from the same lead bank within the previous five years (Bharath et al., 2011). This structure allows us to directly assess whether portfolio decarbonization reflects changes to legacy relationships or reallocation of new lending flows.

Our results show that following the Paris Agreement, *Brown* banks significantly reduce the financed emissions of their energy-sector lending portfolios. These effects are driven exclusively by non-relationship portfolios and amount to 19.8% reduction in financed emis-

[3]Banks may also reduce exposure via loan sales or securitization. Our analysis focuses on credit allocation at origination, the channel most directly linked to screening and monitoring.

sions. We find no comparable effects in relationship lending portfolios or non-energy sectors. A decomposition of portfolio changes reveals that emission reductions are driven by a decline in the number of new energy-sector borrowers, and a shift toward lower-emitting new borrowers. We do not find any changes in the lending amounts or lenders' loan shares in these portfolios in the post-Paris years. Further analyses show that divestment from non-relationship lending is not only driven by borrowers that have ESG-oriented institutional investors or green bond commitments but also by borrowers that rely exclusively on bank financing and monitoring. Moreover, the effects we document are not driven only by carbon pricing regimes of borrowers' headquartered countries, such as carbon taxes and emissions trading systems, but are also present in portfolios of borrowers headquartered in countries without carbon pricing regimes. These tests provide additional evidence of banks' decarbonization efforts even in the absence of ESG-oriented institutional investors or green bond commitments, and country-level environmental regulations imposed on borrowers.

By contrast, we find little evidence of engagement. Financed emissions do not decline within relationship-lending portfolios through post-origination screening or monitoring. Declines observed among non-relationship borrowers reflect selection at origination rather than subsequent engagement. We confirm these effects by comparing environmental covenants imposed in loan agreements in the pre- and post-Paris years.

Our findings are robust to a range of alternative specifications and data choices. We obtain similar results when allowing for a continuous measure of banks' pre-Paris exposure to energy-sector lending, when using an alternative emissions dataset covering only publicly listed firms, and when excluding the post-COVID years associated with a high interest-rate environment around the world. Finally, accounting for banks' voluntary climate commitments, defined as participation in the Science Based Targets initiative, does not affect our conclusions. This supports the interpretation that the documented effects reflect banks' responses to the Paris Agreement rather than self-selected sustainability pledges.

Overall, our findings indicate that banks' responses to the Paris Agreement operate primarily through selective reallocation of lending flows rather than sustained engagement with incumbent borrowers. By focusing on financed emissions and explicitly distinguishing between divestment and engagement within relationship and non-relationship lending, this paper provides new evidence on the mechanisms through which banks respond to climate policy requirements. These results highlight the limits of voluntary bank-led engagement and underscore the importance of lending relationships, borrower characteristics, and institutional context in shaping the environmental impact of bank lending.

This paper contributes to the literature on climate finance by providing new evidence on how the Paris Agreement shaped banks' lending behavior and portfolio carbon exposure. We construct a comprehensive measure of bank-level financed emissions associated with newly originated syndicated loans for a global sample of banks and study its evolution around the Paris Agreement. In contrast to existing work that focuses on loan pricing, credit volumes, balance-sheet exposures, or stated climate commitments, our approach directly measures the environmental outcomes of bank lending decisions (e.g., Monasterolo and De Angelis, 2020; Seltzer, Starks, and Zhu, 2022; Ginglinger and Moreau, 2023; Bolton and Kacperczyk, 2024; Kölbel et al., 2024). This allows us to assess whether banks' lending portfolios became aligned with a decarbonizing emissions trajectory following the Paris Agreement, a core objective of Article 2.1(c), using realized lending flows rather than ex ante announcements or aggregate disclosures.

Our analysis adds directly to the literature on banks' responses to climate-related transition risk. While prior studies document modest repricing of carbon risk and some reallocation of credit toward lower-emitting firms, they leave open the question of how banks reduce their financed emissions and whether such adjustments reflect divestment or engagement (e.g., Ehlers, Packer, and De Greiff, 2022; Degryse et al., 2023; Delis et al., 2024; Reghezza et al., 2022; Sautner et al., 2023; Mueller and Sfrappini, 2025). We address this gap by explicitly distinguishing between these two channels and by focusing on banks with high

pre-Paris exposure to energy-sector lending. We show that post-Paris reductions in financed emissions are concentrated in newly originated loans, particularly to energy-sector borrowers, and are driven by shifting away from high-emitting non-relationship borrowers rather than by post-origination monitoring. In doing so, we complement loan-level evidence on credit reallocation (Martini et al., 2024; Benincasa, Kabas, and Ongena, 2022) by identifying the mechanisms through which banks' portfolio emissions decline.

Finally, our findings contribute to the literature on relationship banking and sustainable finance by assessing whether banks' monitoring advantages translate into engagement-driven decarbonization. Relationship lending theory emphasizes banks' superior ability to screen and monitor borrowers (Leland and Pyle, 1977; Diamond, 1984; Boot, 2000), but also highlights the presence of relationship-specific rents that may discourage costly divestment (Phelan, 2017; Dang et al., 2017). Consistent with this tradeoff, we find no evidence that relationship lenders reduce financed emissions through divestment from or engagement with incumbent borrowers. Moreover, these insignificant effects do not change when we account for voluntary net-zero commitments (Sastry, Verner, and Ibanez, 2024; Giannetti et al., 2023; Hale, Meisenbacher, and Nechio, 2024), ESG-oriented institutional ownership (Atta-Darkua et al., 2023), green bond issuance (Flammer, 2021; Ehlers, Mojon, and Packer, 2020), or country-level carbon pricing (Ivanov, Kruttli, and Watugala, 2024; Laeven and Popov, 2023). Together, these results highlight the limits of voluntary bank-led engagement, and underscore the importance of lending relationships, borrower characteristics, and institutional context in understanding how banks respond to climate policy.

The paper is organized as follows. Section 2 reviews the related literature. Section 3 describes the data and variable construction, and Section 4 outlines the empirical strategy. Section 5 presents the results, and Section 6 concludes.

2. Literature Review

The Paris Agreement is a legally binding international treaty adopted by 196 parties at the 2015 UN Climate Change Conference (COP21) in Paris.[4] Its objective is to limit global temperature increases to well below 2°C, and preferably to 1.5°C above pre-industrial levels. A central pillar of the Agreement is Article 2.1(c), which calls for making financial flows consistent with a pathway toward low greenhouse gas emissions and climate-resilient development. For financial institutions, this provision implies the need to align lending and investment activities with a net-zero transition, raising fundamental questions about the financing of fossil fuels. Fossil fuels accounted for 81% of global energy supply in 2022 (IEA, 2021) and more than 75% of global greenhouse gas emissions, including roughly 90% of CO_2 emissions.[5] Media scrutiny has increasingly highlighted banks' role in financing fossil fuel extraction and other carbon-intensive activities (e.g., Financial Times, 2018, 2021, 2023; Reuters, 2022, 2023; WSJ, 2022; CNN, 2023; Wired, 2023), most prominently documented in the Banking on Climate Chaos reports (Dilworth et al., 2024).

A growing theoretical literature examines why banks may seek to decarbonize their lending portfolios. Morse and Sastry (2024) introduce a conceptual framework for "net-zero banking," defined as the dynamic alignment of banks' lending portfolios with a declining global emissions trajectory through reductions in financed emissions and increased financing of clean technologies. They emphasize three main drivers of such strategies: risk management (particularly transition and stranded-asset risks), profitability through green lending opportunities, and regulatory or political pressure. The Paris Agreement intensified these pressures by increasing scrutiny from regulators, investors, and civil society, making it an open empirical question whether banks have meaningfully adjusted their lending portfolios in response.

[4] Signed on April 22, 2016 and entered into force on November 4, 2016.

[5] https://www.un.org/en/climatechange/science/causes-effects-climate-change

Empirical evidence on banks' climate-related lending behavior has primarily focused on loan pricing and credit allocation (de Bandt et al., 2023). Several studies document that transition risk is reflected in loan spreads, albeit modestly. Using international syndicated loans, Ehlers, Packer, and De Greiff (2022) identify a small post-Paris carbon premium for firms with higher Scope 1 emissions, but find no evidence that "green" banks, defined as UNEP FI signatories or banks with low carbon exposure, systematically price carbon risk more aggressively. Instead, they document some degree of screening against highly carbon-intensive firms, consistent with evidence for institutional investors (Bolton and Kacperczyk, 2021). Similarly, (Degryse et al., 2023) find that green banks offer cheaper loans to environmentally friendly firms after Paris, while Delis et al. (2024) show that U.S. banks charge higher loan spreads to fossil fuel firms, particularly when banks are green or borrowers are located in stricter regulatory environments. Erten and Ongena (2024) further show that the pricing of environmental risk depends on local beliefs and social attitudes. In contrast, Beyene et al. (2025) find that while bond markets price stranded-asset risk, banks in the syndicated loan market do not, highlighting important differences across financial intermediaries.

Beyond pricing, several studies examine changes in lending quantities. Reghezza et al. (2022) document that European banks reallocated credit away from high-emitting firms following the Paris Agreement, while Sautner et al. (2023) show that U.S. banks reduced their transition risk exposure mainly by shifting lending toward lower emitters rather than cutting off high-emitting borrowers entirely. At the firm level, regulatory exposure and climate policy expectations also matter: Mueller and Sfrappini (2025) find that firms with greater regulatory risk receive more credit after Paris, while Benincasa, Kabas, and Ongena (2022) show that domestic climate policy stringency reduces lending to carbon-intensive borrowers at home but increases cross-border lending to similar firms abroad. However, this literature remains largely silent on whether banks reduce their financed emissions, and whether observed portfolio changes reflect active engagement with existing borrowers or divestment at loan origination.

Another strand of the literature focuses on voluntary climate commitments and disclosures by banks. Evidence on their effectiveness remains mixed, partly due to self-selection concerns. Sastry, Verner, and Ibanez (2024) document a disconnect between net-zero pledges and actual lending behavior among European banks, while Giannetti et al. (2023) find no evidence that greater environmental disclosure leads to divestment from brown firms. Hale, Meisenbacher, and Nechio (2024) similarly find limited effects of sustainability signaling, except for early PRI signatories that already had lower emissions exposure. Some studies report credit reallocation toward cleaner sectors (Mésonnier, 2022), but others argue that such actions do not translate into meaningful emissions reductions, raising concerns about greenwashing (Kacperczyk and Peydró, 2022).

Our paper contributes to this literature by shifting the focus from pricing, quantities, and commitments to the trajectory of banks' financed emissions following the Paris Agreement. Crucially, we distinguish between two decarbonization channels: divestment from high-emitting borrowers and engagement with existing clients. This distinction is particularly salient in the context of relationship lending. A large theoretical and empirical literature emphasizes that banks play a unique role as monitors of borrower behavior due to their ability to collect and process private information (Leland and Pyle, 1977; Diamond, 1984; Fama, 1985; Boyd and Prescott, 1986). These advantages are especially pronounced for relationship banks, which invest in the production of borrower-specific information through repeated interactions over time and across multiple financial products (Boot, 2000). Relationship lending enables banks to accumulate both hard and soft information that can be reused across lending decisions, facilitating more effective screening of subsequent loan applications and closer monitoring of borrowers' ongoing performance (e.g., Diamond, 1991; Rajan and Winton, 1995; Boot and Thakor, 2000; Dennis and Mullineaux, 2000; Sufi, 2007; Gustafson, Ivanov, and Meisenzahl, 2021). In practice, this monitoring involves regular site visits, in-depth reviews of financial statements, covenant enforcement, renegotiation of loan terms, and the conditioning of future credit availability on borrower performance (e.g.,

Fama, 1985; Dennis and Mullineaux, 2000). Through these mechanisms, relationship banks can exert influence over firms' investment, operational, and strategic decisions.

Importantly, relationship lending also generates economic rents. By acquiring proprietary information about borrower quality and correlated loan outcomes, banks can secure future lending mandates and cross-sell a range of financial services, including deposit-taking, underwriting, and advisory services (Bharath et al., 2007). Phelan (2017) show that these rents arise from banks' commitment to continuous monitoring, while Dang et al. (2017) document strong incentives to keep such information confidential in order to protect monopoly profits. These rents increase the value of maintaining long-term relationships, particularly with large or strategically important borrowers. In the context of climate transition, relationship lending therefore creates a fundamental tradeoff. On the one hand, relationship banks are uniquely positioned to engage with incumbent borrowers and potentially influence their decarbonization paths by incorporating climate-related objectives into screening, monitoring, and renegotiation processes (UNEPFI, 2022). On the other hand, exiting established relationships—especially with high-emitting firms—may entail the loss of relationship-specific rents, making divestment from relationship borrowers a costly strategy. As a result, banks may find it more profitable to decarbonize their portfolios by reallocating lending away from high-emitting non-relationship or one-time borrowers toward cleaner new borrowers, rather than by terminating existing relationships. Observed reductions in financed emissions may therefore reflect changes in lending flows at origination rather than sustained engagement with existing clients.

Finally, banks' decarbonization strategies operate within broader regulatory and market environments. Carbon pricing mechanisms, such as carbon taxes and emissions trading systems, are widely viewed as effective tools to reduce emissions (Arrow et al., 1997; Martin, De Preux, and Wagner, 2014; Stroebel and Wurgler, 2021). Recent studies show that such policies affect bank lending and investment behavior (Ivanov, Kruttli, and Watugala, 2024; Laeven and Popov, 2023; Bai and Ru, 2024), and interact with private-sector initiatives and

institutional investors' portfolio choices (Atta-Darkua et al., 2023). At the same time, other ESG stakeholders, such as green bond investors, may substitute for bank monitoring (Flammer, 2021; Ehlers, Mojon, and Packer, 2020). Our analysis incorporates these institutional features to assess whether banks' financed emissions respond primarily to regulatory signals, investor pressure, or internal portfolio reallocation choices.

Taken together, the literature provides evidence of some repricing and reallocation in bank lending following the Paris Agreement, but offers limited insight into how banks reduce financed emissions and whether engagement with existing borrowers plays a meaningful role. By examining financed emissions at the bank level and explicitly distinguishing between divestment and engagement, particularly within relationship lending, we aim to fill this gap and clarify the mechanisms through which banks respond to global climate policy commitments.

3. Data and Variables

3.1. Sample Construction

We start by obtaining data on syndicated loans from Refinitiv LPC Dealscan. Since our analysis is conducted at the bank-level, we aggregate the loan-level data into a panel of bank-borrower loan amounts, where banks are parent lenders that lend to multiple borrowers.[6] We then determine each parent lender's share of participation in each loan tranche. If *lender_share* is missing, we impute values using the following procedure: if only one lender's share is missing within a tranche, we assign the residual amount by subtracting the sum of observed shares from 100. If more than one lender's share is missing in a given tranche, we allocate the residual amount equally across the lenders with missing data (De Haas and

[6]We use 'parent lender', 'lender', and 'bank' terms interchangeably throughout the paper, and all our analysis is conducted at the parent-lender-level.

Van Horen, 2013).[7] After determining lender shares, we exclude all non-bank lenders from the sample. Next, for each parent lender-borrower pair in a given year t, we calculate the *Borrowing amount* as the sum across all tranches of the bank's lender share multiplied by the USD value of each tranche amount (i.e., *lender_share* * *tranche_amount_converted*) for all loans originated in that year.

To construct borrower-level control variables, we collect data on public and private global firms from Compustat North America, Compustat Global and Capital IQ. We merge the firm-level data with LPC Dealscan loans data using Chava and Roberts (2008) Dealscan-Compustat linking file until 2018. For new borrowers after 2018, we fuzzy match borrower names in Dealscan with company names in Compustat. For borrowers that do not match in Compustat, we manually search for name matches in Capital IQ. We convert nominal values of variables to USD using year-end exchange rates from IBES.

We obtain emissions data on borrowing firms from S&P Trucost. Trucost includes scope 1, scope 2, and scope 3 emissions for more than 15,000 public and private firms, representing 95% of global market capitalization. S&P Trucost reports emissions data in two ways: Absolute emissions, measured in metric tons of carbon dioxide and equivalents (tCO_2e), and emissions intensity, which scales emissions by annual revenue (tCO_2e/ USD million). We focus on emissions intensity, as lenders prioritize firms that expand economic activity and production while managing their emissions. They are less concerned with reducing absolute emissions if it comes at the expense of economic growth (Aswani, Raghunandan, and Rajgopal, 2024). We use borrowers' emissions intensity data provided in S&P Trucost as *di*_319407, *di*_319408 and *di*_319409 variables for scope 1, scope 2 and scope 3, respectively.

We merge bank-borrower level loan data from Dealscan with borrower financial data and S&P Trucost emissions data using the GVKEY identifier for public borrowers and the CIQ

[7]Using regulatory data Blickle et al. (2020) propose a method to predict missing lender shares for USD-denominated loans syndicated in the USA and Canada. As our sample includes global syndicated loans in all currencies we cannot adopt their approach. For the subsample of USD-denominated loans syndicated in the USA and Canada, the correlation between our imputed shares and their predicted shares is 0.9.

identifier for private borrowers. Bank-level financial information is collected from Compustat North America, Compustat Global, Capital IQ, Bank Call Reports (for U.S. banks), Bankscope and individual bank websites. Following Schwert (2018), we use the provided linking table to match banks in Dealscan to Compustat and Bankscope. For completeness, we fuzzy name-match bank names to Call Reports, and to match Compustat and Bankscope for banks not included in the linking table. For banks which remain unmatched, we manually identify name matches in Capital IQ. The final sample uses data from Compustat, supplemented by Bank Call Reports, Bankscope, and Capital IQ for banks without data in Compustat. All financial variables are converted to million USD using year-end exchange rates from I/B/E/S. The resulting dataset comprises 233 banks and 5,959 borrowing firms between 2010 to 2023.[8]

3.2. Financed Emissions

Financed emissions of banks are defined as indirect emissions attributed to financing activities, such as lending and investments. To calculate banks' financed emissions through lending, we follow a methodology similar to the Partnership for Carbon Accounting Financials' (PCAF), the Global GHG Accounting and Reporting Standard.[9] To distinguish between divestment and engagement, we calculate financed emissions in two distinct ways. For the *divestment* channel regressions, we construct parent lenders' financed emissions of newly originated loans in a given year t by including all borrowers with non-missing scope 1, scope 2, and scope 3 emissions intensity data in the loan origination year t. For the *engagement* channel regressions, we keep the loan amount from the loan origination year fixed

[8]We start our sample period in 2010 to avoid any effects on bank lending of global financial crisis. We end our sample in 2023 as S&P Trucost data is complete until the end of 2023 at the time this paper is written.

[9]PCAF allocates GHG emissions from loans based on the proportional share of lending to the borrower by computing the product of an attribution factor and absolute emissions (PCAF, 2022). We use a product of emissions and borrowing amount at origination, where the attribution factor is equal to the borrowing amount scaled by the borrower's annual revenue.

and track the borrowers' emissions intensities through the three years after loan origination.

3.2.1. Divestment Channel

To assess the divestment channel, we calculate lead and participant lenders' annual financed emissions from new loan originations as follows:

$$Financed\ Emissions_{j,t} = \log\left(1 + \sum_{i} Borrowing\ amount_{i,j,t} \times Emission\ intensity_{i,t}\right) \quad (1)$$

where j indicates lenders, t indicates years and i indicates borrowing firms. For each lender-borrower pair in a given year t, we calculate *Borrowing amount* as the sum of each bank's lender share multiplied by the USD value of the tranche amount ($lender\_share * tranche\_amount\_converted$) for all loan originations of borrower i in year t. *Emission intensity*$_{i,t}$ is calculated using scope 1 intensity (di_319407) + scope 2 intensity (di_319408) + scope 3 intensity (di_319409) of borrower i in year t. We take the natural logarithm since the distributions of the emission intensity variables in the raw data presented in Table A5, Panel B are right-skewed.

Considering that firms in the fossil fuel sector are the largest contributors to global climate change, we also compute financed emissions separately for banks' energy-sector and non-energy-sector lending portfolios. Specifically, we apply equation (1) by restricting the sample to borrowers operating in the energy and non-energy sectors, respectively. We define energy sector borrowers as firms operating in the production and distribution of electricity (i.e. fossil fuel and utilities sectors) identified using the two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample.

In addition to distinguishing between energy and non-energy sector exposures, we also explore whether banks' incentives to divest and engage differ between their relationship (existing) borrowers and non-relationship (new) borrowers by constructing relationship and non-relationship lending portfolios. Following Bharath et al. (2011), we identify a bank-borrower relationship using an indicator variable of whether a firm has borrowed from the same lead lender in the last five years. In a typical syndicated loan, lead lenders negotiate the primary loan terms with the borrower and subsequently form a syndicate of participating lenders that jointly provide the required funds. Lead lenders (or arrangers) analyze the credit quality, negotiate key terms with borrowers before inviting a group of banks to participate and are responsible for allocating lender shares among participating banks (Lin et al., 2012), suggesting that borrowers are monitored by lead banks. Therefore, first, we identify lead lenders of each loan tranche from the *lead_arranger* variable in the data. Then, we calculate the borrowing amounts for the relationship borrowers of each lead bank, and non-relationship borrowers of each lead and participant bank. Finally, we separately calculate the financed emissions of each bank for its relationship and non-relationship lending portfolios.

In our sample the syndicated loan portfolio of an average lender at origination produces 18.9 billion tCO_2e of scope 1 emissions, 4.1 billion tCO_2e of scope 2 emissions, and 22.4 billion tCO_2e of scope 3 emissions. These correspond to emissions intensities of 1,048,097 tCO_2e per USD million for scope 1, 185,777.5 tCO_2e per USD million for scope 2, and 701.545 tCO_2e per USD million for scope 3. After normalizing using the natural log scale, an average lender in our sample, after accounting for lender share and borrowing amount, has a mean (median) of 12.49 (12.61) of financed emissions (Table 1, Panel A). The average logged financed emissions of banks' relationship and non-relationship lending portfolios is 6.46 and 12.21, respectively. The average normalized financed emissions of banks' energy sector lending portfolios is 8.03, compared to 11.85 for non-energy sector portfolios. The energy sector lending portfolios exhibit lower mean logged financed emissions, due to substantially lower total lending volume to the energy sector presented in Table A5, Panel A. In addition, there is smaller sample of

energy sector borrowers (1,346) compared to non-energy sector borrowers (12,316), shown in Table A5, Panel B. We plot the evolution of the average financed emissions of lenders in our sample in Figure 1, which shows that after the Paris Agreement there is an increasing trend in lenders' financed emissions until 2021, and a sharp decrease starting from 2022.[10] Aggregate financed emissions may respond to many common macro-financial forces, including changes in global credit conditions, commodity prices, and interest rates. Our identification comes from differential changes between *Brown* and *Green* banks in a difference-in-differences framework with year fixed effects, which absorb common time-series shocks affecting all banks.[11]

3.2.2. Engagement Channel

The second channel through which banks may reduce their financed emissions is borrower engagement following loan origination. In the context of decarbonization, engagement entails active screening and monitoring of borrowers by lenders with the aim of reducing borrowers' emissions. To assess whether such engagement occurs, we examine changes in borrowers' emissions after a loan is granted, for loans originated before and after the Paris Agreement. Since our focus is on banks' monitoring efforts, we exclude originate-to-distribute loans defined as *tranche_type* "Term Loan B-K" and those loans that have non-bank lenders identified using the "institutional" category in the *market_segment* variable in the data (Erel and Inozemtsev, 2025). In addition, because participant lenders typically provide capital without direct borrower interaction, whereas lead lenders engage in communication and loan renegotiation with the borrowers, we restrict this analysis to lead lenders of each tranche.

If the Paris Agreement has an impact on banks' behavior, we would expect to see an

[10]The average financed emissions in this graph are calculated using arithmetic average. As a robustness, we provide the evolution of size-weighted financed emissions in Internet Appendix Figure IA.1, which shows similar trends over time.

[11]To ensure that the post-Paris estimates are not driven exclusively by later macro-financial conditions, such as the tightening cycle beginning in 2021 across the world, we re-estimate the main specifications excluding the last two years of the sample. The results remain qualitatively similar and are provided in the Internet Appendix Table IA.5.

increase in lead banks' engagement efforts that result in lower borrower emissions intensities. To test this, we track the emissions intensities of each lead lender's borrowers over the three years following the loan origination year, restricting the sample to loans with a minimum maturity of thirty-six months to allow enough time to observe effects, and to borrowers that did not get another loan throughout these three years to avoid any effects from additional borrowing and monitoring. The analysis includes only those borrowers with non-missing emissions data for four consecutive years beginning from the loan origination year.

We begin by calculating post-loan financed emissions for each bank-level loan origination portfolio over the subsequent three years. We compute these measures separately for loan cohorts originating in the pre-Paris (2010-2012) and post-Paris (2016-2020) periods. Specifically, for each loan origination year, we track the financed emissions of each bank's loan portfolio over event-time t= 0,1,2,3 and then compute the average financed emissions across the pre- and post-Paris cohorts, separately.[12] The choice of origination years allows us to follow each loan cohort for three years through the end of our sample period without overlap between the pre-Paris and post-Paris cohorts.[13] Since borrowers may not demand a loan from the same bank every year, we compute the bank-level averages of financed emissions within pre-Paris and post-Paris cohorts for each event time to prevent the results from being driven by any single origination cohort or borrower pool associated with a given lead bank.

To calculate the average financed emissions in each event time, we define a modified

[12]We acknowledge that three-year post-loan origination might be a very short time period to observe any effects of bank monitoring on financed emissions. However, we are limited by the number of years passed since Paris and increasing the number of years reduces the number of cohorts we can assess, imposing bias towards a certain year in pre- and/or post-Paris analyses.

[13]An overlap arises when a loan originates in a pre-Paris year (2013, 2014 or 2015) but its three years post-origination window coincide extends into or beyond 2016, the year of the Paris Agreement's ratification. Since the Paris Agreement might impact a lender's screening and monitoring efforts, we exclude loan origination years 2013-2015 to avoid such overlap.

version of equation (1) as follows:

$$Financed\ Emissions_{j,t} =$$
$$\log\left(1 + \frac{1}{N_{pre}\ or\ N_{post}} \sum_{\substack{n_{pre}\in\{2010-2012\} \\ \vee\ n_{post}\in\{2016-2020\}}} \sum_{i} Borrowing\ amount_{i,j,n,0} \times Emission\ intensity_{i,n+t}\right) \tag{2}$$

where j indexes banks, i borrowing firms, loan-origination cohorts n (pre-Paris $n_{pre} \in \{2010, 2011, 2012\}$; post-Paris $n_{post} \in \{2016, ..., 2020\}$), and $t \in \{0, 1, 2, 3\}$ event time relative to loan origination. For each bank-firm-cohort (j,i,n) we calculate *Borrowing amount* at origination as the sum of bank j's lender share multiplied by the USD value of the tranche amount (*lender_share*tranche_amount_converted*) for all loan originations of firm i in cohort year n. By construction, *Borrowing amount* is fixed at origination (event time t=0) and *Emission intensity* updates with t. For example, for the 2010 loan origination cohort at t = 0, financed emissions reflect 2010 *Borrower amount* and 2010 *Emission intensity*. At t=1, financed emissions use the same 2010 *Borrower amount* and 2011 *Emission intensity*. This pattern continues such that t=2 and t=3 financed emissions are based on 2010 *Borrowing amount* and *Emission intensity* in 2012 and 2013, respectively. The 2011 loan origination cohort is defined analogously, with 2011 *Borrowing amount* and 2011-2014 *Emission intensity*. In all cases, financed emissions are calculated using the borrowing amount at origination year and borrower emissions intensities in the corresponding event year. After calculating cohort- and event-time financed emissions for each lender and origination cohort, we compute the average financed emissions across the three pre-Paris cohorts (2010- 2012) ($N_{pre} = 3$) and five post-Paris cohorts (2016-2020) ($N_{post} = 5$) for each lender j and event time t. To reduce skewness in the distribution of financed emissions measured in metric tons CO_2e (tCO_2e), we apply a logarithm transformation to the calculated values.

Similar to *divestment* analysis, we calculate the energy and non-energy sector portfolios as

well as relationship and non-relationship lending portfolios of *engagement* subsample using equation (2). The summary statistics of *engagement* subsample are reported in Table 1, Panel B. On average, banks in this sample have mean (median) log-unit financed emissions of 11.98 (12.22). The mean logged financed emissions of banks' relationship lending portfolios is 8.94 and that of non-relationship lending portfolios is 11.35. The mean logged financed emissions of banks' energy sector lending portfolios is 7.77, while that of banks' non-energy sector portfolios is 11.32.

3.3. Definition of *Brown* and *Green* banks

We classify banks as *Brown* and *Green* banks based on their exposure to energy-sector lending prior to the Paris Agreement. Since larger banks' lending amount will be larger, in each bank-year, we compute *Energy intensity* as the ratio of lending to energy-sector borrowers to total lending. We then compare each bank's energy intensity to the median energy intensity of all banks in the pre-Paris period (2010-2015). Banks with above-median energy intensity are classified as *Brown* (treatment group), while banks with below-median energy intensity are classified as *Green* (control group).[14] Under this classification, 111 of the 233 lenders in our sample, are classified as *Brown* and 122 as *Green*.

3.4. Control Variables

To control for time-varying heterogeneity across banks, we include bank-level accounting and financial variables in all our regressions. Specifically, we define *Size* as the natural logarithm of lender's total assets, return on assets (*ROA*) as net income divided by total assets, and *Leverage* as total liabilities divided by total book value of equity. We calculate

[14]Using the average energy intensity of all banks in the pre-Paris years to define green and brown banks helps mitigate potential bias arising from anticipatory behavior in the lead-up to the Paris Agreement. Specifically, it reduces the risk of misclassifying *Brown* (*Green*) banks as *Green* (*Brown*) if they reduced (increased) lending to energy sector firms in a certain year leading up to the Paris Agreement.

Total lending amount as the natural logarithm of one plus the sum of each bank's lender share multiplied by the dollar value of tranche amount lent in each year (*lender_share* tranche_amount_converted*) for all borrowers, including those for which we do not obtain carbon emissions data. To control for the banks whose lending strategy may not be consistent with divesting from the energy sector (i.e. banks specialized exclusively in lending to energy sector firms), we include an *Energy specialization* variable, defined following the excess specialization measure developed by Blickle, Parlatore, and Saunders (2023). While the authors define excess specialization for every sector, for the purpose of our analysis, we define it only for the energy sector. Therefore, *Energy specialization* is defined as the difference between two ratios in each year: bank i's lending to the energy sector relative to its total lending across all sectors, and all banks' lending to the energy sector relative to all banks' total lending across all sectors. In addition, we control for competition by including Herfindahl-Hirschman index (HHI) variable, defined as the sum of the square of the ratio of bank i's lending amount to sector s (defined using SIC 2-digit classification) to its total lending amount in each year, across all sectors.

According to the summary statistics presented in Table 1, Panel A, an average bank in the sample has a size of $422.92 billion (11.69 in natural logarithm), book leverage ratio of 13.95, and ROA of 0.7%. The total lending amount is $5.27 billion (6.99 in natural logarithm), on average, among which 13.7% is granted to energy sector firms.[15] We observe similar values for the engagement portfolio of loans presented in Table 1, Panel B, even though the sample size is smaller by construction.

In addition to bank-specific characteristics and performance, lending decisions also depend heavily on borrower attributes. While it is not feasible to control for the performance of individual borrowers in a lender-level portfolio analysis, we include average borrower characteristics and performance at the year of loan origination to account for average borrower-level

[15] As defined in the previous section, *Energy intensity* is the ratio of a banks' lending to energy sector borrowers to its total lending across all borrowers in a given sample year.

factors that may influence loan terms,especially the loan amount, which is a component of financed emissions. Specifically, we construct measures of average *Borrower Size* (the natural logarithm of one plus total assets), *Borrower Leverage* (total debt divided by the book value of equity), and *Borrower ROA* (net income over total assets). Since borrowers in the syndicated loans market can be public or private firms, we collect data from CapitalIQ, Compustat North America, and Compustat Global.

Syndicated loans include lenders from multiple countries. Therefore, in addition to financial ratios, we collect GDP and GDP growth rate variables from the World Bank's World Development Indicators (WDI) to control for country-level time-varying macroeconomic factors that might influence lending decisions focusing on the country where a lender is headquartered.[16] Table 1, Panel A, reports that the countries in which the lenders in our sample are located have an average GDP of about $720 billion ($27.3 in natural logarithm) and an average GDP growth rate of 2.44%.

4. Empirical Strategy

The adoption of the Paris Agreement in December 2015 constitutes a plausibly exogenous shock to financial institutions by generating a sudden and globally coordinated shift in expectations about climate policy and public awareness of climate risks. It marks a turning point for the finance industry, with climate change becoming a primary concern for customers, investors, and regulators (Ardia et al., 2023). The Agreement brought the topic of climate change to the forefront of policy discussions and investor considerations (Krueger, Sautner, and Starks, 2020), notably by increasingly attracting negative media attention (Engle et al., 2020), but also by reshaping companies' and investors' beliefs about physical climate risk (Ginglinger and Moreau, 2023). Kruse, Mohnen, and Sato (2020) exploit the Paris Agree-

[16]Our sample include banks from Taiwan. As Taiwan is not included in WDI data we collect data on Taiwan from the macro database of the National Statistics of the Republic of China (Taiwan): https://nstatdb.dgbas.gov.tw/dgbasall/webMain.aspx?k=engmain.

ment as an exogenous political shock that signaled increased global commitment to climate action. The authors argue that although markets anticipated ongoing climate negotiations, the timing, content, and breadth of the final accord were not known ex ante, and elements such as the unexpectedly ambitious 1.5°C temperature target and the unanimous support of emerging and developing economies introduced an element of surprise. Mueller and Sfrappini (2025) further argue that it is highly unlikely that reaching such an ambitious accord was anticipated given the high uncertainty around the Paris summit. For all these reasons, numerous studies have used the Paris Agreement as a plausibly exogenous natural shock which led to rising awareness of climate risks in the post-2015 period (e.g., Seltzer, Starks, and Zhu, 2022; Bolton and Kacperczyk, 2024; Kölbel et al., 2024; Delis et al., 2024).

We exploit the enactment of the Paris Agreement as a quasi-natural experiment to identify its causal effect on the financed emissions of banks' lending portfolios. Using a difference-in-differences (DiD) methodology, we compare the financed emissions of the newly-originated lending portfolios of *Brown* banks (treated) and *Green* banks (control) before and after the Paris Agreement. Specifically, we estimate the following equation:

$$\begin{aligned} Financed\ Emissions_{j,t} = \alpha + \beta_1 * (PostParis \times Brown_j) \\ + \gamma_1 * X_{j,t} + \gamma_2 * Z_{k,t} + \delta_j + \theta_t + \varepsilon_{j,t} \end{aligned} \tag{3}$$

where j indicates banks; t indicates years; k indicates home country of bank j and δ_j are bank fixed effects that account for time-invariant unobserved heterogeneity across banks, such as bank culture, management style, geographic location, etc. θ_t are year fixed effects that control for yearly unobserved factors that might affect banks' lending behavior. $X_{j,t}$ includes bank-level control variables to account for time-varying differences between *Green* and *Brown* banks. $Z_{k,t}$ includes country-level control variables defined above (GDP and GDP growth rate). We calculate bank j's financed emissions in year t using equation (1) and equation (2) for the *divestment* and *engagement* channel tests, respectively. Since the

Paris Agreement was signed and ratified in 2016, we define *PostParis* as a dummy variable equal to one for years 2016-2023, and zero for years 2010-2015. Accordingly, the interaction variable $PostParis * Brown$ gives us the difference-in-differences estimation coefficient in the regression while *PostParis* variable drops in the presence of year fixed effects. To ensure our inference is not affected by multicollinearity, we report pairwise correlations among key explanatory variables in Appendix Table A2. The correlation between *Energy specialization* and *Energy intensity* indicators is 0.33, while the correlation between *Size* and *Total lending amount* is 0.62. All correlations are below 0.7, and variance inflation factors are below 2.5 for all variables, indicating multicollinearity is not a concern.

5. Results

We explore two channels through which banks can decarbonize their lending portfolios. One is the *divestment* channel, which includes withdrawing lending or reducing the loan amount to high-emitting borrowers and reallocating capital to less-emitting borrowers. The second is the *engagement* channel, which refers to screening and monitoring of borrowers and engaging with them to reduce their carbon footprint while continuing to lend.

5.1. Effect of Paris Agreement on Banks' Divestment

In this section, we investigate whether the Paris Agreement had an impact on *Brown* banks' financed emissions through the *divestment* channel. For each bank, we focus on newly issued loans in each year to track changes in the financed emissions of their lending portfolios. Since energy sector borrowers are known to be major emitters, we analyze whether *Brown* banks treat these borrowers differently with regard to their lending decisions. To do so, we look at how financed emissions of *Brown* banks' lending portfolios differ across energy and non-energy sector borrowers in the pre- versus post-Paris years. We present the results of

our estimation of equation (3) in Table 2. In columns (1) and (4), we present our estimation results using all energy sector borrowers and all non-energy sector borrowers, respectively. In column (1) we observe a 1.309 decrease in *Brown* banks' logged financed emissions in energy sector borrower portfolios in the post-Paris years, statistically significant at the 1% level. This decrease is economically significant too, corresponding to 16.3% of the mean logged value of financed emissions of these portfolios (1.309/8.031). On the other hand, in column (4) there is a positive but statistically insignificant effect in *Brown* banks' financed emissions in non-energy sector borrower portfolios in the post-Paris years.

To observe whether banks exert more effort to screen and monitor the energy sector borrowers when they have an ongoing lending relationship, we estimate equation (3) separately for the banks' relationship and non-relationship lending portfolios within energy sector and non-energy sector portfolios in columns (2) and (3), and columns (5) and (6), respectively.[17] These results show that the statistically significant decrease we observe in energy sector portfolios are driven exclusively by the non-relationship lending portfolios of *Brown* banks. Specifically, in column (2) we find a 0.094, statistically insignificant, increase in *Brown* banks' logged financed emissions in energy-sector relationship lending portfolios in the post-Paris years. On the other hand, in column (3), we find 1.516 decrease in *Brown* banks' financed emissions in energy sector non-relationship lending portfolios in the post-Paris years, statistically significant at the 1% level and corresponding to 19.8% of the mean logged financed emissions of these portfolios (1.516/7.642). In comparison, we do not find statistically significant changes in non-energy sector relationship and non-relationship lending portfolios in columns (5) and (6), respectively.

To substantiate that these results are driven by the Paris Agreement and not by confounding factors, we provide evidence that the treated (*Brown* banks) and control (*Green* banks) groups have parallel trends in the years prior to the Paris Agreement. In Figure 2 we plot the coefficients of a dynamic difference-in-differences model, which estimates the

[17] We report regressions using banks' total portfolios in Appendix Table A3.

differences in financed emissions between *Brown* and *Green* banks over the sample period, for relationship and non-relationship lending portfolios. We use year $t-1$ (2015) as the base year and include all control variables from Table 2. We plot the graphs with 95% (vertical lines) and 99% (shaded areas) confidence intervals. The graphs show that at least three years prior to the Paris Agreement, *Brown* and *Green* banks do not have statistically significant differences in their financed emissions at the 1% significance level.

To disentangle the underlying drivers of these changes, we decompose the financing and emissions components in Section 5.1.1.

5.1.1. Component Analysis of Financed Emissions

In this section, we investigate whether the divestment results we document in the previous section are driven by changes in the financing component or by changes in the emissions intensity component of the financed emissions variable defined in equation (1). In the *divestment* channel, the financing component consists of three sub-components: the ratio of energy-sector or non-energy-sector borrowers to total borrowers, lending amounts, and lender share. In the post-Paris years, *Brown* banks' lending portfolios may reallocate lending away from energy-sector borrowers and towards non-energy sector borrowers, and/or shift within each sector from non-relationship to relationship borrowers. To capture the aggregate shifts we re-estimate equation (3) using the ratio of energy-sector borrowers to total borrowers as the dependent variable in the energy-sector portfolio regressions in Table 3, columns (1)-(3), and the ratio of non-energy-sector borrowers to total borrowers as the dependent variable in non-energy-sector portfolio regressions in columns (4)-(6). We find that in the post-Paris years, *Brown* banks have fewer energy-sector borrowers (column (1)) and more non-energy-sector borrowers (column (4)), compared to *Green* banks and the pre-Paris period. The decline in energy-sector borrowers in column (1) is driven entirely by a reduction in non-relationship borrowers in column (3), suggesting that the decline in financed emissions we

document in energy-sector non-relationship lending portfolios in Table 2 is partly driven by a decline in the number of borrowers in this portfolio in the post-Paris years. The increase in non-energy-sector borrowers reflects an increase in non-relationship borrowers (columns (5) and (6)) exclusively.

We complement the above analysis with intensive-margin tests that attempt to disentangle credit supply from credit demand.[18] We estimate bank-borrower-level regressions that exploit firms' simultaneous relationships with multiple banks, to absorb borrower-level demand shocks. The empirical specification is given by equation (4) below:

$$\begin{aligned} Lending\ Amount_{i,j,t} = \alpha &+ \beta_1 * (PostParis \times Brown_j) + \beta_2 * (PostParis \times Rel.ship_j) \\ &+ \beta_3 * (PostParis \times Brown_j \times Rel.ship_j) + \gamma_1 * X_{j,t} \\ &+ \gamma_2 * Z_{k,t} + \eta_{i,t} + \delta_j + \varepsilon_{i,j,t} \end{aligned} \tag{4}$$

where i indicates borrowers; j indicates banks; t indicates years; k indicates home country of bank j, lending amount is defined as the product of lender share and tranche amount summed across all loan tranches between a bank-borrower pair in a given year, and δ_j are bank fixed effects to account for time-invariant unobserved heterogeneity across banks such as bank culture, management style, geographic location, etc. $\eta_{i,t}$ denotes borrower*year fixed effects which control for unobserved time-varying factors such as firm-level credit demand, changes in investment opportunities, cash flows, risk, funding needs, and exposure to aggregate or sector-specific shocks.

We also estimate loan-level regressions using lender share as a dependent variable. Specif-

[18]Syndicated loan data from Dealscan record only originated loans and do not include information on loan applications or rejections, thus we cannot directly identify whether the estimated effects reflect shifts in credit demand or changes in credit supply.

ically, we estimate equation (5) below:

$$\begin{aligned} Lender\ Share_{l,i,j,t} = \alpha + \beta_1 * (PostParis \times Brown_j) + \beta_2 * (PostParis \times Rel.ship_j) \\ + \beta_3 * (PostParis \times Brown_j \times Rel.ship_j) + \gamma_1 * X_{i,t} + \gamma_2 * Z_{j,t} \\ + \gamma_3 * Z_{k,t} + \gamma_4 * Z_{l,t} + \eta_i + \delta_j + \theta_t + \varepsilon_{l,i,j,t} \end{aligned} \tag{5}$$

where l indicates loans, i indicates borrowers; j indicates banks; t indicates years; k indicates homes country of bank j, and η_i, δ_j and θ_t are firm, bank and year fixed effects. Summary statistics for lending amounts of portfolios and borrower-level emissions intensities are reported in Appendix Table A5, Panel A and B respectively. Panel A shows that lending amounts to energy-sector borrowers are lower than those to non-energy borrowers, and relationship lending portfolios have lower lending amounts in both sectors. Panel B confirms that despite the lower lending amounts energy sector borrowers have much higher emissions intensities compared to non-energy sector borrowers.

In Table 4 columns (1)-(4), we present bank-borrower level regressions of lending amounts. To account for demand-side factors we include borrower*year fixed effects in all specifications. Columns (1) and (2) report results for energy-sector relationship and non-relationship lending portfolios, respectively whereas, columns (3) and (4) report results for non-energy-sector relationship and non-relationship lending portfolios, respectively. The estimates indicate that in the post-Paris years, there is a statistically significant increase in *Brown* banks' lending amount to energy sector relationship borrowers in column (1) whereas, in column (2) we find a negative, yet statistically insignificant effect on *Brown* banks' lending amount to energy sector non-relationship borrowers in the post-Paris years, compared to *Green* banks and pre-Paris years. In column (3), we observe no statistically significant effect on *Brown* banks' lending amount to non-energy sector relationship borrowers. However, in column (4) we find an increase in *Brown* banks' lending amount to non-energy sector non-relationship borrowers.

In columns (5) and (8) of Table 4, we further breakdown the lending amount from the previous analysis and focus on lender shares in each loan tranche since lender share is exclusively determined by lenders and reflect only supply side factors. We estimate these regressions at the loan level and add loan amount and loan maturity as additional controls. According to these analyses, we observe a positive but statistically insignificant effect on *Brown* banks' loan shares in energy sector relationship and non-relationship borrowers' loans. In non-energy sector results in columns (7) and (8), we observe a statistically significant decline in loan share of *Brown* banks' non-energy sector non-relationship borrowers' loans in the post-Paris years.

Next, we examine the emissions component of the financed emissions measure. Using the natural logarithm of borrowers' scope 1 + scope 2 + scope 3 emissions intensity as the dependent variable, we estimate equation (3) at the bank-borrower level and report the results in Table 5. These results show that the declines in financed emissions of energy sector non-relationship portfolios documented in Table 2 are also driven by a reduction in the borrowers' emissions intensities in the post-Paris years. Specifically, in the post-Paris period, *Brown* banks lend to lower-emitting, energy sector non-relationship borrowers. In non-energy sector, *Brown* banks form new relationships with lower emitting borrowers in the post-Paris years compared to pre-Paris years and *Green* banks.

Taken together, the results from our component analyses of the *divestment* channel suggest that the observed decrease in the financed emissions of *Brown* banks energy-sector non-relationship portfolios in the post-Paris years is driven by a decrease in the ratio of new borrowers to total borrowers (Table 3), and a strategic shift toward lending to lower-emitting new borrowers(Table 5). On the other hand, considering the positive but statistically insignificant results in energy-sector relationship lending portfolios in Table 2, the statistically significant increase in lending amount to this portfolio of borrowers is not large enough to dominate the overall effect in the bank-level portfolio analysis, which includes a statistically insignificant, yet negative effect on the ratio of borrowers (Table 3) and emissions inten-

sity (Table 5) in the post-Paris years. In the non-energy sector relationship lending portfolio results, we observe a negative effect in all components of financed emissions, with only statistical significance observed in emissions intensity results (Table 5). Yet, overall, these effects do not dominate across banks in the bank-level portfolio analysis.

5.2. Effect of Paris Agreement on Banks' Engagement

In this section, we investigate whether the Paris Agreement had an impact on banks' financed emissions through the *engagement* channel. Similar to our *divestment* channel discussion we expect relationship lenders to have more incentives to screen and monitor their borrowers' emissions intensity than one-time, non-relationship lenders in the post-Paris years. We expect to observe this effect especially in *Brown* banks' energy sector lending portfolios. Therefore, we compare banks' average financed emissions of pre-Paris loan origination cohorts to those of post-Paris loan origination cohorts defined in Section 3.2.2. In Table 6 we present the results of our estimation of equation (3) using the financed emissions calculated in event time in equation (2) for the banks' relationship and non-relationship lending portfolios within energy sector and non-energy sector portfolios in columns (2) and (3), and columns (5) and (6), respectively.[19] In the energy-sector portfolio results in columns (1), we find that *Brown* banks decrease their financed emissions in the post-Paris years. Surprisingly, however, in the energy sector relationship lending portfolios in column (2) we observe a statistically significant increase of 1.494 in the financed emissions of *Brown* banks post-Paris at the 10% statistical significance level. This effect corresponds to about a 29.2% increase in the mean logged financed emissions of the energy-sector relationship lending portfolios (1.494/5.112). The negative effect in column (1) originates exclusively from the banks' non-relationship lending portfolios in column (3). Specifically, column (3) indicates that there is a 2.629 decrease in the financed emissions of *Brown* banks post-Paris at the

[19] We provide the results of regressions using banks' total portfolios in Appendix Table A4.

5% statistical significance level, corresponding to about a 40% decrease in the mean logged financed emissions of the energy-sector non-relationship lending portfolios (2.629/6.588). This result in non-relationship lending portfolios can be interpreted as the continuation of divestment results we report in Table 2. That is, banks lend to fewer and lower-emitting non-relationship energy-sector borrowers in the post-Paris years and these borrowers continue to emit lower compared to those in the pre-Paris years. We do not find statistically significant changes in the non-energy sector relationship or non-relationship lending portfolio results in columns (4)-(6) of Table 6. In sum, this analysis documents that there is no evidence of engagement efforts of *Brown* banks in the post-Paris years throughout our sample period.

5.3. Heterogeneity Tests of ESG Stakeholders and Country-Level Carbon Pricing Polices

5.3.1. ESG Stakeholders

Banks' incentives to screen and monitor borrowers' emissions can depend on the broader financing environment in which borrowers operate, particularly when borrowers have environmental, social or governance (ESG)-oriented institutional investors or issue green bonds (Flammer, 2021). Borrowers with ESG-focused institutional investors or green bond commitments (ESG stakeholders), are subject to greater public scrutiny, heightened reputational concern, and in many cases, environmental disclosure requirements and specific environmental targets. These external pressures create additional discipline that may reduce banks' perceived monitoring costs or climate-risk exposure, as such borrowers are already incentivized to maintain strong environmental performance. In this setting, banks may rely more heavily on the oversight provided by ESG stakeholders, thereby reducing the need for intensive monitoring or alternatively, they might coordinate monitoring efforts with these stakeholders. In contrast, borrowers who rely solely on bank financing may face less external pressure to disclose or manage emissions, placing more responsibility on banks to screen and

monitor environmental risks. For these borrowers, banks' incentives to screen and monitor may be stronger; which can lead to stricter screening at origination and portfolio rebalancing towards lower-emitting clients.

In this section we analyze heterogeneity in the *divestment* and *engagement* channels by separating banks' lending portfolios based on whether borrowers have other ESG stakeholders - specifically, ESG-oriented institutional investors and/or green bond issuance. Following Atta-Darkua et al. (2023), we identify ESG-focused institutional investors as the global institutional investors that are signatories of the Carbon Disclosure Project (CDP), an independent and the most prominent investor-led initiative to combat climate change. Using institutional ownership (13F) filings data from LSEG, we name-match the institutional equityholders of our sample borrowers to CDP-signatory institutional investors. To identify borrowers that issue or have outstanding green bonds we use the global green bond issuer database compiled by the Banque de France (Descombes, Kergadallan, and Le, 2022) and name-match these issuers with our borrower sample. Using equation (1) for *divestment* channel and equation (2) for *engagement* channel, we construct two lending portfolios for each bank in each year: (1) a portfolio composed of borrowers with *ESG stakeholders*, and (2) a portfolio composed of borrowers with *only bank financing* throughout the sample period. Within each portfolio, we define energy and non-energy sector borrower groups, and within those, relationship and non-relationship lending portfolios. For each sub-portfolio we estimate equation (3) and report the corresponding results in Tables 7 and 8 for the *divestment* and *engagement* channels, respectively.

Table 7, Panel A reports results for energy sector and non-energy sector portfolios of borrowers with *only bank financing*. Consistent with our main findings, we find strong evidence that *Brown* banks divest from their energy sector non-relationship lending portfolios in column (3). Specifically, we observe a statistically significant decrease of 18.57% (1.308/7.044). In the non-energy sector lending portfolios (columns (4)-(6)), we find insignificant changes in relationship lending and non-relationship lending portfolios portfolios.

In Panel B we provide the results for borrowers with *both* bank financing and ESG stakeholders. Here, we find a statistically significant decline in the financed emissions of the energy-sector non-relationship lending portfolios in column (3) and a statistically significant increase in the non-energy-sector non-relationship lending portfolios of *Brown* banks in the post-Paris years in column (6). The decline in column (3), significant at the 5% level, corresponds to a 22.31% decrease relative to the logged mean of these portfolios (0.761/3.411), while the increase in column (6), also significant at the 5% level, corresponds to a 12.9% increase relative to the logged mean of these portfolios (0.852/6.602).

Taken together, these results show that *Brown* banks exert similar environmental monitoring pressure on borrowers who have *only bank financing* and *both* bank financing and ESG stakeholders.

The *engagement* channel regressions in Table 8 Panel A show a statistically significant decline only in the financed emissions of energy sector non-relationship lending portfolios with only bank financing. These results are similar to what we document in Section 5.2 that *Brown* banks lend to fewer and lower-emitting energy sector non-relationship borrowers in the post-Paris years, and these borrowers continue to emit lower compared to those in the pre-Paris years. In Panel B, we do not observe a statistically significant change in the financed emissions of energy sector portfolios of borrowers with *both* bank financing and ESG stakeholders. However, we observe an increase of 36.8% (1.654/4.494), significant at the 10% level, in the financed emissions of non-energy sector relationship lending portfolios of borrowers with *both* bank financing and ESG stakeholders in column (5).

5.3.2. Carbon Pricing Policies in Borrower Countries

The syndicated loans market is inherently global, connecting borrowers and lenders across borders through large-scale loan agreements. This cross-border structure implies that lenders and borrowers operate under heterogeneous carbon-pricing regimes, reflecting differences in

their home-country regulatory environments. While, relatively few jurisdictions impose binding environmental regulations directly on banks, stricter regulatory requirements on borrowers shape the borrowers' environmental performances and outcomes, potentially encouraging borrowers to pursue more environmentally sustainable practices. Accordingly, we investigate whether the effects we report in our baseline analyses originate from borrowers located in countries with carbon-pricing mechanisms or instead they reflect banks' own efforts to decarbonize their lending portfolios. If the effects we observe are driven exclusively by borrowers from countries with environmental regulations (regulated borrowers), we expect no statistically significant changes in the financed emissions of portfolios of borrowers from countries without environmental regulations (unregulated borrowers). On the other hand, if these effects are driven by banks' own decarbonization strategies, we expect to observe similar reductions in the financed emissions of *Brown* banks across post-Paris lending portfolios of borrowers from both regulated and unregulated countries.

We exploit this heterogeneity among borrower portfolios using country- or region-level (EU) environmental regulations of carbon taxes (CT) and emissions trading systems (ETS). Among the 77 countries where our sample borrower firms are headquartered, we identify those that have adopted CT and/or ETS regulations before the Paris Agreement was enacted, from the World Bank's Carbon Pricing Dashboard. According to this definition, there are 30 borrower countries with environmental regulations in our sample.[20] We test the *divestment* channel across sub-samples of energy and non-energy sector borrowers by computing the financed emissions of borrowers located in countries with and without carbon pricing policies using equation (1). We test the engagement channel of the same sub-samples by identifying event-time financed emissions of the portfolios of borrowers from countries with and without carbon pricing policies as dependent variables using equation (2).

[20]These countries are Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, South Korea, Spain, Sweden, Switzerland, Ukraine and United Kingdom.

Table 9 presents the results of the estimations of equation (3). Panel A reports the impact of the Paris Agreement on the financed emissions of borrowers located in countries that have implemented carbon pricing policies (i.e., *regulated borrowers*). Columns (1)-(3) show that *Brown* banks significantly decrease the financed emissions of non-relationship lending portfolios of regulated borrowers after the Paris Agreement. Specifically, in column (3), *Brown* banks experience a decrease of 0.755 in logged financed emissions of energy sector non-relationship lending portfolios of regulated borrowers at the 5% statistical significance level that corresponds to about 21.11% (0.755/3.575) of the mean logged value of financed emissions of these portfolios. On the other hand, in columns (4)-(6) we do not observe statistically significant changes in the financed emissions of non-energy sector regulated borrowers in the post-Paris years.

In Panel B we report the impact of Paris Agreement on the financed emissions of unregulated borrowers. In column (3), *Brown* banks experience a decrease of 1.596 in logged financed emissions of energy sector non-relationship lending portfolios of unregulated borrowers at the 1% statistical significance level that corresponds to about 25.97% (1.596/6.146) of the mean logged value of financed emissions of these portfolios. Notably, no significant differences are observed between energy sector regulated and unregulated borrowers in relationship and non-relationship lending portfolios between Panels A.1 and A.2, suggesting that *Brown* banks exert efforts to decarbonize their lending portfolios of unregulated borrowers, as the effect is not only driven by regulated borrowers with home-country carbon pricing policies. In comparison, we do not find statistically significant changes in regulated or unregulated non-energy sector portfolio borrowers in both Panels A and B in the post-Paris years.

In Table 10, we examine the *engagement* channel across heterogeneous regulatory environments. Panels A and B report results for financed emissions of regulated and unregulated borrowers, respectively. As shown in Panel A, financed emissions of *Brown* banks' relationship and non-relationship lending portfolios - across both energy and non-energy sectors - do

not exhibit statistically significant changes in the post-Paris period for regulated borrowers. Panel B shows that for unregulated borrowers, financed emissions decline significantly only for energy sector non-relationship lending portfolios in column (3). The estimated effect corresponds to a 3.426 log-point reduction in financed emissions, significant at the 1% level that corresponds to about 61.87% (3.426/5.537) of the mean logged value of financed emissions of these portfolios. This finding is consistent with results from previous sections, indicating that lower-emitting new borrowers of *Brown* banks in the post-Paris period continue to exhibit lower emissions over the subsequent three years of the life of the loan, compared to pre-Paris cohorts and *Green* banks. On the other hand, financed emissions of energy sector relationship lending portfolios of unregulated borrowers in column (2) increase by 54.79% (1.852/3.38) in the post-Paris years, statistically significant at the 10% level. In the non-energy sector we do not observe statistically significant changes in the post-Paris period for regulated borrowers. In sum, these findings also provide evidence that the results we document in our main analyses are not driven by home-country environmental regulations of borrowers. Instead, the effects originate from the decarbonization efforts of *Brown* banks..

5.4. Robustness Tests and Additional Analyses

Continuous Difference-in-Differences (DiD) Estimations: As our first robustness test we estimate continuous DiD model replacing the dummy variable *Brown* with the continuous measure of each bank's median energy intensity ratio over the pre-Paris years (2010-2015), to allow for actual variations in energy financing across banks. We present these results in Appendix Tables A6-A9, which provide evidence that our main results are robust to this definition.

Data Coverage: One possible explanation to our results could be that the coverage of S&P Trucost data may have expanded over time bringing more lower-emission firms into the sample. We plot the ratio of energy and non-energy sector borrowers with S&P Trucost

data to total number of borrowers in each year in Appendix Figure A1. According to this, the ratio of energy and non-energy borrowers with S&P Trucost data follow a very similar pattern, ruling out data coverage concerns.

Alternative Data Source for Emissions: To rule out additional data-driven concerns, we change our emissions data source and use the Corporate GHG Emission Estimations (COGEM) data developed by Barreau, Fahmaoui, and Tankov (2025); Nguyen, Diaz-Rainey, and Kuruppuarachchi (2021) and Assael et al. (2023) and provided by Pladifes hosted at the Institut Louis Bachelier Labs.[21] This dataset covers 47,000 publicly listed global companies between 2005 and 2023. Since this dataset only covers publicly traded firms, our sample size is smaller. However, our results are qualitatively robust. We provide the results of our estimations in Internet Appendix Tables IA.1-IA.4.

Commitments to Science Based Targets Initiative (SBTi): We also explore whether banks committed to the Science Based Targets Initiative (SBTi) exert increased efforts to reduce their financed emissions through divestment and engagement channels. SBTi was established in 2015 as a corporate climate action organization that aims to enable companies and financial institutions worldwide to take action in combating the climate crisis. Science-based targets provide a clearly-defined pathway for companies to reduce greenhouse gas (GHG) emissions, helping prevent the worst impacts of climate change and future-proof business growth by meeting the goals of the Paris Agreement – limiting global warming to 1.5°C above pre-industrial levels.

We address the potential heterogeneity that arises as a result of commitments by identifying the committed banks in our sample that are listed on SBTi's website. There are 29 lenders in our sample that committed to SBTi during our sample period. According to our classification, 15 of them are *Brown* banks and 14 of them are *Green* banks.[22] To esti-

[21]Research work realized thanks to Pladifes COGEM project in the context of the Pladifes EquipEx (ANR-21-ESRE-0036), hosted at the Institut Louis Bachelier.

[22]We provide the list of these banks in bold text in Internet Appendix Tables IA.6 and IA.7.

mate the heterogeneity, we create a dummy variable (*Committed*) that takes value one for a committed bank and zero for a non-committed bank for the entire sample period. Using this variable we estimate three-way interactions to observe the differential impact committed banks may have on their financed emissions through divestment and engagement channels. We provide the results of these tests in Panels A and B of Appendix Table A10. According to these results, in the energy-sector results, *Brown* committed banks do not behave differently from *Brown* uncommitted banks in the post-Paris years.

Environmental Covenants: As our last robustness, We search environmental covenants keywords in loan agreements in 10-K, 10-Q and 8-K SEC filings following Choy et al. (2024). In Table A11 of Appendix, we show that there is no statistically significant change in the existence and number of environmental covenants in loans granted by *Brown* banks in the post-Paris years.

6. Conclusion

This study sheds light on the impact of the Paris Agreement on the financed emissions of *Brown* banks' newly-originated syndicated lending portfolios. Using a difference-in-differences framework, we examine the role of banks in reducing financed emissions through divestment and engagement with relationship and non-relationship borrowers.

We find that banks' lending behaviors vary significantly based on pre-existing lending relationships and borrower sectors. Banks with high pre-Paris exposure to energy-sector lending (*Brown* banks) significantly reduce the financed emissions of their energy-sector portfolios. These reductions are driven by a contraction in the number of new energy-sector borrowers, and a shift toward lower-emitting new borrowers. We do not find any changes in the lending amounts or lenders' loan shares in these portfolios in the post-Paris years. In addition, we find no comparable adjustments in energy-sector relationship lending portfolios or non-energy-sector portfolios. These results indicate that portfolio decarbonization is con-

centrated in energy-sector lending portfolios and operates mainly through changes in lending flows to new borrowers at loan origination, rather than through ongoing engagement with existing borrowers. In the engagement analysis, we document that financed emissions do not decline within relationship-lending portfolios through post-origination screening or monitoring. Declines observed among non-relationship borrowers reflect selection at loan origination rather than subsequent engagement. We confirm these effects by comparing environmental covenants imposed in loan agreements in the pre- and post-Paris years.

Moreover, we document that banks' decarbonization efforts are not driven by borrowers that have ESG-oriented institutional investors or green bond issuance. Banks exert decarbonization efforts even on portfolios of borrowers that rely exclusively on bank financing and monitoring. We also show that the observed effects are not driven by carbon pricing policies in borrowers' home countries, nor by banks' voluntary climate commitments, such as participation in the Science Based Targets Initiative, raising concerns about the effectiveness of voluntary sustainability pledges in shaping lending behavior in high-emitting energy sectors.

Overall, our findings highlight the role of the Paris Agreement in inducing selective portfolio decarbonization by banks, while also underscoring the importance of relationship dynamics and financial incentives in shaping lending decisions. Although global climate agreements (i.e. the Paris Agreement) can increase pressure on banks to align with net-zero objectives, actual adjustments in lending portfolios depend critically on sectoral characteristics and lending relationships.

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Table 1: Summary Statistics

Panel A: Summary Statistics of Divestment Portfolios								
	N	Mean	SD	Min	p25	Median	p75	Max
Financed emissions of portfolios								
All loan portfolios	2,649	12.489	2.377	4.767	10.859	12.610	14.247	17.327
Relationship lending	2,649	6.456	6.219	0	0	8.127	12.352	16.619
Non-relationship lending	2,649	12.211	2.508	0	10.750	12.410	14.015	17.256
Energy sector	2,649	8.031	6.065	0	0	10.419	13.137	17.272
Energy sector rel.	2,649	3.433	5.664	0	0	0	10.184	16.299
Energy sector non-rel.	2,649	7.642	5.997	0	0	10.084	12.767	17.199
Non-energy sector	2,649	11.851	2.830	0	10.394	12.182	13.711	17.013
Non-energy sector rel.	2,649	6.033	6.007	0	0	7.352	11.821	16.186
Non-energy sector non-rel.	2,649	11.571	2.937	0	10.280	11.998	13.523	16.705
Bank-level financial variables								
Size	2,649	11.688	1.807	1.338	10.482	11.618	13.071	15.376
Leverage	2,649	13.948	6.388	0.452	9.544	13.156	17.235	39.466
ROA	2,649	0.007	0.007	−0.019	0.003	0.006	0.010	0.053
Total lending amount	2,649	6.976	1.885	1.616	5.603	6.898	8.272	11.341
HHI	2,649	0.080	0.219	0	0	0.003	0.027	1
Energy intensity	2,649	0.137	0.176	0	0	0.082	0.192	1
Energy specialization	2,649	−0.001	0.176	−0.194	−0.120	−0.052	0.052	0.894
Borrower size	2,649	10.598	1.873	4.585	9.290	10.305	11.861	18.501
Borrower leverage	2,649	0.602	0.730	0.006	0.412	0.470	0.547	5.646
Borrower ROA	2,649	0.033	0.031	−0.202	0.020	0.034	0.046	0.172
Other control variables								
GDP	2,649	27.315	4.574	12.913	27.212	28.577	29.153	30.687
GDP growth rate	2,649	2.439	3.649	−11.167	0.955	2.259	3.871	24.475

Panel B: Summary Statistics of Engagement Portfolios								
	N	Mean	SD	Min	p25	Median	p75	Max
Financed emissions of portfolios								
All loan portfolios	904	11.978	1.912	6.199	10.827	12.220	13.326	15.298
Relationship lending	904	8.944	4.888	0	8.199	10.583	12.196	14.944
Non-relationship lending	904	11.351	2.223	0	10.244	11.853	12.759	14.872
Energy sector	904	7.772	5.556	0	0	10.040	12.188	14.753
Energy sector rel.	904	5.112	5.780	0	0	0	10.888	14.417
Energy sector non-rel.	904	6.588	5.539	0	0	9.251	11.469	14.467
Non-energy sector	904	11.323	2.426	0	10.399	11.766	12.758	14.878
Non-energy sector rel.	904	8.298	4.829	0	7.143	10.176	11.563	14.115
Non-energy sector non-rel.	904	10.819	2.528	0	9.862	11.449	12.345	14.872
Bank-level financial variables								
Size	904	12.338	1.841	5.454	11.434	12.610	13.686	15.167
Leverage	904	14.297	6.370	0.452	10.046	13.649	17.234	39.466
ROA	904	0.007	0.006	−0.012	0.003	0.006	0.010	0.053
Total lending amount	904	7.932	1.578	2.684	6.967	7.826	9.101	11.212
HHI	904	0.108	0.252	0	0.002	0.007	0.059	1
Energy intensity	904	0.155	0.198	0	0	0.099	0.219	1
Energy specialization	904	0.008	0.153	−0.194	−0.095	−0.023	0.067	0.889
Borrower size	904	10.368	1.407	5.995	9.389	10.044	11.272	17.933
Borrower leverage	904	0.646	0.646	0.006	0.443	0.481	0.541	5.646
Borrower ROA	904	0.036	0.016	−0.062	0.029	0.037	0.044	0.128
Other control variables								
GDP	904	26.560	5.369	12.913	26.664	28.254	29.150	30.687
GDP growth rate	904	2.679	2.784	−6.020	0.979	2.174	3.851	13.680

This table presents the summary statistics of the variables used in the divestment channel analyses in Panel A, and the summary statistics of the variables used in the engagement channel analyses in Panel B. We provide the variable definitions in Appendix Table A1.

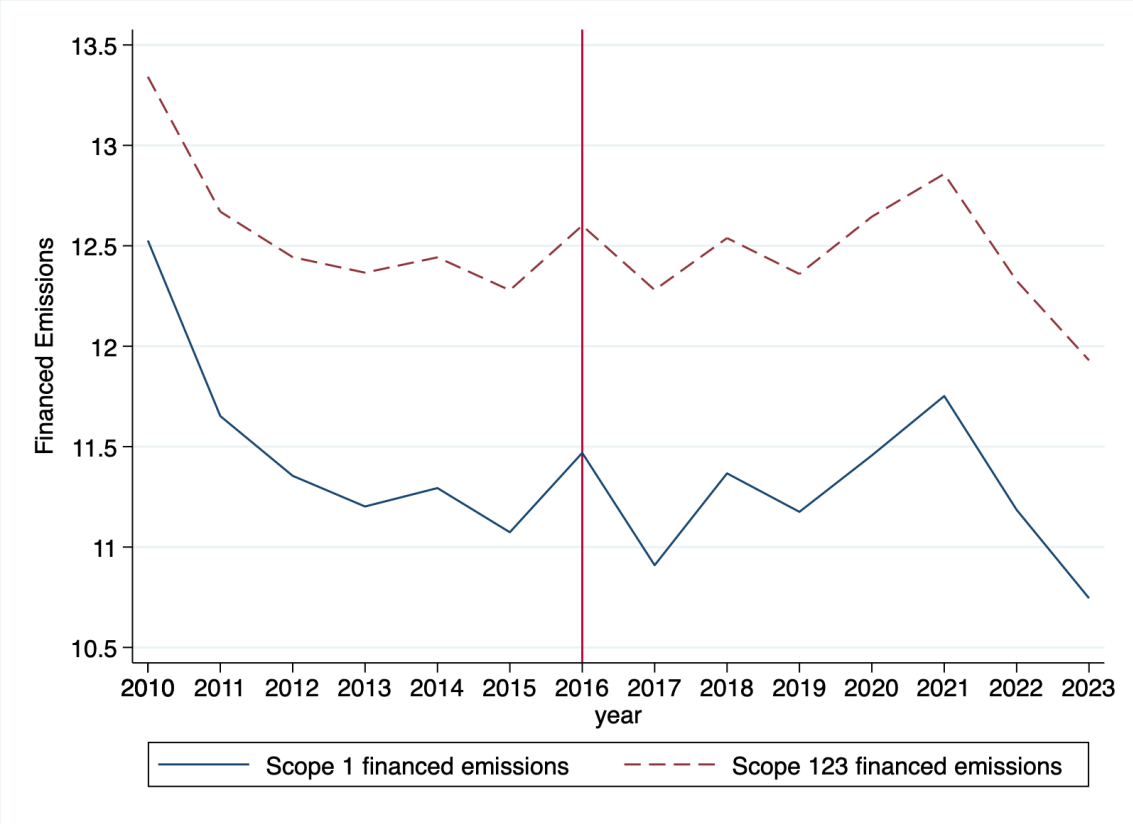


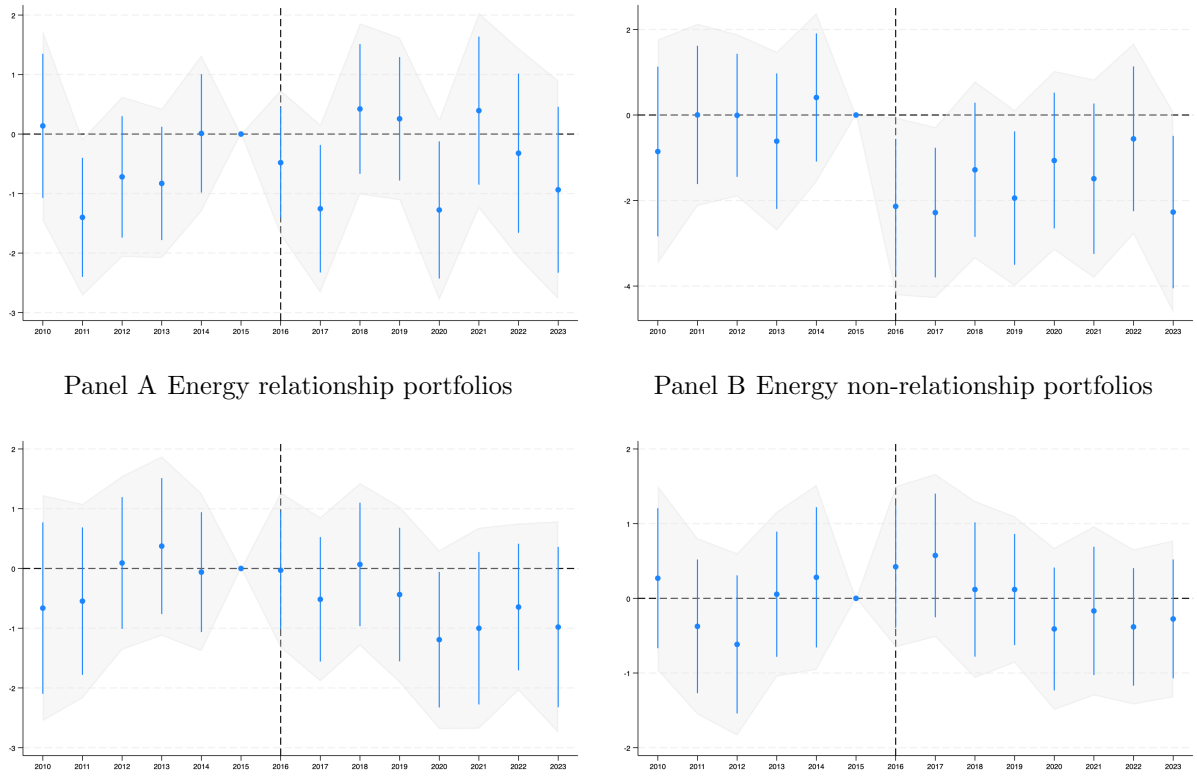
Figure 1: Evolution of Banks' Financed Emissions

This figure plots the evolution of average financed emissions for newly-originated syndicated loan portfolios of banks over 2010-2023. Financed emissions are computed following equation (1), reflecting the *divestment* channel. The vertical line at 2016 marks the beginning of the post-Paris period.

Table 2: Divestment Channel Regressions for Banks' Energy and Non-Energy Sector Portfolios

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.309***	0.094	−1.516***	0.081	−0.469	0.096
	(3.41)	(0.30)	(3.67)	(0.57)	(1.32)	(0.63)
Total lending amount	0.792***	0.277***	0.738***	0.248***	0.558***	0.269***
	(4.89)	(2.98)	(4.56)	(2.69)	(4.24)	(2.70)
Size	−0.178	0.221*	−0.224	−0.041	0.141	−0.075
	(1.14)	(1.65)	(1.39)	(0.31)	(0.77)	(0.61)
Leverage	−0.005	0.016	0.012	0.004	−0.003	0.009
	(0.13)	(0.53)	(0.31)	(0.23)	(0.11)	(0.60)
ROA	10.475	39.867**	2.922	−0.068	−1.352	−1.645
	(0.61)	(1.99)	(0.17)	(0.01)	(0.15)	(0.21)
HHI	0.890	0.389	0.743	−0.186	0.356	−0.359
	(1.50)	(1.48)	(1.26)	(0.46)	(0.77)	(0.75)
Energy specialization	−0.322	0.534	−0.846	−0.080	−1.026**	0.069
	(0.51)	(1.23)	(1.41)	(0.20)	(2.08)	(0.16)
Borrower size	0.190**	0.091**	0.167*	−0.061	0.002	−0.114*
	(2.06)	(2.02)	(1.81)	(1.11)	(0.02)	(1.72)
Borrower leverage	0.129	−0.185*	0.128	0.004	0.087	0.027
	(1.16)	(1.67)	(1.03)	(0.15)	(1.41)	(0.79)
Borrower ROA	−5.039	−1.772	−4.780	0.450	−0.469	0.883
	(1.50)	(0.95)	(1.43)	(0.28)	(0.26)	(0.49)
GDP	1.524	2.445**	0.896	−0.466	0.916	−0.215
	(0.85)	(2.05)	(0.47)	(0.70)	(0.56)	(0.29)
GDP growth rate	−0.023	−0.076***	−0.012	0.014	−0.001	−0.002
	(0.68)	(3.95)	(0.34)	(0.81)	(0.03)	(0.14)
Constant	−38.617	−69.033**	−20.806	23.848	−24.439	17.499
	(0.79)	(2.11)	(0.40)	(1.34)	(0.55)	(0.87)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	8.031	3.433	7.642	11.851	6.033	11.571
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.62	0.74	0.59	0.68	0.81	0.63

This table reports bank-level regression results for the *divestment* channel. Energy sector portfolios comprise borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are computed following equation (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j to borrower i in year t and the borrower's scope 123 emissions intensity in year t. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.



Panel A Energy relationship portfolios

Panel B Energy non-relationship portfolios

Panel C Non-energy relationship portfolios

Panel D Non-energy non-relationship portfolios

Figure 2: Dynamic Effects on Financed Emissions of Energy and Non-Energy Sector Portfolios

These figures plot the coefficients of the dynamic DiD estimations of the financed emissions of portfolios of *Brown* minus *Green* banks across four portfolio types: energy sector relationship and non-relationship lending (Panel A and B), and non-energy sector relationship and non-relationship lending (Panel C and D), using year *t-1* (2015) as the base year, with confidence intervals at 95% (vertical lines) and 99% (shaded areas). The vertical dotted line in 2016 depicts the beginning of the PostParis period.

Table 3: Regressions of the Ratio of Energy and Non-Energy Borrowers to Total Borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Ratio of number of borrowers	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.058***	−0.003	−0.055***	0.058***	−0.002	0.060***
	(4.50)	(0.82)	(4.15)	(4.48)	(0.19)	(3.69)
Total lending amount	0.010	−0.001	0.011	−0.010	0.004	−0.014*
	(1.33)	(0.40)	(1.50)	(1.35)	(0.92)	(1.72)
Size	−0.004	−0.001	−0.003	0.004	0.006	−0.002
	(0.45)	(0.22)	(0.41)	(0.49)	(1.04)	(0.21)
Leverage	0.000	0.001	−0.000	−0.000	−0.001	0.001
	(0.07)	(0.53)	(0.22)	(0.07)	(0.48)	(0.39)
ROA	0.835	0.184	0.651	−0.799	−0.043	−0.756
	(1.10)	(0.92)	(0.87)	(1.03)	(0.08)	(0.91)
HHI	0.023	0.001	0.022	−0.023	0.043	−0.065
	(0.66)	(0.05)	(0.66)	(0.66)	(1.61)	(1.46)
Energy specialization	−0.016	0.016	−0.032	0.015	−0.026	0.041
	(0.46)	(1.58)	(1.00)	(0.43)	(1.15)	(1.02)
Borrower size	0.007	0.002*	0.005	−0.007	0.007	−0.014**
	(1.34)	(1.82)	(1.01)	(1.37)	(1.27)	(2.03)
Borrower leverage	0.003	−0.001	0.004	−0.003	−0.006***	0.004
	(0.88)	(1.13)	(1.23)	(1.03)	(2.89)	(1.18)
Borrower ROA	−0.085	−0.021	−0.065	0.089	−0.212**	0.301*
	(0.56)	(0.70)	(0.43)	(0.58)	(2.08)	(1.72)
GDP	−0.076	0.025	−0.101*	0.077	−0.047	0.124*
	(1.34)	(1.06)	(1.72)	(1.36)	(0.99)	(1.71)
GDP growth rate	−0.001	−0.001	−0.000	0.001	0.002*	−0.001
	(0.81)	(1.51)	(0.19)	(0.84)	(1.76)	(0.62)
Constant	2.139	−0.678	2.817*	−1.172	1.227	−2.399
	(1.41)	(1.08)	(1.78)	(0.77)	(0.95)	(1.23)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.35	0.29	0.35	0.35	0.55	0.42

This table reports bank-level regression results for the ratio of energy (non-energy) sector borrowers to total borrowers at the bank-level. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. We define the ratio of number of energy sector (non-energy sector) relationship and non-relationship borrowers to total number of borrowers in columns (2) and (3) (columns (5) and (6)), respectively. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 4: Bank-Borrower Regressions of Lending Amounts and Loan-Level Regressions of Lender Shares

Dependent variable:	Borrowing amount				Lender share			
	Energy		Non-energy		Energy		Non-energy	
	Rel.	Non-rel.	Rel.	Non-rel.	Rel.	Non-rel.	Rel.	Non-rel.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PostParis*Brown	0.224**	−0.037	−0.029	−0.117***	0.006	0.006	−0.008	−0.004*
	(2.12)	(0.63)	(0.86)	(3.71)	(0.82)	(1.15)	(1.37)	(1.82)
Total lending amount	−0.000	0.000***	0.000***	0.000***	0.001	0.006**	0.007**	0.006***
	(0.54)	(3.83)	(3.88)	(3.39)	(0.20)	(2.33)	(2.56)	(5.97)
Size	0.125**	−0.001	−0.004	0.021	0.014***	0.001	0.004	0.001
	(1.99)	(0.03)	(0.25)	(1.53)	(5.01)	(0.49)	(1.38)	(0.99)
Leverage	−0.007	−0.000	0.003	−0.000	−0.001	0.000	0.000	−0.000
	(1.31)	(0.11)	(1.41)	(0.07)	(1.34)	(0.57)	(0.40)	(1.14)
ROA	1.924	0.341	−0.040	0.103	0.259	−0.112	0.258**	−0.048
	(0.78)	(0.28)	(0.05)	(0.14)	(1.41)	(0.62)	(2.00)	(0.78)
HHI	4.034***	−0.122	0.150	0.030	0.172**	−0.009	−0.016	0.009
	(2.94)	(0.68)	(0.46)	(0.31)	(2.58)	(0.31)	(0.62)	(0.74)
Energy specialization	0.121	−0.038	−0.109	−0.028	0.021	0.006	−0.012	−0.006
	(0.34)	(0.50)	(1.32)	(0.67)	(1.52)	(0.61)	(1.10)	(1.57)
GDP	−0.634***	0.149	−0.192	0.179	−0.032	−0.008	−0.011	−0.011
	(2.96)	(0.67)	(1.29)	(1.61)	(1.35)	(0.36)	(0.36)	(1.04)
GDP growth rate	−0.004	−0.004	−0.005	−0.001	0.001	0.000	−0.000	0.000
	(0.28)	(0.69)	(1.59)	(0.52)	(1.51)	(0.69)	(0.77)	(0.30)
Borrower size					−0.019**	−0.021**	−0.007	−0.006**
					(2.19)	(2.50)	(1.44)	(2.35)
Borrower leverage					0.007	0.009	−0.000*	0.001
					(0.25)	(0.50)	(1.70)	(0.89)
Borrower ROA					−0.029	−0.011	−0.031	−0.012
					(1.29)	(0.47)	(0.93)	(1.03)
ESG Investor					0.005	−0.001	0.007	0.006
					(0.59)	(0.08)	(1.34)	(1.53)
Green Bond					−0.007	−0.046**	0.002	−0.004
					(0.29)	(2.15)	(0.27)	(0.64)
Tranche amount					−0.017***	−0.016***	−0.015***	−0.013***
					(3.64)	(5.95)	(4.99)	(12.00)
Tenor maturity					−0.000	−0.000	−0.000	−0.000
					(0.44)	(1.56)	(0.24)	(0.34)
Constant	21.420***	0.066	9.894**	−1.082	1.152*	0.570	0.489	0.492
	(3.86)	(0.01)	(2.35)	(0.35)	(1.81)	(0.85)	(0.59)	(1.61)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,328	11,864	32,885	94,902	4,328	11,864	32,885	94,902
R^2	0.85	0.88	0.95	0.88	0.65	0.65	0.64	0.71

This table reports bank-borrower level regression results for lending amounts in columns (1)-(4) and loan-level regressions results for lender share in columns (5)-(8). Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* equals one for bank borrowers who have borrowed from the same lead bank within the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Lending amounts are defined as the sum across all loan originations of borrower i in year t of the bank's lender share multiplied by the USD value of the tranche amount ($lender\_share * tranche\_amount\_converted$). Lender shares are obtained from Dealscan and missing values are imputed through the procedure described in Section 3.1. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank and borrower level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 5: Borrowers' Emissions Intensity Regressions

	Energy sector		Non-energy sector	
Dependent variable:	Relationship	Non-rel.	Relationship	Non-rel.
Emission intensity	(1)	(2)	(3)	(4)
PostParis*Brown	−0.015	−0.081**	−0.047***	−0.018
	(0.27)	(2.09)	(2.80)	(1.59)
Total lending amount	−0.036	−0.011	0.002	0.003
	(1.44)	(0.70)	(0.28)	(0.98)
Size	0.004	−0.007	0.014	0.005
	(0.38)	(0.64)	(1.41)	(1.52)
Leverage	0.001	−0.001	−0.001	−0.001**
	(0.61)	(1.27)	(1.35)	(2.07)
ROA	−0.660	−1.349	−1.109**	−0.550**
	(0.63)	(1.29)	(2.55)	(2.50)
HHI	−0.422	−0.010	0.168	0.046
	(0.82)	(0.11)	(1.07)	(1.47)
Energy specialization	0.121	−0.044	0.009	−0.021*
	(1.19)	(0.82)	(0.21)	(1.84)
Borrower size	0.224*	0.221**	−0.009	0.015
	(1.90)	(2.13)	(0.34)	(1.17)
Borrower leverage	−0.003	0.292	−0.000	−0.000
	(0.02)	(1.43)	(1.45)	(0.53)
Borrower ROA	−0.183	−0.168	−0.006	0.233*
	(0.62)	(0.90)	(0.08)	(1.68)
ESG Investor	−0.018	−0.011	−0.018	−0.032
	(0.20)	(0.12)	(0.71)	(0.93)
Green Bond	0.086	0.082	0.049	0.050
	(0.57)	(0.65)	(1.03)	(0.95)
GDP	0.561*	0.379*	0.169	0.069
	(1.67)	(1.83)	(1.49)	(1.62)
GDP growth rate	0.001	−0.008	−0.001	0.000
	(0.16)	(1.50)	(0.24)	(0.34)
Constant	−11.733	−6.203	0.375	3.054**
	(1.24)	(0.95)	(0.11)	(2.55)
Bank FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	2,617	7,775	18,306	55,313
R^2	0.95	0.96	0.98	0.98

This table presents bank-borrower level regression results for borrower emission intensity. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* variable takes value one for bank borrowers who have borrowed from the same lead bank within the last 5 years, and zero otherwise. *PostParis* variable takes value one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Emission intensity is the sum of scope 1 + scope 2 + scope 3 emissions intensities of each borrower in year t, obtained from S&P Trucost data. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank and borrower level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 6: Engagement Channel Regressions for Banks' Energy and Non-Energy Sector Portfolios

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.984*	1.494*	−2.629**	−0.205	1.038	−0.308
	(1.72)	(1.70)	(2.26)	(0.45)	(1.21)	(0.61)
Total lending amount	0.393	−0.187	1.164**	0.404	1.764***	0.198
	(0.76)	(0.46)	(2.29)	(1.28)	(5.04)	(0.64)
Size	1.070	0.124	1.632*	0.372	−0.387	0.596
	(1.29)	(0.19)	(1.79)	(0.88)	(0.76)	(1.40)
Leverage	−0.049	0.069	−0.033	0.021	0.089	−0.000
	(0.64)	(0.67)	(0.33)	(0.80)	(1.62)	(0.01)
ROA	7.485	−65.690	21.836	27.091	−12.151	22.109
	(0.13)	(0.95)	(0.38)	(1.03)	(0.35)	(0.78)
HHI	−0.651	−0.550	0.215	−0.371	−2.137	0.758
	(0.27)	(0.36)	(0.09)	(0.23)	(1.14)	(0.42)
Energy specialization	3.996**	2.877**	2.177	−0.524	−0.395	−0.323
	(2.54)	(2.18)	(1.41)	(0.92)	(0.47)	(0.53)
Borrower size	−0.008	−0.097	0.073	0.016	0.262	−0.020
	(0.04)	(0.61)	(0.34)	(0.13)	(0.82)	(0.17)
Borrower leverage	0.195	0.216	0.136	−0.140*	−0.147	−0.099
	(0.84)	(0.93)	(0.56)	(1.94)	(0.80)	(1.39)
Borrower ROA	5.800	−14.961*	7.649	−10.619*	−6.972	−10.996*
	(0.43)	(1.95)	(0.58)	(1.70)	(0.85)	(1.77)
GDP	2.978	8.227**	0.112	0.359	3.690	0.804
	(0.60)	(2.40)	(0.02)	(0.12)	(1.29)	(0.27)
GDP growth rate	−0.217*	−0.031	−0.179	0.125	−0.085	0.122
	(1.79)	(0.50)	(1.63)	(1.43)	(1.33)	(1.46)
Constant	−85.986	−212.956**	−25.227	−6.409	−102.383	−19.234
	(0.67)	(2.41)	(0.21)	(0.09)	(1.34)	(0.26)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	7.772	5.112	6.588	11.323	8.298	10.819
N	904	904	904	904	904	904
R^2	0.74	0.82	0.74	0.75	0.84	0.76

This table presents bank-level regression results for the *engagement* channel. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and scope 123 emissions intensity of borrower i in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 7: Heterogeneity Tests for the Divestment Channel: Bank Financing and ESG Stakeholders

Panel A: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.102***	0.018	−1.308***	−0.124	−0.428	−0.148
	(2.84)	(0.06)	(3.15)	(0.65)	(1.26)	(0.75)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	7.525	3.204	7.044	11.409	5.758	11.12
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.62	0.72	0.57	0.63	0.79	0.59

Panel B: Portfolios of borrowers with bank financing, ESG investors and/or green bonds						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.564*	0.374	−0.761**	0.711**	0.229	0.852**
	(1.74)	(1.43)	(2.30)	(2.10)	(0.73)	(2.47)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	3.528	1.217	3.411	6.911	2.862	6.602
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.72	0.68	0.70	0.73	0.75	0.72

This table presents bank-level regression results for the *divestment* channel. Panel A includes portfolios of borrowers with only bank financing and Panel B includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years.*PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of the total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. All regressions include the control variables listed in Table 2. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 8: Heterogeneity Tests for the Engagement Channel: Bank Financing and ESG Stakeholders

Panel A: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−2.383**	0.896	−2.571**	−0.691	1.066	−0.711
	(2.03)	(1.02)	(2.21)	(1.23)	(1.26)	(1.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	7.523	4.705	6.357	10.942	7.933	10.465
N	904	904	904	904	904	904
R^2	0.73	0.80	0.73	0.74	0.83	0.76

Panel B: Portfolios of borrowers with bank financing, ESG investors and/or green bonds						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.728	0.740	−1.046	0.272	1.654*	−0.314
	(0.86)	(1.30)	(1.26)	(0.34)	(1.97)	(0.48)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	2.932	1.767	2.291	6.194	4.494	5.28
N	904	904	904	904	904	904
R^2	0.75	0.79	0.68	0.88	0.84	0.89

This table presents bank-level regression results for the *engagement* channel. Panel A includes portfolios of borrowers with only bank financing and Panel B includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 9: Heterogeneity Tests for the Divestment Channel: Carbon Pricing Policies

Panel A: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	-0.491*	0.004	-0.755**	-0.021	-0.232	0.073
	(1.69)	(0.02)	(2.54)	(0.07)	(0.82)	(0.24)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	4.25	2.118	3.575	7.723	3.436	7.479
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.71	0.70	0.59	0.79	0.81	0.77

Panel B: Unregulated borrowers

	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	-1.547***	-0.085	-1.596***	-0.032	-0.342	-0.064
	(3.81)	(0.25)	(3.80)	(0.14)	(0.94)	(0.28)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	6.482	2.5	6.146	9.707	4.686	9.459
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.67	0.70	0.64	0.79	0.80	0.76

This table presents heterogeneity tests of the *divestment* channel based carbon pricing policies of borrowers' home countries. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity of in year t. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table 10: Heterogeneity Tests for the Engagement Channel: Carbon Pricing Policies

Panel A: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	-1.050	-0.316	-1.481	0.260	0.844	0.265
	(1.22)	(0.44)	(1.59)	(0.29)	(1.10)	(0.30)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	5.179	3.713	4.081	7.81	5.27	7.489
N	904	904	904	904	904	904
R^2	0.85	0.84	0.80	0.89	0.89	0.89

Panel B: Unregulated borrowers

	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	-2.250*	1.852*	-3.426***	0.721	0.249	0.842
	(1.84)	(1.89)	(2.99)	(1.13)	(0.23)	(1.27)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dependent var.	6.319	3.38	5.537	10.671	7.142	10.097
N	904	904	904	904	904	904
R^2	0.73	0.71	0.75	0.81	0.81	0.81

This table presents heterogeneity tests of the *engagement* channel based carbon pricing policies of borrowers' home countries. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *Post-Paris* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Appendix

Table A1: Variable Definitions

Variable	Definition	Data source
Financed Emissions	Measured as the natural logarithm of one plus the sum, across all borrowers j, of the product of total borrowing amount from bank i to borrower j in year t and the borrower's scope 1+2+3 (scope 123) emissions intensity in year t. The raw measure is in tons of CO_2e which is then log-transformed.	Dealscan and S&P Trucost
PostParis	An indicator variable equal to one for the years 2016 - 2023, and zero for the years 2010 - 2015	
Regulation	An indicator variable equal to one if a borroweris headquartered in a country that has adopted either carbon tax or emission trading system regulations prior to the Paris Agreement, and zero otherwise	World Bank's Carbon Pricing Dashboard
Lender Characteristics		
Brown	An indicator variable equal to 1 if bank i has above-median energy intensity ratio in the pre-Paris years (2010-2015), and zero otherwise	Dealscan
Total lending amount	Natural logarithm of one plus the sum of each bank's lender share multiplied by the tranche amount lent in each year to all borrowers with and without carbon emissions data	Dealscan
Size	Natural logarithm of lender's total assets	Compustat NA, Compustat Global, Bankscope, FDIC (Call Reports)
Leverage	Total liabilities divided by total book value of equity	Compustat NA, Compustat Global, Bankscope, FDIC (Call Reports)
ROA	Net income divided by total assets	Compustat NA, Compustat Global, Bankscope, FDIC (Call Reports)
HHI	Sum of the square of the ratio of bank i's lending amount to sector s (defined using SIC 2-digit classification) to its total lending amount in each year, across all sectors.	Dealscan
Energy specialization	Difference between the ratio of bank i's lending amount to energy sector to the bank's lending amount to all sectors and all banks' lending amount to energy sector to all banks lending amount to all sectors in each year.	Dealscan
Firm Characteristics		
Borrower size	Average natural logarithm of one plus borrower total assets for bank i in year t	Compustat NA, Compustat Global, CapitalIQ
Borrower leverage	Average borrower total debt divided by total book value of equity	Compustat NA, Compustat Global, CapitalIQ
Borrower ROA	Average borrower net income divided by total assets for bank i in year t	Compustat NA, Compustat Global, CapitalIQ
Country Characteristics		
GDP	Natural logarithm of one plus the GDP of bank i's headquartered country in year t	WDI, National Statistics of the Republic of China
GDP growth rate	GDP growth rate of bank i's headquartered country in year t	WDI, National Statistics of the Republic of China

This table presents the descriptions of the variables and data sources.

Table A2: Correlations of Explanatory Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Size	1.000								
(2) Leverage	0.301	1.000							
	(0.000)								
(3) ROA	-0.263	-0.479	1.000						
	(0.000)	(0.000)							
(4) Total lending amount	0.618	0.093	-0.037	1.000					
	(0.000)	(0.000)	(0.060)						
(5) HHI	-0.221	-0.117	0.105	-0.467	1.000				
	(0.000)	(0.000)	(0.000)	(0.000)					
(6) Energy intensity	0.010	-0.024	0.059	0.041	0.088	1.000			
	(0.598)	(0.208)	(0.002)	(0.035)	(0.000)				
(7) Energy Specialness	0.006	-0.057	0.109	0.056	0.107	0.329	1.000		
	(0.775)	(0.004)	(0.000)	(0.004)	(0.000)	(0.000)			
(8) Borrower size	-0.096	0.151	-0.158	-0.247	0.029	-0.108	-0.147	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.136)	(0.000)	(0.000)		
(9) Borrower leverage	0.052	0.027	0.012	0.073	-0.032	0.010	-0.020	0.067	1.000
	(0.007)	(0.165)	(0.550)	(0.000)	(0.096)	(0.601)	(0.303)	(0.001)	
(10) Borrower ROA	0.075	-0.034	0.081	0.111	-0.074	-0.007	-0.002	-0.080	0.004
	(0.000)	(0.076)	(0.000)	(0.000)	(0.000)	(0.723)	(0.934)	(0.000)	(0.829)

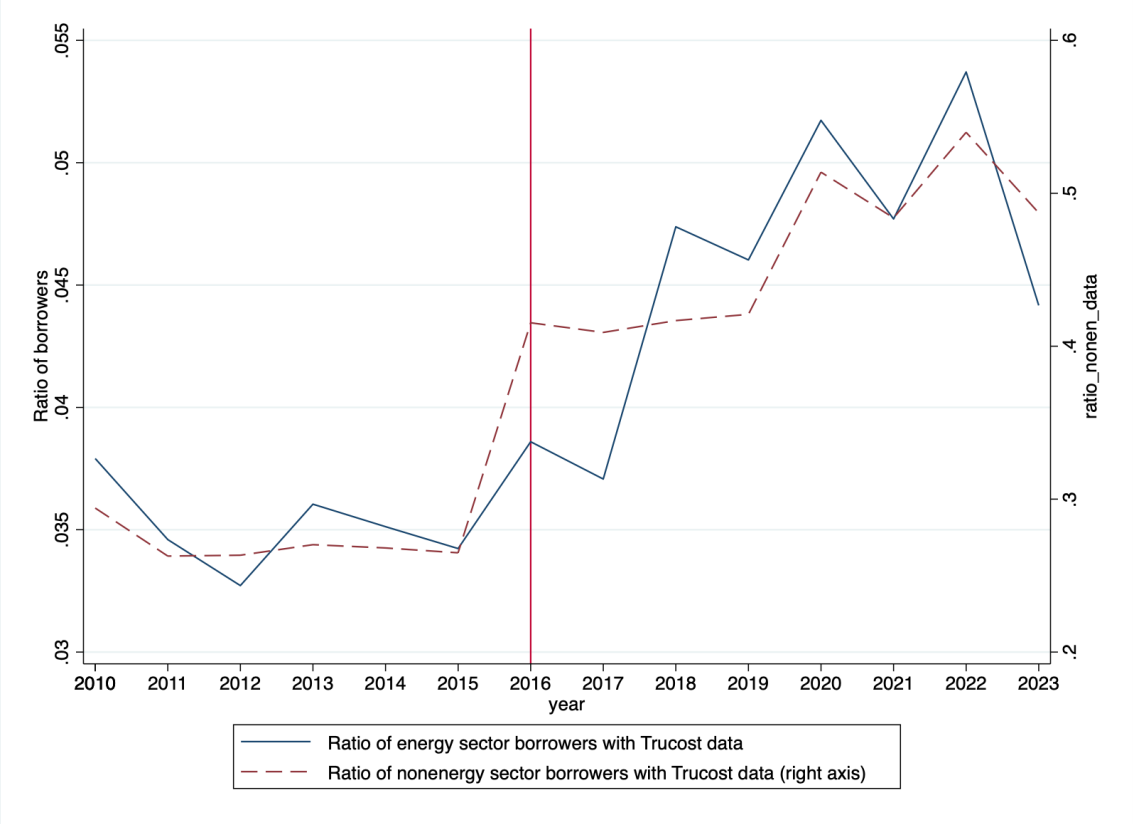


Figure A1: Ratio of Borrowers with S&P Trucost Data

This figure plots the evolution of ratio of energy (non-energy) sector borrowers with S&P Trucost Data to total number of borrowers.

Table A3: Divestment Channel Regressions of All Lending Portfolios

Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)
PostParis*Brown	−0.249*	−0.515	−0.283*
	(1.89)	(1.37)	(1.93)
Total lending amount	0.282***	0.528***	0.327***
	(5.08)	(3.89)	(4.78)
Size	−0.066	0.201	−0.090
	(0.72)	(1.18)	(0.89)
Leverage	0.007	0.001	0.003
	(0.52)	(0.02)	(0.14)
ROA	3.514	−3.425	0.754
	(0.65)	(0.40)	(0.09)
HHI	−0.009	0.561	−0.024
	(0.04)	(1.14)	(0.07)
Energy specialization	−0.203	−0.425	−0.163
	(1.06)	(0.77)	(0.62)
GDP	−0.818	1.175	−0.800
	(1.25)	(0.73)	(1.05)
GDP growth rate	−0.014	−0.006	−0.024*
	(1.29)	(0.18)	(1.66)
Borrower size	−0.036	0.008	−0.090
	(0.85)	(0.09)	(1.62)
Borrower leverage	0.024	0.038	0.044
	(0.77)	(0.58)	(1.26)
Borrower ROA	0.356	−2.225	0.938
	(0.31)	(1.13)	(0.63)
Constant	33.959*	−31.567	33.823*
	(1.92)	(0.72)	(1.66)
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	2,649	2,649	2,649
R^2	0.80	0.80	0.72

This table presents bank-level regression results for the *divestment* channel. *Relationship* portfolios in column (2) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in column (3) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of the total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity in year t. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A4: Engagement Channel Regressions of All Lending Portfolios

Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)
PostParis*Brown	−0.250	1.483	−0.345
	(0.76)	(1.54)	(0.88)
Total lending amount	0.423	9.489***	0.743
	(0.36)	(2.98)	(0.46)
Size	0.239	−0.285	0.571**
	(1.38)	(0.52)	(2.49)
Leverage	−0.014	0.054	−0.011
	(0.76)	(0.89)	(0.49)
ROA	−3.072	−26.718	6.323
	(0.20)	(0.67)	(0.28)
HHI	−0.178	−1.861	1.395
	(0.34)	(0.77)	(1.21)
Energy specialization	0.428	1.276	0.316
	(1.24)	(1.20)	(0.81)
GDP	1.315	7.246**	0.658
	(1.06)	(2.42)	(0.47)
GDP growth rate	−0.027	−0.130**	0.008
	(1.14)	(1.99)	(0.23)
Borrower size	−0.024	0.257	0.001
	(0.29)	(0.77)	(0.01)
Borrower leverage	−0.064	−0.098	−0.045
	(0.96)	(0.55)	(0.66)
Borrower ROA	−0.754	−9.760	−2.881
	(0.22)	(1.14)	(0.65)
Constant	−26.114	−203.400**	−14.622
	(0.77)	(2.53)	(0.40)
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	904	904	904
R^2	0.86	0.81	0.82

This table reports bank-level regression results for the *engagement* channel. *Relationship* portfolios in column (2) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in column (3) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A5: Additional Summary Statistics

Panel A: Lending Amounts of Portfolios

	N	Mean	SD	Min	p25	Median	p75	Max
All loan portfolios	2,649	5,283.351	11,177.911	0.177	266.204	992.352	3,797.894	84,241.852
Relationship lending	2,649	1,638.902	5,032.028	0	0	69.814	740.151	56,777.793
Non-relationship lending	2,649	3,644.449	6,717.169	0	242.365	843.151	3,021.817	52,323.301
Energy sector	2,649	726.561	1,537.588	0	0	89.286	548.696	12,040.229
Energy sector rel.	2,649	212.320	640.002	0	0	0	73.571	7,786.514
Energy sector non-rel.	2,649	514.241	1,027.662	0	0	69.029	446.375	9,074.559
Non-energy sector	2,649	4,552.826	9,793.209	0	221.263	845.681	3,272.829	75,852.820
Non-energy sector rel.	2,649	1,426.524	4,524.323	0	0	57.535	625.435	53,566.113
Non-energy sector non-rel.	2,649	3,126.302	5,812.608	0	200.441	712.362	2,572.539	44,533.914

Panel B: Borrower-level Emissions Intensities

	N	Mean	SD	Min	p25	Median	p75	Max
All borrowers								
Total emissions	13,662	551.822	1,339.852	17.027	98.589	219.319	464.487	39,714.895
Size	13,662	10.545	2.697	1.522	8.492	10.380	12.447	21.140
Leverage	13,662	0.746	8.120	0	0.262	0.427	0.585	435.989
ROA	13,662	0.032	0.105	−3.736	0.010	0.030	0.057	6.198
Energy sector borrowers								
Total emissions	1,321	1,883.293	2,991.980	21.463	381.243	637.301	2,288.910	36,829.836
Size	1,321	10.260	2.528	3.997	8.465	9.819	11.633	19.540
Leverage	1,321	0.503	0.283	0	0.346	0.495	0.619	4.524
ROA	1,321	0.015	0.116	−1.703	0.005	0.026	0.045	0.626
Non-energy sector borrowers								
Total emissions	12,341	409.300	905.374	17.027	91.844	193.485	401.489	39,714.895
Size	12,341	10.575	2.713	1.522	8.498	10.454	12.500	21.140
Leverage	12,341	0.772	8.542	0	0.250	0.418	0.577	435.989
ROA	12,341	0.034	0.103	−3.736	0.011	0.031	0.059	6.198
Borrowers with bank financing and other ESG stakeholders								
Total emissions	2,575	468.733	994.970	17.027	93.313	190.562	397.674	14,278.516
Size	2,575	9.353	2.503	1.522	7.736	8.965	10.438	20.983
Leverage	2,575	0.649	4.152	0	0.251	0.423	0.586	117.921
ROA	2,575	0.036	0.117	−2.295	0.012	0.039	0.077	0.790
Borrowers with only bank financing								
Total emissions	11,087	571.120	1,407.250	18.929	100.301	226.520	488.987	39,714.895
Size	11,087	10.821	2.665	2.313	8.796	10.818	12.691	21.140
Leverage	11,087	0.769	8.789	0	0.263	0.427	0.584	435.989
ROA	11,087	0.032	0.101	−3.736	0.010	0.029	0.053	6.198

This table presents summary statistics of variables used in the bank-borrower level regressions of lending amounts in Panel A and borrower-level total emissions intensities in Panel B. Lending amounts are defined as the sum of the product of lender share and tranche amount for each bank-borrower pair in year t. Borrower-level total emissions intensities are defined as the sum of scope 1 + scope 2 + scope 3 emissions intensities. Variable definitions are provided in Appendix Table A1.

Table A6: Divestment Channel Tests of Lending Portfolios (Continuous DiD)

Panel A: All Portfolios						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−6.384***	−0.102	−6.996***	1.832**	−1.938	2.180**
	(4.23)	(0.09)	(4.54)	(1.99)	(1.64)	(2.23)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.63	0.74	0.59	0.68	0.81	0.63
Panel B: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−5.054***	−0.217	−5.983***	1.281	−1.376	1.461
	(3.45)	(0.20)	(3.92)	(1.22)	(1.30)	(1.34)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.62	0.72	0.57	0.63	0.79	0.59
Panel C: Portfolios of borrowers with bank financing and ESG stakeholders						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−2.590*	0.171	−3.034**	2.184	0.019	3.013**
	(1.87)	(0.23)	(2.14)	(1.43)	(0.02)	(2.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.72	0.68	0.70	0.73	0.75	0.72

This table presents continous DiD estimation results for the *divestment* channel. Panel A includes all portfolios of energy and non-energy sector borrowers. Panel B includes portfolios of borrowers with only bank financing and Panel C includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals value one for years 2016-2023 and zero for years 2010-2015. *Brown* is the continuous measure of bank's median energy intensity ratio over the the years prior to the ratification of Paris Agreement. Financed emissions are calculated following (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity in year t. All regressions include the control variables listed in Table 2. Variables definitions are in Appendix Table A1. T-stats are provided in the parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A7: Engagement Channel Tests of Lending Portfolios (Continuous DiD)

Panel A: All Portfolios						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−5.019	6.880*	−6.757	0.111	7.681*	−0.182
	(0.78)	(1.88)	(1.07)	(0.03)	(1.79)	(0.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.74	0.82	0.73	0.75	0.84	0.76
Panel B: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−5.959	3.080	−6.662	−2.352	5.828	−2.294
	(0.95)	(0.74)	(1.10)	(0.62)	(1.30)	(0.60)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.73	0.80	0.72	0.74	0.83	0.75
Panel C: Portfolios of borrowers with bank financing and ESG stakeholders						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−3.696	0.460	−3.702	2.929	4.740	1.658
	(0.81)	(0.21)	(0.82)	(0.87)	(1.36)	(0.57)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.75	0.78	0.68	0.88	0.84	0.89

This table presents continous DiD estimation results for the *engagement* channel. Panel A includes all portfolios of energy and non-energy sector borrowers. Panel B includes portfolios of borrowers with only bank financing and Panel C includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable equals one for years 2016-2023 and zero for years 2010-2015. *Brown* is the continuous measure of bank's median energy intensity ratio over the the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A8: Divestment Channel and Carbon Pricing Policies (Continuous DiD)

Panel A: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−2.568**	0.437	−3.333***	0.661	−1.330	1.253
	(2.42)	(0.73)	(2.89)	(0.69)	(1.61)	(1.30)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.71	0.70	0.59	0.79	0.81	0.77

Panel B: Unregulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−5.908***	−0.805	−6.531***	1.064	−0.615	1.001
	(3.40)	(0.68)	(3.74)	(0.99)	(0.56)	(0.85)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.67	0.70	0.64	0.79	0.80	0.76

This table presents heterogeneity tests of the *divestment* channel based carbon pricing policies of borrowers' home countries. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* is the continuous measure of bank's median energy intensity ratio over the the years prior to the ratification of Paris Agreement. Financed emissions are calculated following (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity in year t. All regressions include the control variables listed in Table 2. Variables definitions are in Appendix Table A1. T-stats are provided in the parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A9: Engagement Channel and Carbon Pricing Policies (Continuous DiD)

Panel A: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−4.954	1.309	−6.086	−0.466	−1.640	−0.169
	(0.92)	(0.50)	(1.09)	(0.11)	(0.47)	(0.04)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.85	0.84	0.80	0.89	0.89	0.89

Panel B: Unregulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−4.817	6.205	−10.098	2.665	7.408	2.673
	(0.74)	(1.60)	(1.65)	(0.85)	(1.43)	(0.78)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.72	0.70	0.74	0.81	0.81	0.80

This table presents heterogeneity tests of the *engagement* channel based carbon pricing policies of borrowers' home countries. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable takes value one for years 2016-2023 and zero for years 2010-2015. *Brown* is the continuous measure of bank's median energy intensity ratio over the the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A10: SBTi Commitments

Panel A: Divestment channel analyses of banks' SBTi commitments

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.455***	0.064	−1.543***	−0.008	−0.580	−0.027
	(3.41)	(0.18)	(3.34)	(0.05)	(1.46)	(0.16)
PostParis*Committed	−0.106	−0.343	0.218	−0.208	−1.580***	−0.316
	(0.15)	(0.57)	(0.31)	(1.13)	(2.67)	(1.58)
PostParis*Brown*Comm	0.898	0.244	0.126	0.574	0.951	0.798*
	(1.03)	(0.29)	(0.13)	(1.37)	(1.26)	(1.88)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,649	2,649	2,649	2,649	2,649	2,649
R^2	0.63	0.74	0.59	0.68	0.81	0.63

Panel B: Engagement channel analyses of banks' SBTi commitments

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.896	1.848*	−2.849**	0.055	1.518	−0.194
	(1.46)	(1.74)	(2.16)	(0.11)	(1.63)	(0.33)
PostParis*Committed	1.621	0.736	1.153	0.418	0.623	−0.073
	(0.72)	(0.63)	(0.55)	(0.36)	(0.37)	(0.06)
PostParis*Brown*Comm	0.058	−1.633	1.551	−1.271	−2.560	−0.656
	(0.02)	(0.93)	(0.60)	(1.09)	(1.39)	(0.53)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	904	904	904	904	904	904
R^2	0.75	0.82	0.74	0.75	0.84	0.76

This table presents regression results for SBTi commitments by banks for the *divestment* channel in Panel A and *engagement* channel in Panel B. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable takes value one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. *Committed* variable takes value one for banks that committed to SBTi during our sample period. In Panel A, financed emissions are calculated following (1). In Panel B, financed emissions are calculated following equation (2). All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table A11: Environmental Covenants

	Energy sector borrowers		Non-energy sector borrowers	
Dependent variable:	Env.cov.exist	Num of env.cov	Env.cov.exist	Num of env.cov
PostParis*Brown	0.003	0.004	-0.002	-0.002
	(0.86)	(1.32)	(0.92)	(0.97)
PostParis*Relationship	-0.006	-0.007	-0.001	-0.002
	(1.08)	(1.50)	(0.35)	(0.48)
PostParis*Brown*Relationship	-0.004	-0.004	0.001	0.001
	(0.89)	(1.13)	(0.31)	(0.25)
Brown*Relationship	0.001	0.003	0.003	0.003
	(0.27)	(1.06)	(1.27)	(1.06)
Relationship	0.000	0.002	-0.002	-0.002
	(0.17)	(0.75)	(0.98)	(0.66)
Total lending amount	0.000	-0.000	-0.001	-0.001
	(0.36)	(0.19)	(1.21)	(1.58)
Size	0.000	0.001	-0.001	-0.001
	(0.17)	(0.84)	(1.40)	(1.27)
Leverage	-0.000	-0.000	0.000	0.000
	(0.55)	(0.15)	(1.26)	(1.00)
ROA	-0.064	0.097	0.075	0.082
	(0.87)	(0.68)	(1.30)	(1.33)
HHI	0.000	-0.003	0.002	0.003
	(0.04)	(0.51)	(0.47)	(0.80)
Energy Specialization	-0.001	-0.000	-0.004	-0.003
	(0.15)	(0.06)	(1.38)	(1.32)
GDP	-0.024	-0.025	0.005	0.001
	(1.36)	(1.35)	(1.19)	(0.45)
GDP growth rate	0.000	0.000	-0.000	-0.000
	(1.02)	(1.01)	(1.35)	(1.37)
Constant	0.911*	0.917*	0.072	0.131*
	(1.80)	(1.69)	(0.74)	(1.93)
Bank FE	Yes	Yes	Yes	Yes
Borrower*Year FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	3,493	3,493	22,955	22,955
R2	1.00	0.99	0.99	0.99

This table presents regression results for environmental covenants in loan agreements. We search environmental covenants keywords in loan agreements in 10-K, 10-Q and 8-K SEC filings following Choy et al. (2024). Columns (1) and (2) present the results of energy sector borrowers. Columns (3) and (4) present the results of energy sector borrowers. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. In columns (1) and (3) the dependent variable is *Env.cov.exist*, which takes value one if a bank imposed an environmental covenant in at least one of the loans granted to a borrower in that year. In columns (2) and (4) the dependent variable is *Num of env.cov*, which is the natural logarithm of one plus the number of environmental covenants a bank imposed in loans granted to a borrower in that year. *Relationship* equals one for bank borrowers who have borrowed from the same lead bank within the last 5 years. *PostParis* variable takes value one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Internet Appendix

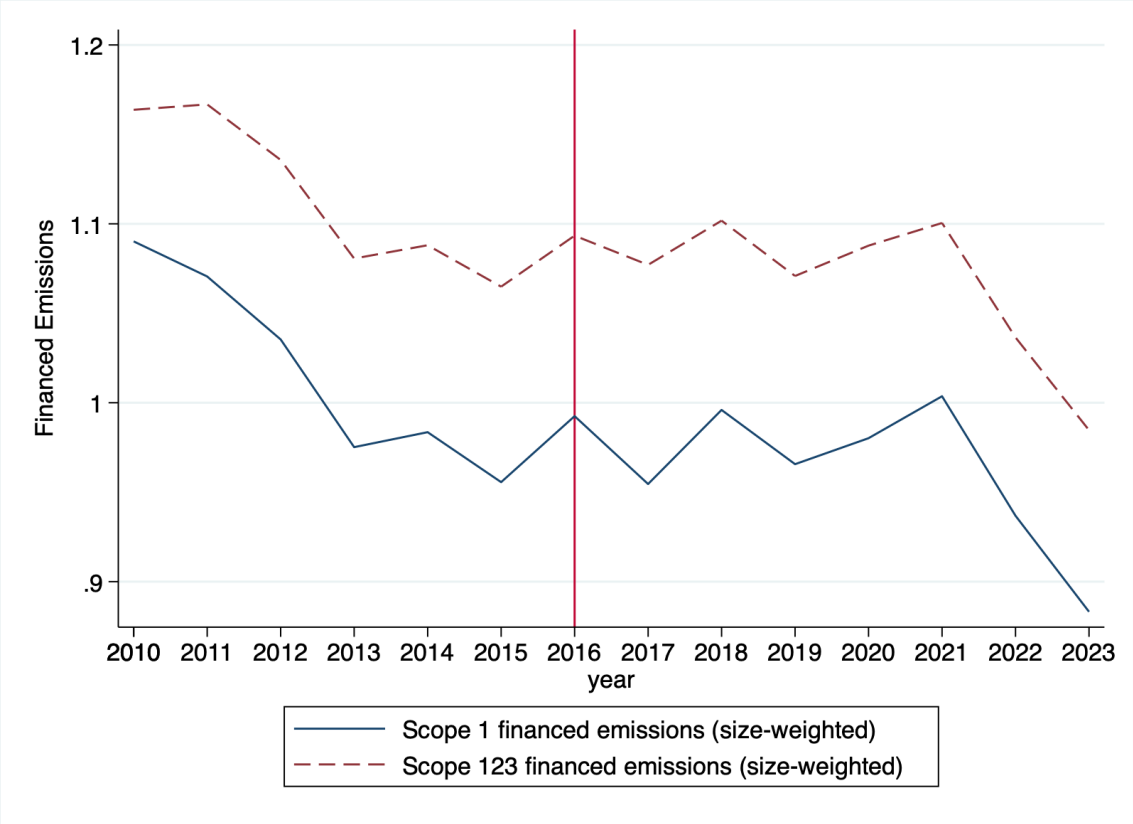


Figure IA.1: Evolution of Banks' Financed Emissions

This figure plots the evolution of bank size-weighted financed emissions for newly-originated syndicated loan portfolios of banks over 2010-2023. Financed emissions are computed following equation (1), reflecting the *divestment* channel. The vertical line at 2016 marks the beginning of the post-Paris period.

Table IA.1: Divestment Channel Tests of Lending Portfolios (Alternative Emissions Data)

Panel A: All Portfolios						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.859*	−0.202	−1.189**	0.360**	−0.161	0.307
	(1.92)	(0.54)	(2.47)	(1.99)	(0.42)	(1.63)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,229	2,229	2,229	2,229	2,229	2,229
R^2	0.60	0.74	0.54	0.67	0.78	0.63
Panel B: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.160**	−0.446	−1.527***	0.089	−0.403	−0.003
	(2.39)	(1.29)	(3.00)	(0.41)	(1.10)	(0.01)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,229	2,229	2,229	2,229	2,229	2,229
R^2	0.58	0.71	0.49	0.62	0.75	0.59
Panel C: Portfolios of borrowers with bank financing and ESG stakeholders						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.351	0.752**	−0.572*	1.356***	0.612*	1.242***
	(1.06)	(2.49)	(1.71)	(3.46)	(1.79)	(3.28)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,229	2,229	2,229	2,229	2,229	2,229
R^2	0.72	0.62	0.69	0.74	0.74	0.73

This table presents regression results for the *divestment* channel using CGEE data. Panel A includes all portfolios of energy and non-energy sector borrowers. Panel B includes portfolios of borrowers with only bank financing and Panel C includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following (1) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity in year t. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are provided in the parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table IA.2: Engagement Channel Tests of Lending Portfolios (Alternative Emissions Data)

Panel A: All Portfolios						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.447	2.405**	−3.070**	0.001	−0.667	0.149
	(1.14)	(2.60)	(2.34)	(0.00)	(0.99)	(0.34)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	736	736	736	736	736	736
R^2	0.76	0.83	0.74	0.79	0.88	0.81
Panel B: Portfolios of borrowers with only bank financing						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.578	1.618*	−2.738**	−0.333	−0.838	0.210
	(1.27)	(1.76)	(2.13)	(0.59)	(1.21)	(0.38)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	736	736	736	736	736	736
R^2	0.76	0.82	0.74	0.74	0.86	0.78
Panel C: Portfolios of borrowers with bank financing and ESG stakeholders						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable:	All	Relationship	Non-rel.	All	Relationship	Non-rel.
Financed Emissions	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios	Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.655	1.297**	−1.343*	0.027	0.855	0.040
	(0.81)	(2.27)	(1.77)	(0.04)	(1.01)	(0.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	736	736	736	736	736	736
R^2	0.73	0.75	0.71	0.88	0.85	0.84

This table reports regression results for the *engagement* channel using CGEE data. Panel A includes all portfolios of energy and non-energy sector borrowers. Panel B includes portfolios of borrowers with only bank financing and Panel C includes borrowers with both bank financing and ESG stakeholders. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table IA.3: Divestment Channel and Carbon Pricing Policies (Alternative Emissions Data)

Panel A: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.514	−0.041	−0.948***	0.462	0.226	0.449
	(1.65)	(0.16)	(2.86)	(1.36)	(0.70)	(1.32)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,229	2,229	2,229	2,229	2,229	2,229
R^2	0.68	0.71	0.51	0.79	0.77	0.77

Panel B: Unregulated borrowers

	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.910**	−0.326	−0.934**	0.366	−0.109	0.213
	(1.99)	(0.82)	(1.97)	(1.58)	(0.29)	(0.92)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,229	2,229	2,229	2,229	2,229	2,229
R^2	0.64	0.67	0.60	0.78	0.76	0.76

This table presents heterogeneity tests of the *divestment* channel based carbon pricing policies of borrowers' home countries using CGEE emissions data. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in year t and borrower i's scope 123 emissions intensity in year t. Variables definitions are provided in Appendix Table A1. T-stats are reported in the parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table IA.4: Engagement Channel and Carbon Pricing Policies (Alternative Emissions Data)

Panel A.1: Regulated borrowers

	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−0.822	0.058	−0.838	0.211	0.251	0.035
	(1.00)	(0.07)	(0.83)	(0.28)	(0.30)	(0.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	736	736	736	736	736	736
R^2	0.87	0.84	0.82	0.93	0.89	0.91

Panel B: Unregulated borrowers

	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	−1.255	2.495**	−2.902**	0.431	0.257	0.251
	(0.86)	(2.43)	(2.11)	(0.64)	(0.25)	(0.37)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	736	736	736	736	736	736
R^2	0.72	0.71	0.73	0.85	0.84	0.86

This table presents heterogeneity tests using CGEE data of the *engagement* channel based carbon pricing policies of borrowers' home countries using CGEE emissions data. Panels A includes banks' portfolios of regulated borrowers - borrowers from countries with carbon taxes and/or emissions trading systems in place before the Paris Agreement. Panel B includes banks' portfolios of unregulated borrowers - borrowers from countries without carbon taxes and/or emissions trading systems in place before the Paris Agreement. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years. *PostParis* variable equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions are calculated following equation (2) by taking the natural logarithm of one plus the sum, across all borrowers, of the product of total borrowing amount from bank j of borrower i in event year $t = 0$ and borrower i's scope 123 emissions intensity in event years $t = 0, 1, 2, 3$. All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table IA.5: Baseline Regressions Excluding Last Two Years

Panel A: Divestment Channel						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
PostParis*Brown	-1.352***	0.180	-1.589***	0.160	-0.375	0.180
	(3.46)	(0.59)	(3.82)	(1.10)	(1.05)	(1.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,293	2,293	2,293	2,293	2,293	2,293
R^2	0.63	0.76	0.60	0.68	0.81	0.63

Panel B: Engagement Channel						
	Energy sector portfolios			Non-energy sector portfolios		
Dependent variable: Financed Emissions	All Portfolios	Relationship Portfolios	Non-rel. Portfolios	All Portfolios	Relationship Portfolios	Non-rel. Portfolios
	(1)	(2)	(3)	(4)	(5)	(6)
	-2.155*	1.544*	-2.822**	-0.106	0.931	-0.185
	(1.88)	(1.73)	(2.44)	(0.25)	(1.07)	(0.40)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	897	897	897	897	897	897
R^2	0.75	0.82	0.74	0.75	0.83	0.76

This table presents bank-level regression results excluding 2022-2023. Panel A includes results of for the *divestment* channel. Panel B includes results of for the *engagement* channel. Energy sector portfolios include borrowers operating in industries with two-digit SIC codes as follows: 12 (Coal Mining), 13 (Oil & Gas Extraction), 29 (Petroleum & Coal Products), or 49 (Electric, Gas, & Sanitary Services), excluding four-digit SIC codes 4941 (Water Supply), 4971 (Irrigation Systems), 4959 (Sanitary Services), which include renewable and low-carbon distribution and services firms in our sample. *Relationship* portfolios in columns (2) and (5) include loans to borrowers who have borrowed from the same lead bank within the last 5 years. *Non-relationship* portfolios in columns (3) and (6) include loans to borrowers who have not borrowed from the same lead bank in the last 5 years.*PostParis* equals one for years 2016-2023 and zero for years 2010-2015. *Brown* indicates banks with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. Financed emissions in Panel A are calculated following equation (1). Financed emissions in Panel B are calculated following equation (2). All regressions include the control variables listed in Table 2. Variable definitions are provided in Appendix Table A1. All regressions include the control variables listed in Table 2. T-stats are reported in parenthesis. Standard errors are clustered at the bank level. *, **, *** denote the 10%, 5% and 1% significance levels, respectively.

Table IA.6: List of *Brown* banks

Bank name	Country ISO	Bank name	Country ISO	Bank name	Country ISO
77 Bank Ltd	JPN	**Credit Agricole**	FRA	National Bank of Canada	CAN
ABN AMRO Bank NV	NLD	**Credit Suisse AG**	CHE	Natixis SA	FRA
ATB Financial	CAN	DNB	NOR	Nedbank Ltd	ZAF
Allahabad Bank	IND	DZ Bank AG	DEU	Nordea Bank AB	NOR
Apple Bank for Savings	USA	Danske Bank A/S	DNK	Oversea-Chinese Banking Corp Ltd	SGP
Arab Bank Group	JOR	Deutsche Bank AG	DEU	PNC Bank	USA
Associated Bank NA	USA	Development Bank of Japan Inc	JPN	PT Bank Central Asia Tbk	IDN
Axis Bank Ltd	IND	Development Bank of Singapore Ltd	SGP	Punjab National Bank	IND
BNP Paribas SA	FRA	Erste Bank AG	AUT	RBC Capital Markets	CAN
BOK Financial Corp	USA	Export-Import Bank of Korea	KOR	**Raiffeisen Bank International AG**	AUT
BBVA	ESP	Fifth Third Bank	USA	Royal Bank of Scotland Plc	GBR
Banco Bradesco SA	BRA	First Abu Dhabi Bank	ARE	Scotiabank	CAN
Banco Santander SA	ESP	Frost National Bank	USA	Shanghai Commercial & Savings Bank	TWN
Bank of Baroda	IND	Goldman Sachs & Co	USA	**Shinhan Financial Group**	KOR
Bank of China Ltd	CHN	**HSBC Banking Group**	GBR	Shinsei Bank Ltd	JPN
Bank of Communications Co Ltd	CHN	HSH Nordbank AG	DEU	**Societe Generale SA**	FRA
Bank of Hawaii	USA	Hancock Bank	USA	Standard Bank Group Ltd	ZAF
Bank of India	IND	Huntington Bancshares	USA	**Standard Chartered Bank Plc**	GBR
Bank of New York Mellon	USA	**ING Group**	NLD	State Bank of India	IND
Bank of the Philippine Islands	PHL	Industrial & Commercial Bank of China Ltd	CHN	Stifel Financial Corp	USA
Banque Misr SAE	EGY	**Industrial Bank of Korea**	KOR	Sumitomo Mitsui Financial Group Inc	JPN
Barclays	GBR	**Intesa Sanpaolo SpA**	ITA	Swedbank AB (publ)	SWE
BofA Securities	USA	JP Morgan	USA	Syndicate Bank	IND
CIBC	USA	KeyBank	USA	Toronto Dominion Bank	CAN
CIT Group Inc	USA	KfW Bankengruppe	DEU	Truist Financial	USA
CM-CIC	FRA	Korea Development Bank	KOR	UBS AG	CHE
Cadence Bank NA	USA	Korea Exchange Bank	KOR	UCO Bank	IND
Caixabank	ESP	Landesbank Baden-Wurttemberg	DEU	UMB Bank NA	USA
Canadian Western Bank	CAN	Landesbank Hessen-Thuringen GZ	DEU	US Bancorp	USA
Canara Bank	IND	Lloyds Banking Group Plc	GBR	UniCredit	ITA
Capital One Financial Corp	USA	Macquarie Group Ltd	AUS	Union Bank of India	IND
China Citic Bank	CHN	Malayan Banking Bhd	MYS	United Bank	USA
Citi	USA	Mediobanca SpA	ITA	United Overseas Bank Ltd	SGP
Cobank ACB	USA	Mitsubishi UFJ Financial Group Inc	JPN	Wells Fargo & Co	USA
Comerica Inc	USA	Morgan Stanley	USA	**Westpac Banking Corp**	AUS
Commercial Bank QSC	QAT	NIBC	NLD	**Yes Bank**	IND
Commonwealth Bank of Australia	AUS	National Australia Bank Ltd	AUS	Zions Bancorporation	USA

This table presents the *Brown* banks in our sample. *Brown* banks are defined as those with above-median energy intensity ratio in the years prior to the ratification of Paris Agreement. The bank names in bold indicate the banks that committed to SBTi during our sample period.

Table IA.7: List of *Green* banks

Bank name	Country ISO	Bank name	Country ISO	Bank name	Country ISO
AgFirst Farm Credit Bank	USA	Citizens Financial Group	USA	Liberbank SA	ESP
Agricultural Bank of China	CHN	**Commerzbank AG**	DEU	M&T Bank	USA
Agricultural Bank of Taiwan	TWN	Dah Sing Bank Ltd	CHN	Mashreqbank psc	ARE
Aichi Bank	JPN	Daito Bank	JPN	Mie Bank	JPN
Alpha Bank AE	GRC	Doha Bank QPSC	QAT	Minato Bank	JPN
Aomori Bank Ltd	JPN	**E Sun Commercial Bank Ltd**	TWN	Miyazaki Bank	JPN
Aozora Bank	JPN	East West Bank	USA	Mizrahi Tefahot Bank Ltd	ISR
Australia & New Zealand Banking Group Ltd	AUS	Eighteenth Bank Ltd	JPN	Musashino Bank	JPN
BPCE SA	FRA	Emirates NBD PJSC	ARE	Nanto Bank Ltd	JPN
Banca March SA	ITA	EnTie Commercial Bank	TWN	National Bank of Greece SA	GRC
Banco BPI SA	PRT	Far Eastern International Bank	TWN	Nomura Holdings Inc	JPN
Banco Cooperativo Espanol SA	ESP	First Bank of Highland Park	USA	Norinchukin Bank	JPN
Banco Popular Inc	USA	First Financial Holding Co Ltd	TWN	**Northern Trust Corp**	USA
Banco de Sabadell SA	ESP	First Horizon Bank	USA	**Nykredit Bank AS**	DNK
Banco do Brasil	BRA	First National Bank	USA	O-Bank Co Ltd	TWN
Bangkok Bank Public Co Ltd	THA	**Fubon Financial Holding Co Ltd**	TWN	OP Financial Group	FIN
Bank Al Habib	PAK	Fukui Bank	JPN	PT Bank Negara Indonesia (Persero) Tbk	IDN
Bank Hapoalim BM	ISR	Gunma Bank Ltd	JPN	People's United Bank	USA
Bank Muscat SAOG	OMN	HDFC Bank Ltd	IND	Qatar Islamic Bank QSC	QAT
Bank fur Tirol und Vorarlberg AG	AUT	Hachijuni Bank Ltd	JPN	Rabobank	NLD
Bank of East Asia Ltd	CHN	**Hana Financial Group Inc**	KOR	Raymond James Financial Inc	USA
Bank of Fukuoka Ltd	JPN	**Hang Seng Bank Ltd**	CHN	Regions Bank	USA
Bank of Ireland Group	IRL	Higashi-Nippon Bank	JPN	SVB Financial Group	USA
Bank of Kyoto	JPN	Hokkoku Bank Ltd	JPN	Shanghai Pudong Development Bank	CHN
Bank of Panhsin	TWN	Hokuetsu Bank	JPN	Shikoku Bank	JPN
Bank of Saga	JPN	Hyakugo Bank Ltd	JPN	Shoko Chukin Bank	JPN
Bank of Shanghai	CHN	IKB Deutsche Industrie Bank AG	DEU	Siam Commercial Bank	THA
Bank of Taiwan	TWN	Ibercaja	ESP	State Street Bank	USA
Bank of Yokohama	JPN	Indian Overseas Bank	IND	Sumitomo Mitsui Trust Holdings Inc	JPN
Bankinter SA	ESP	IndusInd Bank Ltd	IND	Ta Chong Bank	TWN
Banque Cantonale Vaudoise	CHE	Industrial Development Bank of India	IND	Taichung Commercial Bank	TWN
BayernLB	DEU	Iyo Bank Ltd	JPN	Taiwan Business Bank	TWN
CIMB Group Holdings Bhd	MYS	Jefferies	USA	**Taiwan Cooperative Bank**	TWN
CTBC Financial Holding Co Ltd	TWN	Jih Sun International Bank	TWN	Tokyo Tomin Bank	JPN
Chang Hwa Commercial Bank Ltd	TWN	KBC Group	BEL	Unicaja	ESP
Chiba Bank Ltd	JPN	KGI Bank	TWN	VTB Bank JSC	RUS
China Construction Bank	CHN	KUTXABANK	ESP	Webster Bank NA	USA
China Development Bank	CHN	Kansai Urban Bank	JPN	Wintrust Financial Corp	USA
China Merchants Bank Co Ltd	CHN	Kasikornbank Public Co Ltd	THA	Yamagata Bank	JPN
Chong Hing Bank	CHN	**La Banque Postale SA**	FRA	**mBank SA**	POL
Chukyo Bank	JPN	Land Bank of Taiwan	TWN		

This table presents the *Green* banks in our sample. *Green* banks are defined as those with below-median energy intensity ratio in the years prior to the ratification of Paris Agreement. The bank names in bold indicate the banks that committed to SBTi during our sample period.