Cross-border Green Lending

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Abstract

This paper examines the effects of climate policy and banks' voluntary environmental commitments on the supply of cross-border green lending. We focus on heterogeneous effects across debt instruments—such as green and sustainability-linked loans (SLLs)—and across areas with different income levels. Using a sample of cross-border syndicated loans, we find that banks' participation in cross-border green loans and SLLs behaves differently than in conventional loans. While the latter increases when the lender's country adopts stricter climate policies, participation in green lending abroad does not, and in the case of green loans, it declines significantly. Moreover, the retreat from cross-border green lending is particularly pronounced when the lender has made public environmental commitments or when borrowers are located in relatively lower-income countries. Our findings underscore the limitations of green loans and SLLs in promoting green finance in developing regions, suggesting that domestic incentives and reputational concerns may discourage banks from extending such financing abroad, even when the environmental benefits of such operations could be more impactful.

Key words: Sustainable Finance, Syndicated Loan Markets, Cross-border Lending

1 Introduction

Growing concerns about environmental issues and the urgency to mitigate climate change have intensified pressure on financial institutions to support sustainability initiatives. In response, the financial industry has introduced a range of products and strategies aimed at promoting decarbonization and sustainable investments. However, as emphasized in the COP28 Second High-Level Expert Report on Climate Finance, global private climate finance remains insufficient to meet the Paris Agreement's targets, with the majority of funds concentrated in developed regions. This uneven distribution raises critical questions about the factors shaping the supply of green lending, particularly across borders, and whether financial constraints, information asymmetries, or institutional frictions hinder the flow of green capital to the areas that need it most.

This study investigates how environmental societal pressure affects the supply of cross-border green lending in the syndicated loan market. By examining the period from 2016 to 2022, we analyze an era marked by growing sustainability awareness, financial innovation, climate policy developments, and significant macroeconomic shifts in cross-border lending. In this evolving context, green lending volumes reflect the strategic responses of both lenders and borrowers to environmental concerns. To isolate supply-side dynamics, we leverage the unique institutional characteristics of the syndicated loan market. Specifically, we exploit within-loan variation in a banks' contributions to syndicated loans. This empirical strategy allows us to identify how banks' cross-border green lending activities respond to external pressures, including climate policies and public commitments.

We define green lending broadly to include green loans and sustainability-linked loans (SLLs), as well as conventional loans to firms in green sectors. Green loans are designed to fund projects with clear environmental benefits, while SLLs may incentivize sustainable practices by linking loan terms to a borrower's environmental performance. Green loans and sustainability-linked loans (SLLs) have become central to the global financial response to climate change since their introduction by ING in 2017. By 2022, these instruments represented 10.5% of global syndicated loan volumes and 25.6% of syndicated cross-border loans. Beyond labeled green instruments, banks' approach to sustainable finance often extends to a broader assessment of their loan portfolios' carbon footprint. As financial institutions (and regulators) emphasize the decarbonization of lending activities—often by measuring sectoral or firm-level emissions—conventional loans to green industries also play a role in aligning financial flows with climate goals. These different forms of lending have become central to banks' sustainability strategies, with managerial incentives increasingly tied to their issuance. By considering various types of green lending, we highlight distinctions between loans that support inherently green firms and those that encourage firms—regardless of sector—to achieve sustainability targets. The addition of green loans and SLLs is particularly relevant given findings from Hartzmark and Shue (2022), which suggest that an exclusive focus on the current levels of emissions when measuring the greenness of a firm could slow the pace of climate action since firms that are already classified as green often have limited scope for further emissions reductions,

highlighting the need for financial products that effectively incentivize the adoption of cleaner technologies and the transition to lower-carbon business models.

We examine two distinct environmental social pressure measures. First, following Benincasa et al. (2022), we use the Climate Change Performance Index (CCPI) from Germanwatch as a proxy for national climate policy. This comprehensive index covers 59 countries, enabling us to assess climate policy characteristics for syndicate members and borrowers. This measure allows us to focus on the lenders' climate policy and analyze the relative climate policy stringency between lenders and borrowers. Second, following Sastry et al. (2024), we analyze banks' commitments through their participation in the Net Zero Banking Alliance (NZBA). As the largest global initiative of its kind, the NZBA comprised 141 bank groups by 2022. Member banks commit to aligning business practices with net-zero greenhouse gas emissions by 2050, in accordance with the Paris Agreement. The alliance, part of the United Nations Environment Programme Finance Initiative (UNEP FI), mandates that members set intermediate emissions targets by 2030, disclose progress transparently, and integrate climate considerations into investment strategies. By examining the national climate policy performance (through the CCPI) and individual voluntary bank commitments (through NZBA membership), we capture two distinct mechanisms of environmental pressures in cross-border lending. The national-level index provides a macro perspective on climate policy effectiveness, taking into account governmental and national-level commitments to climate action. In contrast, the bank-level commitment measure offers insight into institutional-level strategic responses to climate challenges or social expectations. These institutional commitments are often shaped by strategic considerations in anticipation of future policy, mitigation of physical risks from extreme climate events, and reputational management to avoid negative depositor reactions to environmental controversies (Morse and Sastry, 2024).

Prior research on cross-border syndicated lending has documented various drivers of fund allocation, including regulatory arbitrage, risk management, and geographic diversification. Recent studies highlight how lending decisions are shaped by climate policies (Benincasa et al., 2022), regulatory risks (Mueller and Sfrappini, 2022), and geographic diversification (Doerr and Schaz, 2021) on lending decisions. We argue that the dynamics of cross-border green lending may differ significantly from those observed in the conventional syndicated loan market. In traditional syndicated lending, banks often respond to stricter domestic regulations by shifting activities abroad, engaging in regulatory arbitrage to mitigate compliance costs (Benincasa et al., 2022). In contrast, the response of green lending to stricter domestic climate policies may not follow this pattern. On the one hand, such policies may reflect heightened societal demand for sustainability, strengthening local interest in green financial instruments and increasing domestic lending opportunities. On the other hand, these policies could heighten reputational risks for domestic banks, discouraging them from participating in green lending in some areas. By empirically addressing this question, our paper contributes new evidence to the growing literature on green finance and cross-border lending flows, shedding light on the potential limitations of green loans and SLLs in mobilizing resources across

countries to support climate action.

Our results show that banks react differently to stricter climate policies or to adopting environmental commitments when it comes to cross-border green lending compared to conventional loans abroad. While banks tend to increase their participation in conventional cross-border loans following such changes, the supply of green loans and SLLs does not show a consistent upward trend and, in some cases, diminishes -particularly for green loans. This decline is especially evident when borrowers are in lower-income countries. On the other hand, banks from countries with relatively weaker climate policies but strong public environmental commitments are more inclined to engage in cross-border green lending, yet they primarily favor borrowers in higher-income countries.

To further examine these patterns, we analyzed loan volumes at the bank-country level and found that cross-border lending behaves differently from domestic lending. Specifically, international loans are more sensitive to changes in a bank's climate policy stance or environmental commitments, such as joining the Net-Zero Banking Alliance (NZBA). Our analysis of aggregate loan volumes confirms that the decline in green loans and SLLs is generally not offset by an increase in other types of loans. As a result, this leads to an overall reduction in funding—except for higher-income countries, which experience an increase in both conventional and green lending availability. By further disaggregating our sample based on the location of borrowers and lenders, we confirmed that this overall effect is primarily driven by banks in wealthier countries reducing their lending to lower-income borrowers.

To account for potential market expansion effects, which might enable NZBA members to dominate a broader range of markets, we also examined the composition of each bank's loan portfolio. We estimated a discrete-choice model using the share of each country in the aggregate loan portfolio of each bank. Once again, we find that banks in wealthier countries increase their supply of green lending primarily to other wealthy countries while showing a lower willingness to lend in lower-income regions. Interestingly, stricter domestic climate policies increase the likelihood of banks providing green loans to high-income borrowers abroad—but only when the lender itself is located in a wealthy country.

Our paper contributes to a growing strand of research examining green finance, cross-border capital flows, and the intersection of the two. Correa et al. (2023) investigate how banks adjust loan pricing in response to climate change-related natural disasters. Their findings indicate that banks increase loan interest rates for borrowers exposed to, but not directly affected by, climate-induced disasters, reflecting a reassessment of risk perceptions. Kacperczyk and Peydro (2024) analyze the relationship between carbon emissions and the bank-lending channel. Their study suggests that firms with a higher carbon footprint previously borrowing from committed banks subsequently receive less bank credit. Furthermore, Ivanov et al. (2024) explores the interplay between corporate lending and cap-and-trade policies. They find that firms subject to carbon regulation face higher loan spreads, indicating that banks incorporate regulatory risks into their lending decisions. Claessens (2017)

analyzes the evolution of global banking post-financial crises, noting a decline in cross-border capital flows from advanced economies and a concurrent rise in international banking activities by emerging market banks. The study highlights that long-term debt flows are less volatile and that foreign banks with a larger presence, more domestic funding, and closer relationships provide more finance and share risks better. Ho and Wong (2023) study examines climate-related risks' impact on the cost of bank loans in emerging economies. They use a novel dataset of syndicate loans originating in emerging market economies. Their analysis reveals that heightened climate risks lead to increased loan spreads, suggesting that banks price in these risks when lending in vulnerable regions. Our paper contributes to the literature by examining how broader societal forces influence bank lending decisions, with a particular focus on the heterogeneity of effects across countries with different income levels. Using a large sample of cross-border syndicated loans allows us to examine how the cross-border capital flow can be influenced by the domestic societal pressures that banks face around environmental issues, highlighting the differences across the different types of instruments usually classified as green lending.

The findings of this paper suggest that green loans and SLLs, while highly visible to stakeholders, may incentivize banks to prioritize domestic markets to mitigate reputational risks associated with environmental controversies. This localized focus could hinder the potential for these instruments to drive meaningful green finance in developing regions, where the need for climate investment is often greatest. Our evidence underscores the limitations of green loans and SLLs in addressing global climate finance gaps and highlights the need for targeted mechanisms to enhance green lending in developing economies.

The remainder of this paper is organized as follows. Section 2 provides an overview of recent trends in the cross-border green lending market. Section 3 discusses briefly the data used in our empirical analysis. Section 4 describes the econometric techniques used in our main empirical exercise. Section 5 discusses the results. Section 6 presents our main conclusions.

2 Institutional background

2.1 The cross-border syndicated loan market

Syndicated loans, which pool resources from multiple financial institutions to provide large-scale financing, play an important role in funding climate transition initiatives (Martini et al., 2024). Addressing climate change requires substantial capital for projects such as renewable energy infrastructure, green transportation systems, energy efficiency upgrades, and carbon capture technologies. Many of these projects exceed the funding capacity of individual lenders. The cross-border nature of syndicated lending is particularly valuable for climate projects, as it allows firms to access global funding for capital-intensive investments such as renewable energy infrastructure, green

transportation systems, and carbon capture technologies.

In the syndicated loan market, borrowers typically negotiate with a lead arranger or group of arrangers, often large international banks, the structure and terms of the loan. These arrangers act, in turn, as intermediaries between the borrower and other potential lenders who choose the level of participation in the loan based on the borrower's creditworthiness, industry risks, and geopolitical factors. This market feature has been widely used in the literature to isolate supply-side determinants of market outcomes (Sufi, 2007; Ivashina, 2009), and we similarly rely on this empirical strategy to explore how pressure on banks to incorporate environmental considerations into their business policies is influencing cross-border green lending dynamics.

2.2 Evolution of green cross-border lending

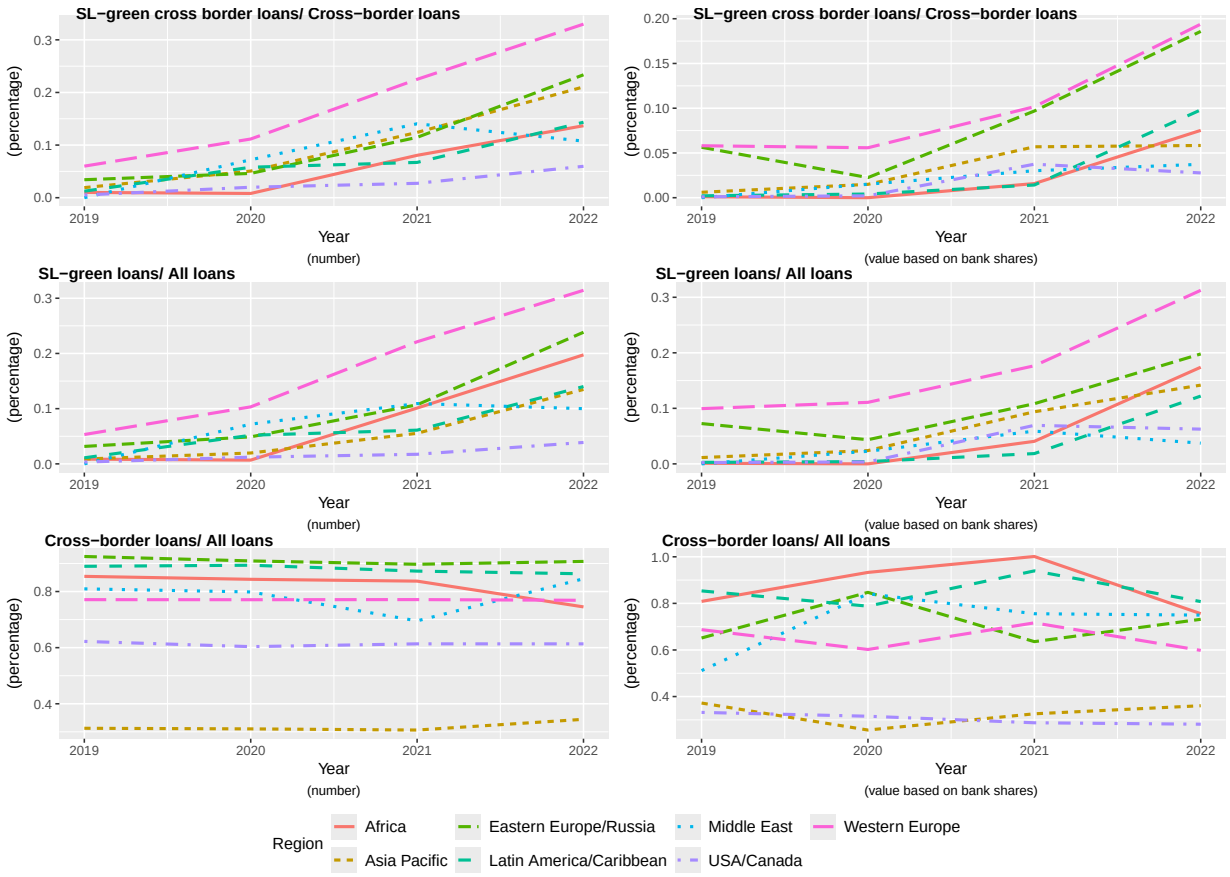
Prominent Japanese and Western European banks were among the first financial institutions to provide SLLs and green loans, establishing themselves as key players in this growing market. Their influence has been especially notable within Western Europe, the United States, the United Kingdom, and Canada. The significant role of these global banks explains the prominence of such loans in the cross-border lending market. In 2022, foreign banks were highly active in supplying green loans and SLLs, accounting for around 50% of the total value of these loans (among those loan contracts with available information on bank shares) and participating in approximately 75% of the loan syndicates.

Figure 1 illustrates the evolution of the SLLs and green cross-border loans market in recent years, according to the borrower's location. The top row shows the increasing share of SLLs and green loans in the overall cross-border syndicated loan market in terms of number and value. These types of loans have increased prominence in all regions, particularly in Western Europe, where they represented 33.8% of the syndicated loans' value in 2022. This trend is similar to the one observed for the SLL-green loans market, including domestic operations (middle row). Finally, The bottom row of the figure presents the share of cross-border loans relative to the entire syndicated loan market. Developing regions such as Africa and Latin America exhibit a greater share of cross-border operations in the syndicated loan market (higher than 80%). In contrast, lower shares are seen in Asia and North America, where a higher proportion of syndicates is composed solely of domestic banks. After 2020, the cross-border loans market experienced slower growth, particularly in emerging regions such as Africa and Latin America, associated with an adverse macroeconomic environment and geopolitical tensions.

Figure 2 shows that the participation of countries in the top 20% of the income distribution in the cross-border syndicated market has increased significantly in recent years, reaching 90.5% in 2022.[1]

[1]The income distribution referenced here is based on countries included in the Dealscan database, specifically those with at least one borrower between 2017 and 2022.

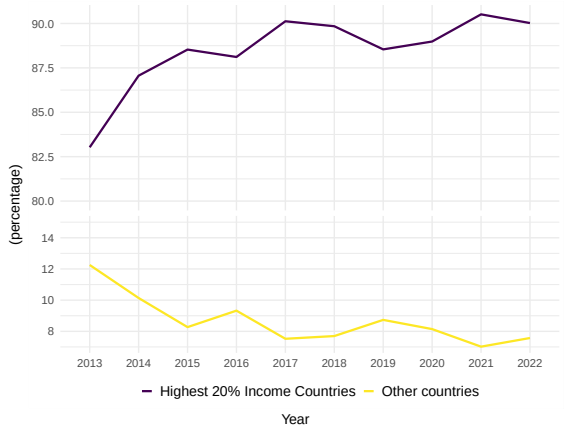
Figure 1: SLLs and green cross-border loans market shares across geographic markets.



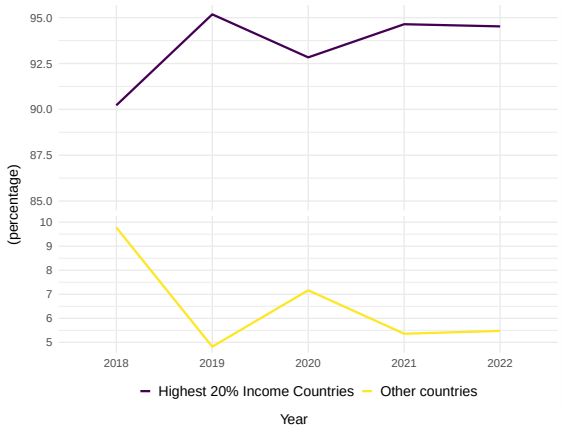
(a) This Figure presents the value of SLLs and green cross-border loans by borrowers' region as a percentage of the value of all cross-border syndicated loans.

The figure also shows this trend is even more pronounced for green loans and SLLs, suggesting that banks find greater difficulty in supplying this type of loans in areas with lower income, where actions towards emissions reduction could be more cost-effective, contributing to a greater concentration of the overall funding in higher income regions.

Figure 2: Market share and cross-border loans volume to borrowers in highest and lowest income countries

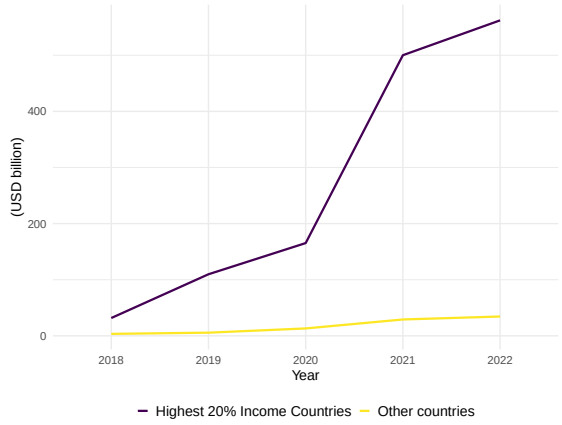


(a) All loans (market share)



(b) Green loans and SLLs (market share)

(c) All loans (volume)



(d) Green loans and SLLs (volume)

3 Data

3.1 Loan and Bank Data

For our analysis we make use of various datasets. We use loan data from the Loan Pricing Corporation's DealScan database. We used records of credit operations originating from 2018 to 2022. Following Benincasa et al. (2022), we consider only syndicated loans originated by commercial,

investment, cooperative, and savings banks to non-financial firms. We excluded from our sample, therefore, those loans exclusively provided by development financial institutions or government sponsored lenders. We also collect from DealScan information on loan characteristics such as loan type, amount, maturity, date of origination, etc. Furthermore, we also included information about borrowers and lenders, such as their country of operation (or that of the headquarters if it is a subsidiary bank) and the lender's share in the loan contract. Our definition of a cross-border operation is based on the borrower's and the lender's location. We consider a loan a cross-border operation if there is at least one foreign bank (or bank group) in the syndicate.

A critical distinction exists between deals and tranches in the syndicated loan market. A deal represents the overarching agreement for the loan, while tranches are individual portions (term loans, credit lines, etc.), each with potentially different terms such as currency, interest rates, or maturities. Firms obtain additional funding for their operations by negotiating new deals, which allow them to tap into a broader pool of lenders or increase their funding capacity, or by amending or adding tranches to existing deals, which may be faster and more cost-efficient. When a new tranche is added to an existing agreement, the composition of the syndicate may change. Some syndicate members (including lead arrangers) may opt not to participate in additional tranches if they are structured differently or do not align with their risk preferences or currency exposure strategies.

Notably, distinctions between sustainability-linked loans (SLLs) and green loans are typically made at the tranche level rather than the deal level, as tranches often reflect specific sustainability goals or project purposes. Consequently, our analysis will focus on changes in lender participation at the tranche level, as the syndicate composition can vary significantly across tranches within the same deal. DealScan explicitly labels the loan tranches as "green" or "Sustainability-linked" based on information about their purpose and structure in the contract, press releases, borrower reports, and other sources. Our primary econometric analysis requires detailed information on the loan shares for each syndicate member. This data is available for 1009 SLLs and green loans and 20,198 conventional cross-border loan tranches out of 3,386 SLLs/green loans and 88,220 conventional loans. Table 1 provides more information about our sample composition.

We hand-match the lenders extracted from DealScan with financial information in BankScope and BankFocus using a combination of bank and location, linking subsidiaries and branches to their parent. Prior to this match, we processed the bank names in DealScan to account for name changes, mergers, and acquisitions over the sample period. Our sample contains information on 2034 bank groups and 4142 subsidiaries. Among them, 213 issued green loans, and 269 issued SLLs.

Table 1: Sample Composition

	Green Loan	SLL	Conventional-Green Sector	Other
Panel Al. All loans				
Number of Deals	633	1576	10742	56199
Number of Tranches	1309	2946	29097	121379
Number of Borrowers	591	1273	6207	33370
Borrowers' Countries	64	62	131	167
Number of Lenders	689	1129	3846	8125
Number of Parent Lenders	431	644	2181	4804
Panel B. Cross-border loans				
Number of Deals	523	1209	6072	28646
Number of Tranches	1135	2251	18338	69903
Number of Borrowers	494	1018	3687	19217
Borrowers' Countries	61	62	131	167
Number of Lenders	612	990	3015	6241
Number of Parent Lenders	370	522	1631	3535
Panel C. Cross-border loans with lender's loan share available (Dealscan)				
Number of Deals	226	399	1926	10551
Number of Tranches	369	640	3305	16904
Number of Borrowers	218	345	1402	8176
Borrowers' Countries	47	50	118	163
Number of Lenders	325	498	1600	3852
Number of Lender Parent Operating Countries	45	49	77	113
Number of Parent Lenders	213	269	780	1865

Notes: This table presents an overview of the sample of syndicated loans included in the analysis. These deals and tranches were originated between 2017 and 2022. The sample includes only syndicated loans originated by commercial, investment, cooperative, and savings banks to non-financial firms and those taken by borrowers in the financial sector. The loans are categorized as Green Loans, SLLs, Conventional loans to borrowers in green industries, according to the classification proposed by Pastor et al. (2022), and other loans.

3.2 Environmental Concerns

We are interested in understanding the effects of increasing pressure on banks to incorporate environmental considerations in their business models on cross-border green lending. We consider two measures to capture this phenomenon: first, we examine the level of climate policy stringency. Cross-country differences in climate policies are captured using the Climate Change Performance Index (CCPI) from Germanwatch. The CCPI consists of four main components: GHG Emissions Improvement (60%), Renewable Energy (10%), Energy Efficiency (10%), and Climate Policy (20%); the CCPI ranges between 0 and 100, with higher scores indicating better performance. The index has a broad coverage, available for 59 countries, covering 90% of global GHG emissions. Following Benincasa et al. (2022),Atanasova and Schwartz (2019), and Delis et al. (2024), we used the CCPI as our primary measure of climate policy stringency. This measure is comprehensive, capturing different dimensions of climate policy, and facilitates cross-country comparisons by summarizing them in a single metric.

Second, our analysis examines how banks' voluntary climate commitments influence their behavior. In recent years, financial institutions have faced increasing pressure from shareholders and clients to demonstrate tangible action on climate transition, leading to their participation in various climate-related initiatives. Following the methodological approach of Sastry et al. (2024), we focused on the banks' decision to join the Net Zero Banking Alliance (NZBA). This global initiative is the largest of its type, including 141 bank groups at the end of 2022. NZBA member institutions commit to aligning their lending and investment portfolios with net-zero greenhouse gas emissions by 2050, in accordance with the Paris Agreement objectives. Operating under the United Nations Environment Programme Finance Initiative (UNEP FI), the alliance mandates that participating banks establish interim targets for 2030 or earlier. Members must also maintain transparency through regular progress reporting and demonstrate how climate considerations are integrated into their investment strategies. The NZBA's credibility stems from its dual emphasis on rigorous reporting requirements and the implementation of scientifically validated methodologies for measuring progress toward climate goals.

3.3 Country-level information

We incorporated a comprehensive set of variables into our econometric specifications to capture the economic conditions and institutional contexts of both lenders' and borrowers' countries. Data on macroeconomic conditions—including GDP per capita growth, the unemployment rate, and private sector credit as a share of GDP—were obtained from the World Development Indicators (World Bank). Measures of institutional quality were sourced from the Worldwide Governance Indicators, also from the World Bank. Specifically, we considered the indexes Rule of Law, Strength of Legal Rights, Control of Corruption, Regulatory Quality, Government Effectiveness, and Voice

and Accountability as key institutional factors shaping lending environments (see Table A.1 in the Appendix for a detailed description).

Additionally, we included geographic and cultural proximity variables to account for bilateral factors influencing cross-border lending. These include the geographic distance between lenders' and borrowers' countries and shared attributes such as distance between capitals, official language, religion, and legal tradition. Country-pair-level data for these variables were sourced from the CEPII Gravity database (Conte, 2022).

Including these control variables helps to isolate the effects of our primary variables of interest while accounting for the well-documented role of cultural and institutional proximity in shaping international lending decisions (Demirgüç-Kunt, 2023).

3.4 Characteristics of green loans and conventional cross-border loans

Table 2 presents descriptive statistics on the syndicated loans in our sample, categorized by loan type.

Panel A highlights key differences in loan size, maturity, and interest rate margins across green loans, sustainability-linked loans (SLLs), and conventional loans. Green loans tend to be significantly smaller than conventional loans ($150.2 million vs. $281.5 million USD for conventional loans issued to firms in non-green sectors). In contrast, SLLs and conventional loans to green-sector firms are substantially larger, averaging $350 million.

Maturity structures also differ: Green loans have the most extended average maturity (8.3 years), whereas other loan types range between 4.7 and 5.8 years. In terms of pricing, SLLs have the lowest all-in-drawn spread (170.5 basis points (bp) and 14.7 bp, respectively), followed by green loans (218.6 bp). Conversely, conventional loans to green-sector firms carry the highest average spread (369 bp). Furthermore, green loans are less likely to be sponsored or include covenants than other loan types.

Panel B reveals notable differences in syndicate structure across loan types. Green loans are typically provided by smaller syndicates (3.6 lenders) but exhibit greater foreign participation (65%). In contrast, SLLs have larger syndicates (6.2 lenders), with foreign participation averaging 56.5%, a level closer to that of conventional loans. In terms of bank participation, NZBA members retain a higher share of green loans (43.3%) and SLLs (50.6%) compared to conventional loans to green-sector firms (24.7%).

Panel C shows that green loan borrowers are significantly smaller (as measured by sales size) than borrowers of SLLs or conventional loans. Meanwhile, Panel D indicates that banks participating in green loans tend to be larger, have lower ROE than lenders of other loan types, and are more

likely to be members of the NZBA Alliance.

Table 2: Syndicate and Loan Statistics

Variable	Green loans		SLL		Conventional-Green Sector		Other	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Panel A. Loan Statistics								
Tranche Amount (USD millions)	150.188	312.673	351.081	702.630	352.002	1479.186	281.480	778.846
Maturity (years)	8.323	5.936	4.780	2.334	5.440	4.215	5.829	4.573
All-In-Drawn Spread (bps)	218.567	152.110	170.456	113.834	369.037	191.534	300.265	187.809
All-In-Undrawn Spread (bps)	140.000	101.148	14.760	6.677	40.939	43.534	34.814	34.290
Term Loan (dummy variable)	0.539	0.499	0.443	0.497	0.593	0.491	0.537	0.499
Sponsor (dummy variable)	0.011	0.102	0.047	0.213	0.350	0.477	0.156	0.363
Project Finance (dummy variable)	0.607	0.489	0.070	0.256	0.059	0.236	0.243	0.429
Covenants (dummy variable)	0.002	0.046	0.067	0.249	0.089	0.285	0.077	0.267
New Tranche ((dummy variable)	0.953	0.211	0.854	0.353	0.716	0.451	0.831	0.375
Panel B. Syndicate Statistics								
Number of Lenders	3.594	4.256	6.166	7.162	3.807	5.142	4.452	5.812
Number of Parent Lenders	3.539	4.153	6.087	7.033	3.744	4.988	4.372	5.651
Number of Foreign Parent Lenders	2.586	3.316	3.763	5.446	2.450	3.658	2.967	4.369
Share retained by NZBA_members	0.432	0.448	0.506	0.435	0.247	0.400	0.315	0.420
Share Retained by Foreign Lenders	0.652	0.427	0.565	0.431	0.454	0.462	0.533	0.452
Avg. Parent Lender Share	0.252	0.317	0.144	0.231	0.203	0.296	0.184	0.268
Avg. Foreign Parent Lender Share	0.291	0.351	0.162	0.278	0.237	0.340	0.210	0.305
Avg. Share by NZBA members	0.258	0.307	0.177	0.258	0.304	0.359	0.251	0.328
Avg. Share Retained by NZBA arrangers	0.261	0.304	0.215	0.293	0.359	0.383	0.271	0.327
Panel C. Borrower Statistics								
Sales Size (USD billion)	3.367	6.772	20.530	99.847	16.674	177.724	23.055	370.821
CCPI Score Borrower	49.820	14.951	54.347	13.188	50.140	14.595	49.965	13.675
Panel D. Lender Parent Statistics								
Total Assets (USD billion)	881.408	1044.135	793.139	984.093	694.388	862.975	707.759	918.902
ROE	9.873	5.624	10.440	7.231	11.545	13.598	11.676	13.979
Tier-1 Capital Ratio	15.304	3.611	15.032	3.242	14.985	4.080	15.051	5.598
Capital Adequacy Ratio	20.242	18.225	20.524	19.406	19.994	18.141	20.872	20.445
CCPI Score Lender Parent	51.417	11.463	47.770	13.872	51.097	13.153	50.863	12.885
NZBA member	0.551	0.498	0.512	0.500	0.426	0.495	0.453	0.498

Notes: This table presents summary statistics of the cross-border syndicated loans included in the analysis (with available information on lenders' loan shares), including loan, syndicate, borrower, and lender characteristics. The Climate Policy Index (CCPI), by Germanwatch, is reported for the borrower and Bank-Group headquarters operating country. The variable 'NZBA' is an indicator variable that takes the value 1 when a bank has become a member of the Net-Zero Bank Alliance.

4 Effects of environmental social pressure on cross-border green lending

To examine the effect of changes in climate policy and voluntary environmental commitments on cross-border green lending, we used the following econometric model:

$$\begin{aligned} y_{ijt} = \alpha_{jt} + \beta^{CP}\Delta\mathsf{CCPI}_{ijt} + \beta^{NZ}\mathsf{NZBA}_{it} + \sum \beta^{Type}\mathsf{LoanType}_{jt} + \\ \sum \beta^{CP_{Type}}\mathsf{LoanType}_{jt} * \Delta\mathsf{CCPI}_{ijt} + \sum \beta^{NZ_{Type}}\mathsf{LoanType}_{jt} * \mathsf{NZBA}_{it} + \\ \sum \beta^{CPNZ_{Type}}\mathsf{LoanType}_{jt} * \Delta\mathsf{CCPI}_{ijt} * \mathsf{NZBA}_{it} + \boldsymbol{\omega}\boldsymbol{X}_{jit} + \delta_i + \epsilon_{ijt}, \end{aligned} \tag{1}$$

where the dependent variable, y_{ijt}, is the lender's participation in each cross-border syndicated loan operation. Since banks' environmental policy and public climate commitments are typically set at the bank group rather than the subsidiary level, we chose to focus on loan participation at the bank group level. Our interest variables are $\Delta\mathsf{CCPI}_{ijt}$, which represents the difference between the climate policy index observed in the lender's and borrower's countries and NZBA_{ijt}, an indicator variable that takes the value one after bank group i has become a NZBA member in year t.

The interaction terms allow us to capture potential heterogeneous effects across loan types (green loans, SLLs, or conventional loans to green sectors) and potential differentiated impacts of climate policy for NZBA members. Our specification includes a set of controls, represented here as $\boldsymbol{X}_{jit}$, that includes loan characteristics (size, type, maturity, collateral, presence of covenants), bank group characteristics (size, liquidity, and capital ratio), as well as measures of the economic activity and institutional characteristics of the lender's country, such as regulatory quality and levels of rule of law, accountability and corruption, as well as the geographical distance to the borrowers' country and the presence of similar language and legal traditions. Table A.1 in the Appendix summarizes the variables that we used in our analysis.

We also included fixed effects at the borrower-year (or at the loan level, alternatively) and bank group level to account for unobserved heterogeneity. Our identification strategy, therefore, exploits variation across lenders providing funding to the same borrower in a particular year. The granular set of fixed effects included in our specification allows us to incorporate information on any time-variant variables on the borrower side, such as changes in their financial situation or the economic and regulatory environment in the borrower's country, as well as unobserved time-invariant characteristics of the lender (bank group). Alternative specifications using borrower-lender fixed effects or loan fixed effects led to similar results as the ones reported here.

Climate policy and voluntary climate commitments by banks are potentially endogenous because they may correlate with unobservable factors that influence both the economic prospects of borrowers and the long-term business strategy of lenders. Specifically, banks operating in economies with stronger climate policies or voluntary commitments may be systematically different from those in

less regulated environments in ways not fully captured by observable data. For instance, lenders in countries with more stringent environmental regulations might also have more risk-averse lending practices or a greater preference for sustainable investments, making it difficult to disentangle the actual causal effect of climate policies on lending decisions.

To address these endogeneity concerns, we re-estimate the regression described in Equation 1 using an instrumental variables (IV) approach, following a methodology similar to Demirgüç-Kunt et al. (2023) and Houston et al. (2017). Our instruments are based on climate policy and the overall regulatory quality of all countries, excluding the specific borrower-lender country pair. The rationale behind these instruments is that climate policies in other countries may indirectly influence the borrower-lender relationship through regulatory spillovers while remaining exogenous to the unobserved characteristics of individual loan contracts. To enhance the relevance of the instruments, we assign greater weight to borrower-lender country pairs with smaller distances—geographical, institutional, and cultural—under the assumption that regulatory contagion is more likely in these situations.

We construct our measure of country closeness using variables that exhibit minimal time variation over the study period, such as geographical distance, the presence of a common official language, legal tradition, and a shared colonial history. To synthesize these factors into a single measure, we apply principal component analysis (PCA), which generates an informative index capturing the degree of closeness between countries. The resulting instruments are specific to each borrower-lender country pair and exhibit time variation as they incorporate evolving regulatory conditions across countries.

Additionally, we construct bank group-specific instruments by considering the regulatory environment faced by each bank's competitors. For each bank, we compute a weighted average of the regulatory conditions in the countries where its competitors operate. Since lending decisions may respond to contemporaneous regulatory changes, we use static weights based on portfolio composition observed between 2013 and 2017, ensuring that time variation in our instrument is driven by regulatory changes across countries and not by the changes in each bank's loan portfolio. To further refine the instrument, we remove the contribution of banks operating in the borrower's country, ensuring that the constructed measure reflects external regulatory exposure rather than local lending market conditions.

Since the Net-Zero Banking Alliance (NZBA) was launched in 2021, we construct additional instruments by interacting the previously defined instruments with a dummy variable that takes a value of one for the years 2021 and 2022. This interaction captures the period when the decision to join the NZBA alliance became feasible and relevant for the banks in our sample, allowing us to isolate the effect of climate policy changes in a setting where voluntary commitments to net-zero targets became more salient. Additional interaction terms in Equation 1 are instrumented using interactions of the instruments described above, along with the loan types indicator variables.

4.1 Funding availability across countries

Because the identification strategy described above relies on variations across lenders' shares within the same syndicate, we cannot infer the overall impact on funding availability across countries. For instance, a lower share of green loans and sustainability-linked loans (SLLs) by an individual bank group could be offset if that bank chooses to participate in more deals or increase its deal values, thereby maintaining the overall supply of funding to firms. Additionally, reductions in green lending to borrowers in certain countries could be counterbalanced by increases in conventional lending.

To explore these possibilities, we calculate the loan volume provided by each bank group to each country in the DealScan sample. This is done by multiplying each bank group's loan shares by the respective tranche value, converted to U.S. dollars. We build, therefore, a database with bank-group observations and estimate separate panel regressions using the logarithm of the volume of conventional loans, green loans, and SLLs as dependent variables. In this analysis, we also included domestic operations to assess whether cross-border transactions respond differently to changes in our interest variables.

Finally, we employ a discrete-choice model, following McFadden (1984), to examine how environmental and societal pressures influence the distribution of countries in banks' loan portfolios. This estimation includes only banks that issued at least one green loan or SLL between 2018 and 2022. For these banks, we consider only countries that received at least one loan in these categories during the same period as feasible alternatives. The outside option is defined as lending in the domestic market, and market shares for each bank are obtained by dividing the volume of loans provided in each country over the bank's total loan volume. The model specification is as follows:

$$\begin{aligned} \ln(s_{ijt}/s_{it}^{0}) = \alpha_{jt} + \beta^{CP}\Delta\mathsf{CCPI}ijt + \beta^{NZ}\mathsf{NZBA}it + \sum \beta^{Type}\mathsf{LoanType}jt + \\ \sum \beta^{CPType}\text{Lender-Borrower Pair Type}ijt * \mathsf{NZBA}it + \\ \sum \beta^{NZ_{Type}}\text{Lender-Borrower Pair Type}ijt * \Delta\mathsf{CCPI}ijt + \delta_i + \epsilon_{ijt}, \end{aligned} \tag{2}$$

where Lender-Borrower Pair Type$_{jt}$ represents a set of variables indicating whether the borrower or lender is located in an advanced economy. We estimated separate regressions for conventional loans, green loans, and SLLs.

5 Results

5.1 Evidence from lenders' loan shares

Table 3 presents the results of our main specification. Our key variables of interest are $\Delta\mathsf{CCPI}_{ijt}$, which captures the difference in climate policy scores between the lender's (bank group headquarters) and the borrower's country, and NZBA_{it}, indicating whether a bank group is a member of the Net Zero Banking Alliance (NZBA).

Column (1) of the table reports the effects on the bank group's total loan share. A relative tightening of climate policy in the lender's country is associated with an increase in the bank group's participation in cross-border lending. There is, however, no significant effect on the bank group headquarters' direct involvement in the loan, which suggests that banks are more likely to increase their participation in cross-border operations via their subsidiaries abroad. This result is consistent with previous findings by (Benincasa et al., 2022), who find that banks are more likely to increase their lending activities abroad as a response to a relative tightening in domestic climate policy.

By contrast, the effect is negative and statistically significant for green loans and sustainability-linked loans (SLLs). Specifically, tightening domestic climate policy results in a net reduction in the bank group's participation in green loans. Similarly, voluntary climate commitments, such as NZBA membership, are associated with significantly lower participation in cross-border green loans and SLLs. For example, NZBA membership corresponds to a reduction of nearly 15 percentage points in green loan participation and close to 2 percentage points in SLL participation. A similar trend is observed when analyzing the bank group's loan share not intermediated through local subsidiaries or the bank group's active participation in loans, as shown in Columns (2) and (3). This outcome could be explained by the fact that banks are more likely to participate directly in cross-border green loans and SLLs, and they are also more likely to take an active role in green loan and SLL syndicates compared to traditional ones (92.7% vs. 82.7%).

The effect of changes in climate policy does not seem to be significantly different for members of the NZBA regarding their shares in conventional and green loans. In the case of SLLs, however, we observe a larger reduction in the active participation of bank groups that are members of the NBZA when the climate policy of the lender's country becomes relatively more stringent. This result indicates that NZBA members are less willing to expose themselves to the responsibilities of structuring, underwriting, and managing cross-border SLLs when the climate policy tightens at home.

The results of our IV estimation are presented in column (IV) in Table 3. As in the OLS estimation, we observe a reduction of the bank group's participation in green loans when the lender's domestic climate policy becomes relatively stricter or when the lender decides to make voluntary

Table 3: Effect of Climate Policy and Environmental Commitments on Lender Participation in Cross-border Loans

Dependent Variable:	Bank Group's total loan share			
Model:	(OLS)	(OLS)	(OLS)	(IV)
Variables				
ΔCCPI	0.0527		0.0485	0.3146***
	(0.0390)		(0.0397)	(0.1206)
ΔCCPI × Green Loan	-0.1431*		-0.1670*	-0.5249***
	(0.0806)		(0.1005)	(0.1814)
ΔCCPI × SLL	-0.0397**		-0.0521*	-0.2216**
	(0.0186)		(0.0271)	(0.1081)
ΔCCPI × Green Sector	-0.0049		0.0062	-0.1063*
	(0.0184)		(0.0208)	(0.0621)
NZBA		0.4797	-0.1956	0.9299
		(0.5622)	(0.7390)	(3.860)
NZBA × Green Loan		-3.005*	-4.197*	-18.65**
		(1.797)	(2.259)	(8.844)
NZBA × SLL		-0.1554	-0.1726	-6.787
		(0.8532)	(1.125)	(8.317)
NZBA × Green Sector		1.217	2.713*	-3.276
		(0.9333)	(1.397)	(4.865)
NZBA × ΔCCPI			0.0120	-0.0326
			(0.0253)	(0.0871)
NZBA × ΔCCPI × Green Loan			0.0380	0.2903
			(0.0874)	(0.2457)
NZBA × ΔCCPI × SLL			0.0149	0.0724
			(0.0367)	(0.2721)
NZBA × ΔCCPI × Green Sector			-0.0630	0.1628
			(0.0386)	(0.1267)
Fixed-effects				
Borrower_Id_tranche_year	Yes	Yes	Yes	Yes
Lender_Parent_Name	Yes	Yes	Yes	Yes
Fit statistics				
Observations	9,739	15,038	9,739	8,159
R^2	0.96408	0.95029	0.96414	0.96502
Within R^2	0.16975	0.15740	0.17107	0.15098
Sargan test (instruments validity)				0.19797

Notes: This table presents the results of OLS and IV regressions with the following dependent variable: *Bank group total share*. Δ *CCPI* is the difference between the Climate Policy Index (CCPI) of the lender and borrower, and *NZBA* is an indicator variable that takes the value one if and when the bank group is a member of the Net Zero Bank Alliance. The instrumental variables used in the IV regression are described in Section 4. All specifications include loan controls, lender's country-level controls, and bank-group controls.
Clustered (Borrower-Year) standard errors in parentheses.
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

climate commitments such as joining the NZBA. The effect of changes in climate policy is now also significant for SLLs, and the overall magnitudes of the effects are greater. In particular, joining the NZBA Alliance leads to a reduction of 18.6 percentage points in the bank group's average participation in green loans abroad, whereas an increase of one point in the relative climate policy score leads to a reduction of 0.52 percentage points. In summary, our findings suggest that banks facing stronger pressures to integrate environmental considerations into their operations are less inclined to participate in cross-border green loans and SLLs.

Next, we explore the potential heterogeneous effects of climate policy and voluntary environmental commitments across different groups of lenders and borrowers. Specifically, we examine whether lenders exposed to tighter climate policies could become more inclined to focus their green lending activities in the most developed countries. To this end, we classified the countries into two groups, the first representing the countries in the top 10% of the GDP per capita distribution as of 2022.[2]

Table 4 presents the results of our main specification for different samples, categorized by the income levels of the lenders' and borrowers' countries. Countries are classified into two groups: those in the top 10% of the income distribution and all others. Column (1) of Table 4 shows the results for transactions where lenders and borrowers are located in the highest-income countries. In these cases, a relative tightening of climate policy in the lender's country does not lead to significant changes in the bank group's participation in cross-border loans, regardless of loan type. However, NZBA membership is associated with a notable increase in the bank group's willingness to fund cross-border green loans.

By contrast, the results of our model using transactions involving lenders headquartered in the highest-income countries and borrowers located elsewhere (Column 2) reveal a significant decrease in lender's participation in cross-border green lending. This decline is observed when the lender's domestic climate policy becomes relatively stricter and when the lender adopts voluntary environmental commitments, such as joining the NZBA.

Columns (3) and (4) present the results of our model based on transactions where the lender is not headquartered in the highest-income country. In both cases, we observe a similar reduction in cross-border green lending following NZBA membership; however, when the borrower is in a high-income country, this drop is less pronounced for SLLs and conventional loans to firms in green sectors for lenders that experienced a stricter domestic climate policy. The results of an IV estimation of the model presented in Table A.5 confirm our main findings. Again, we find a significant increase in lenders' participation in green loans associated with joining the NZBA Alliance when both the lender and the borrower are located in the highest-income countries, whereas there is a significant

[2]The income distribution is based on the 2022 GDP per capita of countries with at least one borrower or lender in our sample, which includes transactions from 2018 to 2022. The countries in the top 10% of the GDP per capita distribution are Australia, the United States, the United Kingdom, Norway, Switzerland, Singapore, Denmark, Bermuda, the Cayman Islands, Luxembourg, Sweden, the Netherlands, Ireland, Macao, Qatar, Monaco, and Iceland. 46.1% of bank groups and 44.7% of borrowers in our sample are headquartered in these countries.

decrease when the borrower is located elsewhere.[3]. Interestingly, we find significant moderating effects for NZBA members who experience stricter climate policies at home.

Finally, we extend our analysis by incorporating domestic loan operations, where both the lending bank group and the borrower are headquartered in the same country. This allows us to assess whether banks' lending behavior differs between domestic and cross-border transactions after they adopt voluntary environmental commitments. Table 5 reveals that consistent with our previous findings, NZBA membership is associated with a significant decline in banks' participation in cross-border green lending. However, we find no comparable reduction in domestic green lending, suggesting that banks' retreat from international markets is inconsistent with a uniform shift in sustainability strategies.

This distinction underscores the importance of considering institutional and informational asymmetries in green finance allocation. Lenders may perceive cross-border green investments as more uncertain or costly to evaluate than domestic projects. Future research could further investigate the drivers of this divergence and explore whether policy interventions—such as enhanced transparency in green loan markets or targeted financial incentives—can mitigate the decline in cross-border green lending while maintaining progress toward sustainability goals.

5.2 Bank Loan Volumes

Next, we consider the effects of changes in climate policy and individual environmental commitments on the volume of different types of loans at the bank-country level. We estimated separate regressions for conventional and green lending (green loans and SLLs). The results are presented in Table 6. Columns (1) and (2) show the results for the total volume of loans. In this case, joining the NZBA Alliance has a negative and significant effect on the volume of loans provided to borrowers abroad of 0.037% (Column 2), while the effect is not significant for domestic loans. Furthermore, lending significantly expands in countries with higher income (0.313%), especially when the borrower and the lender are located in the same country (an additional 1.82%).

Columns (3) and (4) present the results for green loans and SLLs. The results are similar to those observed for the total loan volume, except that the magnitude of the effects is smaller, particularly regarding the decision to join the NZBA.

Table 7 presents the estimated effects of climate policy changes and lenders' environmental commitments on the volume of cross-border green loans and SLLs, highlighting heterogeneous impacts across countries with different income levels. We find no significant effect on green lending volumes when both the lender and borrower are located in countries in the top 10% of the income distribu-

[3]This coefficient could not be estimated for the group in which neither the lender nor the borrower was located in a higher income country due to lack of observations.

Table 4: Effect of Climate Policy and Environmental Commitments on Lender Participation in Cross-border Loans

Dependent Variable:	Bank Group's Loan Share			
Model:	(Top-Top)	(Top-No Top)	(No Top - Top)	(No Top- No Top)
Variables				
ΔCCPI	-0.0416	-0.0061	0.1207	0.2692
	(0.1550)	(0.3073)	(0.0943)	(0.1852)
ΔCCPI × Green Loan	-0.0230	-0.6850***	-0.1783	0.1033
	(0.0504)	(0.2169)	(0.1297)	(0.0982)
ΔCCPI × SLL	-0.1145	-0.2669**	-0.0619	0.1166
	(0.0916)	(0.1332)	(0.0461)	(0.0812)
ΔCCPI × Green Sector	0.0743	-0.0168	-0.0483**	-0.0126
	(0.0590)	(0.0512)	(0.0221)	(0.0732)
NZBA	1.700	-0.1980	-0.9099	2.764
	(1.431)	(2.332)	(1.207)	(2.483)
NZBA × Green Loan	11.57**	-9.953**	-3.619*	-4.885**
	(4.511)	(4.670)	(2.182)	(2.234)
NZBA × SLL	-4.187	-7.341**	0.1062	-3.610
	(2.909)	(3.720)	(1.059)	(4.061)
NZBA × Green Sector	0.5390	2.431	1.400	-2.086
	(3.507)	(2.651)	(1.236)	(5.113)
ΔCCPI × NZBA	0.0193	0.1165	0.0159	0.0615
	(0.0410)	(0.0878)	(0.0420)	(0.1224)
ΔCCPI × Green Loan × NZBA	0.1664	0.7526***	0.0170	-0.0316
	(0.1410)	(0.2195)	(0.1019)	(0.2403)
ΔCCPI × SLL × NZBA	0.0449	0.2046*	0.0934*	0.0294
	(0.0538)	(0.1134)	(0.0496)	(0.2107)
ΔCCPI × Green Sector × NZBA	-0.0734	-0.0206	0.0764**	-0.5113*
	(0.0947)	(0.0703)	(0.0329)	(0.2891)
Fixed-effects				
Borrower - Year	Yes	Yes	Yes	Yes
Bank Group	Yes	Yes	Yes	Yes
Fit statistics				
Observations	1,611	1,429	4,374	2,408
R^2	0.98715	0.95314	0.97020	0.95562
Within R^2	0.31646	0.11728	0.17339	0.20586

Notes: This table presents the results of an OLS regression where the dependent variable is the lender (bank group)'s loan share, and the interest variables are: i) Δ CCPI: the difference between the lender's and borrower's CCPI Score, and ii) $NZBA$: an indicator variable that takes the value one when a bank is member of the NZBA. Column (1) includes observations where both lender and borrower are headquartered in a country that belongs to the top 10% of the income distribution. Column (2) considers cases where only the lender is the group of high-income countries. Column (3) includes observations where only the borrowers belong in this group, and Column (4) includes observations where neither side is located in these countries. All specifications include loan controls, lender's country-level controls, and bank-group controls. Clustered (Borrower-Year) standard errors in parentheses.
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

Table 5: Effects of Lender's Environmental Commitments on Green Lending Participation (Cross-Border only vs. All Loans)

Dependent Variable:	Bank Group's loan share
Model:	(All Loans)
Variables	
ΔCCPI	0.0404
	(0.0585)
ΔCCPI × Green Loan	-0.2282**
	(0.0888)
ΔCCPI × SLL	-0.035**
	(0.0178)
ΔCCPI × Green Sector	-0.0175
	(0.0228)
NZBA	-0.1345
	(0.8172)
NZBA × Green Loan	-9.060**
	(3.902)
NZBA × SLL	-1.575*
	(0.8895)
NZBA × Green Sector	1.494
	(1.196)
NZBA × Domestic Loan	0.9021
	(1.240)
NZBA × Green Loan× Domestic Loan	0.9179
	(6.658)
NZBA × SLL× Domestic Loan	1.197
	(1.733)
NZBA × Green Sector × Domestic Loan	-1.454
	(1.820)
Fixed-effects	
Borrower - Year	Yes
Bank- Group	Yes
Fit statistics	
Observations	11,627
R^2	0.92329
Within R^2	0.08527

Notes: This table presents the results of an OLS regression where the dependent variable is the Bank Group's total share in the syndicate. The variable of interest is *NZBA*, an indicator variable that takes the value one if and when a bank becomes a member of the Net Zero Bank Alliance (NZBA). The indicator variable *Domestic Loan* takes the value one if the loan and the bank group are headquartered in the same country. All specifications include loan controls, lender's country-level controls, and bank-group controls.
Clustered (Borrower-Year) standard errors in parentheses.
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

Table 6: Effects of Lender's Environmental Commitments on Total Lending and Green Lending Volumes

Dependent Variables:	Total loans volume		Green Loans/SLLs	
Model:	(1)	(2)	(3)	(4)
Variables				
NZBA	-0.0690**	-0.0369**	-0.0137**	-0.0144***
	(0.0300)	(0.0162)	(0.0016)	(0.0011)
NZBA × domestic loans	1.035*	-0.4431	0.0088	0.0381
	(0.5933)	(0.4504)	(0.0216)	(0.0355)
NZBA × top10 income	0.3134***	0.1838**	0.0121***	0.0124***
	(0.0908)	(0.0878)	(0.0044)	(0.0042)
NZBA × domestic loans × top10 income	1.887**	1.827***	0.0576***	0.0604***
	(0.7845)	(0.6581)	(0.0101)	(0.0196)
Fixed-effects				
Bank Group Country - Borrower Country	Yes		Yes	
Bank Group	Yes		Yes	
Year	Yes	Yes	Yes	Yes
Bank Group - Borrower Country		Yes		Yes
Fit statistics				
Observations	52,556	52,556	52,556	52,556
R^2	0.41020	0.65792	0.18278	0.35050

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Notes: This table presents the results of an OLS regression where the dependent variable is the logarithm of the loan volume at the bank-country level. The variable of interest is *NZBA*, an indicator variable that takes the value one if and when a bank becomes a member of the Net Zero Bank Alliance (NZBA). All specifications include loan controls, lender's country-level controls, and bank-group controls.
Clustered (Borrower-Year) standard errors in parentheses.
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

tion. However, when only the lender is based in a high-income country, voluntary environmental commitments—such as joining the NZBA—are associated with reducing cross-border green lending. Additionally, tighter climate policies in the lender's country significantly reduce the volume of cross-border green loans among NZBA members. In contrast, stricter climate policies in the borrower's country are associated with higher volumes of green lending, a result that holds across all sub-samples.

The third column of the table examines cases where only the lender is headquartered in a high-income country. Here, NZBA membership is associated with an increase in green lending, in contrast to the earlier finding when the borrower is also from a high-income country.

Finally, when neither the lender nor the borrower is located in a country with a top 10

In an alternative specification, Table 7 reports results using the logarithm of cross-border loan volume as the dependent variable. We observe that NZBA membership increases cross-border loan volumes when both lender and borrower are located in high-income countries, but the effect is more minor in magnitude and not statistically significant when the borrower is located elsewhere. Additionally, when the borrower is in a higher-income country, tighter climate policy on the borrower's side is associated with lower loan volumes, particularly among NZBA members headquartered in high-income countries.

Table 7: Effects of Climate Policy and Lender's Environmental Commitments on Country Loan Volumes (Regions)

	Top-Top		Top-Other		Other-Top		Other-Other	
Model:	(All)	(Green/SLL)	(All)	(Green/SLL)	(All)	(Green/SLL)	(All)	(Green/SLL)
Variables								
CCPI Lender	-0.0028	0.0032	-0.0017	-0.0017	0.0024	-0.0108**	-0.0008	0.0025**
	(0.0086)	(0.0095)	(0.0021)	(0.0020)	(0.0041)	(0.0053)	(0.0012)	(0.0011)
CCPI Borrower	-0.0078	0.0133	-0.0020	0.0046***	-0.0073**	0.0074**	-0.0024**	0.0034***
	(0.0063)	(0.0083)	(0.0015)	(0.0016)	(0.0036)	(0.0034)	(0.0010)	(0.0009)
NZBA	0.4118	0.5877	0.3637**	-0.1829**	0.6140	1.723***	0.3504***	-0.2341**
	(0.6242)	(0.5551)	(0.1546)	(0.0827)	(0.4126)	(0.4884)	(0.1347)	(0.0969)
CCPI Lender×NZBA	-0.0114*	-0.0012	-0.0008	0.0025**	-0.0073	0.0095	-0.0038*	0.0055***
	(0.0067)	(0.0059)	(0.0016)	(0.0010)	(0.0064)	(0.0062)	(0.0019)	(0.0013)
CCPI Borrower×NZBA	-0.0040	-0.0022	-0.0071***	0.0008	-0.0040	-0.0290***	-0.0051**	0.0015
	(0.0073)	(0.0077)	(0.0027)	(0.0017)	(0.0046)	(0.0061)	(0.0024)	(0.0015)
Fixed-effects								
Bank Group - Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	3,888	2,475	19,868	12,650	9,020	7,220	40,594	32,494
R^2	0.74581	0.37029	0.65688	0.43653	0.73813	0.48952	0.65235	0.44697
Within R^2	0.02425	0.05727	0.00340	0.00880	0.01102	0.08440	0.00344	0.00753

Clustered (Bank Group-Country) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: This table presents the results of an OLS regression where the dependent variable is the volume of cross-border loans aggregated at the bank group-country level, and the interest variables are: i) Δ CCPI: the difference between the lender's and borrower's CCPI Score, and ii) $NZBA$: an indicator variable that takes the value one when a bank is member of the NZBA. Column (1) includes observations where both lender and borrower are headquartered in a country that belongs to the top 10% of the income distribution. Column (2) considers cases where only the lender is located in one of these high-income countries. Column (3) includes observations where only the borrower is located in this group of countries, and Column (4) includes observations where neither the borrower nor the lender is located in these countries. All specifications include loan controls, lender's country-level controls, and bank-group controls.

Clustered (Borrower-Year) standard errors in parentheses.

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

Finally, we analyze banks' decision to lend across borders by estimating the logit model described in Equation 2. The results, presented in Table 8, indicate that stricter climate policies reduce the propensity of banks to lend abroad for conventional loans, suggesting that climate regulations may discourage cross-border lending. However, this effect is significantly moderated when the lender is outside high-income countries.

By contrast, climate policy positively affects green loans, with banks in high-income countries more likely to engage in cross-border green lending.

Table 8: Effects of Lender's Environmental Commitments on Country's Share in the Bank Group's Portfolio

Dependent Variables:	$ln(s_{ijt}/s^0_{it})$		
Model:	Conventional	SLL	Green
Variables			
ΔCCPI	-0.0725***	-0.0104	0.0792***
	(0.0179)	(0.0168)	(0.0099)
ΔCCPI × 'Lender:Top10 - Borrower:Other	0.0030	-0.0043	-0.0015
	(0.0200)	(0.0197)	(0.0109)
ΔCCPI × 'Lender:Other - Borrower:Other	0.0683**	-0.0418*	-0.0922***
	(0.0270)	(0.0235)	(0.0180)
ΔCCPI × 'Lender:Other - Borrower:Top10	0.0588*	-0.0414	-0.0706***
	(0.0322)	(0.0270)	(0.0223)
NZBA	-1.662***	3.373***	1.530***
	(0.4186)	(0.3742)	(0.2282)
NZBA × 'Lender:Top10 - Borrower:Other	0.9244*	-0.8004*	-1.6868***
	(0.4928)	(0.4336)	(0.2511)
NZBA × 'Lender:Other - Borrower:Other	-3.474***	-5.824***	-3.871***
	(0.5489)	(0.5251)	(0.5325)
NZBA × 'Lender:Other - Borrower:Top10	-3.545***	-6.390***	-4.263***
	(0.6106)	(0.5827)	(0.6142)
Fixed-effects			
Bank Group - Country	Yes	Yes	Yes
Year	Yes	Yes	Yes
Fit statistics			
Observations	51,583	51,583	51,583
R^2	0.62211	0.48153	0.43816
Within R^2	0.02894	0.08532	0.09816

Notes: Notes: This table presents the results of an OLS regression where the dependent variable is the logarithm of the loan volume at the bank-country level. The variable of interest is *NZBA*, an indicator variable that takes the value one if and when a bank becomes a member of the Net Zero Bank Alliance (NZBA). All specifications include loan controls, lender's country-level controls, and bank-group controls.
Clustered (Borrower-Year) standard errors in parentheses.
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

Turning to the effects of NZBA membership, we find significant differences across conventional

loans, SLLs, and green loans. NZBA membership is associated with reduced cross-border lending for traditional loans, particularly when the lender is based in a lower-income country. In contrast, for SLLs and green loans, banks appear more inclined to lend internationally rather than domestically after joining the NZBA Alliance. However, in the case of green loans, this effect is almost nullified when the borrower is in a lower-income country, suggesting that banks prefer cross-border green lending but primarily to high-income borrowers.

6 Conclusion

This study provides new insights into how climate policy stringency and banks' voluntary environmental commitments shape cross-border lending dynamics, particularly for green loans and sustainability-linked loans (SLLs). The findings reveal significant heterogeneity in banks' responses, underscoring the complexity of aligning financial flows with global climate goals. Our results indicate that the impact of domestic climate policy on cross-border lending supply varies by loan type. While participation in cross-border conventional syndicated loans increases, the same pattern does not hold for green loans and SLLs. In some cases, banks reduce their loan share in these categories, reflecting a selective adjustment in lending behavior.

Voluntary commitments, such as joining the Net-Zero Banking Alliance (NZBA), also influence cross-border green lending. NZBA members exhibit a sharp decline in participation in cross-border green loans and SLLs, and their supply of green lending appears more sensitive to domestic climate policy changes than that of non-members.

We also observe important geographic variations in how banks respond to domestic pressure to incorporate environmental considerations into their business models. When both lenders and borrowers are based in high-income countries, stricter climate policies increase banks' willingness to lend abroad without significantly altering the dynamics of cross-border green lending. However, when high-income lenders finance borrowers in lower-income regions, we find evidence of a notable retreat from green lending, particularly among NZBA member banks.

These findings suggest that while stricter climate policies and voluntary commitments can drive shifts in lending behavior, they may also lead to unintended consequences. The decline in cross-border green lending to lower-income regions raises concerns about the global financial system's ability to support a just transition to sustainable development. If this reduction stems from information asymmetries in the intermediation process, it could further exacerbate regional disparities in climate finance access. Future research could explore policy frameworks that mitigate the retreat from green lending in developing regions and identify mechanisms to balance domestic and global environmental priorities in financial decision-making.

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A Additional Descriptive Statistics

Table A.1: Variables Description

Variable	Description/Comment	Obs. Unit	Source
	Panel A. Dependent Variables		
Total loan share	Total lender's loan share	Bank Group-Tranche	DealScan
Direct loan share	Lender's loan share excluding subsidiaries	Bank Group-Tranche	DealScan
Active loan share	Lender's loan share (only active members of the syndicate)	Bank Group-Tranche	DealScan
Total volume of loans (USD billion)	Logarithm. Calculated as the sum of the bank group's loan shares times the tranche amount.	Bank Group-Country	DealScan
Vol. of green loans (USD billion)	Logarithm. Calculated as the sum of the bank group's loan shares times the tranche amount (only green loans).	Bank Group-Country	DealScan
Vol. of SLLs (USD billion)	Logarithm. Calculated as the sum of the bank group's loan shares times the tranche amount (only SLLs)	Bank Group-Country	DealScan
Vol. of Conv.loans (USD billion)	Logarithm. Calculated as the sum of the bank group's loan shares times the tranche amount (only firms in green sectors)	Bank Group-Country	DealScan
	Panel A. Interest Variables		
NZBA	Indicator Variable (1:NZBA member)	Bank Group	NZBA Website
CCPI Score	Index: 0(looser) - 100(stricter)	Country pair	GermanWatch
Domestic	Indicator variable. 1: the borrower is located in the same country as the bank group	Bank Group-Country	DealScan
	Panel A. Loan Variables		
Tranche Amount (USD millions)	Total amount converted to USD (log)	Tranche	DealScan
Secured Tranche	Indicator variable. (1:Collateral)	Tranche	DealScan
Maturity	Number of years until repayment	Tranche	DealScan
Refinancing Tranche	Indicator variable. (1:Refinancing)	Tranche	DealScan
No. of bank groups in the syndicate	Members with loan shares greater than 0	Tranche	DealScan
No. of previous deals	Between 2013 and the year previous to the loan	Bank Group-Borrower	DealScan

Notes: This table presents descriptive statistics of the countries of borrowers and lenders included in our cross-border syndicated loan sample. The variables in the table are used as controls in the regressions exploring the effects of climate policy and environmental commitments on green cross-border lending. CCPI is the Climate Policy Index developed by Germanwatch.

Table A.2: Variables Description (continues)

Variable	Description/Comment	Obs. Unit	Source
	Panel B. Country Variables		
GDP per capita	logarithm	Country	World Bank
GDP annual growth	percentage	Country	World Bank
Total Unemployment rate	percentage	Country	World Bank
GHG Emissions per capita	logarithm	Country	World Bank
Government Effectiveness	Index	Country	World Bank
Regulatory Quality	Index	Country	World Bank
Voice Accountability	Index	Country	World Bank
Control Corruption	Index	Country	World Bank
Population Growth	Index	Country	World Bank
Distance between capitals (km)	(logarithm)	Country pair	CEPII Data
Common Language	Indicator variable, 1: same official language	Country pair	CEPII Data
Common Legal Tradition	Indicator variable, 1: same legal tradition	Country pair	CEPII Data
	Panel B. Bank-Group Variables		
Assets (USD billion)	(logarithm)	Bank Group	BankScope
ROE	Consolidated banking-group ratio	Bank Group	BankScope
Tier-1 capital ratio	Consolidated banking-group ratio	Bank Group	BankScope
Equity assets ratio	Consolidated banking-group ratio	Bank Group	BankScope

Notes: This table presents descriptive statistics of the countries of borrowers and lenders included in our cross-border syndicated loan sample. The variables in the table are used as controls in the regressions exploring the effects of climate policy and environmental commitments on green cross-border lending. CCPI is the Climate Policy Index developed by Germanwatch.

Table A.3: Country Characteristics 2017-2022

	Observations	1st Qu..25%	Median	Mean	3rd Qu..75%
Panel A. Borrower country					
Total Population	9,124	5,663,152	21,506,813	117,400,588	71,697,030
GDP annual growth (percentage)	8,991	1.40	2.76	2.74	4.92
GDP per capita	8,991	6,265.44	26,514.32	31,711	47,006.14
Total Unemployment Rate	8,678	3.69	5.12	6.44	7.66
Legal Rights Index	6,339	3	6	5.73	8
Credit to private sector to GDP (percentage)	8,030	48.39	88.65	95.34	131.28
Regulatory capital vs. weighted assets (percentage)	5,913	15.15	17.08	17.85	19.66
Bank capital; to assets ratio (percentage)	7,297	6.14	8.03	8.47	9.78
CCPI (Ranking)	5,310	16	33	31.70	46
CCPI (Score)	5,310	47.53	54.77	53.13	61.19
Panel B. Bank-Group Operating Country (headquarters)					
Total Population	9,083	9,600,379	51,764,822	156,854,046	93,377,890
GDP annual growth (percentage)	9,062	1.14	2.24	2.15	3.57
GDP per capita (USD)	9,057	27,239.35	41,682.03	39,295	48,443.73
Total Unemployment Rate	9,057	3.67	4.89	6.25	7.42
Legal Rights Index	6,706	3	5	5.51	7
Credit to private sector to GDP (percentage)	8,338	84.92	119.90	121.52	154.90
Regulatory capital vs. weighted assets (percentage)	6,152	14.96	17.13	17.55	19.53
Bank capital; to assets ratio (percentage)	7,552	5.46	6.64	7.24	8.62
Relative CCPI (Ranking)	7,269	15	31	31.13	47
Relative CCPI (Score)	7,269	47.21	54.91	53.09	61.75
Panel C. Borrower-Bank-Group country pairs					
Credit Agreement (WTO)	8,036	0	0	0.47	1
Distance between capitals	8,036	1,436	5,200	5,696.06	8,917.50
Common Language	8,009	0	0	0.21	0
Common Legal Tradition	8,036	0	0	0.40	1

Notes: This table presents descriptive statistics of the countries of borrowers and lenders included in our cross-border syndicated loan sample. The variables in the table are used as controls in the regressions exploring the effects of climate policy and environmental commitments on green cross-border lending. CCPI is the Climate Policy Index developed by Germanwatch.

Table A.4: Effect of Climate Policy and Voluntary Climate Commitments on Alternative Measures of Loan Participation - IV Estimation.

Dependent Variables:	Bank Group's loan share	Bank Group's loan share (direct)	Bank Group's loan share (active)
Model:	(1)	(2)	(3)
Variables			
ΔCCPI	0.3146***	0.1499	0.2478**
	(0.1206)	(0.1433)	(0.1204)
ΔCCPI:Green Loan	-0.5249***	-0.3979**	-0.4519***
	(0.1814)	(0.1675)	(0.1491)
ΔCCPI:SLL	-0.2216**	-0.1693	-0.1920**
	(0.1081)	(0.1350)	(0.0882)
ΔCCPI:Green Sector	-0.1063*	-0.1894*	-0.0946
	(0.0621)	(0.0969)	(0.0623)
NZBA	0.9299	-2.883	-2.537
	(3.860)	(4.198)	(2.963)
NZBA:Green Loan	-18.65**	-18.49**	-11.48*
	(8.844)	(8.943)	(6.685)
NZBA:SLL	-6.787	-9.010	-2.843
	(8.317)	(9.080)	(5.323)
NZBA: Green Sector	-3.276	-3.380	1.035
	(4.865)	(5.404)	(4.216)
ΔCCPI:NZBA	-0.0326	0.1168	-0.0987
	(0.0871)	(0.1002)	(0.0760)
ΔCCPI:NZBA :Green Loan	0.2903	-0.0817	0.2760
	(0.2457)	(0.4066)	(0.2059)
ΔCCPI:NZBA :SLL	0.0724	0.2386	0.3026
	(0.2721)	(0.3149)	(0.2402)
ΔCCPI:NZBA:Green Sector	0.1628	0.2126	0.2204*
	(0.1267)	(0.1607)	(0.1126)
Fixed-effects			
Borrower-Year	Yes	Yes	Yes
Bank Group	Yes	Yes	Yes
Fit statistics			
Observations	8,159	8,155	8,156
R^2	0.96502	0.95208	0.92768
Within R^2	0.15098	0.09635	0.06232

Notes: This table presents the results of OLS and IV regressions with the following dependent variables: *Bank-Group share (active role)*: Bank-group share, including only lenders with an active role in the syndicate. *Bank-Group share (direct)*: Bank-Group's loan shares, excluding the contribution of subsidiaries in locations different from the headquarters of the Bank-Group.All specifications include loan controls, lender's country-level controls, and bank-group controls.

Clustered (Borrower-Year) standard errors in parentheses.

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.

Table A.5: Effect of Climate Policy and Voluntary Climate Commitments on Bank Group's loan shares - IV Estimation.

Dependent Variable:	Bank Group's total loan share			
Model:	(Top10 -Top10)	(Top10- Other)	(Other-Top10)	(Other-Other)
Variables				
ΔCCPI	0.5560	-0.5119	0.0117	0.1884
	(0.4581)	(0.5707)	(0.1340)	(0.3642)
ΔCCPI:Green Loan	-0.1541*	-0.6492**	-0.2749	0.2812
	(0.0798)	(0.2815)	(0.1947)	(0.1776)
ΔCCPI:SLL	-0.0548	-0.2817**	-0.2709	0.1234
	(0.0486)	(0.1132)	(0.1820)	(0.1729)
ΔCCPI:Green Sector	-0.0095	-0.0481	-0.1143***	0.2052
	(0.0776)	(0.1088)	(0.0421)	(0.1664)
NZBA	4.885	9.399	-3.220	2.847
	(6.939)	(6.342)	(2.423)	(7.444)
NZBA:Green Loan	36.42**	-8.658**	-7.246**	
	(16.25)	(3.768)	(3.648)	
NZBA:SLL	-11.79	-3.174*	-1.759	3.908
	(7.247)	(1.860)	(3.778)	(9.596)
NZBA:Green Sector	6.341	-2.301	-2.644	7.722
	(7.741)	(5.914)	(4.907)	(17.67)
ΔCCPI:NZBA	-0.1954	-0.5841	-0.0256	-0.7230
	(0.2125)	(0.3673)	(0.0685)	(0.4982)
ΔCCPI:Green Loan:NZBA	1.191**	0.7909**	0.4462**	
	(0.5223)	(0.3383)	(0.1819)	
ΔCCPI:SLL:NZBA	0.3198**	0.2927	0.3664	0.3110
	(0.1625)	(0.2168)	(0.2272)	(0.3503)
ΔCCPI:Green Sector:NZBA	-0.2146	0.2746	0.1750	-0.3816
	(0.2263)	(0.3304)	(0.1310)	(1.187)
Fixed-effects				
Borrower-Year	Yes	Yes	Yes	Yes
Bank Group	Yes	Yes	Yes	Yes
Fit statistics				
Observations	1,546	1,275	3,615	1,931
R^2	0.97828	0.95455	0.97354	0.95588
Within R^2	0.24884	0.16165	0.17773	0.16020

Clustered (Borrower-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: This table presents the results of OLS and IV regressions with the following dependent variables: *Bank-Group share (active role)*: Bank-group share, including only lenders with an active role in the syndicate. *Bank-Group share (direct)*: Bank-Group's loan shares, excluding the contribution of subsidiaries in locations different from the headquarters of the Bank-Group.All specifications include loan controls, lender's country-level controls, and bank-group controls.

Clustered (Borrower-Year) standard errors in parentheses.

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1.