

Facing the hard truth: Evidence from Climate Change Ignorance

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Bank of Italy, June 13

- What are the political-economy consequences of transitioning to net zero? Focus: beliefs about climate change
- Why does skepticism about climate change persist among the public?

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- Growing policy effort to accelerate green transition (European Green Deal, RepowerEU, Biden's IRA)
- Transition implies “massive industrial transformation processes” (European Commission's Directorate-General for Economic and Financial Affairs). Important that it is “sustainable” (backlash to green policies slows urgently needed change)

Motivation II - Persistence of climate change skepticism

- Strong consensus in the scientific community about the existence of climate change and its causes :
 - * 97–98% of the most actively publishing climate researchers support the consensus on anthropogenic climate change (Anderegg et al. [2010]).
- Non-negligible share of the population worldwide denies or ignores the existence of climate change and its causes:
 - **US**, 2023: 26% of respondents skeptical about whether climate change is happening; 40% skeptical about its anthropogenic causes
 - **UK, France, Germany, Denmark, Sweden**, 2023: *at least* 30% of respondents claim that climate is not changing/is changing but NOT because of human activity/are not sure [27% in Italy].
- Climate change skepticism prevalent among populist parties (Tea Party, AfD, Sweden Democrats, Fratelli d'Italia..)

Conceptual framework: climate opinions response to green transition

- This paper: how do climate opinions respond to mass-layoff of coal miners?
- Trade (“China shock”) and automation linked to increasing vote shares for populist parties (Guriev and Papaioannou 2022).
- Green transitions resembles previous shocks: winners and losers; political support largely only among liberal parties...
- But also unique features: how climate opinions respond to green transition not obvious ex-ante.

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Conceptual framework: climate opinions response to green transition (cont.)

- High level of climate skepticism in fossil-fuel dependent communities (oil & gas and coal extraction) (Dewitte, 2023)
- Skepticism plausibly linked to information avoidance, aimed at:
 - avoiding anxiety and maintain optimism about the future [climate crisis & changes required to address it cause anxiety and pessimism] (Marshall 2014)
 - Protecting [identity](#) [commitment to climate beliefs to continue to enjoy a sense of self] (Dewitte 2023, Benabou & Tirole, 2011)

Conceptual framework: climate opinions response to green transition (cont.)

Layoffs shock to:

- a. economic dependence on fossil-fuel industry \implies higher pre-shock information avoidance to maintain optimism or avoid anxiety \implies climate skepticism **declines** post-shock
- b. standard of living + identity, interaction of economic and cultural factors (Guriev and Papaioannou, 2022): \implies higher post-shock information avoidance to **restore threatened identity**; salience of identity component \implies climate skepticism **increases** post-shock

- ① Climate change scepticism and apathy:
 - Cognitive limitation, public “confused” by:
 - Sponsored research: Gelbspan (1997)
 - Unbalanced press coverage: Shapiro (2016), Beattie (2020)
 - Captured politicians (Meyer 2019)
 - “Cultural cognition hypothesis”: Kahan et al. (2012)
 - Salience (Gagliarducci, Paserman and Patacchini, 2020)
- ② The Political Economics of the Green Transition (Besley and Persson, 2023, Egli et al., 2022, Coalantone et al., 2024)
- ③ Active information avoidance:
 - Review: Goldman, Hagman, Loewenstein (2017)
People protect their priors → increased opinion polarization

- Long-term consequences of green transition among highest affected communities
- Focus on public opinions about climate change \Rightarrow Directly linked to environmental policy-making (Millner and Ollivier, 2016)
- Study information avoidance as a determinant of climate scepticism in real-world setting (as Dewitte, 2023), distinguishing between *economic* and *identity* motives.



The Achilles' Heel of Biden's Climate Plan? **Coal Miners.**

Unions representing other workers affected by climate legislation have struck deals, but opposition from coal miners has persisted, complicating the path to enactment.

The Loveridge coal mine in Fairview, W.Va. Coal workers continue to regard clean-energy jobs as likely to represent a major drop in their standard of living. Kristian Thacker for The New York Times

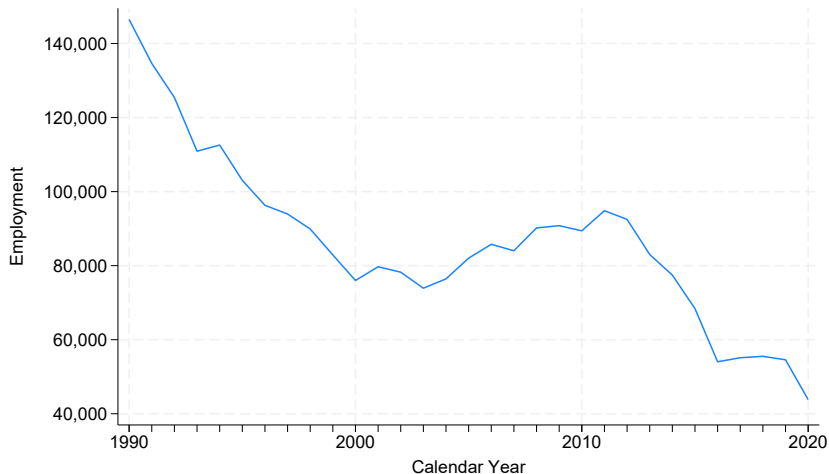
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Outline from here

- ① Data and Diff-in-diffs
- ② Triple diff estimates/Placebos
- ③ Partisanship
- ④ Next steps
- ⑤ Conclusion

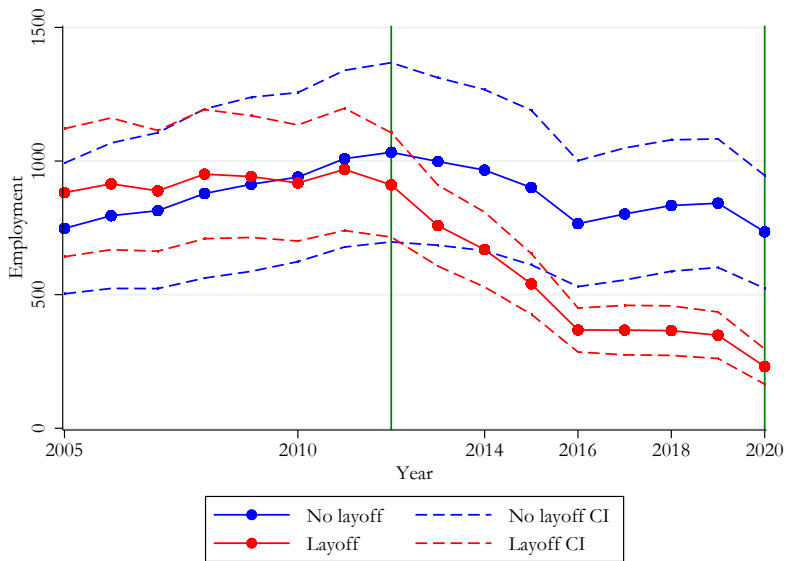
- Sample: All US counties with at least 300 mining jobs in 2012 (on average 1.2% of population)

Employment in coal mines since 1990, US

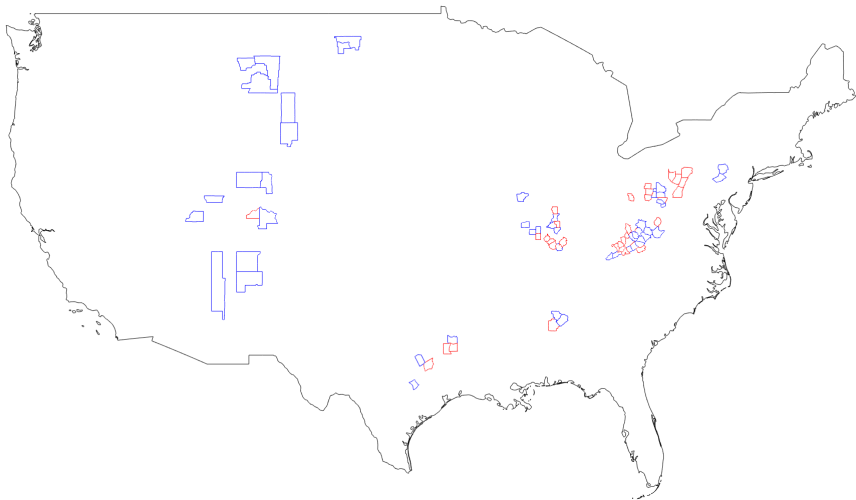


- Sample: All US counties with at least 300 mining jobs in 2012 (on average 1.2% of population)
- Treatment: At least 50% of miners laid off between 2012 and 2020
⇒ Treatment group 48 counties, Control group 35 counties

Employment shock

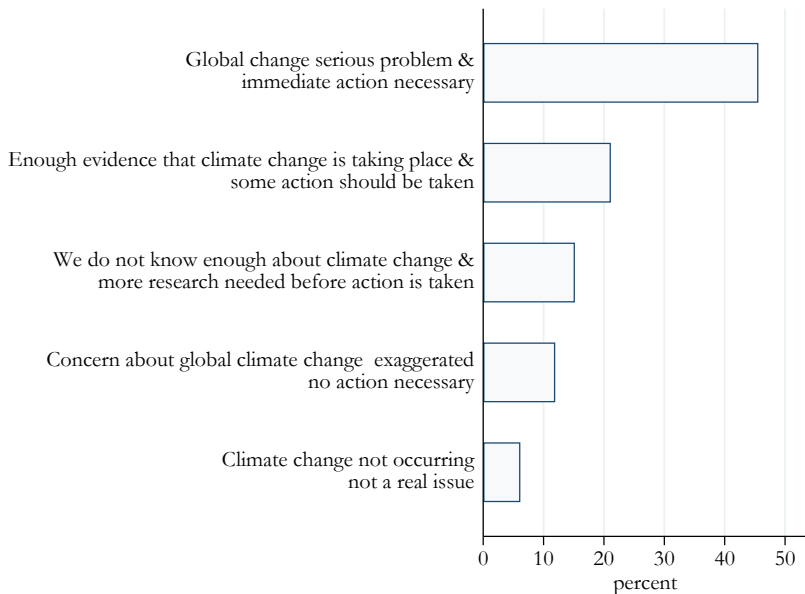


Treated and control counties



- Sample: All US counties with **at least 300 mining jobs in 2012** (on average 1.2% of population)
- Treatment: At least **50% of miners laid off** between **2012 and 2020**
⇒ Treatment group **48 counties**, Control group **35 counties**
- Climate opinions: Cooperative Election Study, 7 waves (2006, 2007, 2009, 2010, 2011, **2012, 2022**). N=3,153
 - *From what you know about global climate change or global warming, which one of the following statements comes closest to your opinion?*

Opinions about climate change in US, 2022



Balance table - 2012

	No layoff	Layoff	Diff.	p-value
Believe	0.49 (0.03)	0.48 (0.03)	0.01 (0.04)	0.76
Age	51.61 (0.79)	51.28 (0.84)	0.33 (1.16)	0.78
Female	0.57 (0.02)	0.58 (0.03)	-0.00 (0.04)	0.89
Educ. (years)	14.10 (0.11)	13.89 (0.11)	0.21 (0.15)	0.18
Unemployed	0.07 (0.01)	0.10 (0.02)	-0.03 (0.02)	0.15
Employed	0.44 (0.02)	0.38 (0.03)	0.06 (0.04)	0.10
HH inc. (cat.)	5.41 (0.16)	4.88 (0.17)	0.53 (0.23)	0.02
Black	0.14 (0.02)	0.05 (0.01)	0.09 (0.02)	0.00
Hispanic	0.03 (0.01)	0.02 (0.01)	0.01 (0.01)	0.18
Republican	0.27 (0.02)	0.25 (0.02)	0.02 (0.03)	0.55
Population 2010	297,181 (11,954)	85,965 (3,440)	211,216 (13,504)	0.00
Urban pop 2010	0.72 (0.01)	0.45 (0.01)	0.27 (0.02)	0.00
<i>N</i>	402	333	735	

Balance table - 2022

	No layoff	Layoff	Diff.	p-value
Believe	0.59 (0.02)	0.62 (0.02)	-0.03 (0.03)	0.37
Age	50.94 (0.70)	50.94 (0.78)	-0.00 (1.05)	1.00
Female	0.57 (0.02)	0.56 (0.02)	0.01 (0.03)	0.73
Educ. (years)	13.85 (0.09)	13.60 (0.10)	0.25 (0.14)	0.07
Unemployed	0.09 (0.01)	0.08 (0.01)	0.01 (0.02)	0.57
Employed	0.46 (0.02)	0.46 (0.02)	0.00 (0.03)	0.92
HH inc. (cat.)	5.73 (0.15)	5.24 (0.16)	0.50 (0.22)	0.03
Black	0.16 (0.02)	0.06 (0.01)	0.10 (0.02)	0.00
Hispanic	0.03 (0.01)	0.03 (0.01)	0.01 (0.01)	0.54
Republican	0.28 (0.02)	0.34 (0.02)	-0.05 (0.03)	0.07
<i>N</i>	548	423	971	

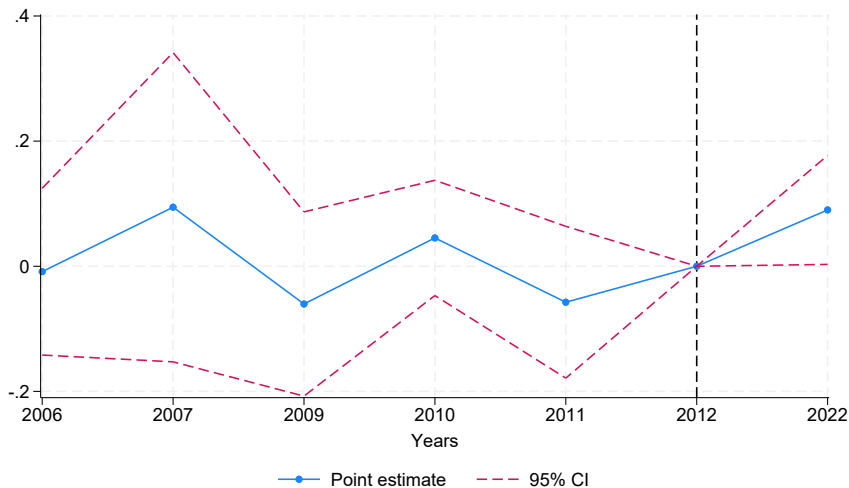
Table: Believes in climate change

	(1) 2012	(2) 2022	(3) Diff-in-Diff	(4) Diff-in-Diff
Layoff	0.00 (0.03)	0.06* (0.03)		
Layoff X After			0.10* (0.05)	0.10* (0.05)
Observations	730	970	1700	1700
Adjusted R^2	0.107	0.157	0.154	0.153
Mean(y)	0.49	0.59	0.55	0.55
County FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
State X Year Shocks	No	No	No	Yes
Other controls	Yes	Yes	Yes	Yes
N. Counties	77	80	83	83

Note: Mean(y) baseline prob. of believing in climate change. SE clustered by county in parenthesis, adjusted for spatial correlation in square brackets, wild-bootstrapped p-value for SE clustered by State in curly brackets.

**1%, *5%.

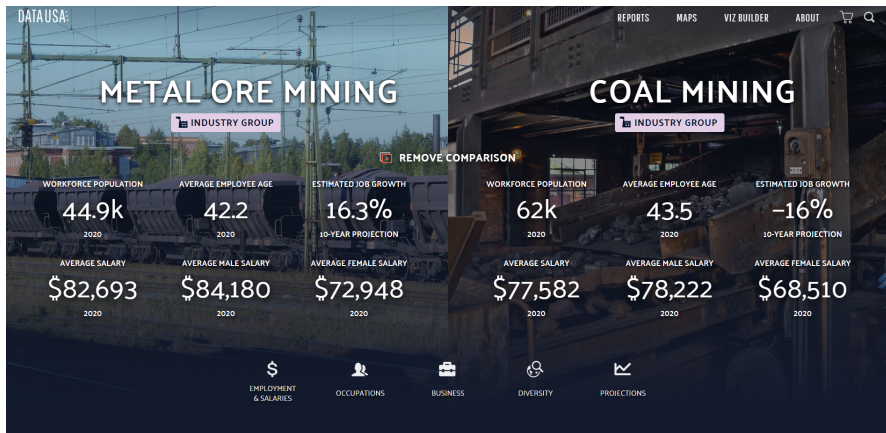
Parallel trends



Is it specific to coal?

- Living in county affected by mass layoffs of coal miners \implies more learning about climate change.
- Our preferred explanation: higher willingness to learn about climate change when economic dependence from fossil-fuel extraction declines.
 - New green jobs might also play a role
- Implication: effect of layoffs on opinions about climate change should (at least) be lower in non-fossil-fuel-extraction related sectors/industries.
- Two placebos:
 - 1 Layoffs of metal miners
 - 2 Layoffs in manufacturing sector

- Metal and coal mining largely comparable sectors...



Employment in metal mining, 1990-2020

- ..but few layoffs of metal miners in the last decade



Table: Believes in climate change

	(1) 2012	(2) 2022	(3) Diff-in-Diff	(4) Triple Diff-in-Diff
Layoff	0.00 (0.01)	-0.02 (0.01)		
Layoff X After			-0.03* (0.01)	-0.03 (0.01)
$layoff_{after_{coal}}$				0.14*** (0.03)
Observations	5214	5818	11032	12732
Adjusted R^2	0.210	0.173	0.197	0.193
Mean(y)	0.54	0.66	0.60	0.59
County FE	No	No	Yes	No
Year FE	No	No	Yes	No
Other controls	Yes	Yes	Yes	Yes
Sample	Metal	Metal	Metal	Coal & Metal
N. Counties	73	71	76	159

Note: Mean(y) baseline prob. of believing in climate change. SE clustered by county in parenthesis, adjusted for spatial correlation in square brackets, wild-bootstrapped p-value for SE clustered by State in curly brackets.

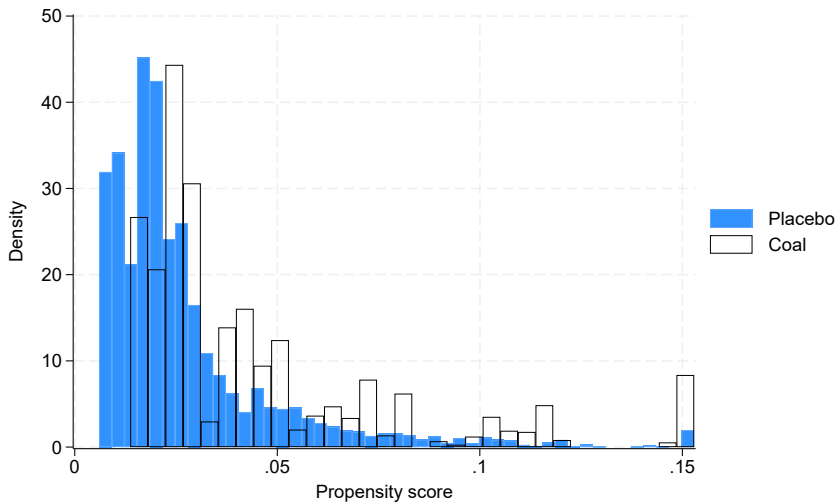
**1% *5%.

- Potential limitation: coal counties smaller and less urban than metal counties
 - Avg pop: coal counties $\approx 56,000$, metal counties $\approx 400,000$
 - Share urban pop: coal counties $\approx 36\%$, metal counties $\approx 53\%$
- Another placebo: layoffs in manufacturing sector
 - BCP data, 2014-2016
 - 1,681 “manufacturing counties” (that are not coal counties)
 - 422 layoff counties \rightarrow larger sample, can match to coal sample based on population

Propensity score matching

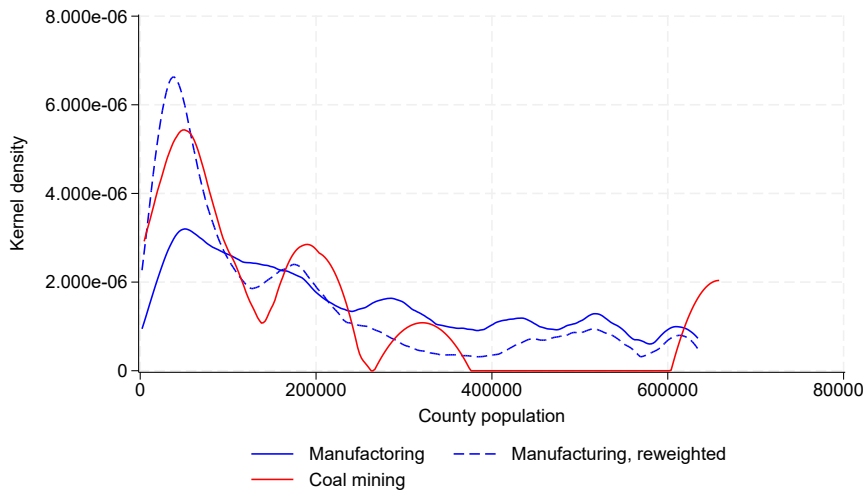
- Select manufacturing counties with population lower than max pop in coal counties. $N = 1,589$
- Predict probability of living in “coal county” based on county of residence population and share urban population

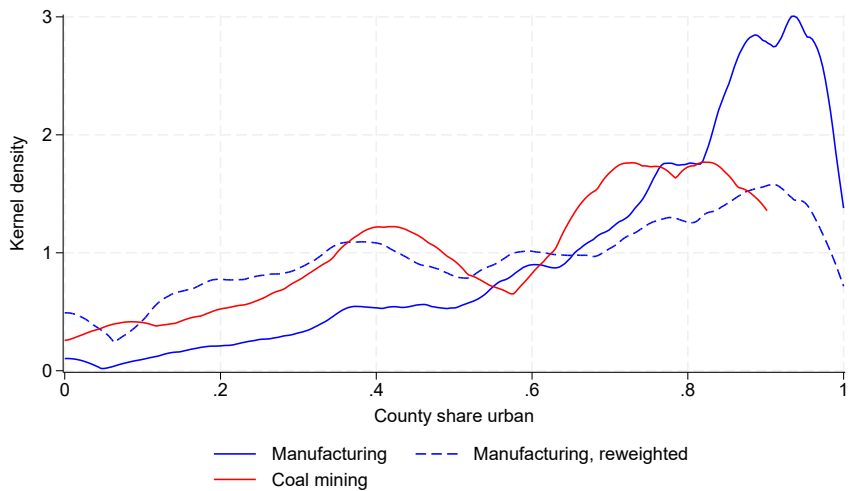
Distribution of propensity score



Propensity score matching

- Select manufacturing counties with population lower than max pop in coal counties. $N = 1,589$
- Predict probability of living in “coal county” based on county of residence population and share urban population
- Weight manufacturing counties based on propensity score





Triple-diff results, manufacturing sector

Table: Believes in climate change

	(1) 2012	(2) 2022	(3) Diff-in-Diff	(4) Triple Diff-in-Diff
Layoff	-0.01 (0.01)	0.01 (0.01)		
Layoff X After			0.02* (0.01)	0.02* (0.01)
Layoff X After X Coal				0.08** (0.02)
Observations	28577	31167	59744	61444
Adjusted R^2	0.159	0.171	0.199	0.198
Mean(y)	0.54	0.63	0.59	0.59
County FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Sample	Manuf.	Manuf.	Manuf.	Coal & Manuf.
N. Counties	1,524	1,558	1582	1,665

Note: Mean(y) baseline prob. of believing in climate change. SE clustered by county in parenthesis, adjusted for spatial correlation in square brackets, wild-bootstrapped p-value for SE clustered by State in curly brackets. **1%, *5%.

Selective migration

- Did public opinion in coal counties change or different types of people choose to live in coal counties?
- Some indications that selective migration might have not played a big role
 - ① Estimates are conditional on (and insensitive to) controls for demographics
 - ② [Data suggest](#) there was not massive outflow of migrants from layoff counties, especially vis-a-vis non-layoff counties (consistent with Ottinger and Poyker, 2022)
 - ③ In 2022, no difference between layoff and non-layoff counties in support for gun control, abortion rights, vaccination mandate for public employees etc.

Table: Thinks of themselves as Republican

	(1) 2012	(2) 2022	(3) Diff-in-Diff	(4) Diff-in-Diff
Layoff	-0.01 (0.05)	-0.00 (0.04)		
Layoff X After			-0.01 (0.06)	-0.03 (0.05)
Observations	735	971	1706	1706
Adjusted R^2	0.043	0.068	0.085	0.086
Mean(y)	0.27	0.28	0.28	0.28
County FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
State X Year Shocks	No	No	No	Yes
Other controls	Yes	Yes	Yes	Yes
N. Counties	77	80	83	83

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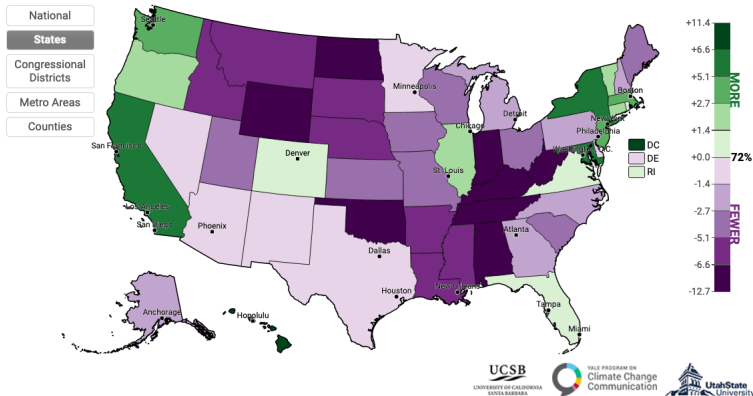
- Consider other supply factor: local media
- Consider other questions on environmental preferences
- Study more closely transition in layoff counties
- Germany (data from GSOEP)
 - External validity + Data quality

- Layoff of coal miners decreases learning about climate change
- The same effect is largely absent or substantially smaller in other industries (including metal mining)
- Consistent with information avoidance motivated by economic interests
- Phasing-out from coal (and other fossil fuels?) might not necessarily cause backlash against green transition, at least in the long-run

THANK YOU!

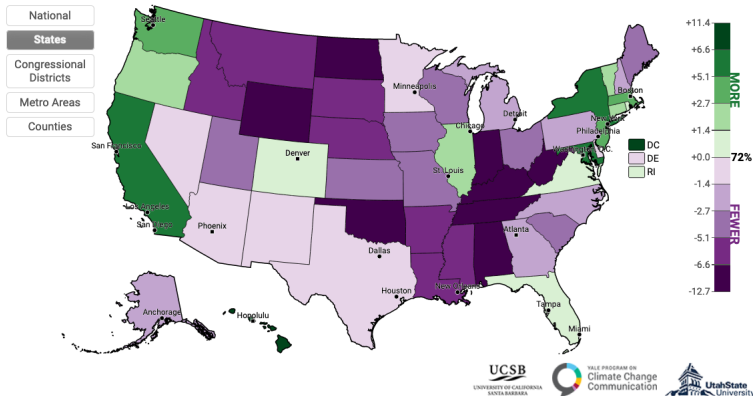
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Motivation - Climate change scepticism in the US



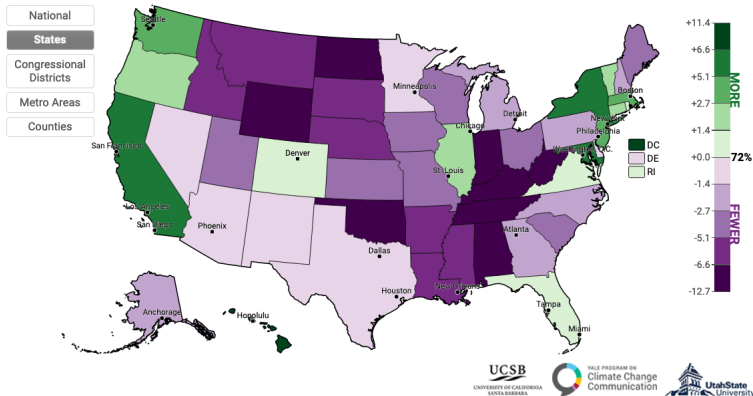
- As of 2023, 26% of US population, asked whether they think that global warming is happening, answers no or to be unsure.
- Heterogeneity across States.
- Skepticism tends to persist.
- US second largest CO₂ polluter worldwide.

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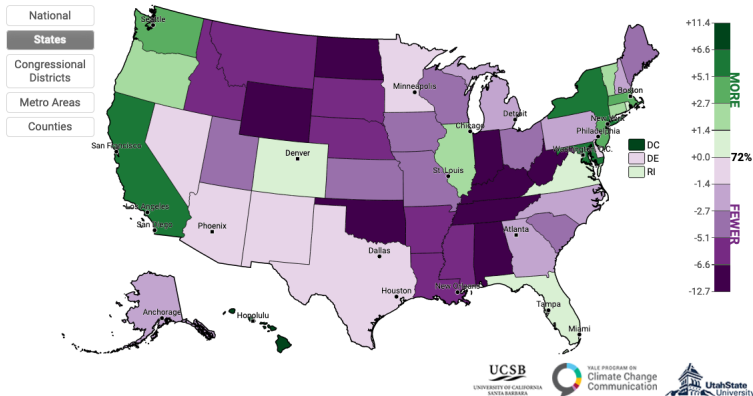
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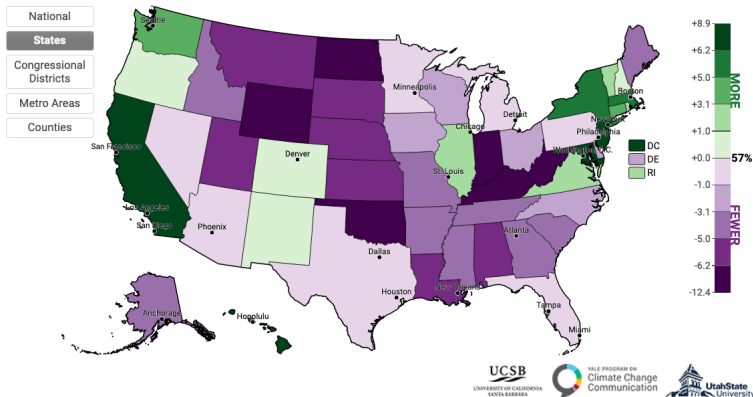
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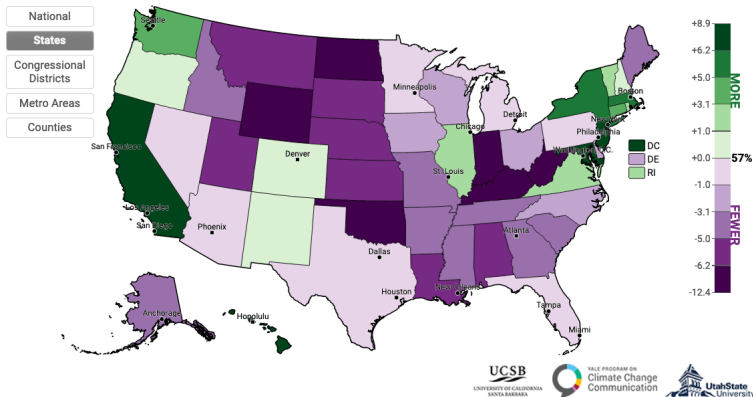
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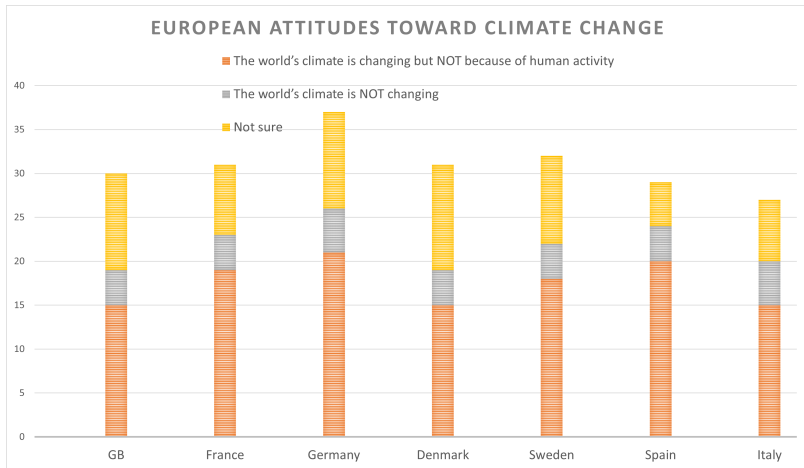
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- Heterogeneity across States.

Motivation - Climate change scepticism in the US



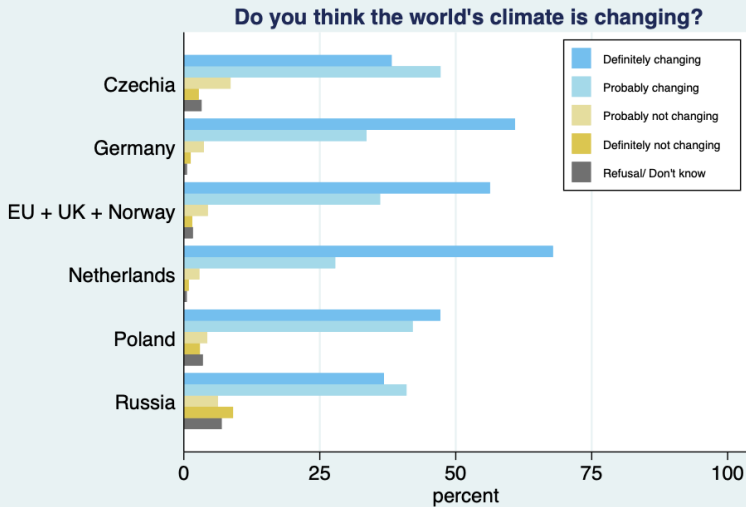
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- Heterogeneity across States.

Motivation - Climate change scepticism in Europe



► more on Europe

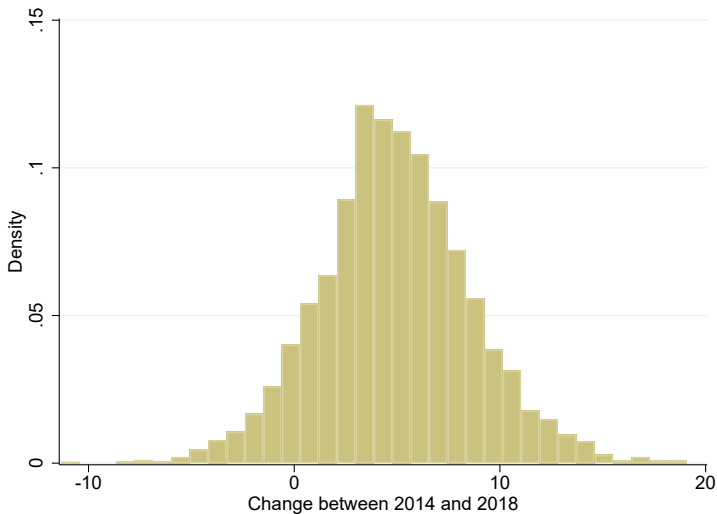
Motivation - Climate change scepticism in Europe



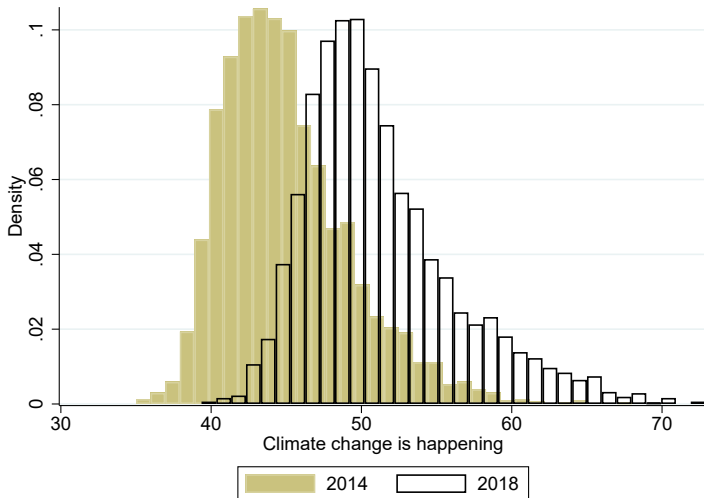
Note:

Respondents who opted for *no answer* are excluded from the total.

Global Warming is Happening. Learning in the US



Motivation



“The bottom line is that we do not accept climate change because we wish to avoid the anxiety it generates and the deep changes it requires.”



“An identity is a definition, an interpretation, of the self ... People who have problems with identity are generally struggling with the difficult aspects of defining the self, such as the establishing of long-term goals, major affiliations, and basic values.” (Baumeister 1986)



Identity in coal mining communities

Ich bin Bergmann, wer ist mehr?

“Miners often share a strong sense of identity, and closures can have important psychological effects on individuals and communities” (Stockholm Environmental Institute, 2019)

“Coal is a unique industry because it holds a special cultural significance in the imaginary of the American public, especially in regions with a history of extraction, with coal miners and the heritage of mining often culturally celebrated. [...] (The) deep nostalgia for the heyday of mining is a direct result of industry efforts to construct what Bell and York (2010) call *community economic identity*.” Community economic identity refers to a situation wherein a community, or perhaps an entire region, has embraced one industry or another as a cornerstone or their collective sense of self.” (Mayer, 2018)



Coal mine closures

- Coal-based electricity generation in US: more than half of total generation ten years ago, one-fifth — and falling - today.
- Coal mines predicted to close across the world (climate policies + rapidly falling costs of renewable energy and gas + concerns about air pollution)
- Germany pledged to close all its coal mines by 2038
- EU Commission objective: phase out from coal-fired electricity generation by 2030. In some countries (Poland, Czechia, Bulgaria) more than 50% of electricity generation fuelled by coal. EU-average: 21%.
- “Silesian coal is a matter of national identity”.
- German AfD turned to climate scepticism and raised in popularity in coal-regions in Eastern Germany (Lusatia coal most polluting fuel in the world).

Balanced covariates

	No layoff	Layoff	Diff
Population	66,112 (15,559)	45,754 (7,192)	20,358 (19,720)
Urban pop. (2010)	0.433 (.034)	0.285 (.038)	0.148** (0.053)
Urban population > median	0.604 (.071)	0.333 (.083)	0.271* (0.110)
Unemployment rate (2014)	0.069 (.004)	0.076 (.004)	-0.007 (0.006)
Poverty rate (2014)	0.184 (.011)	0.202 (.011)	-0.018 (0.016)
Observations	48	33	81

⇐ Robustness checks

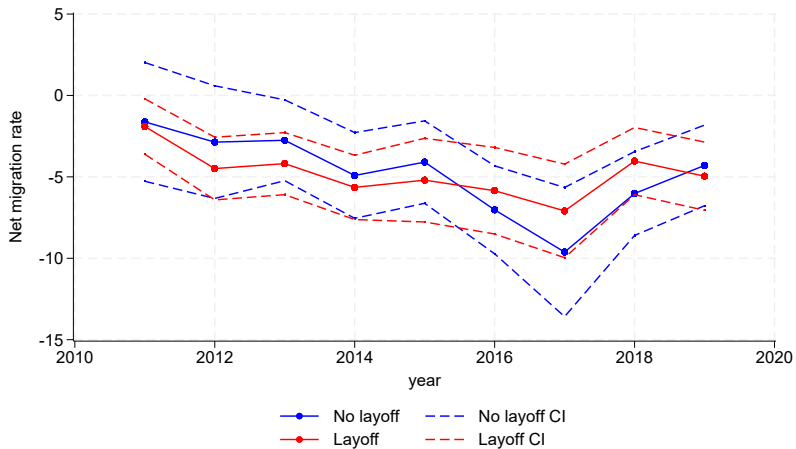
Why metal mining?

- Same data
- Comparable industry based on economic sector, average earnings and age of workers

Selective migration

- What if there is a selective **outgoing migration** from layoff counties?
- We can construct some bounds using net migration (similar in spirit to Lee Bounds). Basic idea: “send back migrants”
 - Lower bounds:
 - ① All negative net migration consists of climate deniers $\Rightarrow \uparrow$ climate ignorants in layoff counties
 - ② All positive net migration consists of climate believers $\Rightarrow \downarrow$ climate believers in layoff counties
 - Upper bounds:
 - ① All negative net migration consists of climate believers $\Rightarrow \uparrow$ climate believers in layoff counties
 - ② All positive net migration consists of climate deniers $\Rightarrow \downarrow$ climate deniers in layoff counties

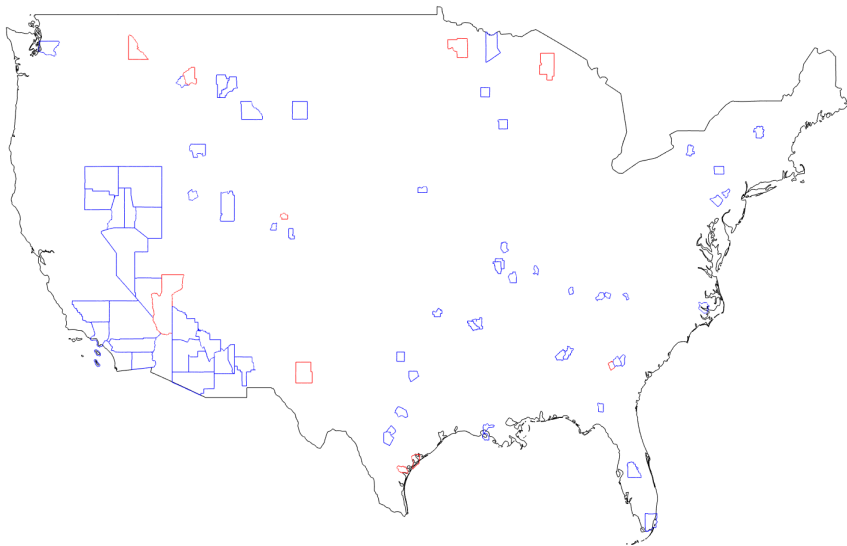
Net migration



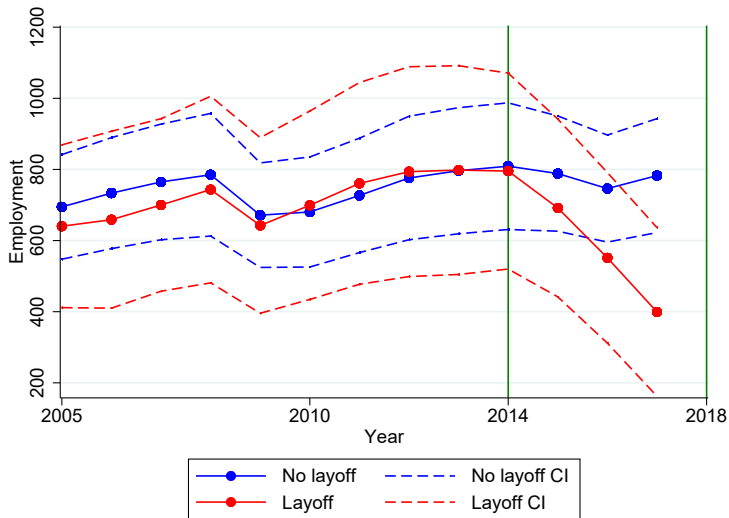
- “Effective challenges to a strongly held (identity) elicit forceful counterreactions aimed at restoring the threatened beliefs”
(Benabou and Tirole, 2011)



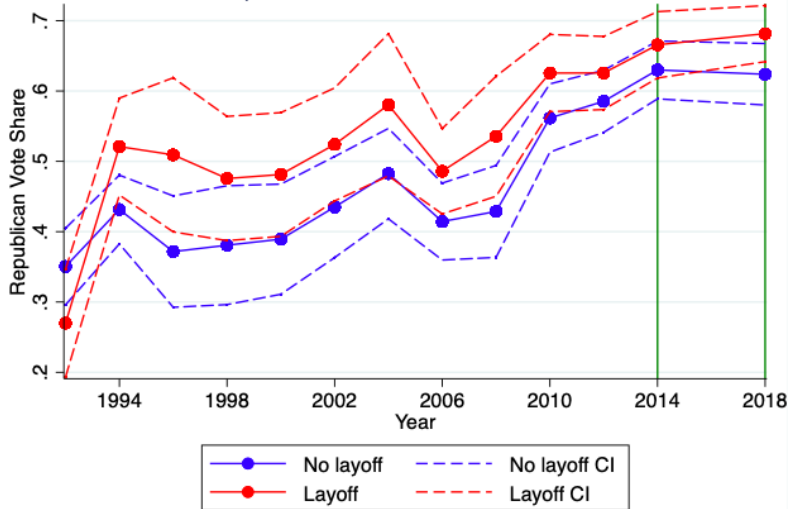
Metal mines



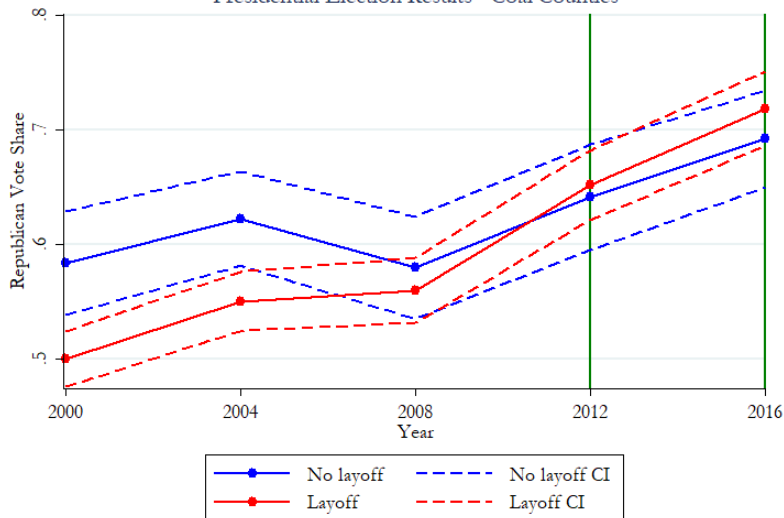
Parallel trends



House of Representatives Election Results - Coal Counties



Presidential Election Results - Coal Counties



Layoffs, information avoidance and mass-media

- Layoffs \Rightarrow advertisement from coal industry $\Downarrow \Rightarrow$ less sceptical coverage/more coverage of climate change
 - Not obvious this should affect only local media in layoff counties
- Layoffs $\Rightarrow \Uparrow$ scepticism among local readers \Rightarrow more sceptical coverage/less coverage of climate change in local media
 - Media bias as a consequence of information avoidance (Golman et al., 2017; Gentzkow and Shapiro, 2010)