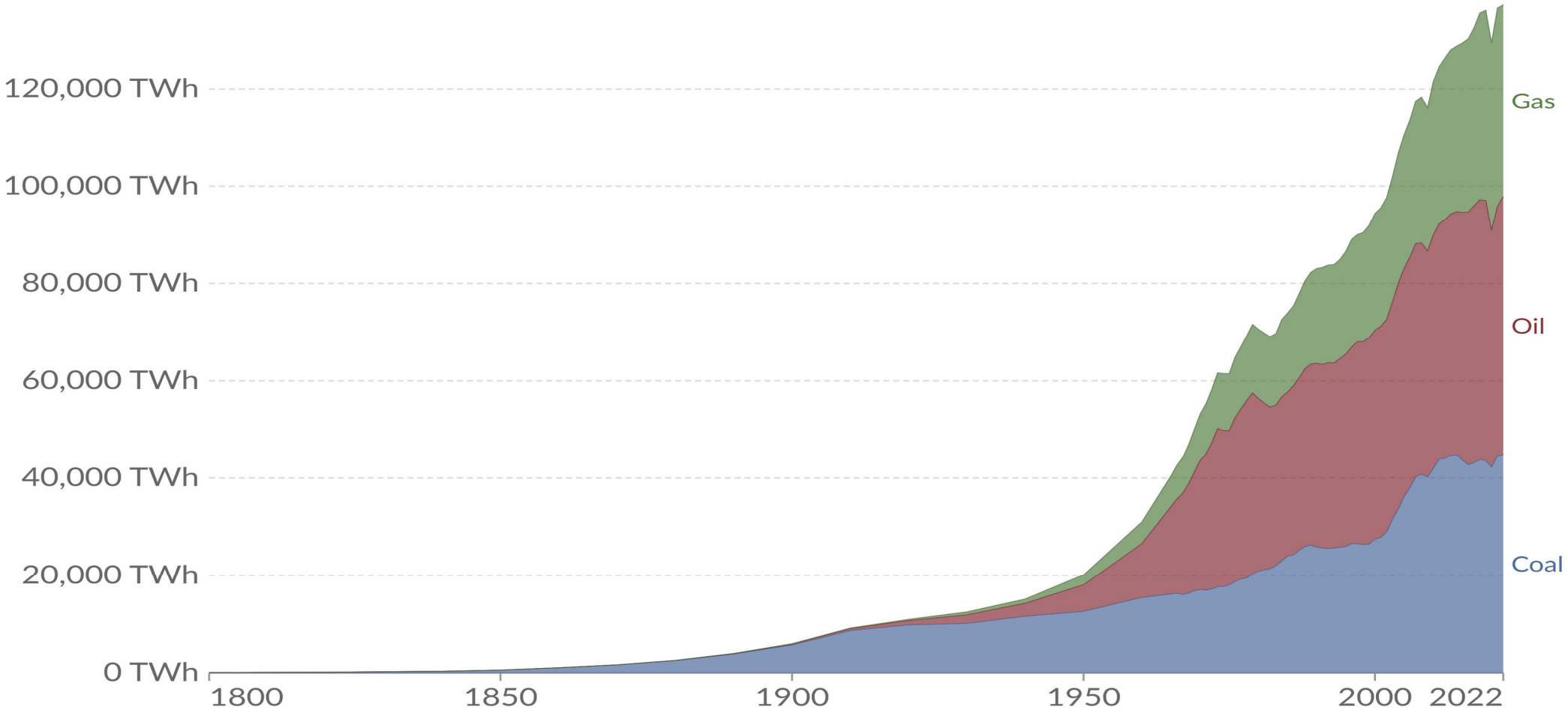
Global Banks and Fossil Fuel Firms

Steven Ongena, *University of Zurich, Swiss Finance Institute, KU Leuven, NTNU Business School, CEPR*

5th BIS Workshop
"Research on global financial stability: the use of BIS international banking and financial statistics"
Basel, Friday 15 December 2023

Global fossil fuel consumption

Global primary energy consumption by fossil fuel source, measured in terawatt-hours (TWh).



Data source: Energy Institute Statistical Review of World Energy (2023); Vaclav Smil (2017)
OurWorldInData.org/fossil-fuels | CC BY

Assessed by: Beyene, Winta, Manthos D. Delis and Steven Ongena, 2022, Financial institutions' exposures to fossil fuel assets: An assessment of financial stability concerns in the short term and in the long run, and possible solutions, Economic Governance Support Unit, Directorate-General for Internal Policies, European Parliament, June 6.

Total Fossil Fuel Financing

Financing across all sectors.

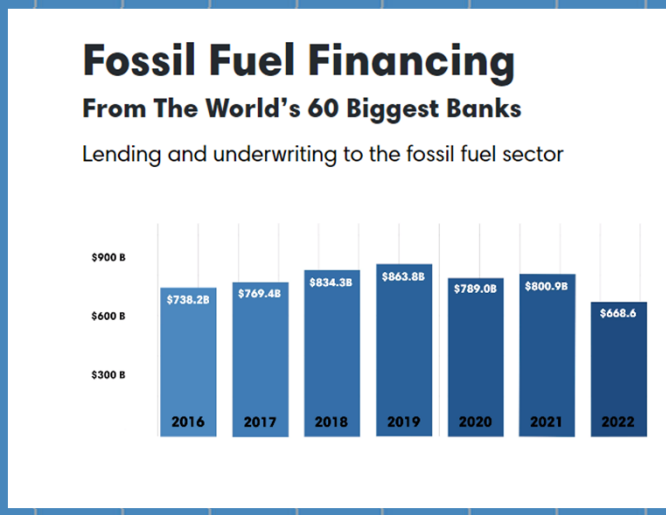
2016 2017 2018 2019 2020 2021 2022

Financing in US Dollars (B = Billions)

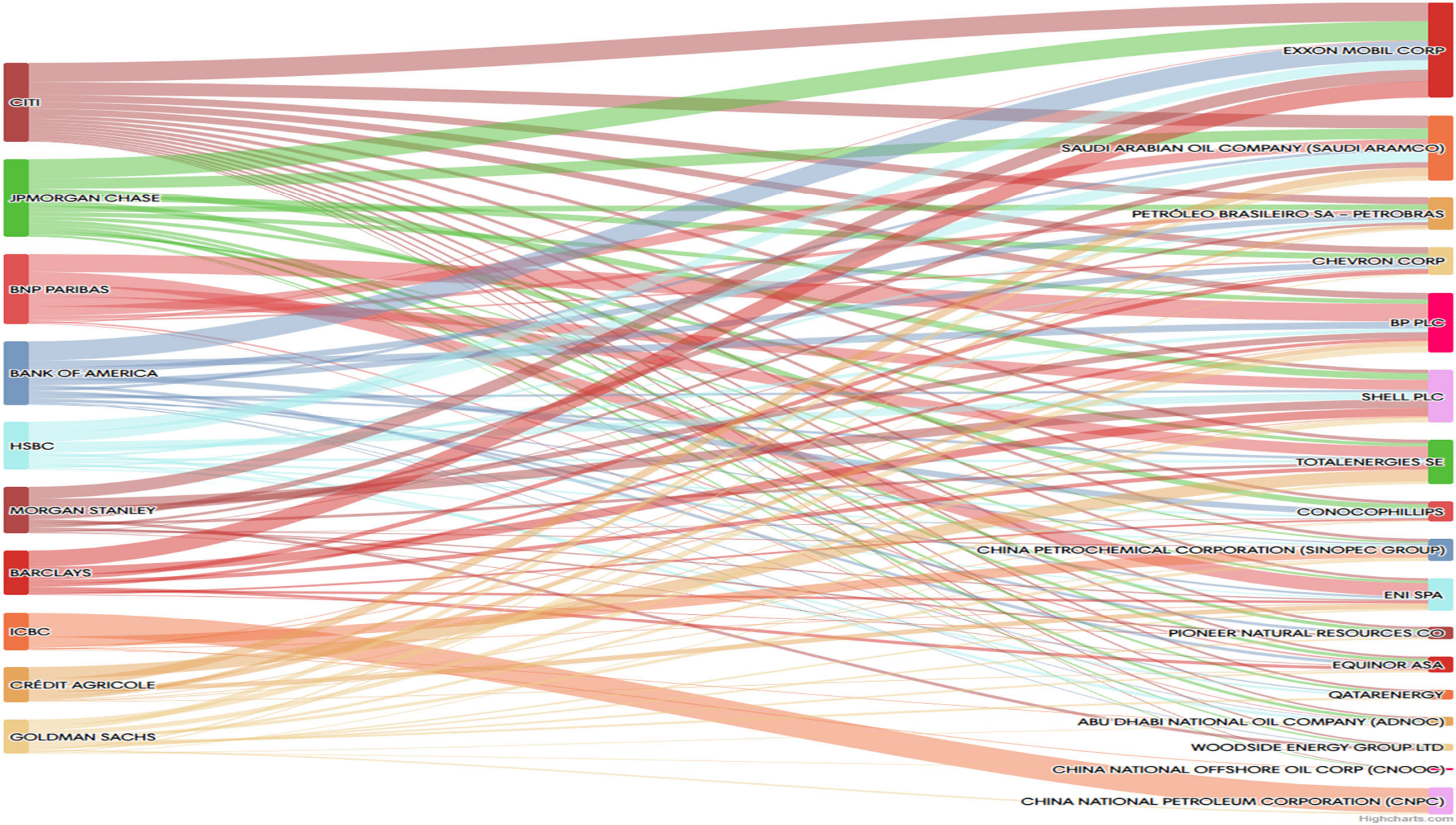
$0B $25B $50B $75B $100B $125B $150B $175B $200B $225B $250B $275B $300B $325B $350B $375B $400B $425B $450B $4…

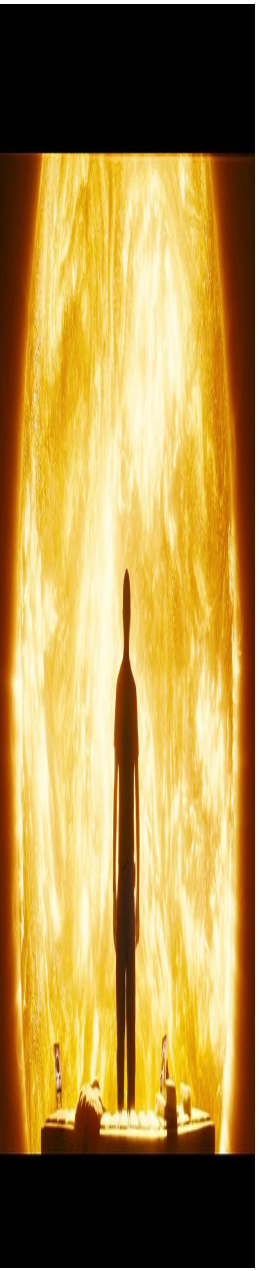
TA= 3666 B
CET1 = 13.2%

JPMorgan Chase $434.15 B
Citi $332.91 B
Wells Fargo $316.70 B
Bank of America $279.73 B
RBC $249.98 B
MUFG $219.64 B
Barclays $190.58 B
Mizuho $189.61 B
Scotiabank $182.31 B
TD $173.20 B
BNP Paribas $165.89 B
Morgan Stanley $153.43 B
HSBC $144.93 B
Goldman Sachs $143.28 B
Bank of Montreal $138.38 B
SMBC Group $135.96 B
Bank of China $134.46 B
ICBC $133.76 B
CIBC $114.54 B
Credit Suisse $104.62 B
Société Générale $98.29 B
Deutsche Bank $96.49 B
Crédit Agricole $89.03 B



https://www.bankingonclimatechaos.org/ on November 13, 2023


CITI
JPMORGAN CHASE
BNP PARIBAS
BANK OF AMERICA
HSBC
MORGAN STANLEY
BARCLAYS
ICBC
CRÉDIT AGRICOLE
GOLDMAN SACHS
EXXON MOBIL CORP
SAUDI ARABIAN OIL COMPANY (SAUDI ARAMCO)
PETRÓLEO BRASILEIRO SA – PETROBRAS
CHEVRON CORP
BP PLC
SHELL PLC
TOTALENERGIES SE
CONOCOPHILLIPS
CHINA PETROCHEMICAL CORPORATION (SINOPEC GROUP)
ENI SPA
PIONEER NATURAL RESOURCES CO
EQUINOR ASA
QATARENERGY
ABU DHABI NATIONAL OIL COMPANY (ADNOC)
WOODSIDE ENERGY GROUP LTD
CHINA NATIONAL OFFSHORE OIL CORP (CNOOC)
CHINA NATIONAL PETROLEUM CORPORATION (CNPC)
Highcharts.com



Climate Policy

Climate Awareness

BOND VIGILANTES

Fossil Fuel Firms

Abroad

BANK

BANK

Equity investors

Depositors

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Too-Big-To-Strand: Bond to Bank Substitution in the Transition to a Low-carbon Economy

Winta Beyene (*Zurich, SFI*)

Kathrin de Greiff *(SFI)*

Manthos D. Delis *(Audencia Business School)*

Steven Ongena *(Zurich, SFI, KU Leuven, NTNU, CEPR)*

$$Climate\ Policy\ Exposure\ (CCPI)_{t,i} = \sum_c Relative\ Reserves_{t,i,c} \times CCPI_{t,c}$$

- Hand-collected firm-year data on the fossil fuel reserves of firms across countries, 2007-2018.
- Country-year climate policy index: Climate Change Performance Index (CCPI).

Burck, Hermwille and Bals (2016)

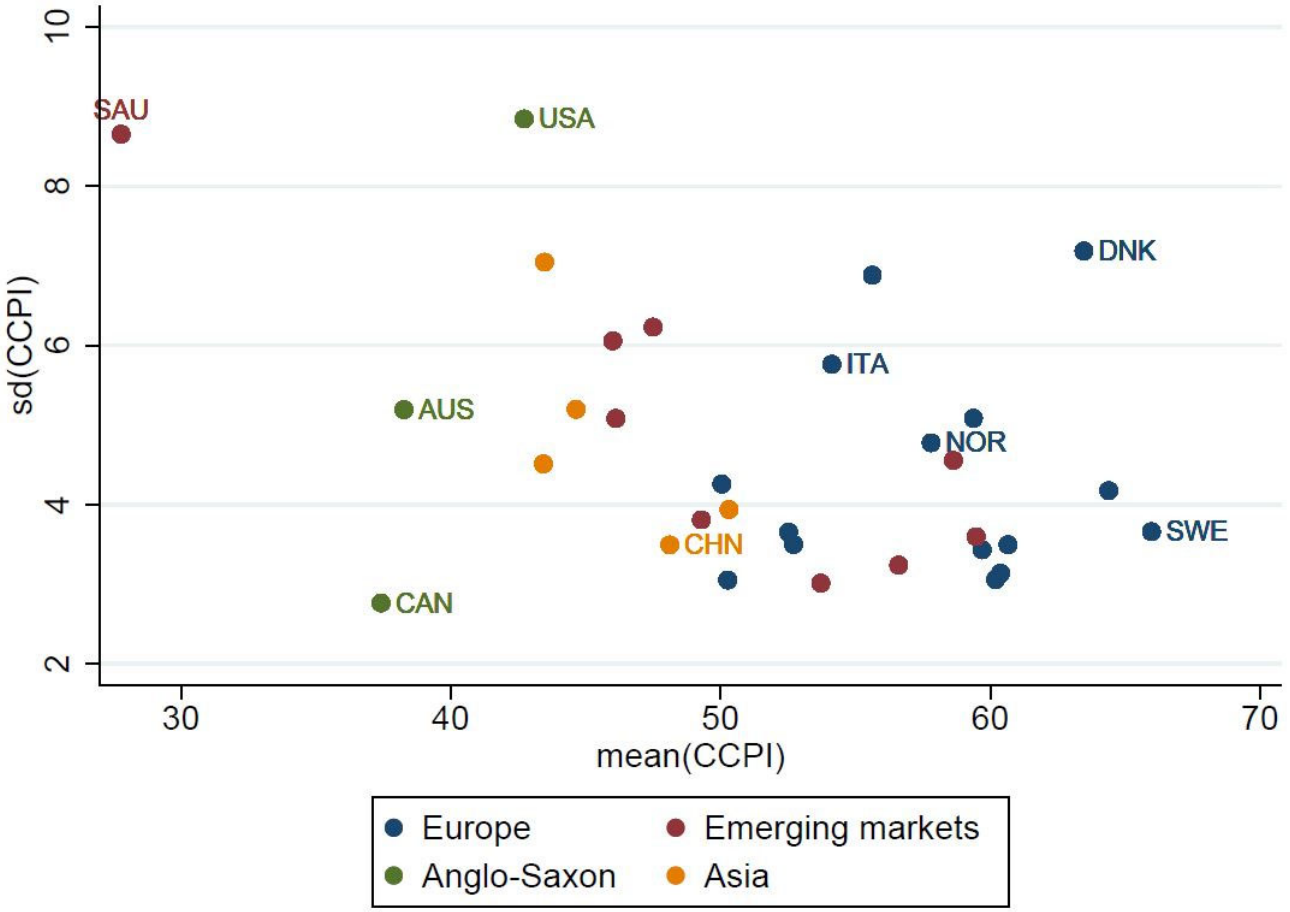
Use other measures of policy stringency.
Can also do exercises with US state level variation in policy and location of oil wells owned by US firms.

Climate Change Performance Index: Advantages

- Why an index?
  1. It is a transparent measure; not conditional to subjective choices (when constructing a measure, for example)
  2. There are many different climate policies across countries. An index makes global comparison possible and easy

- Why the CCPI?
  1. It covers 90 percent of global GHG emissions
  2. Presented at the UN's annual climate change policy conference; used by policy institutions (e.g. World Bank, Financial Stability Board) and financial industry (e.g. Black Rock, NN Investment)
  3. *Unique* section on the national and international climate policy of a country Burck, Hermwille, and Bals, 2016
  4. It is a comprehensive measure of a country's climate policy
     - Singular climate policy instruments (carbon taxes, government expenditure on environmental protection, reduction in fossil fuel subsidies) not comprehensive and clean enough

Variation in the climate policy stringency



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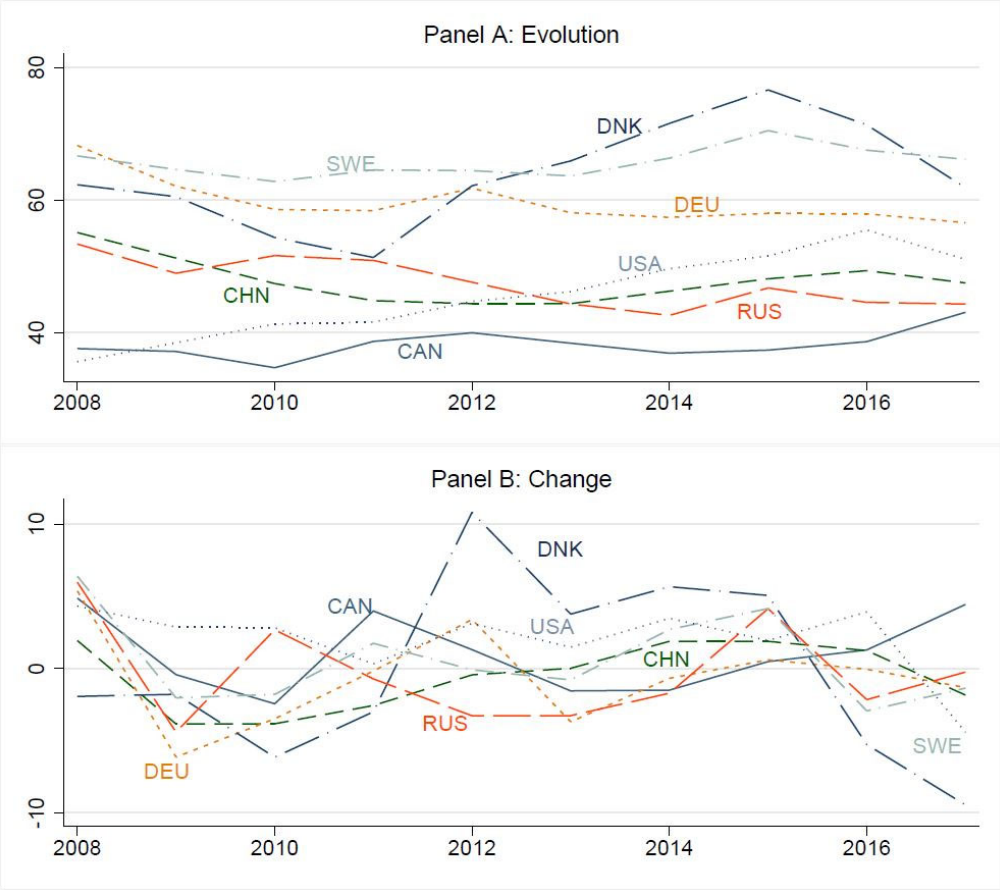
Climate Change Performance Index: Evolution and change overtime



Panel A: Evolution of the CCPI overtime

Panel B: Annual change (%) in the CCPI

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Bond markets vs banks in funding fossil fuel firms?

1. **Pricing of stranded asset risk** of fossil fuel firms by the corporate bond market and by banks.

Strong evidence of stranded asset risk being priced "more" by the corporate bond market than by banks.

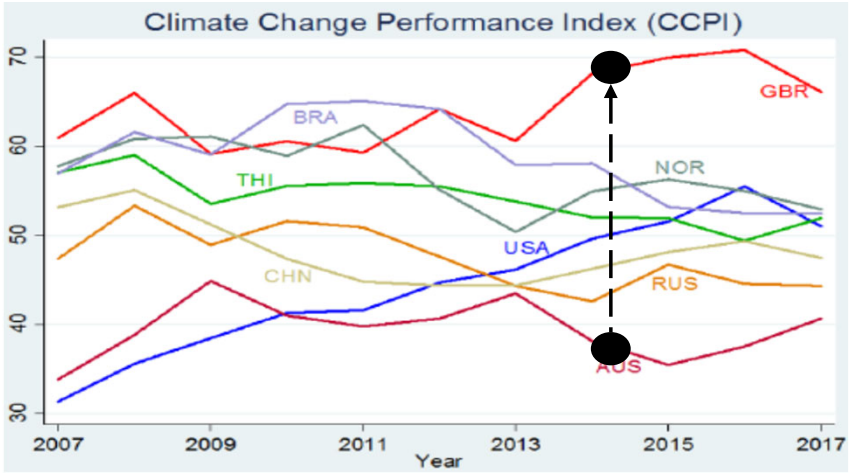
2. **Bond to bank substitution**: If the bond market prices climate policy risk more than the banking sector, ceteris paribus, some firms who would issue bonds otherwise instead try to obtain bank loans.

e.g., Rajan, JF, 1992; Becker and Ivashina, JME 2014

Fossil fuel firms substitute from issuing bonds to obtaining bank loans as their stranded asset risk exposures increase.

3. Similar effects play within the set of banks that both underwrite and lead manage (within-bank)

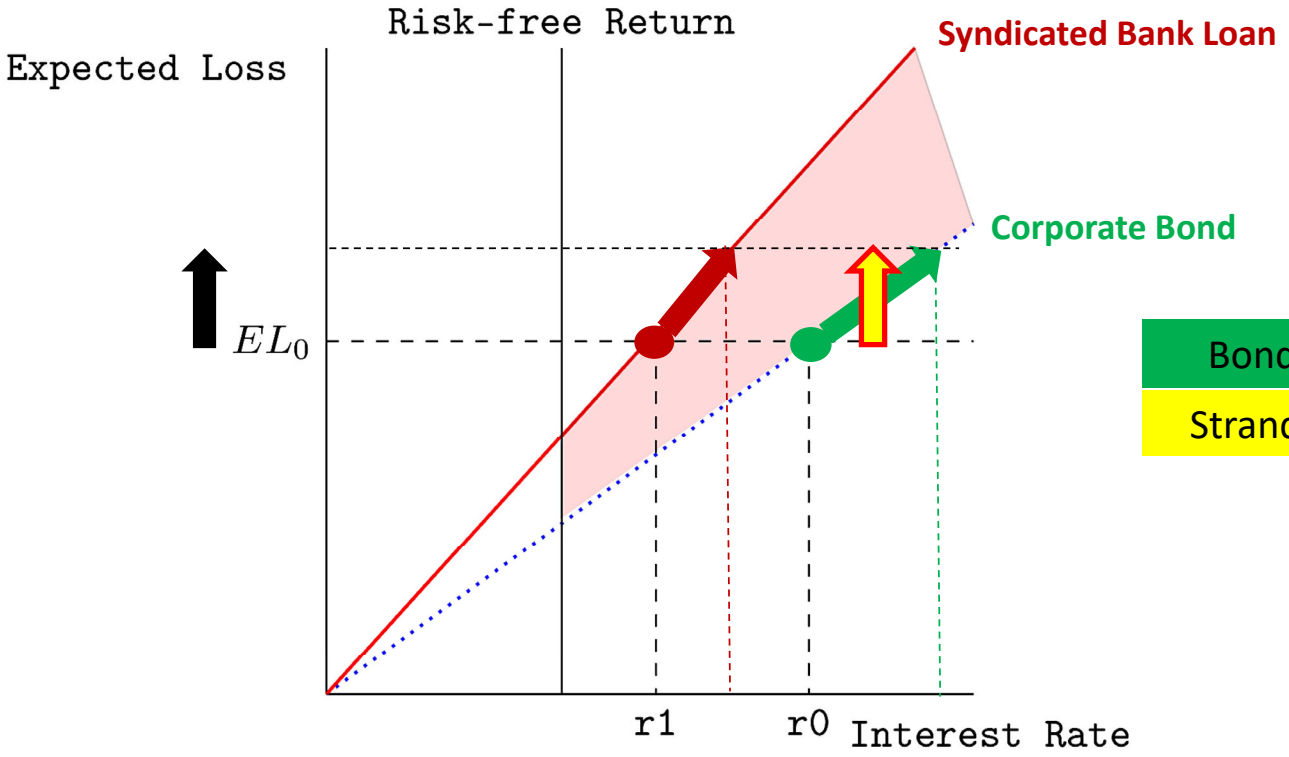
Hence Bond-to-bank substitution is unlikely to arise from differences in banks that underwrite corporate bonds from banks that lead syndicated bank loans.



	Banks	Bonds	
Mean	AISD = 231	Spread = 195	
Extra Basis Points		All	Exchange-listed
Fossil Fuel Firms	*31****	*82***	*32*
Fossil Fuel Firms with all their 2014 reserves in Great Britain versus Australia (+30 index points)	*3*	*43***	*60***

With Increasing Risk of Stranded Assets …

↑ Climate Policy Exposure ⇒ ⊿ Expected Loss > 0



Bonds charge more and extra

Stranding assets move to banks

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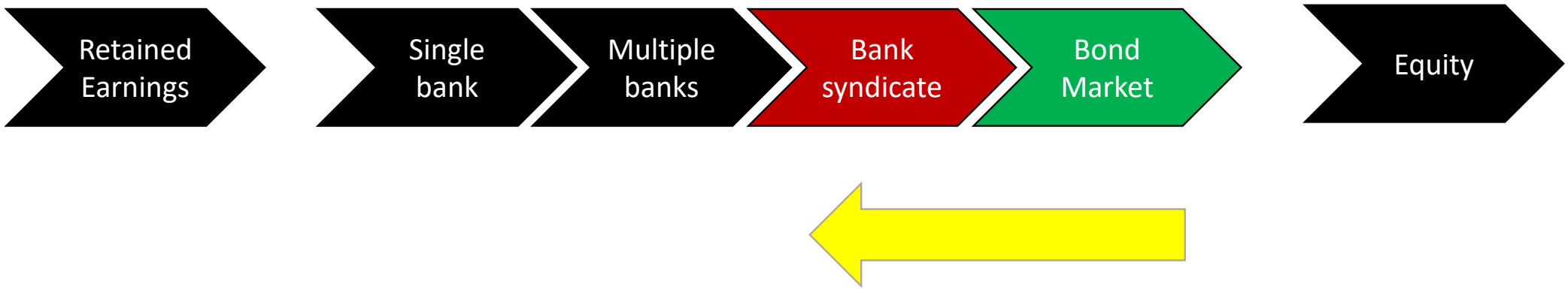
Pecking Order Theory
"Financial Graduation"

Increasing risk, hence increasing cost of financing →

→ Information asymmetry leading to higher cost of financing from external parties

Internal Financing	External Financing



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Large banks and fossil fuel firms?

4. Heterogeneity among banks: Is stranded assets risk increasingly concentrated in a few large exposures for some large banks?

Too-Big-To-Strand (TBTS)?

→Across all syndicated loans, large banks acting as lead managers charge a lower all-in spread drawn than small banks do, and …

→There is a migration towards the very largest lead manager banks along fossil fuel firm's Climate Policy Exposure.

→Correlated with the support factor which is part of the (all-in) bank credit ratings.

“There is No Planet B”, But for Banks “There are Countries B to Z”: Domestic Climate Policy and Cross-Border Lending

Emanuela Benincasa (*Zurich, SFI*)

Gazi Kabas *(Tilburg, Zurich, SFI)*

Steven Ongena *(Zurich, SFI, KU Leuven, NTNU, CEPR)*

Do banks react to the heterogeneity in national climate policy?

What does this heterogeneity mean for cross-border lending?

Do banks refocus cross-border lending from “green” to “brown” firms and countries?

- 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 Climate Change Performance Index (CCPI) as a global measure of climate policy stringency to estimate effects of cross-border bank 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

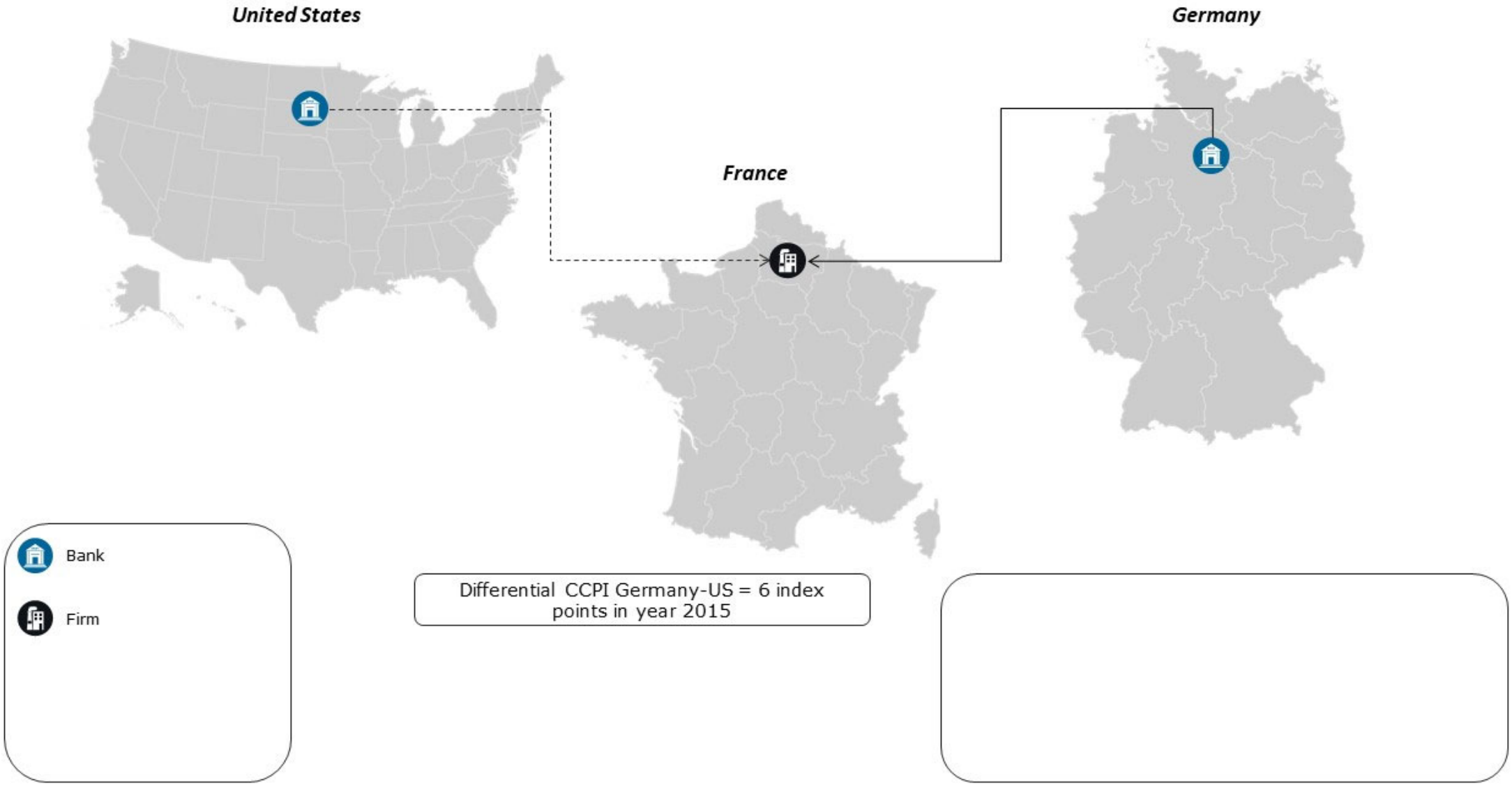
$$\text{Lender Share}_{b,l,f,t} = \alpha_l + \beta \text{CCPI}_{c,t} + \gamma \mathbf{X}_{b,t-1} + \varepsilon_{b,l,f,t}$$

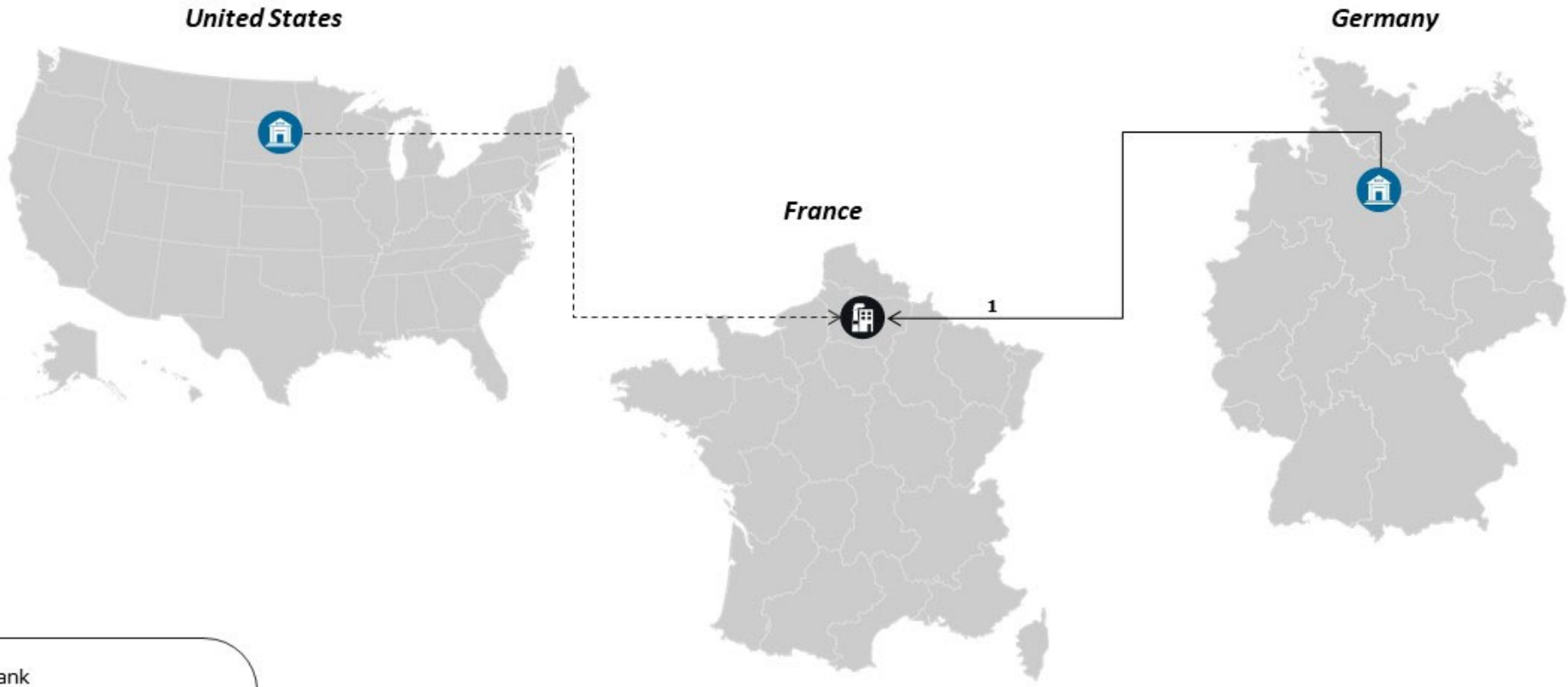
- We compare lenders within the same loan saturating the model with loan fixed effects

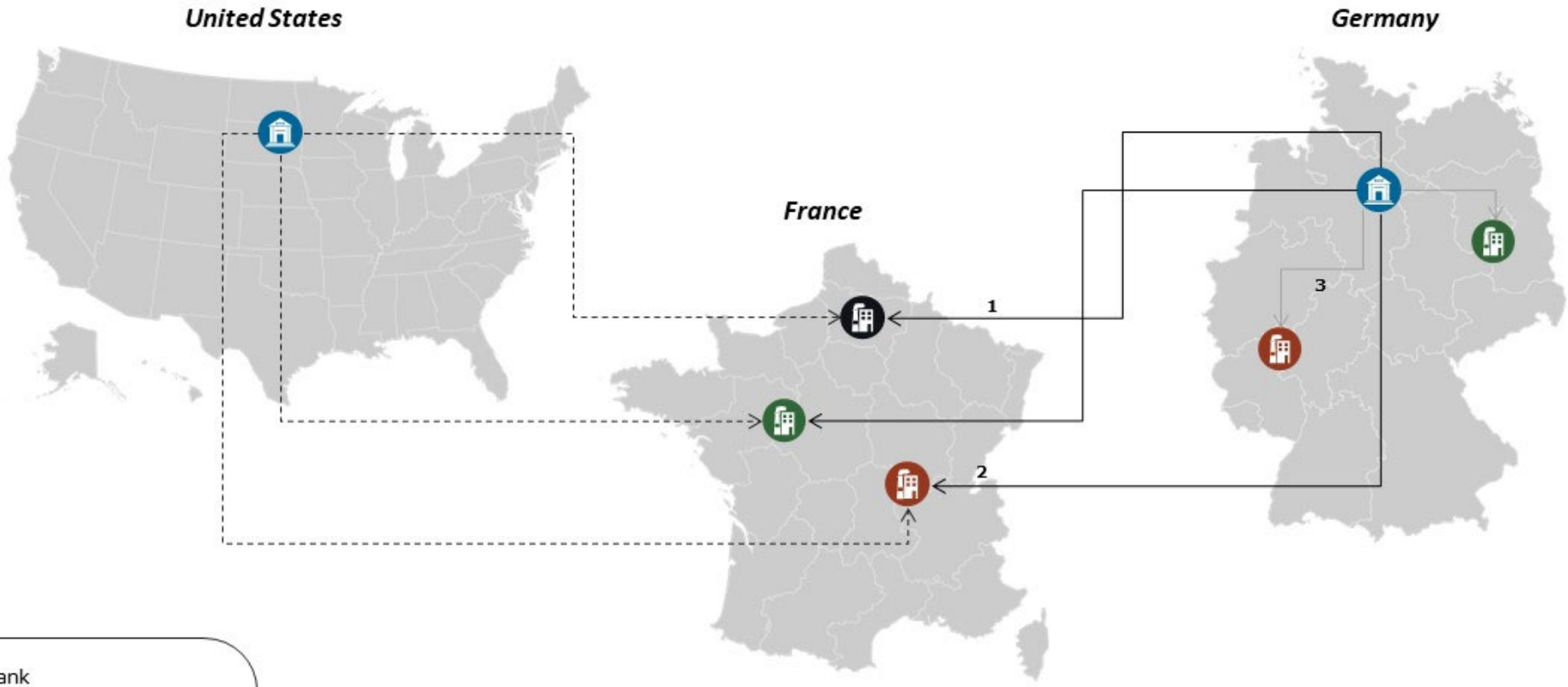
- We control for variables (culture, distance, quality of institutions, bank regulation, bank competition, economic, and demographic conditions) that are associated with cross-border lending

  Qian and Strahan, JF 2007; Mian, JF 2008; Houston, Lin, and Ma, JF 2012; Ongena, Popov, and Udell, JFE 2013; Karolyi and Taboada, JF 2015

- Green Party share in the parliaments as an IV for climate policy stringency
  - → **Relevance condition:** Higher Green Party share can predict stringent policies, thanks to party's mandate
  - → **Exclusion restriction:** To the extent that election cycles are orthogonal to economic cycles, IV can satisfy this assumption
  - → **We also instrument with the log(time in years since a country's GDP per capita crosses 5,000 USD)**


United States
Germany
France
Bank
Firm
Differential CCPI Germany-US = 6 index points in year 2015


United States
Germany
France
1
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 = **7.59 percent**, **3.3 percent** relative to the mean)



Bank

Firm

High carbon intensity firm

Low carbon intensity firm

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

1. Increase in cross-border loan share by 0.6 p.p. (mean loan share = 7.59 percent, 3.3 percent relative to the mean)
2. **Increase** in cross-border loan share by **5.5 percent**
3. **Decrease** in domestic loan share by **15 percent**

Underlying mechanism

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

- Remaining question: What is the economic mechanism at a play?

- Our conjecture: *Race-to-the-bottom*
  - Regulatory heterogeneity among countries' climate policy can be viewed as a form of regulatory arbitrage
  - Banks can circumvent climate policies by using cross-border lending (international banking)
  - 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

Climate Change and Bank Deposits

s:fi EDUCATION

Özlem Dursun-de Neef (Monash)

Steven Ongena *(Zurich, SFI, KU Leuven, NTNU, CEPR)*

Motivation

- Abnormally warm temperatures are becoming more common
  - 2023 so far is the second warmest year on record behind 2016 (World Meteorological Organization)
    - August 2023 was the hottest August on record – around 1.5°C warmer than the pre-industrial average for 1850-1900
    - June to August of 2023 was the warmest summer

Motivation

- How do people react to abnormally warm temperatures?
  - Attention to climate change increases with abnormally warm weather

    (see, e.g., Kahn and Kotchen, 2011; Cavanagh et al., 2014; Lang, 2014; Duan and Li, 2021)
  - This leads to actions or changes in financial preferences that help people fight climate change

    (see, e.g., Li et al., 2011; Herrnstadt and Muehlegger, 2014; Choi et al., 2020)

Our research question:

- Do people revise their beliefs about climate change upward when they experience temperatures warmer than usual?

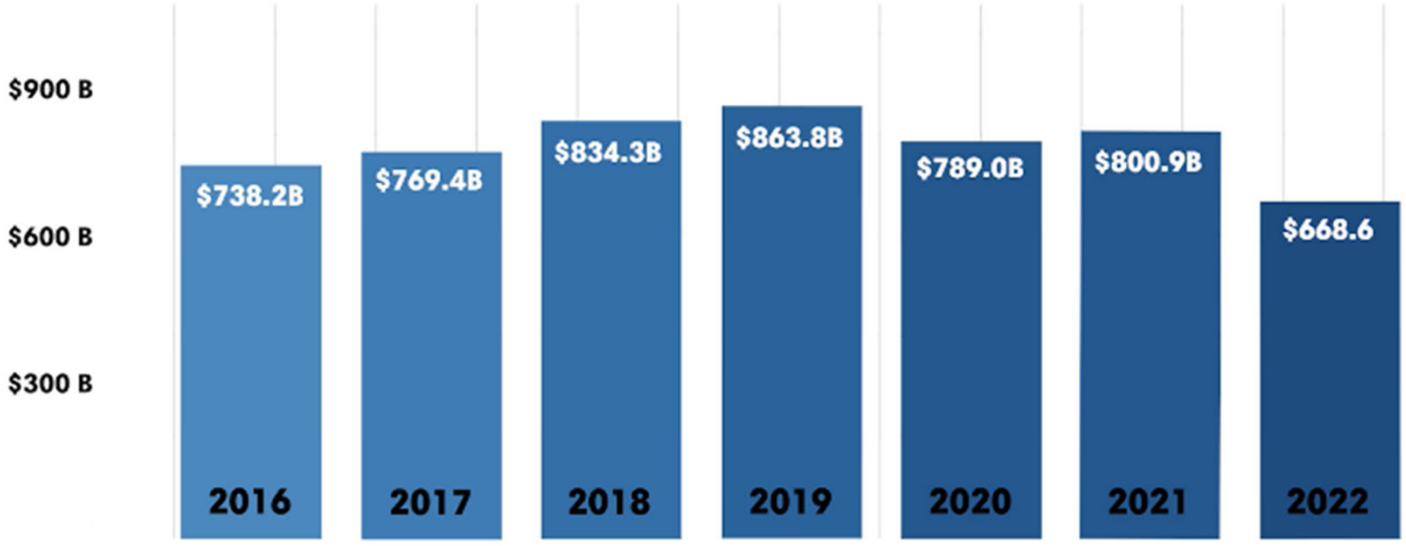
- As a reaction, do they move their deposits away from climate-unfriendly banks?

Climate-unfriendly banks

- Which banks are climate-unfriendly banks?

Climate-unfriendly banks

- **Banking on Climate Chaos Report**:
- The top 60 fossil-fuel-financing banks pumped $5.5 trillion into the fossil fuel industry since the Paris Agreement



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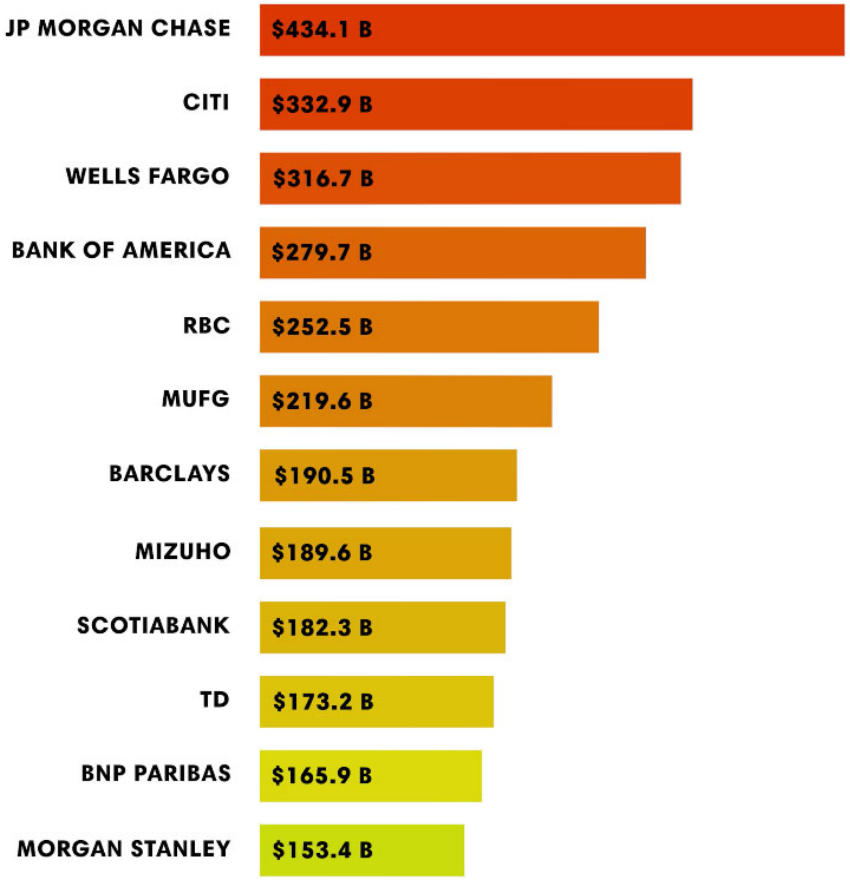
Climate-unfriendly banks

- **<u>Banking on Climate Chaos Report</u>**:
- total fossil fuel financing for each bank
  - lending
  - underwriting



Climate-unfriendly banks

- How do depositors know whether their bank is a climate-unfriendly bank?

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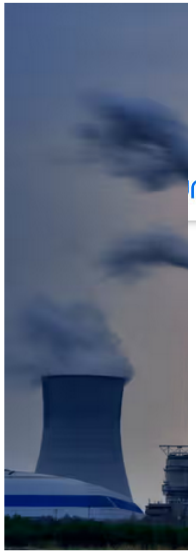
fossil fu

Coal, oil and gas
Paris climate de



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fossil fuel firms rem

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companies sinc
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2016 or 2017, a f

BNP Parib
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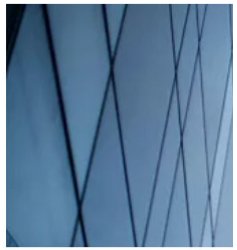

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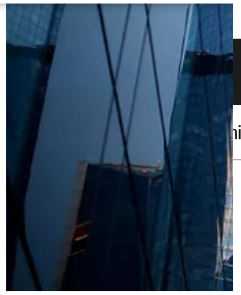

By Lottie Limb
Published on 1

Share th

Big banks
Game of T

Banks are i
new short f
transferring

To Fight Climate Change, Change Your Bank

ESG and responsible investing get a lot of attention. The fossil-fuel investments of large banks like JPMorgan Chase, Citi, Wells Fargo and Bank of America fly under the radar.

July 28, 2022 at 9:00 PM GMT+10

By Tanja Hester
Tanja Hester is the author of "Wallet Activism" and "Work Optional," and host of the podcast "Wallet Activism."

US Edition

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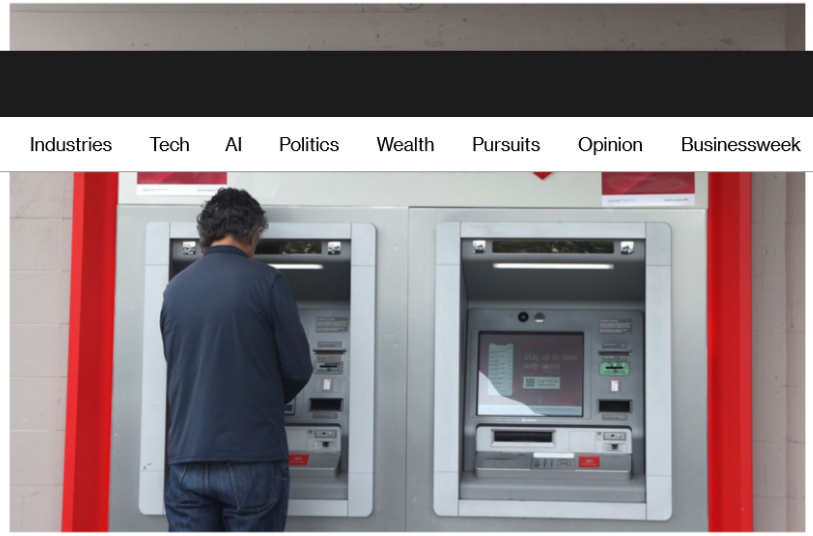
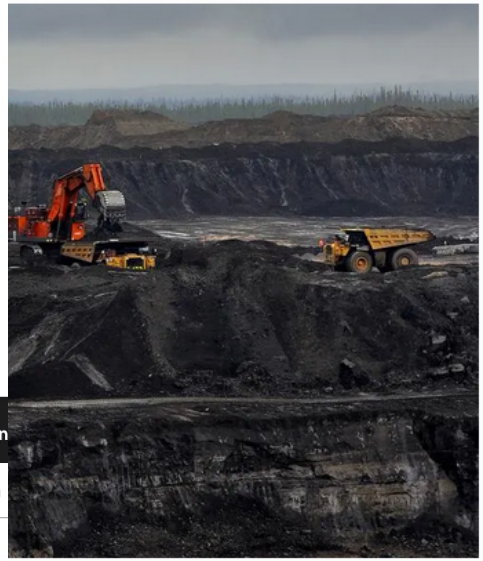


Come for the hundreds of ATMs, stay for greenhouse gases. *Photographer: Justin Sullivan/Getty Images North America*

Save

Forbes



in Alberta, Canada. U.S. and Canadian banks
ETTY IMAGES

umped a staggering $3.8 trillion
e years, a new report by an

Chaos,' shows that the world's 60
ased their investments in fossil
ng the Paris Agreement, peaking

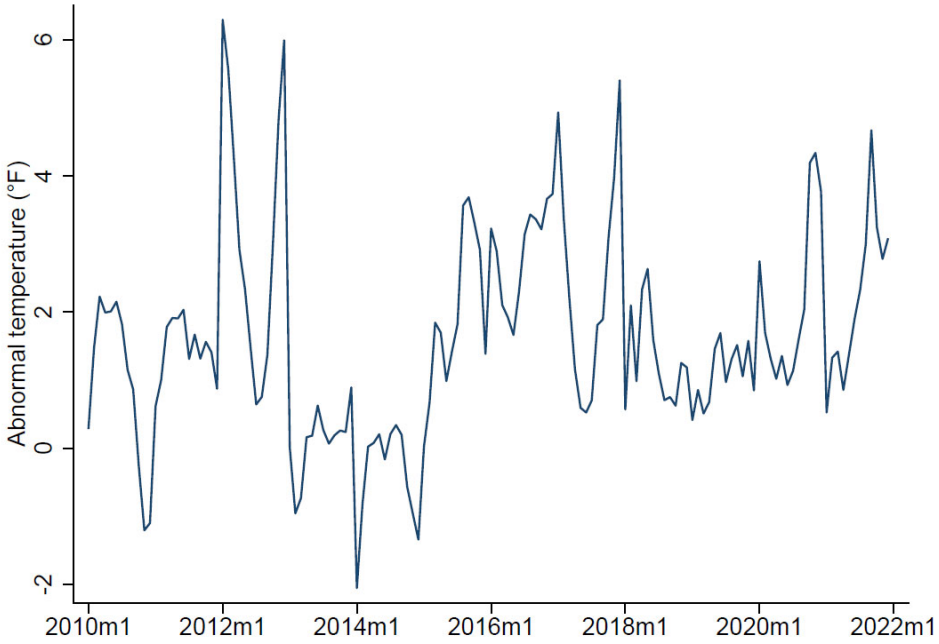
te

Outline

- Motivation
- **Data**
- Methodology and Results
- Conclusion

Data

- Monthly temperatures from the National Oceanic and Atmospheric Administration (NOAA)
  - 1900 – 1999: historical average temperatures
  - Monthly abnormal temperature = local temperature – historical average



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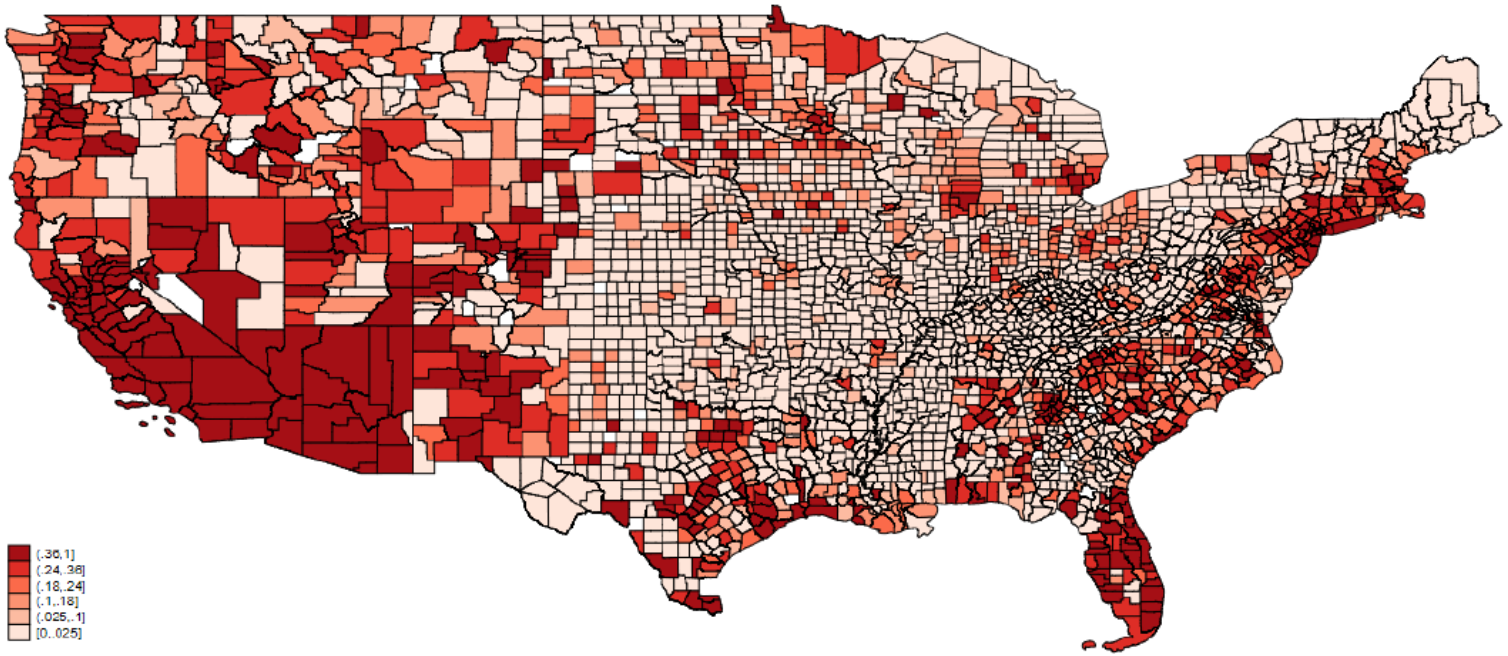
Data

- Monthly temperatures from the National Oceanic and Atmospheric Administration (NOAA)
  - 1900 – 1999: historical average temperatures
  - Monthly abnormal temperature = local temperature – historical average
- Branch-level deposits from Federal Deposit Insurance Corporation (FDIC)
  - Aggregated at the bank-county-year level
- Bank characteristics from Call Reports and county controls
  - Size, capital ratio, loan loss reserves, interest income, ROA, cash, deposit ratio
  - Population, percentage of people above 25 with at least a college degree, income per capita, and median age
- Our final sample
  - 561,444 bank-county-year observations from 2010 to 2021

Fossil-fuel-financing banks

- Presence of fossil-fuel-financing banks
  - They cover around one-third of the deposit market in the U.S.



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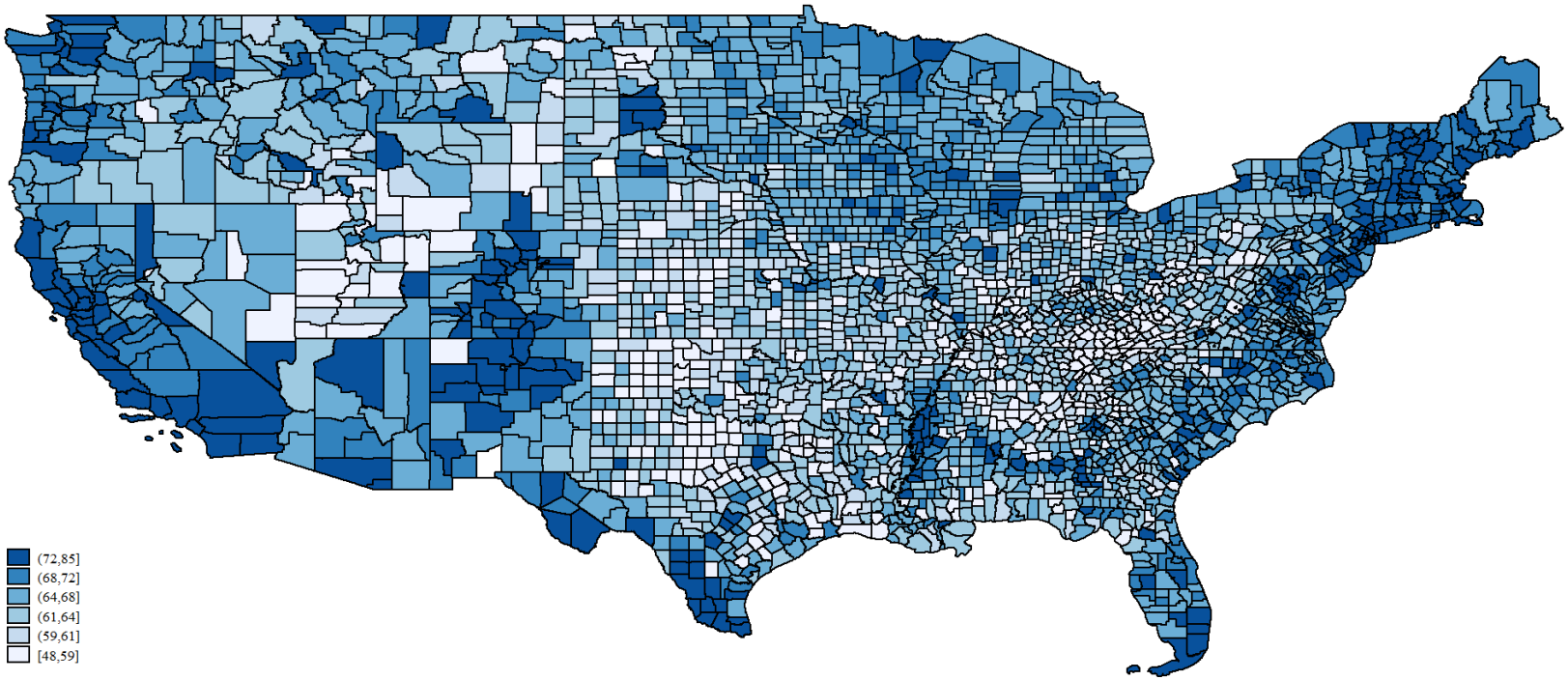
Climate Change Beliefs

- Annual county-level climate change belief measures from Yale Climate Opinion Maps
  - Percentage of respondents that answer the question " Do you think that global warming is happening? " with a " Yes "
  - Available for the post period 2016 – 2021, excluding 2017

Climate Change Beliefs

- Annual county-level climate change belief measures from Yale Climate Opinion Maps



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Outline

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- Conclusion

Empirical Methodology – Impact on Climate Change Beliefs

- The impact of abnormal temperature on climate change beliefs

$$Belief_{j,t} = \alpha + \beta_1 Abnormal\ temperature_{j,t} + \beta_2 C_{j-1,t} + \delta_j + \delta_{s,t} + \epsilon_{j,t},$$

- Abnormal temperature: 12-month moving average of the monthly abnormal temperatures for abnormally warm months
- County controls: population (log), percentage of people above 25 with at least a college degree, income per capita (log), and median age
- Fixed effects: county fixed effects, state-year fixed effects

Climate Change Beliefs

	(1)	(2)	(3)	(4)
Abnormal temperature	0.002***	0.002***	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Abnormal temperature × Republicans			0.003***	0.003***
			(	)
Education		-0.084***		
		(0.023)		
Income per capita		0.010**		
		(0.004)		
Median age		0.000		
		(0.001)		
Population		0.107***		0.105***
		(0.012)		(0.012)
County fixed effects	Yes	Yes	Yes	Yes
State×year fixed effects	Yes	Yes	Yes	Yes
Observations	15,451	15,442	15,451	15,442
Adjusted R-squared	0.961	0.962	0.961	0.962

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1°F increase in the abnormal temperature led to a 0.2 percent increase in the climate change beliefs in that county

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Climate Change Beliefs – Cross-sectional Results

- One expects that the increase in climate change beliefs would be more pronounced in counties with less believers
  - 82% of Democrats think global warming has already begun to happen, while only 34% of Republicans agree with that (Gallup survey, 2018)
  - Counties with less believers: Counties with more Republicans – with above-median percentage of residents that voted for the Republican party in the 2016 Presidential election

Climate Change Beliefs – Cross-sectional Results

	(1)	(2)	(3)	(4)
Abnormal temperature	0.002***	0.002***	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Abnormal temperature × Republicans			0.003***	0.003***
			(0.000)	(0.000)
Education		-0.084***		-0.083***
		(0.023)		(0.023)
Income per capita		0.010**		0.010**
		(0.004)		(0.004)
Median age		0.000		-0.000
		(0.001)		(0.001)
Population		0.107***		0.105***
		(0.012)		(0.012)
County fixed effects	Yes	Yes	Yes	Yes
State×year fixed effects	Yes	Yes	Yes	Yes
Observations	15,451	15,442	15,451	15,442
Adjusted R-squared	0.961	0.962	0.961	0.962

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Update in climate change beliefs happens only in counties with more Republicans

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Empirical Methodology – Impact on Bank Deposits

- The impact of abnormal temperature on bank deposits

$$Deposit\ growth_{i,j,t} = \alpha + \beta_1 Abnormal\ temperature_{j,t} \times Post \times Fossil\ fuel_i + \beta_2 Abnormal\ temperature_{j,t} \times Fossil\ fuel_i + \delta_{i,t} + \delta_{j,t} + \epsilon_{i,j,t},$$

- Abnormal temperature: 12-month moving average of the monthly abnormal temperatures for abnormally warm months
- Fossil fuel is a dummy that equals 1 for fossil-fuel-financing banks in the top 60 list
- Post is equal to 1 during 2016 – 2021
- Fixed effects: bank-year fixed effects, county-year fixed effects

Bank Deposits

	(1)	(2)
Abnormal temperature	-0.735**	
	(0.336)	
Abnormal temperature × Post	0.815*	
	(0.424)	
Abnormal temperature × Fossil fuel	1.145**	0.938*
	(0.487)	(0.562)
Abnormal temperature × Post × Fossil fuel	-1.863**	-1.548*
	(0.842)	(0.867)
County fixed effects	Yes	
Bank×year fixed effects	Yes	Yes
County×year fixed effects		Yes
Observations	456,018	455,519
Adjusted R-squared	0.102	0.117

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1°F increase in the abnormal temperature led to a 1.6 pp relative reduction in the deposit growth rate of fossil-fuel-financing banks

Bank Deposits

	(1)	(2)
Abnormal temperature	-0.735**	
	(0.336)	
Abnormal temperature × Post	0.815*	
	(0.424)	
Abnormal temperature × Fossil fuel	1.145**	0.938*
	(0.487)	( )
Abnormal temperature × Post × Fossil fuel	-1.863**	-1.548
	(0.842)	(0.867)
County fixed effects	Yes	
Bank×year fixed effects	Yes	Yes
County×year fixed effects		Yes
Observations	456,018	455,519
Adjusted R-squared	0.102	0.117

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1°F increase in the abnormal temperature led to a 0.8 pp increase in the deposit growth rate of other banks

Bank Deposits – Cross-sectional Results

	More Republicans (1)	Less Republicans (2)
Abnormal temperature × Fossil fuel	0.489	1.251
	(0.402)	(0.818)
Abnormal temperature × Post × Fossil fuel	-1.610***	-1.356
	(0.531)	(1.330)
Bank×year fixed effects	Yes	Yes
County×year fixed effects	Yes	
Observations	218,194	213,3
Adjusted R-squared	0.178	0.12

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The reallocation of deposits happens only in counties with more Republicans

Outline

- Motivation
- Data
- Methodology and Results
- **Conclusion**

Conclusion

- People revise their beliefs about climate change upward when they experience abnormally warm weather
  - 1°F increase in the abnormal temperature increases climate change beliefs by 0.2 percent
  - More pronounced in counties with more Republicans

- As a result of this upward shift in their climate change beliefs, depositors move their money away from fossil-fuel-financing banks
  - 1°F increase in the abnormal temperature leads to a 1.6 pp reduction in the deposit growth rate

Common Ownership of Banks and Fossil Fuel Firms

s:fi EDUCATION

TEASER

Elena Carletti (*Bocconi, Unicredit, CEPR*)

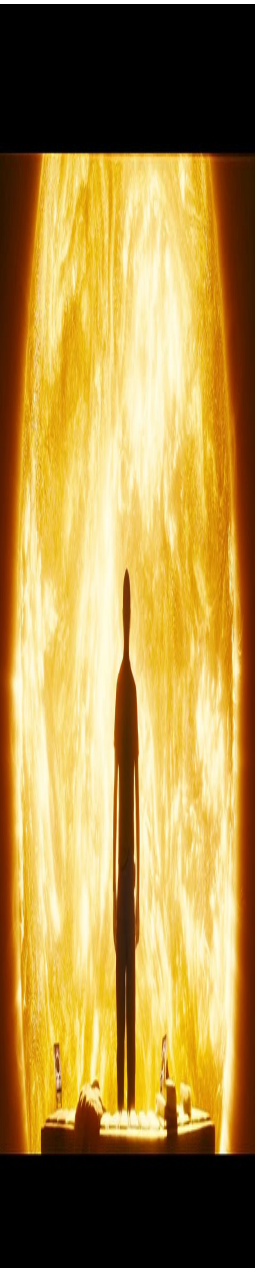
Anja Duranovic (*Utrecht*)

Irene Monasterolo (*Utrecht*)

Steven Ongena *(Zurich, SFI, KU Leuven, NTNU, CEPR)*

What We Do? What We See?

- Collect common ownership of banks and fossil fuel firms for more than a decade
- Common ownership of banks and fossil fuel firms compared to banks and other firms relatively increases over time, but especially after Paris COP21
- Does this increase access to syndicated bank credit for fossil fuel firms?
- Does this alter syndicated loan terms?



Climate Policy

Climate Awareness

BOND VIGILANTES

Fossil Fuel Firms

Abroad

BANK

BANK

Equity investors

Depositors

swiss:finance:institute

Potential Take-Aways for Global Financial Stability

1. Stranding risks accumulate on global banks` balances sheets
    1. Pitting (national/international) environmental against financial stability regulators? Too big to strand?
    2. Forging an alliance between fossil fuel firms and banks? Political delay in stranding?
2. Global banks take brown risks abroad away from domestic supervisory scrutiny
    1. May weaken domestic oversight
    2. Need for global environmental/stability coordination
3. Retail depositors may depart from brown banks when it is unusually "hot"
    1. Providing some discipline on stranding risk accumulation
        1. But global banks did collect new (uninsured) deposits when mid-sized banks were distressed
    2. Exacerbating (retail deposit) funding uncertainties for banks
    3. If brown banks are large, small local banks that obtain the deposits may end up taking risks elsewhere (Doerr, Kabas & Ongena, JFQA 2023)
4. Common ownership of fossil fuel firms and banks
    1. Further accumulation of stranding risks on banks` balance sheets and forging of alliances?

Follow-up Research?

1. Do fossil fuel firms start accessing bilateral bank loans again more (after the syndicated loan market start to dry up)? Or non-banks, finance companies, private financiers?

2. In addition to going abroad, will banks also set up off-balance sheet arrangements to finance fossil fuel firms?

3. Does this type of green depositor discipline work, with geographical labor mobility, aging, …

4. Given also common ownership, will banks assist fossil fuel firms (even more) in working the political system?
   - Do banks in the US also start lobbying politicians in the energy sector committees?