"There Is No Planet B", But for Banks "There Are Countries B to Z": Domestic Climate Policy and Cross-Border Lending

Emanuela Benincasa
UZH and SFI

Gazi Kabas
Tilburg

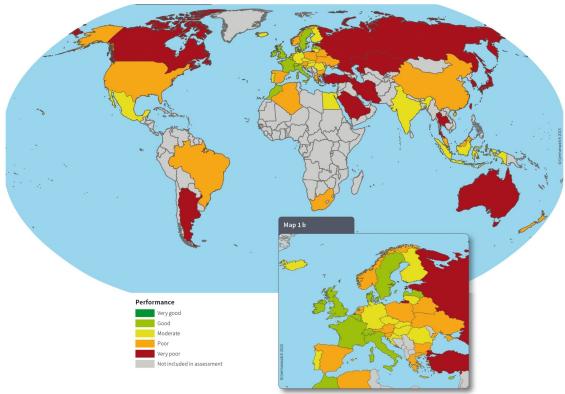
Steven Ongena
UZH, SFI, KU Leuven, NTNU Business School, CEPR

Banca d'Italia Workshop on Climate Change Risk and Credit Assessment
October 21, 2022

Climate change: A global challenge

- Climate change is a global challenge whose solution requires global coordination and cooperation

- There is a significant heterogeneity across countries regarding climate policy stringency



The Climate Change Performance Index 2016: Results

Climate policy: A global challenge

- In the **domestic market**, stringent climate policy may:
  1. Increase the demand for funds for innovation and green technologies
     - Bank lending not well-suited to finance innovation (Minetti RF 2011; De Haas and Popov, 2022; Degryse, Roukny and Tielens, 2022)
  2. Require a change in firms' business model or production process
     - Might decrease firms' profitability
     - Domestic lending less appealing?

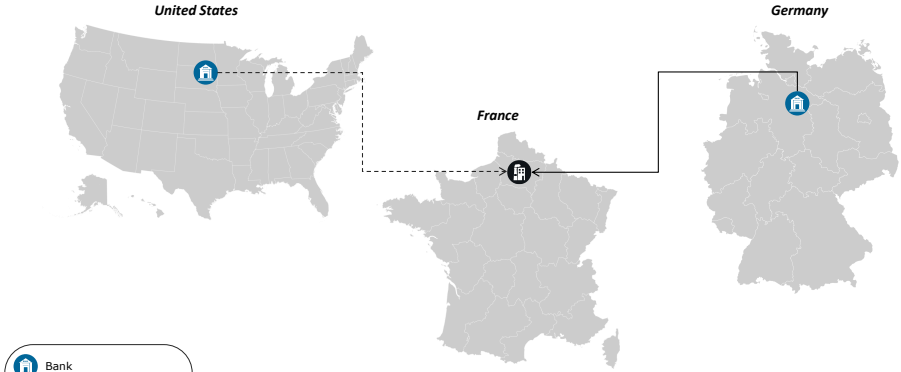
- **Little known** about effects on bank lending across borders
  - Reaction to the heterogeneity in countries' climate policy?
  - Refocusing cross-border lending from 'green' to 'brown' countries and firms?

This paper

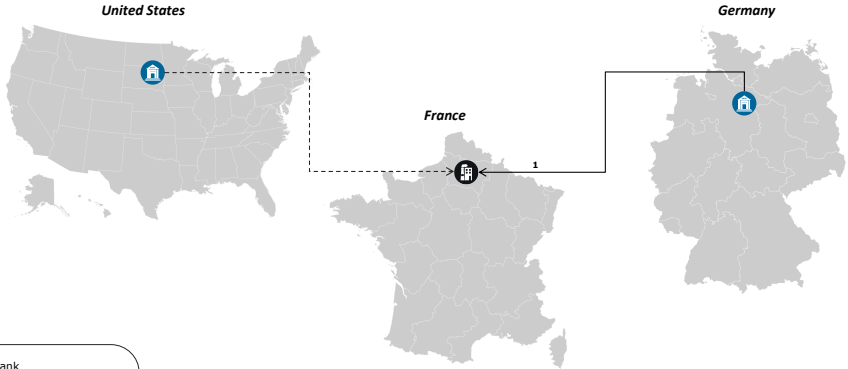
- Evidence that **banks exploit the lack of global coordination in climate policies** by increasing cross-border lending to 'brown' firms in 'brown' countries

- Exploit the CCPI Index to identify climate policy stringency and estimate its effects on cross-border lending in the syndicated loan market
  - Isolate credit supply by using loan fixed effects
  - Use **change in the green party share** in the parliament as **instrument** to estimate causal effects of domestic climate policy stringency

Main results



Main results



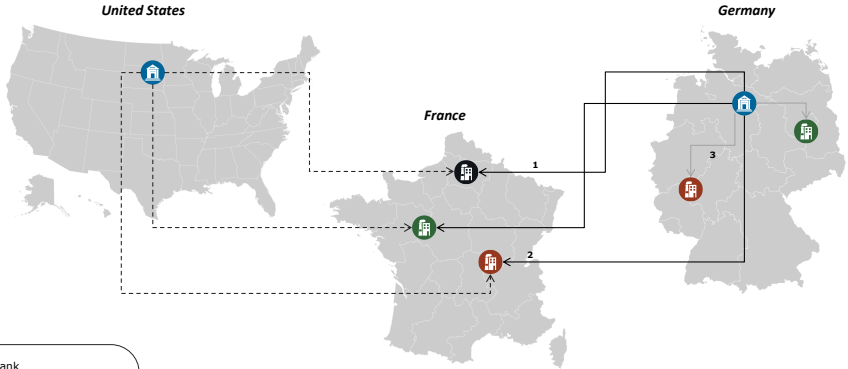
Bank

Firm

Differential CCPI Germany-US = 6 index points in year 2015

1. Increase in cross-border loan share by 0.5 p.p. (mean loan share = 7.72 percent, 6 percent relative to the mean)

Main results



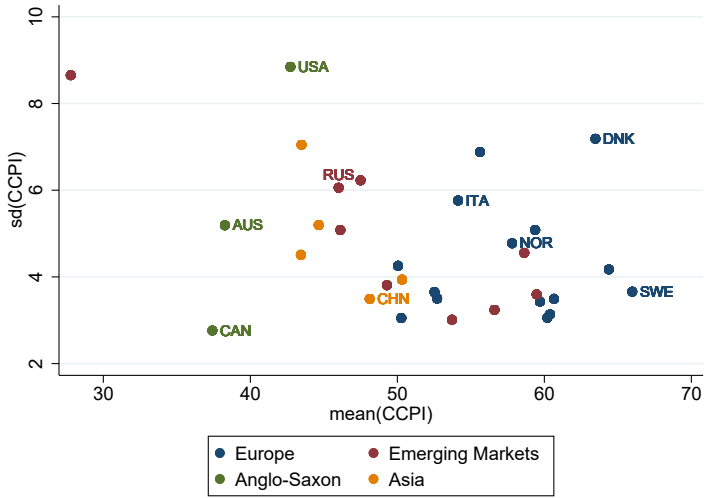
Data and Identification

Climate policy stringency

- Challenge: It is not easy to measure country-level climate policy stringency
  - → Stringency is combination of many aspects (energy consumption, emissions, regulations, etc.)
  - → Countries may have different measures

- We measure climate policy stringency using the Climate Change Performance Index (CCPI)
  - Country-year climate policy index developed by Germanwatch (non-profit, independent, environmental organization) (Burck, Hermwille, and Bals, 2016)
  - It covers 57 countries
  - Four main categories: Greenhouse Gas Emissions (60%), Renewable Energy (10%), Energy Efficiency (10%), and Climate Policy (20%)
  - There are many different climate policies across countries. An index makes global comparison possible and easy

The Climate Change Performance Index



Cross-border lending

- We use syndicated loans to measure cross-border lending (source: LPC DealScan)
  - A group of lenders come together (syndicate) and provide funds to a single borrower

- Sample: Only (observable) cross-border loan shares
  - Period: 2007-2017
  - Loans provided by a bank to a borrower with different nationality (De Haas and Van Horen, RFS 2013)
  - Firm's location: Headquarter country
  - Bank's location: Country
  - Hand-match loan shares to bank balance sheet data (source: Bankscope)

Identification

$$\text{Lender Share}_{b,k,l,f,t} = \underbrace{\alpha_l}_{\text{Loan FE}} + \beta \text{CCPI}_{\text{lender}c,t} + \gamma \mathbf{X}_{b,l,t-1} + \varepsilon_{b,l,f,t}$$

1. **Loan demand**: Borrowers can adjust their loan demand
   → We compare lenders within the same loan saturating the model with loan fixed effects

2. Variables correlated with climate policy stringency and cross-border lending
   → We control for variables that are associated to cross-border lending (Houston Lin and Ma 2012 JF; Ongena Popov and Udell 2013 JFE; Karolyi and Taboada 2015 JF)
   → Green Party share in the parliaments as an IV for climate policy stringency
   - **Relevance condition**: Green Party's policy mandate
   - **Exclusion restriction**: Election cycles are orthogonal to economic cycles

Results

The effect of home country climate policy stringency on cross-border lending

	Lender Share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$CCPI_{lender}$	0.027	0.043***	0.044***	0.045***	0.042***	0.042***	0.081***
	(0.019)	(0.008)	(0.008)	(0.008)	(0.008)	(0.013)	(0.016)
Controls & Fixed Effects:							
Bank Group Controls	✓	✓	✓	✓	✓	✓	
Borrower FE		✓	✓				
Year FE			✓				
Borrower × Year FE				✓			
Loan FE					✓	✓	✓
Bank Group FE						✓	
Bank Group × Year FE							✓
Obs.	12,478	12,478	12,478	12,478	12,478	12,394	12,105
R^2	0.004	0.735	0.736	0.809	0.842	0.863	0.878
Mean(Lender Share)	7.722						

German bank has 0.5pp or **6% on average higher loan share** than an American bank in the same loan (+6 index points)

Mitigating concerns about omitted variables

	Lender Share					
	(1)	(2)	(3)	(4)	(5)	(6)
$CCPI_{lender}$	0.039***	0.034***	0.032***	0.037***	0.045**	0.058*
	(0.008)	(0.008)	(0.008)	(0.009)	(0.019)	(0.033)
Controls & Fixed Effects:						
Loan FE	✓	✓	✓	✓	✓	✓
Bank Group Controls	✓	✓	✓	✓	✓	✓
Economic Controls	✓	✓	✓	✓	✓	✓
Culture Controls		✓	✓	✓	✓	✓
Bank Competition Controls			✓	✓	✓	✓
Demography Controls				✓	✓	✓
Bank Regulation Controls					✓	✓
Institutions Controls						✓
Obs.	11,530	11,076	11,076	11,076	5,810	3,571
R^2	0.853	0.854	0.854	0.854	0.865	0.872
Mean(Lender Share)	7.722					

Saturating the model with relevant controls does not change the effect

Green Party share as an IV for CCPI

	$CCPI_{lender}$	Lender Share		
	(1)	(2)	(3)	(4)
Δ Green Party Vote Shr.	1.620***			
	(0.277)			
$\widehat{CCPI}_{lender}$		0.120***	0.122***	0.121***
		(0.032)	(0.031)	(0.037)
Controls & Fixed Effects:				
Country Controls			✓	✓
Bank Controls				✓
Loan FE	✓	✓	✓	✓
Obs.	3,216	3,216	3,084	3,191
R^2	0.340	0.026	0.033	0.062
1^{st} Stage Eff. F-stat	34.252	34.252	35.612	29.508
Mean(Lender Share)	7.716			

- First stage: Weak instrument test by Montiel Olea and Pflueger JBES (2013)
  - Larger than the threshold level of 23.1 for 10 percent worst-case benchmark

- ▸ Relaxing the exclusion restriction assumption ▸ Correlation with economic conditions ▸ Alternative IV

Mechanism

Underlying mechanism

- Results show that a more stringent climate policy leads to an increase in cross-border lending

- **What is the economic mechanism at a play?**

- Our conjecture: Race-to-the-bottom mechanism
  - Heterogeneity among countries' climate policy can be viewed as a form of regulatory arbitrage
  - Banks may want to increase their cross-border lending to protect their loan portfolio from the risks entailed by strict domestic climate policy, leading to a race-to-the-bottom behavior

Cross-border lending as a regulatory arbitrage tool

Lender Share	Interaction		$CCPI_{borrower} < CCPI_{lender}$			
	(1)	(2)	(3) Yes	(4) No	(5) Yes	(6) No
$CCPI_{lender}$	0.046***	0.043***	0.061***	0.008	0.060***	0.009
	(0.008)	(0.008)	(0.015)	(0.016)	(0.016)	(0.017)
$CCPI_{lender} \times CCPI_{borrower}$	-0.002**	-0.002***				
	(0.001)	(0.001)				
Controls & Fixed Effects:						
Bank Group Controls	✓	✓	✓	✓	✓	✓
Borrower × Year FE	✓		✓	✓		
Loan FE		✓			✓	✓
Obs.	12,478	12,478	7,980	3,860	7,763	3,519
R^2	0.809	0.842	0.812	0.819	0.851	0.841
Mean(Lender Share)	7.722					
Difference			0.052**		0.052**	

Effect decreases in borrower's stringency and **it is absent if $CCPI_{borrower} > CCPI_{lender}$**

Does a higher CCPI change the supply of credit domestically?

Lender Share	Carbon-intensive firms				
	(1)	(2)	(3)	(4)	(5)
Same Country × High Carbon Intensity Risk × $CCPI_{lender}$	-0.317**	-0.353***	-0.344***	-0.234**	-0.234**
	(0.125)	(0.110)	(0.111)	(0.097)	(0.096)
Same Country × High Carbon Intensity Risk	19.355***	19.198***	18.794***	11.999**	11.733**
	(7.041)	(6.585)	(6.619)	(5.664)	(5.672)
High Carbon Intensity Risk × $CCPI_{lender}$	0.085	0.070	0.077	0.104**	0.083*
	(0.085)	(0.068)	(0.065)	(0.044)	(0.043)
Same Country × $CCPI_{lender}$	0.066	0.086	0.079	0.011	0.023
	(0.101)	(0.125)	(0.126)	(0.099)	(0.107)
Same Country	-1.752	-2.171	-1.784	2.550	1.799
	(5.998)	(7.491)	(7.539)	(5.939)	(6.354)
High Carbon Intensity Risk	-4.178	-0.698	-1.201		
	(5.066)	(4.887)	(4.680)		
$CCPI_{lender}$	-0.022	0.012	0.002	-0.023	-0.021
	(0.067)	(0.069)	(0.067)	(0.045)	(0.044)
Controls & Fixed Effects:					
Bank Group Controls	✓	✓	✓	✓	✓
Borrower FE		✓	✓		
Year FE			✓		
Borrower × Year FE				✓	
Loan FE					✓
Obs.	2,540	2,540	2,540	2,540	2,540
R^2	0.073	0.540	0.543	0.612	0.701
Mean(Lender Share)	9.008				

Climate policy stringency decreases loan supply to domestic borrowers with high carbon risk while increasing loan supply if such borrowers are abroad

Climate policy stringency and corporate profits

	ROE	ROC	Net Margin	Opr. Margin
	(1)	(2)	(3)	(4)
CCPI	-0.007**	-0.004*	-0.007**	-0.004*
	(0.003)	(0.002)	(0.003)	(0.002)
Controls & Fixed Effects:				
Controls	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Obs.	214	213	216	216
R^2	0.302	0.291	0.337	0.395
Mean(Dep. var.)	0.096	0.079	0.076	0.097

The changes induced by stringent climate policy may hurt the firms' profitability, which in turn can lead the lenders to increase their lending abroad

Tentative conclusions

- We investigate whether banks use cross-border lending to react to a change in climate policy stringency in their home country

- Banks exploit uncoordinated national climate policies by refocusing syndicated lending from 'green' to 'brown' countries and firms

Lack of policy harmonization may trigger a race-to-the-bottom behavior and threaten the effectiveness of climate policies

Appendix

Summary statistics

	Obs.	Mean	Std. Dev.	Min.	Max.
Lender share	12,478	7.722	7.989	0.070	94.210
$CCPI_{lender}$	12,478	55.689	8.179	22.848	76.620
$CCPI_{borrower}$	12,478	49.961	8.887	22.848	76.620
Bank-level controls					
log(Total assets)	12,478	28.097	3.088	11.169	36.838
Tier 1 capital ratio	12,478	12.342	7.255	3.700	182.760
log(Customer deposits)	12,478	27.260	3.375	6.639	36.813
Liquidity ratio	12,478	49.097	35.340	0.720	395.494
ROAE	12,478	5.626	11.212	-223.690	46.090
Net interest margin	12,478	1.481	0.782	-0.130	9.170
Country-level controls					
log(GDP per capita)	11,942	10.497	0.709	6.906	11.685
GDP growth	11,942	1.949	2.605	-8.075	14.526
Domestic credit to GDP	11,705	121.545	37.846	25.456	206.671
Unemployment rate	11,942	7.562	3.457	0.489	27.071
Common language	11,510	0.246	0.431	0	1
log(Distance)	11,510	7.908	1.025	4.798	9.384
Top 5 bank concentration	12,259	73.559	14.744	28.970	100
Population growth	11,943	0.547	0.532	-1.854	5.322
Young workforce	11,942	26.572	4.370	15.767	55.337
Old workforce	11,942	25.379	6.296	4.192	45.125
Capital regulatory index	9,004	6.851	1.778	2	10
Independence of supervisory authority	10,688	2.020	0.813	0	3
Bank supervisory power	11,264	10.106	1.909	6	16
Property rights	11,838	77.153	18.426	20	97.1
Legal rights index	5,514	5.820	2.782	1	12
log(Contract enforcing days)	6,618	4.598	0.494	3.258	5.720
Financial liberalization index	11,838	67.711	14.805	20	90
Others					
$Climate\ policy_{lender}$	12,478	12.053	4.231	0	20
$Renewable\ energy_{lender}$	12,478	2.617	1.704	0.023	8.094
$Energy\ use_{lender}$	12,478	5.715	1.439	1.017	9.124
$CO_{2lender}$	12,478	35.304	5.257	9.570	45.564
Δ Green Party Shr.	7,573	0.286	1.410	-4.500	6.667
High Carbon Intensity Risk	1,419	0.725	0.447	0	1
log(Loan amount)	12,478	17.352	1.539	6.354	21.563
Same Country	28,217	0.512	0.499	0	1
log(Loan volume)	4,211	19.488	2.180	13.153	25.155
log(Number of loans)	4,211	2.192	1.178	0.693	6.704

▸ Data

Is the Green Party share correlated with economic conditions?

Panel A

	(1) $\log(GDP)_{pc}$	(2) Δ log(GDP)	(3) Credit to GDP	(4) Unemp. Rate
	(1)	(2)	(3)	(4)
Δ Green Party Share$_{t-1}$	0.014	0.168	-1.507	0.147
	(0.024)	(0.294)	(2.876)	(0.378)
Obs.	1,602	1,602	1,600	1,602
R^2	0.021	0.019	0.008	0.011

Panel B

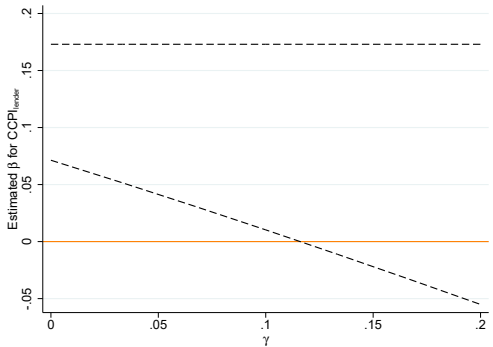
	(1)	(2)	(3)	(4)	(5)
			Δ Green Party Share		
	(1)	(2)	(3)	(4)	(5)
$\log(GDP)_{pc,\ t-1}$	0.696				0.902
	(1.026)				(0.731)
Δ $\log(GDP)_{t-1}$		-0.225			-0.255
		(0.145)			(0.158)
Credit to GDP_{t-1}			0.002		0.006
			(0.005)		(0.006)
Unemp. $Rate_{t-1}$				-0.021	0.011
				(0.177)	(0.184)
Obs.	1,622	1,622	1,622	1,625	1,621
R^2	0.008	0.093	0.002	0.001	0.123

In line with the exclusion restriction, the economic condition variables have insignificant coefficients in all of these models

▸ Back

Relaxing the exclusion restriction assumption

$$\textit{Lender share} = \beta\ \textit{CCPI} + \gamma\ \Delta\textit{Green Party share} + \epsilon$$



Plausibly exogenous instrumental variable method (Conley, Hansen, and Rossi, REStat 2012) provides interval estimates for β when γ deviates from being exactly zero

▸ Back

Alternative instrument: Neighboring countries' climate policy stringency

	$CCPI_{lender}$	Lender Share		
	(1)	(2)	(3)	(4)
Neighbor $CCPI_{lender}$	0.808^{***}			
	(0.078)			
$\widehat{CCPI}_{lender}$		0.048^{***}	0.031^{+}	0.035^{**}
		(0.012)	(0.019)	(0.016)
Controls & Fixed Effects:				
Country Controls			✓	✓
Bank Controls				✓
Loan FE	✓	✓	✓	✓
Obs.	11,070	11,070	10,729	10,729
R^2	0.280	0.010	0.016	0.026
1^{st} Stage Eff. F-stat	105.900	105.900	51.412	56.716
Mean(Lender Share)	7.716			

Alternative IV: Leave-one-out IV (Angrist, Imbens, Krueger, JAE 1999) or the average value of neighbors' CCPI

▸ Back

Influence of domestic bank regulation

Panel A

Lender Share	Ind. of Bank Supervisory Auth.		
	(1) Low	(2) Medium	(3) High
$CCPI_{lender}$	0.071***	0.028	-0.001
	(0.024)	(0.018)	(0.022)
Controls & Fixed Effects:			
Bank Group Controls	✓	✓	✓
Loan FE	✓	✓	✓
Obs.	2,353	2,693	2,826
R^2	0.827	0.867	0.867
Mean(Lender Share)	7.722		

Panel B

Lender Share	Bank Supervisory Power		
	(1) Low	(2) Medium	(3) High
$CCPI_{lender}$	0.071***	0.043	0.027**
	(0.021)	(0.069)	(0.011)
Controls & Fixed Effects:			
Bank Group Controls	✓	✓	✓
Loan FE	✓	✓	✓
Obs.	2,963	2,181	3,420
R^2	0.874	0.841	0.849
Mean(Lender Share)	7.722		

A weak supervision environment can facilitate a race-to-the-bottom behavior by banks

Role of bank reputation

Lender Share	Language		Distance		Border	
	(1) Diff.	(2) Same	(3) High	(4) Low	(5) No	(6) Yes
$CCPI_{lender}$	0.031***	0.019	0.073***	0.001	0.052***	0.010
	(0.008)	(0.014)	(0.011)	(0.011)	(0.009)	(0.047)
Controls & Fixed Effects:						
Bank Group Controls	✓	✓	✓	✓	✓	✓
Loan FE	✓	✓	✓	✓	✓	✓
Obs.	8,156	1,904	6,152	4,952	10,928	972
R^2	0.867	0.842	0.818	0.880	0.838	0.938
Mean(Lender Share)	7.722					
Difference	-0.031*		0.048***		-0.055***	

The effect is stronger when the bank reputation is less likely to be affected, which is in line with race-to-the-bottom behavior

Which component of the CCPI matters the most?

	Lender Share				
	(1)	(2)	(3)	(4)	(5)
Climate policy$_{lender}$	0.040	0.063***	0.058***	0.069***	0.065***
	(0.038)	(0.013)	(0.013)	(0.012)	(0.013)
Renewable energy$_{lender}$	-0.234**	-0.031	0.056	0.020	0.037
	(0.095)	(0.037)	(0.053)	(0.053)	(0.055)
Energy use$_{lender}$	0.103	0.029	0.162*	0.039	0.027
	(0.148)	(0.057)	(0.082)	(0.079)	(0.084)
$CO_{2lender}$	0.053	0.046**	0.012	0.035	0.032
	(0.040)	(0.018)	(0.024)	(0.022)	(0.023)
Controls & Fixed Effects:					
Bank Group Controls	✓	✓	✓	✓	✓
Borrower FE		✓	✓		
Year FE			✓		
Borrower × Year FE				✓	
Loan FE					✓
Obs.	12,478	12,478	12,478	12,478	12,478
R^2	0.006	0.735	0.736	0.809	0.842
Mean(Lender Share)	7.722				

Among four categories, climate policy matters the most

How does the effect differentiate with respect to lenders' characteristics?

Lender Share	Size		Cross-Border		Capital		NPL	
	(1) Low	(2) High	(3) Low	(4) High	(5) Low	(6) High	(7) Low	(8) High
$CCPI_{lender}$	0.018**	0.061***	0.022**	0.107***	0.053***	0.045***	0.031*	0.097***
	(0.008)	(0.010)	(0.009)	(0.013)	(0.013)	(0.009)	(0.018)	(0.031)
Fixed Effects:								
Loan FE	✓	✓	✓	✓	✓	✓	✓	✓
Obs.	5,356	5,337	5,328	5,459	5,406	5,626	847	881
R^2	0.843	0.858	0.842	0.846	0.841	0.861	0.838	0.808
Mean(Lender Share)	7.722							
Difference	0.043***		0.085***		-0.008		0.065*	

The effect is stronger for larger, more experienced in cross-border lending banks, and banks with high NPL ratios

Are there regional patterns?

Lender Share	Europe vs USA	Europe vs Emerging markets	Europe vs Europe	Europe vs Asia	Europe vs Anglo-Saxon
	(1)	(2)	(3)	(4)	(5)
$CCPI_{lender}$	0.029	0.131***	0.008	0.110	0.040*
	(0.026)	(0.032)	(0.016)	(0.071)	(0.023)
Controls & Fixed Effects:					
Bank Group Controls	✓	✓	✓	✓	✓
Loan FE	✓	✓	✓	✓	✓
Obs.	3,751	885	3,069	371	4,091
R^2	0.820	0.894	0.907	0.864	0.833
Mean(Lender Share)	7.722				

- We study regional patterns to see the direction of cross-border lending
- European lenders channel their credit supply towards emerging markets due to a more stringent climate policy at home

Climate policy stringency differentials and cross-border credit flows

	log(Number of loans)				log(Loan amount)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ CCPI	0.025***	0.028***	0.036***	0.028***	0.029***	0.055***	0.073***	0.057***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.008)	(0.009)	(0.010)	(0.011)
Controls & Fixed Effects:								
Borrower country FE		✓				✓		
Borrower country × Year FE			✓	✓			✓	✓
Bank Group Controls				✓				✓
Obs.	4,211	4,208	4,185	4,185	4,211	4,208	4,185	4,185
R^2	0.058	0.265	0.318	0.354	0.024	0.222	0.309	0.373
Mean(dep. var.)	2.198				19.495			

CCPI changes may cause higher lender shares that are offset by fewer loans → Our results are robust to this conjecture

▸ More on loan amounts

Alternative indices for home country climate policy stringency

	Lender Share					
	(1)	(2)	(3)	(4)	(5)	(6)
C3-I$_{lender}$	0.141*	0.162*	0.128			
	(0.072)	(0.093)	(0.131)			
EPI$_{lender}$				0.075***	0.070***	0.064***
				(0.011)	(0.011)	(0.022)
Controls & Fixed Effects:						
Bank Group Controls		✓	✓		✓	✓
Country Controls			✓			✓
Loan FE	✓	✓	✓	✓	✓	✓
Obs.	1,897	1,897	1,742	11,889	11,889	10,833
R^2	0.817	0.822	0.818	0.833	0.835	0.846
Mean(Lender Share)	7.081			7.918		

- We test the robustness of our results to alternative climate policy indices
  1. The Climate Change Cooperation Index (C3-I) by Bernauer and Böhmelt (2013)
  2. The Environmental Policy Index (EPI) developed by YCELP, CIESIN, and the World Economic Forum

Loan amounts

	log(Loan amount)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$CCPI_{lender}$	0.029***	0.012***	0.012***	0.012***	0.012***	0.008***	0.016***
	(0.007)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)
Controls & Fixed Effects:							
Bank Group Controls	✓	✓	✓	✓	✓	✓	
Borrower FE		✓	✓				
Year FE			✓				
Borrower × Year FE				✓			
Loan FE					✓	✓	✓
Bank Group FE						✓	
Bank Group × Year FE							✓
Obs.	12,478	12,478	12,478	12,478	12,478	12,394	12,105
R^2	0.069	0.728	0.732	0.804	0.902	0.925	0.930
Mean(log(Loan amount))	17.352						

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