

DO BANKS PRICE ENVIRONMENTAL RISK? ONLY WHEN LOCAL BELIEFS ARE BINDING!

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MOTIVATION

- ▶ Increasing awareness in environmental sustainability and biodiversity risk
 - 194 countries signed the Paris Agreement
- ▶ Severity and vulnerability of environmental damage subject to heated debate
 - Substantial heterogeneity in environmental attitudes
 - Survey evidence suggests that climate change denial persists
 - Only 39% of Americans believe that global warming is a personal threat
 - Only 62% of Americans believe that global warming is due to pollution from human activities
 - June 2017, Trump withdraws from Paris Agreement
- ▶ Scarce evidence on how banks consider environmental harm and biodiversity risk

RESEARCH QUESTION

- ▶ Do banks penalize “brown” borrowers for their environmental impact?
- ▶ What drives their environmental response?
 - Do banks perceive “brownness” and “biodiversity risk” as a material risk factor?
 - If so, how do banks estimate the significance of such risks?
 - ① The role of local beliefs
 - ② The response to environmental deregulation
- ▶ Study the impact on the U.S. syndicated loan market

OVERVIEW OF RESULTS

- ▶ Banks penalize borrowers for their environmental impact
 - Higher rates to firms with more greenhouse emissions, pollution, waste, and/or natural damage
 - The same lender in the same year charges a 0.9 percentage point (pp) higher rate relative to the mean to borrowers with a one-standard-deviation higher level of total impact on the environment, controlling for borrower and non-price characteristics
- ▶ Environmental risk sensitivity is greater
 - Especially when banks are weakly capitalized
 - Consistent with capital motive, banks reduce their “skin-in-the-game” to environmental harm
 - Firms are in greener states
 - More during periods of local heating shocks
- ▶ Biodiversity risk is also priced
- ▶ In response to the surprise Trump withdrawal from the Paris agreement
 - Environmental risk sensitivity of banks declines in “brownier” states

CONTRIBUTION

- ▶ Literature on the impact of environmental damage on the cost of bank credit
 - The effect of carbon emissions on stock returns (Bolton and Kacperczyk, 2021)
 - The impact of environmental sustainability on loan rates (Degryse *et al.*, 2023)
 - Consider different types of environmental impact, not just carbon emissions
 - Investigate what drives banks to price environmental damage and biodiversity risk
- ▶ Literature on the role of biodiversity in finance
 - The effect of biodiversity risk on stock returns (Giglio *et al.*, 2023; Garel *et al.*, 2023)
 - First study on the impact of biodiversity risk on the cost of bank credit
- ▶ Literature on the role of beliefs on pricing environmental risk
 - Impact on house prices, mortgage rates and bank deposits (Baldauf *et al.*, 2020; Nguyen *et al.*, 2020; Dursun-de Neef and Ongena, 2023)
 - Consider environmental damage and biodiversity in the cost of bank credit
 - Role of local beliefs on the response to environmental deregulation
- ▶ Literature on the impact of environmental deregulations
 - Carbon neutrality commitment, environmental disclosures, EU Emissions, Cap-and-Trade (Antoniou *et al.*, 2020; Kacperczyk and Peydró, 2022; Ivanov *et al.*, 2023; Degryse *et al.*, 2023)
 - Focus on environmental deregulation and local attitudes

DATA

- ▶ Dealscan Syndicated Loan Data
- ▶ S&P Trucost Database for Environmental Impact Measures
 - To what extent the production and revenues depend on and affect the environment
- ▶ Yale Climate Opinion Surveys for Environmental Belief Measures
 - The percentage who agree they personally experienced the effects of global warming
 - The percentage who think global warming will harm them personally
- ▶ Biodiversity Measures
 - Giglio *et. al.* (2023) biodiversity measures
- ▶ Compustat for Borrower Characteristics

EMPIRICAL DESIGN

$$\text{loan rate}_{ijt} = \theta_{j \times t} + \beta \times \text{impact}_{it} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \epsilon_{ijt}$$

- ▶ i indexes firms, j indexes lender, t indexes time
- ▶ loan rate_{ijt} annual interest rate paid over LIBOR for each dollar drawn
- ▶ impact_{it} impact that borrower has on the environment as a % of total revenue
 - Direct impact ratio (through own activities)
 - Indirect impact ratio (through suppliers or customers)
 - Total impact ratio (sum of direct and indirect ratio)
 - Natural resources, Air pollutants, Ghg Emissions, Water, Land & Water, Waste
- ▶ Lender characteristics subsumed by $\theta_{j \times t}$ (time-varying changes in liquidity and ESG preferences)
- ▶ Compare, for same lender, penalty imposed on borrowers with higher environmental damage
- ▶ $X_{i \times t-1}$ borrower controls (log(assets), log(total debt), EBITDA/assets)
 - Borrower characteristics that impact the riskiness and profitability of the borrower
 - State and industry FE that affect borrower demand
- ▶ Z_{ijt} Non-price deal terms (amount, maturity, covenants, non-bank participation)

SHOCKS TO LOCAL BELIEFS

$$\begin{aligned} \text{loan rate}_{ijt} = & \theta_{j \times t} + \theta \times \Delta \text{local beliefs} + \beta \times \text{impact}_{it} \\ & + \zeta \times \text{impact}_{it} \times \Delta \text{local beliefs} \\ & + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \epsilon_{ijt} \end{aligned}$$

- ▶ Interested in β sensitivity
- ▶ Shocks to local beliefs
- ▶ Abnormal monthly heat shocks as $\Delta \text{local beliefs}$
- ▶ Impact on lender pricing
 - unlikely effect on borrower demand as loan applications submitted weeks in advance
 - lender rates take time to materialize based on lender demand
 - environmental harm for borrowers very persistent (95% R -squared with firm FE)
 - short-term temperature fluctuations likely operate on β only through loan rates

TRUMP WITHDRAWAL FROM PARIS AGREEMENT

- ▶ Eliminate the restrictions on energy explorations
- ▶ Open more federal lands to drilling
- ▶ Reduce dependency on foreign energy and create more U.S. jobs
- ▶ Push for the approval of controversial Keystone XL oil pipeline
- ▶ Withdraw any funding for the United Nations programs
- ▶ ... immediate lawsuits from several states and cities!



EMPIRICAL DESIGN: TRUMP DEREGULATION

$$\begin{aligned}
 \text{loan rate}_{ijt} = & \theta_{j \times t} + \beta \times \text{impact}_{it} + \mu \times \text{brown state}_i + \rho \times \text{impact}_{it} \times \text{brown state}_i \\
 & + \theta \times \text{deregulation}_t \\
 & + \gamma \times \text{brown state}_i \times \text{deregulation}_t \\
 & + \kappa \times \text{impact}_{it} \times \text{deregulation}_t \\
 & + \lambda \times \text{impact}_{it} \times \text{deregulation}_t \times \text{brown state}_i \\
 & + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \epsilon_{ijt}
 \end{aligned}$$

- ▶ i indexes firms, j indexes lender, t indexes time
- ▶ Withdrawal suddenly challenged by a number of green and left-wing states
- ▶ Differential change in environmental sensitivity in brown relative to green states
- ▶ Brown states Republican, non-Trump-challengers and climate-deniers
- ▶ More likely to relax environmental sensitivity after the deregulation

SENSITIVITY OF LOAN RATES TO ENVIRONMENTAL IMPACT

	no controls	with borrower controls	with borrower and deal controls	no controls	with borrower controls	with borrower and deal controls	no controls	with borrower controls	with borrower and deal controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
total impact	0.555*** (0.129)	0.456*** (0.143)	0.248** (0.116)						
direct impact				0.866*** (0.143)	0.444** (0.187)	0.280* (0.152)			
indirect impact							-0.665 (0.429)	1.630** (0.824)	0.244 (0.705)
No. obs.	31055	8658	8638	31055	8658	8638	31055	8658	8638
R-squared	0.40	0.47	0.60	0.40	0.46	0.60	0.39	0.46	0.60

- ▶ Do banks price environmental footprint?
- ▶ Yes they lend at higher rates
- ▶ Only direct and salient risks, in particular, total risks are priced
- ▶ A one standard deviation increase in total impact increases loan rates by 2 pp

ENVIRONMENTAL IMPACT AND LENDER CAPITALIZATION

	weak capitalization (1)	high capitalization (2)	weak capitalization (3)	high capitalization (4)
total impact	0.462** (0.191)	-0.0334 (0.152)		
direct impact			0.554** (0.255)	-0.0539 (0.190)
No. obs.	4312	4322	4312	4322
<i>R</i> -squared	0.56	0.64	0.56	0.64

- ▶ External financing and equity issuance more costly for weakly capitalized banks
- ▶ Borrowers subject to environmental risk require more capital reserves

ENVIRONMENTAL IMPACT AND LENDER CAPITALIZATION: LEAD SHARES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
total impact	-0.0251 (0.0219)	-0.0596* (0.0355)	-0.0671** (0.0293)						
direct impact				-0.0517** (0.0218)	-0.0786** (0.0390)	-0.0910*** (0.0293)			
indirect impact							-0.0335 (0.0650)	0.137 (0.211)	0.227 (0.188)
No. obs.	7047	1638	1637	7047	1638	1637	7047	1638	1637
R-squared	0.31	0.41	0.56	0.31	0.41	0.56	0.30	0.41	0.55

- ▶ Banks reduce their “skin-in-the-game” to the borrowers with environmental harm
- ▶ Consistent with the capital motive

THE ROLE OF LOCAL BELIEFS

Personal harm	climate denier state	climate believer state	climate denier state	climate believer state
	(1)	(2)	(3)	(4)
<i>total impact</i>	-0.110 (0.282)	0.973*** (0.253)		
<i>direct impact</i>			-0.121 (0.298)	0.885*** (0.290)
<i>N</i>	1369	3650	0.65	0.54
<i>R</i> ²	0.65	0.55	0.65	0.54
Personal experience	climate denier state	climate believer state	climate denier state	climate believer state
	(1)	(2)	(3)	(4)
<i>total impact</i>	-0.0911 (0.248)	0.883*** (0.275)		
<i>direct impact</i>			-0.261 (0.249)	0.848*** (0.324)
<i>N</i>	1536	3473	1536	3473
<i>R</i> ²	0.63	0.56	0.63	0.56

- ▶ Pricing sensitivity entirely driven by believer/green states
- ▶ Yale Survey data on climate attitudes
- ▶ Above-country-median % of local public believes climate change will harm them
- ▶ Above-country-median % of local public personally experienced global warming

SHOCKS TO LOCAL BELIEFS: WEATHER ANOMALIES

	(1)	(2)	(3)	(4)	(5)	(6)
total impact	0.448*** (0.111)	0.534*** (0.138)	0.405*** (0.124)	0.189* (0.100)	0.306** (0.138)	0.059 (0.130)
abnormal weather	-0.489* (0.254)	-2.073*** (0.333)	-2.447*** (0.272)			
total impact \times abnormal weather	0.043 (0.026)	0.051** (0.022)	0.055** (0.026)			
1 abnormal weather				-5.746*** (2.158)	-9.355*** (2.919)	-10.074*** (2.355)
total impact \times 1 abnormal weather				0.508*** (0.146)	0.480*** (0.153)	0.646*** (0.146)
No. obs.	31040	8658	8638	31219	8710	8690
<i>R</i> -squared	0.328	0.348	0.512	0.329	0.347	0.510

- ▶ Environmental impact priced even more at times of abnormal heats
- ▶ For the average U.S. warming rate, a one standard deviation increase in total impact raises loan rates by additional 32 bp
- ▶ Environmental price sensitivity entirely driven by global warming

SHOCKS TO LOCAL BELIEFS: TEMPERATURE FLUCTUATIONS

	(1)	(2)	(3)	(4)	(5)	(6)
total impact	0.468 (0.466)	-0.580 (0.495)	-0.590 (0.399)	0.534*** (0.124)	0.312* (0.167)	0.0986 (0.129)
temperature (F°)	0.0947 (0.0652)	-0.0953 (0.110)	-0.106 (0.0875)			
total impact \times temperature (F°)	0.00138 (0.00775)	0.0173** (0.00751)	0.0140** (0.00654)			
1 extreme temperature				4.569** (2.152)	2.298 (3.189)	-0.0965 (2.469)
total impact \times 1 extreme temperature				0.0854 (0.215)	0.575** (0.271)	0.592** (0.248)
No. obs.	31040	8658	8638	31055	8658	8638
R -squared	0.40	0.47	0.60	0.40	0.47	0.60

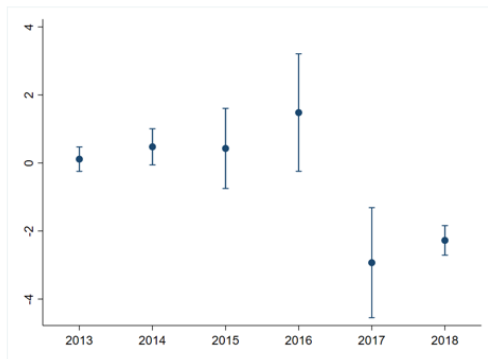
- ▶ Environmental sensitivity increases as temperatures rise
- ▶ For average temperature, a one standard deviation increase in total environmental impact raises loan rates by 2.74 pp

SENSITIVITY OF LOAN RATES TO BIODIVERSITY RISK

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
count	0.340 (5.068)						
regulation		-1.838 (5.588)					
negative			9.999** (4.954)				
employment biodiversity state				-3.009 (1.961)			
gdp biodiversity state					-1.448* (0.834)		
area biodiversity state						38.701 (23.693)	
species biodiversity state							88.689** (43.501)
No. obs.	20325	20325	20325	31738	31773	31772	31734
R-squared	0.57	0.57	0.57	0.54	0.54	0.54	0.54

- ▶ Biodiversity has an impact on the loan rates
- ▶ Loan rates higher to firms with negative biodiversity news
- ▶ Loan rates higher in states with more biodiversity extinction risk

TRUMP WITHDRAWAL FROM PARIS



This graph presents the dynamic regression coefficients λ_{year} from the augmented specification $Loan\ Rate_{ijt} = \beta \times Impact_{ijt} + \sum_{year} \delta_{year} \times no\text{-}lawsuit\text{-}state \times I_{year} + \sum_{year} \lambda_{year} \times Impact_{ijt} \times no\text{-}lawsuit\text{-}state \times I_{year} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j \times t} + \epsilon_{ijt}$ where the year ranges from 2013 to 2018.

TRUMP WITHDRAWAL FROM PARIS AND ENVIRONMENTAL SENSITIVITY

total impact	0.431*** (0.153)	0.392*** (0.132)	1.113*** (0.193)
deregulation	-11.55*** (4.442)	-12.85*** (4.632)	-12.45** (5.071)
total impact \times deregulation	2.634*** (0.741)	2.536*** (0.631)	1.320** (0.623)
no-lawsuit-state	-1.884 (2.198)		
deregulation \times no-lawsuit-state	28.69*** (4.911)		
total impact \times no-lawsuit-state	0.253 (0.219)		
total impact \times deregulation \times no-lawsuit-state	-4.913*** (0.719)		
republican-state		-9.529*** (3.015)	
deregulation \times republican-state		38.98*** (5.877)	
total impact \times republican state		0.455** (0.212)	
total impact \times deregulation \times republican state		-5.373*** (0.568)	
brown state (personal harm)			-1.367 (3.059)
deregulation \times brown state (personal harm)			16.06** (7.685)
total impact \times brown state (personal harm)			-0.677*** (0.254)
total impact \times deregulation \times brown state (personal harm)			-3.353*** (0.826)
No. obs.	8690	8690	5261
R-squared	0.57	0.57	0.51

TRUMP WITHDRAWAL FROM PARIS AND ENVIRONMENTAL SENSITIVITY

	(1)	(2)	(3)	(4)	(5)	(6)
natural resources impact × deregulation × no-lawsuit-state	-6.583 (6.722)					
water impact × deregulation × no-lawsuit-state		-3.887 (4.454)				
land and water impact × deregulation × no-lawsuit-state			-23.97** (10.38)			
air pollutants impact × deregulation × no-lawsuit-state				-8.303*** (2.808)		
ghg emissions impact × deregulation × no-lawsuit-state					-16.03*** (3.130)	
waste impact × deregulation × no-lawsuit-state						-15.21 (28.65)
No. obs.	8690	8690	8690	5261	8690	8690
R-squared	0.57	0.57	0.58	0.51	0.57	0.57

- ▶ Impact driven by land and water impact, and air pollution
- ▶ The main areas that Trump attempted to relax

CONCLUSION

- ▶ Banks penalize borrowers for environmental damage
 - Environmental risk reflected in the cost of bank credit
 - Effects more prevalent for banks with weaker capitalization
 - Consistent with capital motive, banks reduce their “skin-in-the-game” to environmental harm
 - Firms operate in “greener” states and even more during “heating shocks”
 - Biodiversity risk is also priced at origination
- ▶ Surprise Trump withdrawal from Paris Agreement as environmental deregulation
 - Sensitivity of loan rates to environmental risk declines in “brownier” states
- ▶ The pricing of environmental damage and biodiversity depends on local attitudes
 - Banks may perceive local attitudes as a soft shadow constraint
 - If no local pressure, no response!