

Wildfire Smoke and Voting Behavior in the United States

Preliminary Results

February 13, 2026

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

Why Smoke > Fire Proximity

Fire perimeters

- Treatment: ~1,300 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)

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 × election observations
3,108 counties × 4 elections (2008, 2012, 2016, 2020)

Smoke Exposure Varies Dramatically Across Elections



smoke_exposure_map_panel.png

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.

Main Results

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

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

Effect Across the Partisan Spectrum

	R-Leaning	Swing	D-Leaning
Smoke PM _{2.5} (60d)	0.00066*** (0.00021)	0.00049*** (0.00014)	0.00082*** (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

Temporal Dynamics

event_study_windows.png

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

Binscatter: Smoke and Democratic Vote Share

binscatter_smoke_dem_share.png

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 (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
- Congressional and state legislative elections
- Wind direction as instrument for smoke exposure
- State \times year FE; Conley spatial SEs

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

References

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