Wildfire Smoke and Voting Behavior in the United States

Preliminary Results

February 14, 2026

Summary of Comments on Wildfire Smoke and Voting Behavior in the United States - Preliminary Results

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Author: David Subject: Sticky Note Date: 2/14/26, 9:24:43 AM
Add David Clingingsmith, CWRU as the author.

Motivation

- Wildfire smoke is the most widespread *experiential* consequence of climate change in the U.S.
- Does smoke exposure change how people vote?
- Prior work:
  - **Fire proximity** → pro-environment voting in CA, but only among Democrats (Hazlett and Mildenberger, 2020)
  - **Air pollution (PM_{10})** → anti-incumbent voting in Germany (Bellani et al., 2024)
  - **Rain on election day** → lower turnout (Gomez et al., 2007)
- **Gap:** Nobody has linked wildfire-specific smoke $PM_{2.5}$ to U.S. election outcomes

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Author: David Subject: Comment on Text Date: 2/14/26, 9:25:00 AM
A very

Author: David Subject: Comment on Text Date: 2/14/26, 9:25:27 AM
whether and how

Author: David Subject: Highlight Date: 2/14/26, 9:26:05 AM
Overall air pollution

Author: David Subject: Highlight Date: 2/14/26, 9:26:45 AM
Need to say something about how we know about wildfire smoke and why it might be more salient that air pollution

Why Smoke > Fire Proximity

Fire perimeters

- Treatment: ∼1, block groups near fire lines
- California only
- Confounded by property destruction, displacement, insurance
- Endogenous to land use

Wildfire smoke

- Treatment: *every county in the U.S.*
- National scope
- Isolates experiential/health channel
- Plausibly exogenous (wind-driven)

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Author: David Subject: Sticky Note Date: 2/14/26, 9:27:19 AM
This slide is an artifact relative to the previous approach that we don't need here.

Data

1. **Wildfire smoke $PM_{2.5}$** — Stanford Echo Lab (Childs et al., 2022)
   - Daily, county-level, 2006–2020
   - ML separation of wildfire smoke from background $PM_{2.5}$
2. **Presidential election returns** — MIT Election Data Lab (MIT Election Data + Science Lab, 2024)
   - County-level, 2000–2024
3. **Analysis sample:** 12,429 county $\times$ election observations
   3,108 counties $\times$ 4 elections (2008, 2012, 2016, 2020)

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Author: David Subject: Highlight Date: 2/14/26, 9:28:07 AM
On this slide we need to note we are using house returns too and that the coverage of years is different.

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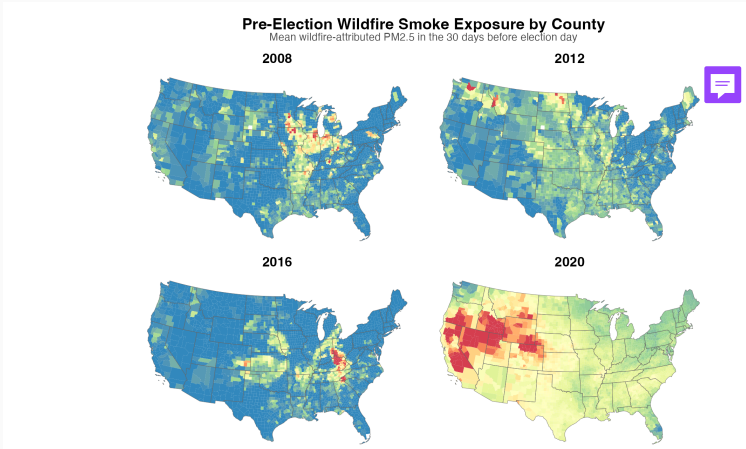
Author: David Subject: Sticky Note Date: 2/14/26, 9:28:44 AM
Make sure every election used in the analysis is represented here. Also include a legend and make sure the scales are identical across figures.

Smoke Exposure Varies Dramatically Across Elections



Empirical Strategy

Two-way fixed effects:

$$Y_{ct} = \alpha_c + \gamma_t + \beta \cdot \text{SmokePM}_{ct} + \varepsilon_{ct}$$

- α_c: County FE — absorb all time-invariant confounders
- γ_t: Election year FE — absorb national swings
- SEs clustered by county
- Treatment: mean smoke $PM_{2.5}$ in the 60 days before election

Identification: Smoke plume direction is determined by wind, not by county politics or demographics.

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Author: David Subject: Comment on Text Date: 2/14/26, 9:30:59 AM
Call this the identifying assumption. Also include any a note on threats to identificaiton. Maybe make a separate slide on these two. Also consider whether there are better estimators than TWFE. Is our continuous smoke measure subject to any of the issues with DiD estimators that lead to the new lit by Calloway and Sant'Anna? If so make note.

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Author: David Subject: Comment on Text Date: 2/14/26, 9:31:25 AM
Need to note when we are doing presidential and when congress.

Main Results

	(1) DEM Vote Share	(2) Incumbent Share	(3) Log Turnout
Smoke $PM_{2.5}$ (60d)	0.00087***	−0.00399***	0.00242***
	(0.00009)	(0.00044)	(0.00018)
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	12,429	12,429	12,429

- **+10 μg/m^3 smoke $\rightarrow$ +0.9 pp DEM vote share**
- Anti-incumbent effect is $\sim$4x larger than pro-DEM effect
- No evidence of turnout suppression

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Effect Across the Partisan Spectrum

	R-Leaning	Swing	D-Leaning
Smoke $PM_{2.5}$ (60d)	0.00066***	0.00049***	0.00082***
	(0.00021)	(0.00014)	(0.00013)
N	4,144	4,141	4,143

- Effect is **present in all terciles** of prior partisanship
- Somewhat larger in D-leaning counties
- Contrast with Hazlett and Mildenberger (2020): fire proximity affects *only* Democratic areas
- Smoke is a broader, less politically sorted treatment

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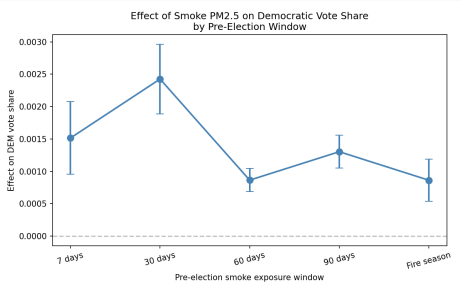
Temporal Dynamics



- Effect significant at all windows
- Strongest at 30 days
- Consistent with recency / salience mechanism
- Not just election-day disruption

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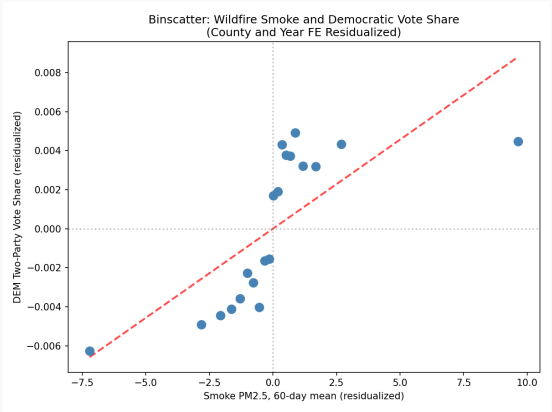
Author: David Subject: Sticky Note Date: 2/14/26, 9:31:50 AM
Make more bins. Maybe 50

Binscatter: Smoke and Democratic Vote Share



County and year FE residualized. 20 equal-sized bins of smoke exposure.

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Author: David Subject: Sticky Note Date: 2/14/26, 9:32:31 AM
Let's leave district house out for now and make it an appendix robustness check in the paper.

House Elections: County-Level Analysis

	(1) County House	(2) District House	(3) Presidential
DEM Vote Share	0.00038***	−0.00027	0.00087***
	(0.00013)	(0.00045)	(0.00009)
Incumbent Share	−0.00153***	−0.00186**	−0.00399***
	(0.00045)	(0.00089)	(0.00044)
Unit	County	District	County
N (contested)	8,391	3,014	12,429
Elections	2016–2020	2006–2020	2008–2020

- County-level House confirms both pro-DEM and anti-incumbent effects
- Avoids crosswalk measurement error → sharper estimates than district-level
- Magnitudes smaller than presidential, consistent with candidate-driven races

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What Mechanism?

Mechanism	Turnout?	Partisan pattern	Our evidence
Salience	No	Pro-environment	✓ DEM shift
Negative affect	No	Anti-incumbent	✓ Large anti-incumb.
Disruption	Suppression	Differential	× No suppression

Evidence is most consistent with **both** salience and negative affect channels operating simultaneously.

Limitations and Next Steps

Current limitations:

- Only 4 presidential elections; 3 House elections (smoke data: 2006–2020)
- County-level aggregation; no individual-level variation
- Turnout measure is crude (no population denominator)

Planned extensions:

- NOAA HMS smoke plumes for extended coverage through 2024
- State legislative elections
- Wind direction as instrument for smoke exposure
- State $\times$ year FE; Conley spatial SEs

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Author: David Subject: Comment on Text Date: 2/14/26, 9:32:53 AM
is that still true? If so fix.

Author: David Subject: Highlight Date: 2/14/26, 9:33:27 AM
This should be in by default. I think it might be?

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Summary

1. Wildfire smoke **increases Democratic vote share** and **punishes incumbents**
2. Effects are **nationally representative** and **cross the partisan spectrum**
3. Smoke is **plausibly exogenous** (wind-driven) and affects **far more people** than fire proximity
4. Consistent with both climate salience and negative affect mechanisms

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References

Bellani, L., Ceolotto, S., Elsner, B., and Pestel, N. (2024). The effect of air pollution on voting behavior. *Proceedings of the National Academy of Sciences*, 121(18):e2309868121.

Childs, M. L., Li, J. S., Wen, J., Heft-Neal, S., Drber, A., and Burke, M. (2022). Daily local-level estimates of ambient wildfire smoke PM2.5 for the contiguous US. *Environmental Science & Technology*, 56(19):13607–13621.

Gomez, B. T., Hansford, T. G., and Krause, G. A. (2007). Weather, turnout, and voting: Is weather a natural experiment? *The Journal of Politics*, 69(3):649–663.

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Hazlett, C. and Mildenberger, M. (2020). Wildfire exposure increases pro-environment voting within Democratic but not Republican areas. *American Political Science Review*, 114(4):1359–1365.

MIT Election Data + Science Lab (2024). County presidential election returns 2000–2024. Harvard Dataverse.

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