Responsible Demand: Irresponsible Lobbying?

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Motivation

- Environmental concerns are rising potentialy lowering demand for dirty goods. (Bénabou and Tirole, 2010; Bartling et al., 2015)
- One possible reaction of firms is to innovate in cleaner technologies. (Aghion et al., 2022)
- Potential challenge: Less revenue from dirty products.
  $\rightarrow$ More anti-environmental lobbying as an alternative response?

This paper

How do firms react to greener household preferences?

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Methodology: Shift-share IV based on different exposure of automotive firms to markets and different changes in household preferences across markets.

- Google trends data to proxy green preferences.
- Natural catastrophes to instrument shifts in green preferences.
- U.S. automotive industry, 2006-2019.

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Findings: Greener preferences imply

1. No impact on total lobbying expenditures.
2. Reallocation of lobbying expenditures towards environmental topics.
3. Reallocation of lobbying is driven by dirtier firms.
4. Positive impact on 'clean' innovation and negative impact on 'dirty' innovation.

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Overview of the Data

- Environmental interest at the state-quarter level built from Google Trends.
- Vehicle registration from S&P Global.
- Data on wildfire from the NASA Fire Information for Resource Management System (FIRMS).
- Lobbying data from the Senate Office of Public Records cleaned by Kim (2018).
- Patent data from the United States Patent and Trademark Office (USPTO).

Sample: Groups of makes in the automotive sector with more than 30'000 registered cars over the period (17 groups).

Index of Environmental Interest

- Google Trends: free tool providing time-series indices of percentage of searches with a given term made in a certain area.
- Keywords: climate change, electric car, recycling.
  $\rightarrow$ Composite index built with principal component analysis.
- Advantage with respect to surveys: high frequency and geographic desegregation, larger scale.
- Disadvantage with respect to surveys: No intention with which a term is search (eg. concern versus skepticism).

Trends.

Wildfires

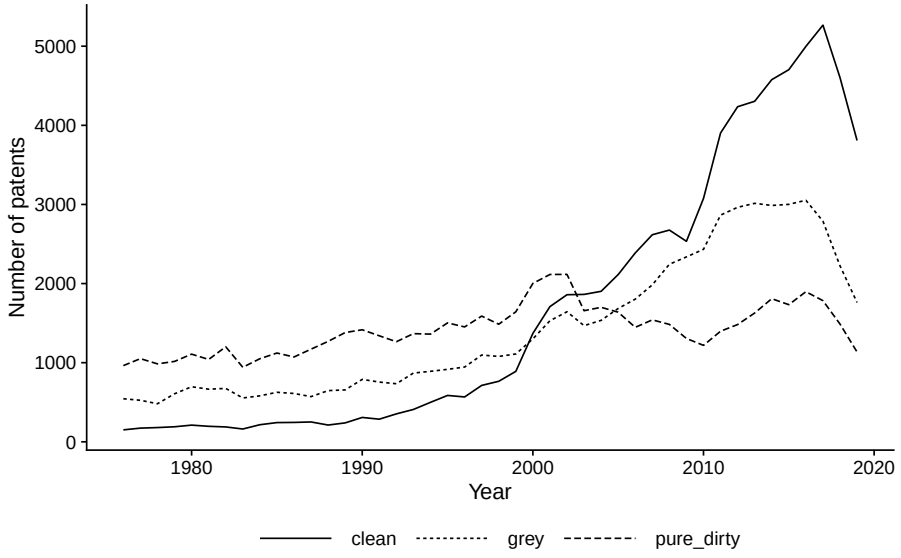
Fire exposure of state l, in time t to all the fires f:

$$\textit{Fire Exposure}_{lt} = \log\left(\sum_{f} \text{intensity}_{ft} * \text{surface}_{ft} / \text{distance}^2_{flt}\right)$$

- *intensity*: fires radiative power (in Megawatts)
- *surface*: size of the fires
- *distance*: distance between the center of gravity of the fire and the state

Maps

Innovation


Number of patents
5000
4000
3000
2000
1000
0
1980
1990
2000
2010
2020
Year
clean
grey
pure_dirty

Lobbying data

Different variables measuring lobbying efforts:

- Total lobbying expenditures
- Lobbying expenditures by group of topics (Environment, Taxation, Trade...)
- Lobbying expenditures by main targeted institutions (House of Representatives, Department of Energy, Environmental Protection Agency (EPA)...)
  $\rightarrow$ gathering institutions related to environmental issues

Summary Statistics

Group	Clean Patents	Dirty Patents	Grey Patents	Lobbying (k$)	Market Share (avg,%)
BMW	10.71	2.52	3.02	131.45	2.32
Daimler	5.12	0.92	2.29	438.45	2.09
FCA	4.46	1.15	1.90	1271.57	11.61
Ford	63.58	25.17	47.96	1786.18	15.03
Geely Automobile Hld.	3.19	0.88	1.83	334.69	0.52
General Motors	47.40	15.48	30.56	2773.49	19.61
Honda	41.50	16.02	11.35	769.56	9.82
Hyundai Kia Automotive Group	79.77	15.35	26.31	437.90	7.01
Isuzu	0.42	0.59	3.76		0.03
Mazda Motors Gr.	2.00	2.46	9.15	35.57	1.85
Renault-Nissan-Mitsubishi	33.79	6.35	12.58	1115.96	8.46
Subaru Gr.	4.00	0.38	1.00	2.50	2.45
Suzuki	3.69	2.28	0.79		0.38
Tata Gr.	4.56	0.68	1.26	127.92	0.45
Tesla	3.21			161.07	0.10
Toyota Group	116.10	19.15	43.31	1577.17	15.00
Volkswagen	21.77	3.46	6.67	381.64	3.34

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Empirical Strategy

Shift-share instrumental variable approach:

$$\Delta y_{it} = \lambda_t + \alpha_i + \beta_{it} \Delta ENV_{it}^{GT} + \gamma X_{it} + \varepsilon_{it}.$$

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- ΔENV_{it}: change in environmental interest of the consumers of firm i between t and $t-h$ constructed as:

$$\Delta ENV_{it}^{GT} = \sum_{l}^{L} s_{ilt-8} \left(ENV_{lt}^{GT} - ENV_{lt-8}^{GT} \right).$$

Shares

Empirical Strategy

Shift-share instrumental variable approach:

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Shares

- To capture a demand-led mechanism, ΔENV is instrumented by:

$$Z_{it} = \sum_{l}^{L} s_{il,t-h} (Fire\ Exposure_{lt} - Fire\ Exposure_{lt-8}).$$

SSIV Research Design: Identification

Identification stems from the exogeneity of the shocks (Borusyak, Hull and Jaravel, 2022).

- *Conditional quasi-random shock assignment:* $\mathrm{E}[\Delta FIRE_{lt} | \bar{\varepsilon}_{lt}, \tilde{X}_{lt} s_{t-h}] = \tilde{X}'_{lt} \cdot \mu$.
- *Many uncorrelated shocks:* Shocks are not to be concentrated in few observations. Inverse of the HHI of weights > 700 and largest importance weight $< 1\%$.
- *Relevance Condition:* The instrument has power, that is $\mathrm{E}[\Delta Y_{it} \cdot Z_{it} | X_{it}] \neq 0$.

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Main Results (1/2)

Δ_8 Lobbying Expenditures (Total)	0.67	0.66	0.70	0.70
	(0.81)	(0.85)	(0.84)	(0.83)
Δ_8 Lobbying Environment Topics	3.10***	3.08***	3.06***	3.09***
	(0.83)	(0.82)	(0.81)	(0.80)
Δ_8 Lobbying Environmental Insitutions	7.47***	7.53***	7.49***	7.47***
	(2.04)	(1.98)	(2.00)	(2.00)
Lagged Demographic Controls		X	X	X
Lagged Transportation Controls			X	X
Lagged Political Controls				X
First-Stage F	46	49	50	50

Note: all equation include year-quarter fixed effects, firm fixed effects and the lagged market share of the firm as control. N=2000 (states-periods) in all regressions. Se clustered at the state level.

Additional topics and institutions

Main Results (2/2)

Δ_8 Clean Knowledge Capital	2.27***	2.37***	2.33***	2.36***
	(0.71)	(0.65)	(0.66)	(0.64)
Δ_8 Dirty Knowledge Capital	-1.09***	-1.11***	-1.09***	-1.08**
	(0.39)	(0.39)	(0.40)	(0.41)
Δ_8 Grey Knowledge Capital	0.79	0.77	0.70	0.70
	(0.92)	(0.74)	(0.71)	(0.72)
Lagged Demographic Controls		X	X	X
Lagged Transportation Controls			X	X
Lagged Political Controls				X
First-Stage F	46	49	50	50

Path Dependency and Heterogeneity (1/2)

Do firms behave differently depending on their initial mix of innovation?

$$\Delta y_{it} = \lambda_t + \alpha_i + \beta \Delta ENV_{it}^{GT} + \delta Dirty\_Ratio_{it-k} + \gamma \Delta ENV_{it}^{GT} \text{x} Dirty\_Ratio_{it-k} + X_{it} + \varepsilon_{it}.$$

- *Dirty_Ratio*: share of dirty technology in the stock of knowledge of the firm.

Path Dependency and Heterogeneity (2/2)

	Total Lobbying Expenditures	Environmental Topics	Environmental Institutions
$\Delta_8 ENV^{GT}$	-0.950	3.235***	8.317***
	(0.801)	(1.045)	(3.067)
Ratio_dirty_{t-8}	-0.121	0.327*	0.604
	(0.216)	(0.189)	(0.454)
$\Delta_8 ENV^{GT}$ * Ratio_dirty_{t-8}	3.022	40.06+	113.0***
	(33.99)	(24.70)	(42.90)
FE: year-quarter	X	X	X
Firm-Trend	X	X	X
State-level controls	X	X	X
Effective Sample (1/HHI)	720	720	720
First stage F-stat	12.47	12.47	12.47

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Conclusion

- A shift in demand towards clean goods spurs clean innovation,
- ... but also results in a reallocation of lobbying expenditures towards environmental topics.
- Dirty firms drive the increase in environmental lobbying expenditures.

Possible interpretation:

- Shift in preferences $\Rightarrow$ Firms want to innovate in cleaner technologies
- Clean innovation is costly $\Rightarrow$ Incentive to avoid additional costs.
- Dirty firms use anti-environmental lobbying to lessen costs from environmental protection.

Thank you!

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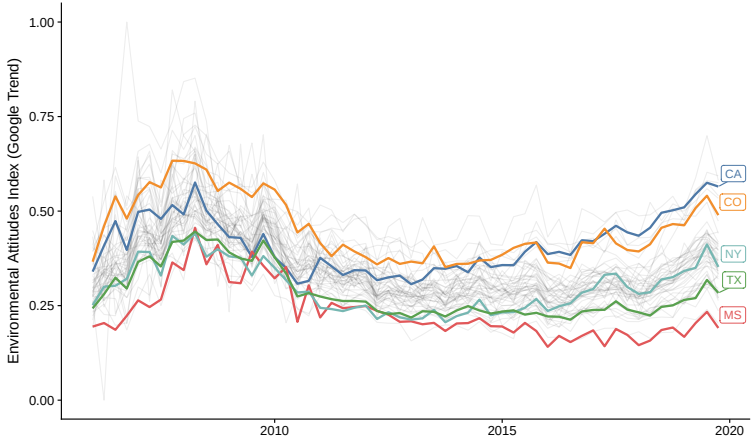
Literature

Competition, innovation and lobbying: Firms innovate to escape competitive pressures (Aghion et al. 2005; Aghion et al., 2009). Empirical validation from the trade literature (Bloom et al. 2016; Brandt et al., 2017; Hombert and Matray, 2018; Autor et al., 2020).
Lobbying can be an alternative to innovation (Akcigit et al., 2022; Bombardini et al., 2021).
→ Analysis on the impact of a demand shock.
→ Possible complementarity of lobbying and clean innovation.

Environmental lobbying: Lobbying has the capacity to shift environmental regulations (Giger and Klüver, 2016; Kang, 2016; Meng and Rode 2019).
→ Environmental lobbying is driven by 'dirty' firms.

Individual social responsibility: Bénabou and Tirole, 2010; Bartling et al., 2005; Falk et al., 2021. Obstacles for social responsability to impact the allocation of resources: income inequality (Vona and Patriarca, 2011; Dobkowitz, 2022), low availability (Vermeir and Verbeke, 2006) or lack of trust in sustainability (Meis-Harris et al., 2021).
→ Lobbying as a barrier to the effectiveness of individual social responsability.

Trends of Index of Environmental Interest



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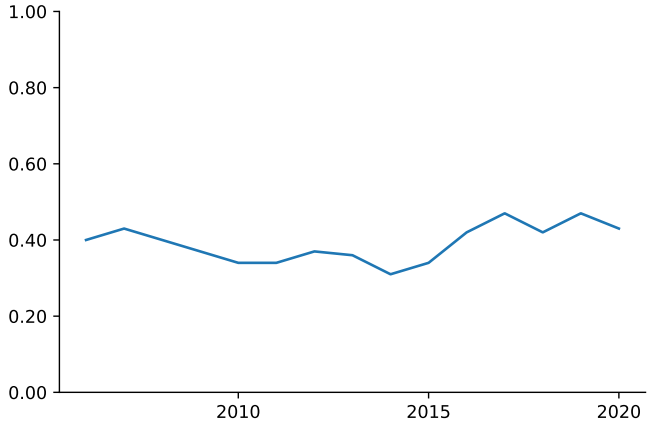
Gallup Survey



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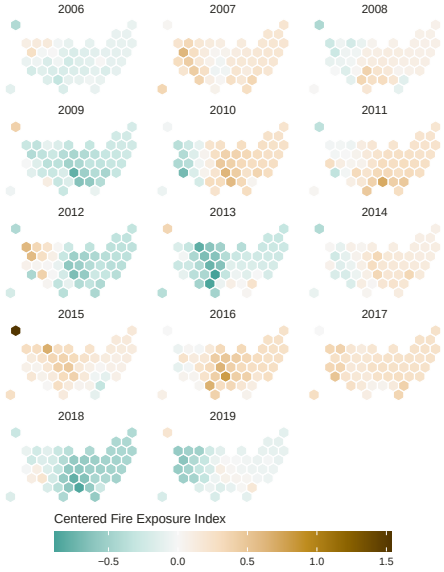
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Centered Fire Exposure Index
−0.5
0.0
0.5
1.0
1.5

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Firms' exposure

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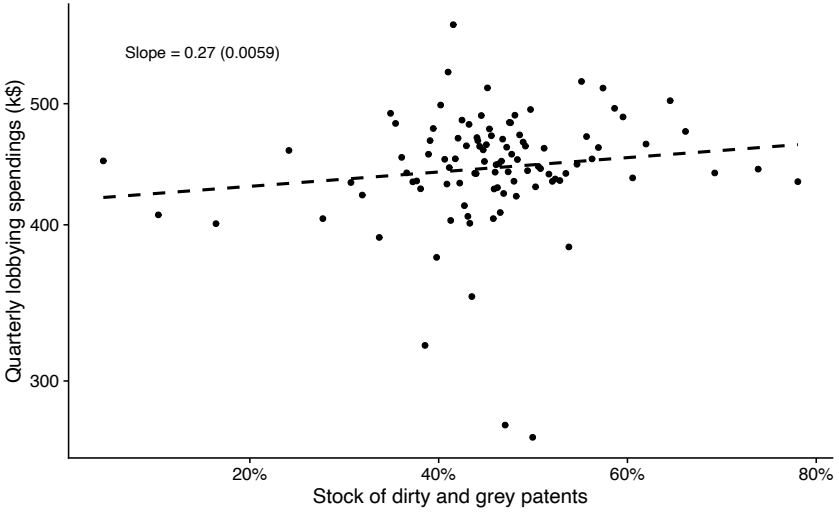
Correlation between share of non-clean patents and lobbying



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Controls

Firm-level control: lagged market-share of the firm.

State-level controls:

1. Demographics controls: share of active in the labor market, share of young, share of rural population, GDP/capita.
2. Transportation controls: pct of population commuting by: personal car, public transportation and by bike; pct of the population working remotely; number of alternative fueling stations.
3. Major political preferences: share of votes for Republicans in the last presidential election.

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Summary Statistics of Shocks and Shares

	Mean	Std. dev.	p5	p95
$\Delta FIRE_{lt}$	−0.04	0.01	−0.02	0.03
$\Delta FIRE_{lt}$ (w. period FE)	0.00	0.01	−0.01	0.01

Panel A: Shocks Summary Statistics

	Mean	Max
$1/HHI$	719.56	719.56
s_{lt} (pct)	0.05	0.44
Treatment Groups	50.00	50.00

Panel B: Shares Summary Statistics

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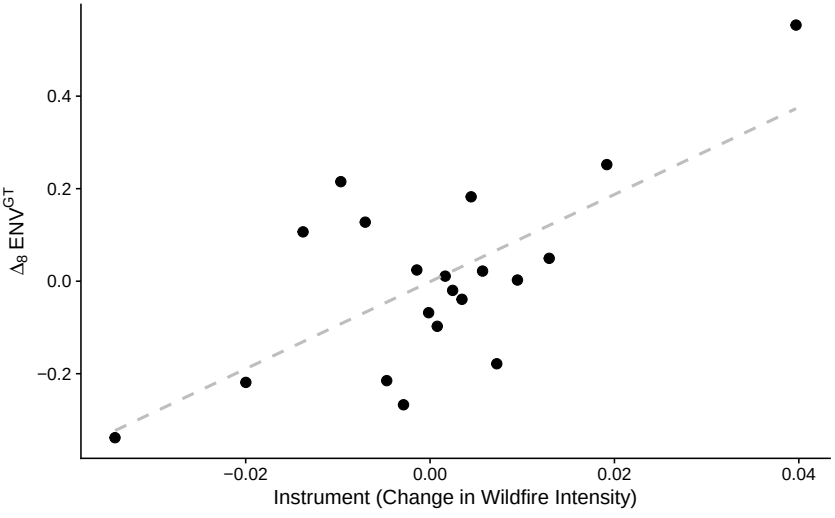
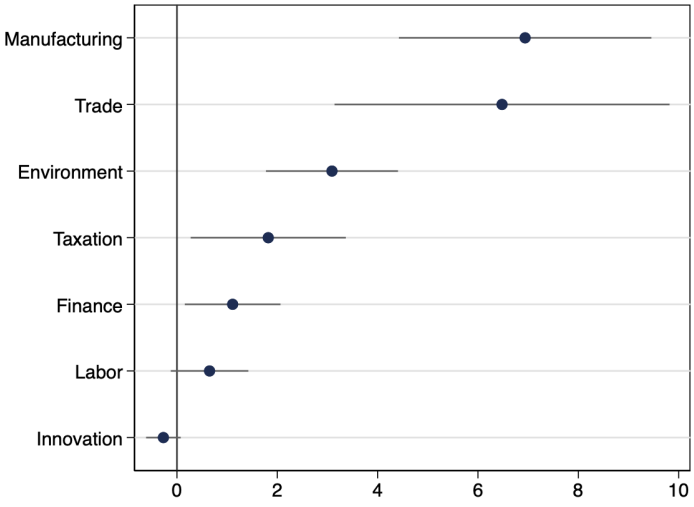
First-stage estimation



Additional Analysis: Topics Lobbied



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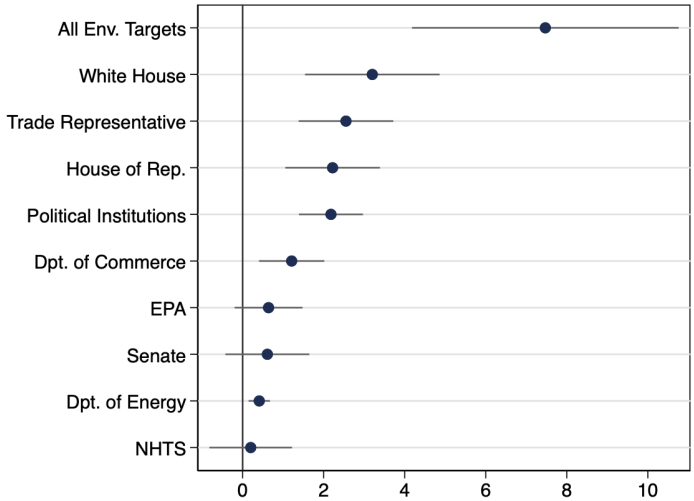
Additional Analysis: Institutions Lobbied



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