Democratic Accountability and Environmental Regulation

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Abstract

Environmental governance presents a core challenge for democracies: pollution yields concentrated benefits and diffuse harms, weakening incentives for political action. We investigate when politicians act to curb pollution, and what breaks this accountability, in the context of crop-residue burning in South Asia, which kills an estimated 2 million people annually. Linking satellite-detected fires, wind fields, and political data across 853 constituencies in northern India over a decade, we use a difference-in-differences design that exploits wind-direction shifts altering whether smoke from a given location drifts into a politician's own constituency or a neighbor's. When their constituents bear the pollution costs, politicians curb fires by 15 percent. Yet two forces systematically undermine this accountability: sanctioning weakens as organized farmer protests pressure politicians to tolerate burning, and selection fails when constituencies elect politicians with private agricultural interests, both increasing fires even where politicians' own voters are harmed. These findings demonstrate that democratic accountability can generate environmental protection under diffuse incentives, but sustaining it requires institutions robust to the concentrated interests that benefit from pollution.

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1 Introduction

Few areas of governance reveal the limits of democratic accountability more clearly than environmental management. A growing body of evidence shows that voters rarely prioritize environmental issues (Singh and Thachil, 2023), leaving politicians with little electoral incentive to address pollution. Even when citizens do care about environmental problems, these preferences seldom translate into policies addressing environmental damage (Dechezleprêtre et al., 2025; Hsiao and Kuipers, 2025).[1] Instead, environmental regulation often reflects the influence of concentrated and organized lobbies (McAlexander and Urpelainen, 2020; Stokes, 2020; Harding et al., 2024; González and You, 2024), reinforcing a growing pessimism about the prospects for democratic political action against environmental degradation.

Yet this pessimism raises a crucial question: do politicians ever act to protect the environment, and if so, under what conditions?[2] Studying this question is challenging because environmental degradation, unlike most policy domains, is a slow-moving process whose harms unfold gradually and often escape citizens' immediate perception. Environmental humanities scholars have described this temporal disjuncture as "slow violence" (Nixon, 2013), and political scientists argue that this very disconnect between environmental harm and lived experience helps explain why environmental issues remain politically marginal and why democratic systems so often struggle to generate sustained action against them (Grossman et al., 2026).

In contrast to the powerful incentives for inaction on the environment described above, we instead document that there is still a promise of accountability: we show that politicians do take meaningful steps to curb pollution when their own constituents bear its toxic effects. However, we also demonstrate that this control is systematically undermined. Building on

[1] Examples of successful action on pollution come from China (see Baragwanath and Gulzar (2025) for a review), where, however, politicians are unelected and face different incentives than in democracies (Buntaine et al., 2024). Moreover, scholars increasingly document that a transition to a democracy may be associated with poorer environmental outcomes (Sanford, 2023; Chesler et al., 2023).

[2] In contrast to the political context, scholars have recently examined these questions within bureaucracies (Dipoppa and Gulzar, 2024; Buntaine et al., 2024).



Figure 1: Gate of India, Delhi, during and after the smog season (Source: CNN, 2020)

classic literature, we examine two key channels of political accountability whose erosion can break down politicians' responsiveness to citizens' welfare: sanctioning and selection. Specifically, we highlight how sanctioning weakens under pressure from multiple principals, as citizens' interests compete with those of concentrated lobbies, and how political selection falters when politicians' self-interest diverges from citizens' well-being (Fearon, 1999). Understanding these mechanisms is crucial for designing institutions that can channel democratic accountability towards durable environmental improvements.

We study these dynamics in the context of South Asia's air pollution crisis, one of the largest public health emergencies on the planet estimated to kill 2 million people every year, with children as one of its most vulnerable victims (Dandona et al., 2020).[3] Each winter, a thick smog so vast it is visible from space, blankets northern India as millions of farmers burn leftover crop residue after rice harvest. Roughly 60 percent of this seasonal pollution originates from these fires (Bikkina et al., 2019; Lan et al., 2022). Figure 1 shows Delhi during smog season. Despite the scale of the crisis, the visibility and consequentiality of the problem, and the illegality of crop burning, the practice continues today. This paper studies how politics explains variation in this persistence.

The first part of the paper examines how democratic accountability shapes political action towards environmental regulation. We propose that politicians will be most incentivized to stop crop burning in places from which smoke pollutes their own constituents, rather than

[3]In comparison, COVID-19 at its peak killed 6 million people in the first two years worldwide.

a neighbors'. We identify when accountability incentives bind by combining changes in wind direction, which temporally determine the direction in which smoke from crop burning would travel, with cross-sectional variation in where a location lies within a politician's own constituency. When wind changes direction, the same location in a politician's jurisdiction can move from being a source of pollution for a neighboring constituency to polluting the home constituency. We use this logic in a difference-in-differences framework and assemble a monthly data set at the level of $5km^2$ grid-cells located in 853 political jurisdictions across northern India over 10 years (2012-2022) for a total of approximately 11 million observations. We combine these grid-cells with spatial information on satellite-detected crop burning fires that are available via VIIRS and MODIS (NASA and NOAA, 2025), and wind direction and speed from Hersbach et al. (2023).

We find that fires decrease by 12 percent right after a change in wind direction switches a location from polluting neighboring jurisdictions to a politician's own constituency, an effect that is 30 percent larger in rice producing areas during harvest months. These results are robust to a host of tests that relax the identifying assumption of the DiD design and vary how we define the outcome, the treatment, and the sample.

We further bolster our interpretation by ruling out that these findings are not explained by the incentives of two key non-politician actors: farmers and bureaucrats. First, if the decline were driven by farmers' pro-sociality rather than by political accountability, we should observe fewer fires when more people live downwind from farmers. In fact, the opposite holds: farmers tend to burn more when their crop burning is likely to affect more people, and the reduction in fires emerges only when political incentives are active. Second, to test if bureaucrats' incentives explain our results instead of politicians', we use the fact that the jurisdictions for the two actors overlap imperfectly in India, allowing us to examine the impact of the same location being a source of pollution for a politician's constituents, the bureaucrat's constituents, both, or neither. We show that our results persist when a location is a source of pollution for politicians but not for bureaucrats, confirming that the logic of

political incentives drives fires.[4]

Ultimately, this first finding provides powerful evidence that there are prospects for political accountability in environmental management even in a setting where action would seem unlikely: indeed, our evidence suggests that politicians are sensitive to environmental pollution when the well-being of their own constituents is at stake. We use this accountability effect as a benchmark to study its limits, focusing on the channels of weakening sanctions via multiple principals, farmers and citizens, and adverse selection through the election of self-interested politicians.

The second part of the paper begins by considering how accountability weakens when citizen sanctioning in democracies competes with organized interests. Around the world, from truck driver strikes in South Korea, Canada, and the UK, to teacher protests during Covid, sectors have lobbied for state intervention amid rising economic pressures. We investigate this dynamic in the context of the largest protest movement in the world's history, the Farmers' Movement of 2020–21 in India, during which more than 25 million farmers mobilized to secure policy concessions, including the decriminalization of crop burning. We examine the impacts of 530 farmers' protest events (2020-2021) on subsequent crop burning in a stacked difference-in-differences framework.

We show that crop-residue fires increase by 25 percent following protests, consistent with politicians relaxing environmental control in response to intense farmer lobbying. Having demonstrated that protests increased the production of pollution, we next show that they also erode the accountability incentives to politicians' own constituents that we document in the first part of this paper. To do so, we compare the reduction in fires produced by accountability effects before and after protests, and show that in places that did not have protests, the accountability-driven decrease in fires persists. In contrast, places that switch to having protests show significantly more crop burning afterwards. This suggests that

[4]Interestingly, we also find that when the location pollutes both the politician's and bureaucrat's jurisdictions, the total reduction in fires is lower than when the location is a source of pollution only for politicians or only for bureaucrats. This is consistent with the interpretation that political effort is sensitive to free-riding considerations in the presence of incentives for action for other government agents.

politicians relax environmental control in response to concentrated lobbying pressure, even when such inaction harms their own constituents.

In addition to lobbying, we examine another lever that undermines political accountability: adverse selection of self-interested politicians. To gain traction on politician's self-interest, we use the idea that in their private lives, politicians have varying degrees of financial interests in the production of crop burning. We proxy for self-interest by gathering the candidacy papers of all 2,565 elected politicians in our ten year sample and coding if politicians are agriculturalists by profession. We then study the impact of a political constituency switching from electing a non-agriculturalist politician to an agriculturalist politician on crop burning in a stacked difference-in-differences framework.

We find that when a constituency switches to electing an agriculturalist politician, the rate of crop burning increases by 14 percent, indicating a more permissive policy environment when politicians have personal stakes in agriculture. We next test whether such self-interest also weakens the accountability mechanisms documented in the first part of the paper. Specifically, we compare the reduction in fires driven by accountability before and after a constituency switches to electing an agricultural politician. When non-agricultural politicians remain in office, fires decline when politicians' own constituents are polluted, as expected. In contrast, after constituencies switch to agricultural politicians, crop burning rises even where accountability incentives to reduce it are present. This pattern indicates that, as with lobbying, self-interest can override the pressure of political accountability, even when citizens directly experience the consequences.

Contributions: This paper makes several contributions. First, we contribute to the literature on how governments regulate the environment, where previous research has tended to focuse on the bureaucracy.[5] We expand this literature by centering the role of politicians: we ask whether and under what conditions politicians in democracies translate citizen in-

[5]See, for instance, Burgess et al. (2012); Lipscomb and Mobarak (2016); Shen (2022); Dipoppa and Gulzar (2024).

terests into better environmental regulation. This contrasts with most studies that portray politicians as obstacles to, not agents of, environmental protection.[6] In doing so, we join very recent work that has begun to probe these questions in the context of political selection by asking if certain politician identity, such as gender and ethnic minorities, improves environmental governance (Mavisakalyan and Tarverdi, 2019; Baragwanath and Zheng, 2024; Gagliarducci et al., 2019; Bragança and Dahis, 2022; Gulzar et al., 2024; Jagnani and Mahadevan, 2025). In contrast to the role of identity, we focus on accountability incentives and document its promise as one of the few levers that can improve environmental governance.

The second strand of literature we contribute to is on the politics of air pollution. Despite its scale and urgency, air pollution has received little systematic attention in political science.[7] This deficit is striking because transboundary air pollution presents a particularly poignant challenge to democratic accountability: Monogan III et al. (2017) show that polluting plants are more likely to be located at US state boundaries to potentially offset localized pollution impacts, while Lee and Voeten (2023) show that international Chinese air pollution shapes blame attribution in South Korea.[8] Probing if regulatory accountability can be leveraged to control air pollution, scholars have thus far tended to focus on the demand side, examining conditions under which citizens consider air pollution to be a political problem. Instead, we turn attention towards the supply side, showing that politicians are sensitive to transboundary incentives, take action to prevent harm to their own constituents, yet are swayed by weakening sanctions and selection. By doing so, we bring the study of air pollution into the core of political economy and contribute to a broader understanding

[6]For instance, scholars have shown that campaign donations and lobbying can depress pro-environment votes and legal enforcement (McAlexander and Urpelainen, 2020; Stokes, 2020; Harding et al., 2024; González and You, 2024), elections can exacerbate environmental harms (Cao et al., 2019; Balboni et al., 2021; Sanford, 2023) (but c.f. List and Sturm (2006)), political control of bureaucratic assignments weakens implementation (Xu, 2025), and parties in power can offload conservation costs onto their opponents (Mangonnet et al., 2022). Even informational nudges about voter preferences often fail to lead politicians to adopt pro-environmental policies (Hsiao and Kuipers, 2025).

[7]See Baragwanath and Gulzar (2025) and Grossman et al. (2026) for recent reviews on environment and climate change more broadly

[8]A related literature in economics also studies transboundary pollution in the context of industrial emissions (Sigman, 2002; Kahn et al., 2015; Lipscomb and Mobarak, 2016).

of when and why politicians act to confront diffuse environmental harms.

Finally, we also make a contribution to the study of environmental politics in South Asia. Nowhere is the problem of air pollution more severe than in South Asia, home to one in four humans, which now bears the world's highest levels of ambient particulate pollution (Pullabhotla et al., 2023). Scholars across disciplines have started investigating the causes and consequences of crop burning, one of the largest contributors to this crisis.[9] We provide the first systematic, large-scale analysis of the political accountability incentives that drive both the persistence and reduction of crop burning in Northern India, the region where most of the subcontinent's air pollution originates and where political action carries profound implications for the lives of millions.

2 The Management of Air Pollution

2.1 Crop Burning in South Asia

Air pollution is one of the foremost threats to human capital and development worldwide. Exposure to fine particulate matter (PM2.5) causes strokes, chronic respiratory disease, diabetes, and premature mortality, with cascading effects on labor productivity, educational attainment, and hospitalization rates (Lelieveld et al., 2015; Deryugina et al., 2019; Heo et al., 2023). The global economic cost of air pollution is estimated at nearly $2.9 trillion annually, or roughly 3.3 percent of global GDP (Myllyvirta, 2020). This burden falls disproportionately on the developing world: South Asia now bears the highest levels of ambient PM2.5 on the planet (Pullabhotla et al., 2023), and recent epidemiological work attributes between 1 and 2 million premature deaths per year in India alone to ambient air pollution (Pandey et al., 2021; Jaganathan et al., 2024).

Agricultural emissions, and crop-residue burning in particular, are among the largest

[9]For a selection, see: Shyamsundar et al. (2019); Dipoppa and Gulzar (2024); Garg et al. (2023); Singh and Thachil (2023); Jack et al. (2025); Bhuvaneshwari et al. (2019)

contributors to seasonal PM2.5 spikes in South Asia (Lelieveld et al., 2015; Bikkina et al., 2019). Crop burning is the practice of setting fire to the stubble left in fields after mechanical harvesting to clear the land quickly and cheaply before the next sowing cycle. As farmers themselves acknowledge, burning is a rational response to tight economic constraints: clearing a field with a matchbox costs virtually nothing compared to the thousands of rupees required to rent a mechanized residue-management alternative (Jitendra et al., 2017; Jack et al., 2025). Yet the aggregate consequences are severe. Each post-monsoon season, millions of fires across Punjab, Haryana, and western Uttar Pradesh generate a vast plume of smoke visible from space, blanketing northern India in smog that persists for weeks (Lan et al., 2022; Bikkina et al., 2019).

The roots of this crisis are structural, traceable to the policy and technological transformations of the Green Revolution. Prior to the late 1960s, Punjab and Haryana were not major rice-producing regions, and large-scale residue burning was essentially unknown (Singh, 2018). The introduction of high-yielding rice and wheat varieties, combined with public procurement guarantees and subsidized inputs, entrenched a rice-wheat cropping system across the Indo-Gangetic Plain that today covers roughly 13.5 million hectares (Kumar et al., 2022). This system demands two harvests per year in rapid succession, leaving farmers with as little as ten to fifteen days between the rice harvest and wheat sowing (Kumar et al., 2015; Sahai et al., 2011). The adoption of combine harvesters, which leave 20–30 centimeters of standing stubble, further raised the volume of residue and the cost of mechanical removal (Grover et al., 2015; Sidhu et al., 2015). The problem was compounded by the Punjab Preservation of Subsoil Water Act of 2009, which mandated that paddy transplanting not begin before mid-June in order to conserve groundwater. While successful in slowing aquifer depletion, the law shifted the rice cycle later into the calendar, compressing the post-harvest window even further and increasing farmers' reliance on fire as the fastest residue-clearing method (Maue, 2021; Tripathi et al., 2016). Finally, sustained out-migration from rural areas has tightened the agricultural labor market, making manual residue collection increasingly

impractical and reinforcing the incentive to burn (Garg et al., 2023; Singh, 2018).

2.2 State Politicians' Role in Curbing Crop Burning

The governance of crop burning in India involves multiple tiers of government. At the national level, the Commission for Air Quality Management (CAQM), established as a statutory body in 2021, coordinates anti-pollution frameworks across the National Capital Region and adjoining states, combining in-situ residue management support, such as the subsidized distribution of Happy Seeders, mulchers, and balers, with ex-situ programs to channel crop residue toward industrial uses in power plants and brick kilns.[10] The CAQM directs states to prepare district-level and block-level action plans targeting hotspot villages, and its 2024 amendment rules substantially increased the environmental compensation penalties for violations.[11] Nevertheless, because air pollution crosses jurisdictions, effective control requires not just higher-level coordination but local-level implementation that is responsive to political incentives (World Bank, 2014).

State legislators, Members of the Legislative Assembly (MLAs), are important actors in translating these national frameworks into local enforcement and service delivery. In India's federal system, MLAs elected from single-member assembly constituencies (ACs) exercise considerable influence over district administrations. They shape the allocation and deployment of subsidized crop-residue management (CRM) machinery through custom hiring centers, direct the attention of nodal officers and village-level functionaries toward enforcement and monitoring, and serve as important interlocutors between farmers and the state bureaucracy on agricultural policy. This role is reinforced by the structure of India's anti-burning policy architecture. Since the central government launched the Promotion of Agricultural Mechanisation for In-Situ Management of Crop Residue scheme in 2018, over 100,000 CRM machines have been distributed across Punjab, Haryana, Uttar Pradesh, and Delhi, with

[10] See the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2021; and PIB/CAQM press release, 2024.

[11] See CAQM Direction No. 84 (October 10, 2024) and the revised schedule of penalties notified in December 2024.

subsidies of 50 percent to individual farmers and 80 percent to cooperatives and panchayats.[12] The utilization of this machinery, however, depends on local-level logistics, such as timely delivery, operator training, equitable access across landholding sizes, and the resolution of disputes over service charges, tasks that are fundamentally shaped by politicians' convening power and constituency service incentives (Jack et al., 2025; Shyamsundar et al., 2019).

Beyond this informal influence, elected representatives also have a formal institutional role in overseeing scheme implementation at the district level. The District Development Coordination and Monitoring Committee (DISHA), constituted by the Ministry of Rural Development since 2016, brings together Members of Parliament, MLAs, and the district bureaucracy in a structured oversight body.[13] Each district's DISHA committee is chaired by the senior-most Lok Sabha MP, with all MLAs from the district serving as members and the District Collector acting as convenor. Meeting quarterly, the committee reviews the implementation of central government schemes, now covering over 100 programs across 37 ministries, including agricultural mechanization and crop residue management, and has formal powers to seek information, identify bottlenecks, and demand follow-up action from district officials.[14] This institutional arrangement gives MLAs a formal channel, alongside their informal leverage, through which they can press district bureaucracies on CRM machinery utilization, anti-burning enforcement, and alternative residue-management programs, or conversely, signal leniency when facing pressure from farmer constituents.

This combination of formal and informal influence extends to enforcement. District magistrates and pollution control boards impose environmental compensation penalties on farmers who burn residue, ranging from Rs. 2,500 to Rs. 15,000 per incident depending

[12]Ministry of Agriculture and Farmers Welfare, Government of India. Between 2018-19 and 2025-26, cumulative releases under the scheme totaled approximately Rs. 4,237 crore. See PIB press release, October 2024.

[13]DISHA superseded the earlier District Vigilance and Monitoring Committees. See DISHA, Ministry of Rural Development.

[14]As of 2024, DISHA chairpersons have been appointed in 689 of 718 districts. See PIB press note on DISHA, 2018.

on landholding size.[15] MLAs can intensify or relax the pressure behind this enforcement: they may direct district officials to step up patrols or put pressure on state level bodies to use remote-sensing dashboards to target hotspot villages during peak burning season. Alternatively, they may signal tolerance for burning in response to farmer grievances. This discretion makes politicians a critical node in the implementation chain, both potentially enabling and constraining the effectiveness of national policy.

2.3 Political Salience of Crop Burning

Crop burning has become a politically salient issue on which elected officials actively seek credit or face blame.

In Punjab, state-level political discourse tends to center on the scale of subsidies for CRM machinery, the construction of biomass and bio-CNG plants, and the allocation of budgetary resources to stubble management. For example, the Governor of Punjab's address to the state legislature in 2024 highlighted that the government had provided subsidies of 80 percent to farmer groups and 50 percent to individual farmers since 2018, distributing over 117,000 machines, alongside investments in compressed biogas projects designed to absorb surplus paddy straw.[16] In Haryana's Vidhan Sabha, legislators have highlighted both punitive and incentive-based measures, from per-acre fines imposed by the Pollution Control Board to subsidies for straw management projects and briquette-making units.[17]

Importantly, opposition politicians use the same issue to hold incumbents accountable for implementation failures. In Punjab's Vidhan Sabha debates, opposition members have alleged that funds earmarked for stubble management were diverted, and that promised per-acre support never materialized on the ground.[18] This pattern of credit-claiming by

[15] See the Haryana Vidhan Sabha Bulletin No. 3 (September 11, 2018) for penalty schedules. https://haryanaassembly.gov.in/wp-content/uploads/2019/01/Bulletin-No.-3-119181st-Sitting.pdf

[16] Address of the Governor of Punjab, March 1, 2024. See also the Punjab Governor's Address of January 2020, which detailed the distribution of 28,609 machines through 5,439 custom hiring centers.

[17] Haryana Vidhan Sabha, Bulletin No. 3, September 11, 2018; and the 45th Report of the Committee on the Welfare of SC/ST/OBC, 2021–22.

[18] Punjab Vidhan Sabha Debates, November 29, 2017.

incumbents and blame-attribution by opponents is consistent with a setting in which public opinion creates electoral incentives for responsiveness on environmental governance.

Crop burning appears regularly in wider public discourse as well: journalists, courts, and civil society groups routinely pressure the central and state governments to demonstrate progress, particularly during the winter smog season when air quality indices reach hazardous levels.

Taken together, the institutional architecture of anti-burning policy in India creates a setting in which politicians are important actors. They occupy the implementation node where national mandates meet local realities: they influence the deployment of machinery, the intensity of enforcement, the distribution of subsidies, and the political messaging around environmental governance. This makes the study of their incentives, and the conditions under which those incentives bind or break down, central to understanding the persistence and variation of crop burning across northern India.

3 Politicians' Incentives to Control Fires

Our first objective is to establish whether accountability incentives drive politicians' action to control environmental damage. In this section, we describe the data, empirical strategy, and results showing that responsiveness to constituents' exposure to pollution shapes politicians' behavior to control crop related fires.

3.1 Data

We assemble data on the identity and characteristics of the politicians in charge of each constituency in the sample, as well as on the behavior of farmers, and spatially merge these with information on fires and wind direction. We begin by describing the political data.

Assembly Constituencies: We focus on members of the State Legislative Assemblies elected from India's single-member assembly constituencies. We focus on the rural areas of

the states where crop burning is a major problem: Punjab, Haryana, Uttar Pradesh, and Bihar, for a total of 827 assembly constituencies and 2,565 politicians over the period from 2012 to 2020, when data on crop-related fires, our outcome of interest, is available. Members of the state legislative assemblies are elected every five years in general elections conducted under a first-past-the-post system.

Politicians' Incentives: We proxy politicians' incentives to curb fires using variation in wind direction, which determines whether smoke from fires is likely to affect politicians' own constituency or a neighboring one. Wind direction and speed data come from the European Centre for Medium-Range Weather Forecasts (ECMWF), which is precise at a 25x25 km resolution. To approximate what politicians might expect for a given month–year, we compute ten-year rolling averages of wind direction using data from the early 2000s onward. Figure B.1 (right panel) shows that actual wind directions and their rolling averages closely track each other, substantiating the expectations that politicians are aware of prevalent wind directions in a season. In this setting, indeed, the two major seasonal wind shifts occur in June and August each year. Section 3.2 explains in more detail how we define political incentives by combining data on wind direction and constituency shapes.

Fires: Our main outcome of interest is the presence and extent of crop stubble burning. We measure crop burning with data on fires from Nasa satellites Moderate Resolution Imaging Spectroradiometer (MODIS, 1km x 1km resolution) and Visible Infrared Imaging Radiometer Suite (VIIRS, 375m x 375m resolution) from September 2012, the first year in which VIIRS starts operating, to August 2022. The satellite records fires from thermal signatures, such that the presence of cloud cover or smoke in the atmosphere does not prevent its detection. The absence of forests in the area of India we study means that we can safely attribute fires to crop burning activity rather than to forest fires. We plot the total number of fires over time in Figure B.1: each year, there are two peaks in the months of April-May and October-November, in correspondence with the crop burning seasons of wheat and rice respectively

(Singh and Kaskaoutis, 2014).[19]

Crops: Rice is the crop responsible for the largest share of stubble burning, followed—though to a lesser extent—by wheat. To focus on areas most affected by crop burning, we collect data on average crop area and production in 2010, the latest year with micro-level crop data available before the start of our analysis period. The data is sourced from the FAO maps, it has a resolution of 5 x 5 arc/min, corresponding to approximately the size of a grid in the final database, and is plotted in Figure B.2.

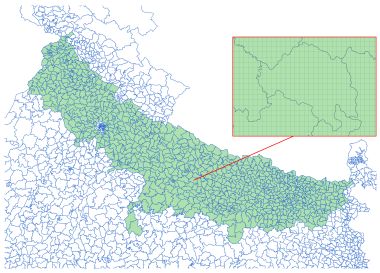
Combining all the data at a 5 square km grid-cell level: We combine all the data into a single dataset at the $5km^2$ grid-cell level. Wind and fire grids do not overlap precisely: to reduce errors in the assignment of fires to wind grids, we split the $25km$x$25km$ wind grid-cells into squares of $5km^2$ each. This guarantees that fires are assigned to the wind grid-cell which contains most of the fire grid-cell. Splitting wind grids in smaller parts also allows us to address another concern: some grids might overlap across jurisdiction boundaries. By reducing their size, we minimize the amount of misattribution and we are able to assign each grid to the appropriate jurisdiction. Any remaining error should bias our findings toward zero, as errors are uncorrelated with the dependent and independent variables. In case of overlap, we assign a grid to the jurisdiction that contains a larger area of the grid. For crop data, we assign the pre-period crop production to each $5km^s$ grid-cell to classify what crops are produced in each location. To exclude areas in which crop burning could not occur, we drop urban grid-cells using the GHS-SMOD dataset (Schiavina et al., 2026), which classifies $1km^2$ pixels according population size and density thresholds to capture the full settlement hierarchy. We define a grid-cell as urban if the majority of pixels within it are classified as Urban Center or Dense Urban Cluster. Our full sample includes 96,535 grid-cells which we observe in each month and year from September 2012 to August 2022, for a total of 11,584,200 observations. We map each constituency in the sample with an illustration of the

[19]Data on fires and wind are taken from Dipoppa and Gulzar (2024).

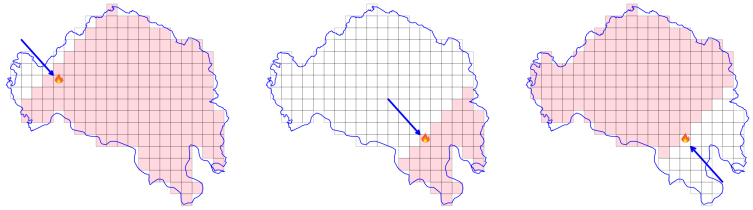
gridded data in Figure 2a.

Figure 2: **How Changes in Wind Direction Affect Political Calculus and Crop Burning**

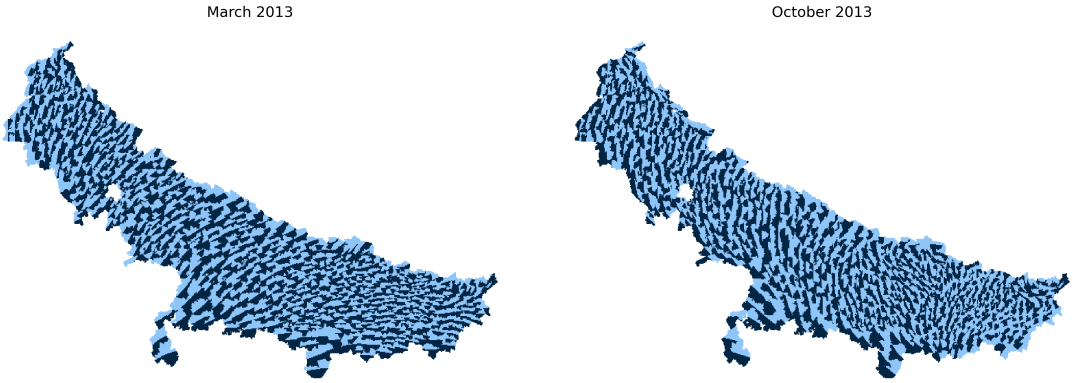
(a) Gridded Dataset



(b) Treatment Definition and Variation Example



(c) Variation in Treated Grids Over Time Across the Sample



Notes: Figure 2a illustrates the 5km^2 gridded dataset in green with constituency boundaries in blue. It shows the Bachhrawan assembly constituency magnified as an example. Figure 2b illustrates the coding of treatment. The blue arrow represents wind direction in a given month-year. In the left panel, the area downwind from a potential fire is larger than the area upwind from the fire. We define this grid as treated. In the central panel, the area downwind from the fire is smaller than the area upwind: we define this grid as control. In the right panel, a change in wind direction converts the same grid into the treatment group because a potential crop burning would now become a source of pollution for the majority of the home constituency. Figure 2c displays the spatial distribution of this treatment and its temporal variation in two different months. In dark blue shading are treated grids and in light blue are control grids.

3.2 Empirical Strategy

Treatment Definition: We start from the premise that politicians have stronger incentives to prevent crop burning when the smoke from a potential fire is likely to pollute their own constituency rather than a neighboring one. Our treatment is designed to capture this accountability incentive: we compute whether any given grid-cell in a constituency is more likely to send pollution into its own constituency or elsewhere depending on wind direction. To approximate the decision of politicians, we use rolling averages of wind direction and calculate, for each grid-cell in each month, the area of the constituency that lies downwind and upwind of that grid-cell. Specifically, for each grid centroid, we draw a line perpendicular to the average wind direction vector through the centroid, which divides the constituency into a downwind area and an upwind area. Because wind direction changes over time, the same grid-cell may in some months primarily pollute its own constituency and in other months primarily pollute a neighboring one. We define a grid-cell as treated in a given month-year if the area of the constituency that lies downwind of the grid-cell is larger than the area that lies upwind. We present an example of treatment definition and change in status for a grid in our sample in Figure 2(b). In Figure 2(c) we also illustrate how treatment varies in the full sample over two given months.

Estimation Strategy: We use this treatment definition to estimate a difference-in-differences model for the impact of a grid switching to polluting most of its jurisdiction on fires, leveraging within grid changes in treatment status over time. For a 5km^2 grid-cell i in assembly constituency j and month-year t, we estimate:

$$\text{Number of Fires }_{it} = \beta \text{Down} > \text{Up}_{it} + \alpha_i + \gamma_j \times \theta_t + \delta X_{it} + \epsilon_{it} \tag{1}$$

where our dependent variable is the number of fires in a grid month-year. The coefficient of interest, β, captures the effect of treatment on the number of fires in that grid. In our main specification, we define $Down > Up$ as a dummy equal to 1 in month-years in which the

area downwind from the grid within its constituency is larger than the area upwind, and zero otherwise. The high-dimensionality of our data allows for the inclusion of fine-grained fixed effects. First, α_i are grid-cell fixed effects that absorb time-invariant factors for over 96,535 grid-cell in our data, such as crop suitability or economic characteristics of small locations. Second, $\gamma_j \times \theta_t$ are jurisdiction by month-year fixed effects that account for time-varying shocks at the constituency level. X is a vector of controls that includes average wind speed and direction. Standard errors are clustered at the grid and month-year by constituency level. The first accounts for temporal dependence of observations at the treatment status level (grid). The second accounts for potential spatial correlation in wind patterns.

A typical concern in the standard difference-in-differences setting is that treatment might be assigned based on pre-existing characteristics of the unit endogenous to the outcome – for example, poorer areas might be more likely to receive welfare interventions. Our setting has instead a unique feature: treatment – which area is more likely to be a source of pollution for a jurisdiction – is assigned based on changes in wind direction interacted with the shape of the district polygon, a quantity which is plausibly exogenous. This feature makes the parallel trends assumption – that treated grid-cells would have displayed a similar trend in fires as the control grid-cells had the wind not shifted, exposing a larger area of the jurisdiction to smoke – considerably more credible, as treatment is assigned quasi-randomly. We nevertheless provide evidence in consistent with the parallel trends assumption.

Event study Specification To trace the behavior of fires around the time in which grids switch into treatment, we estimate the event-study equivalent of Equation 1. For relative time r from the switch to treatment D, we estimate:

$$\text{Fires}_{it} = \sum_{r=-s}^{z} \zeta D_{ir} + \alpha_i + \gamma_j \times \theta_t + \delta X_{it} + \nu_{it} \tag{2}$$

where our coefficients of interest ζ represent the effect of treatment status at each time period (in months) before and after treatment, relative to the month of the switch (the

omitted category). For example, if changes in wind direction convert grid i from control to treatment in May, relative time will take value 0 in May, +1 in June and values -1 in April, -2 in March, and so on.

The event study differs from the main analyses in two ways: first, we restrict the analyses to the sample with a sufficient number of relative time periods, keeping only observations in a six-month window around treatment (Figure B.3); second, we drop grids that are treated in September 2012, first month of the sample, because their relative time cannot be established.

To control for potential violations of the parallel trends assumption, we follow the approach in Dustmann et al. (2022). We fit a linear time trend to our estimated pre-treatment coefficients, anchored in the omitted category, and extrapolate it into the post-treatment period (see Section B.1 for more details). By plotting the deviations of our estimated coefficients from these predicted trends, we can assess whether pre-treatment differences in outcome trajectories are large enough to explain away our estimated treatment effect — that is, whether they alone could account for the entire observed reduction in fires.

3.3 Results

Table 3a reports the main result. When wind is expected to blow smoke into a grid's assembly constituency rather than away from it, we observe 0.007 to 0.011 fewer fires per grid-month, corresponding to a reduction of approximately 5 to 7% relative to baseline. This pattern is consistent with politicians taking action to reduce environmental damage when their own constituents bear the costs of pollution, and being less likely to do so when the same location would instead pollute a neighboring constituency.

Figure 3b plots the de-trended coefficients showing the treatment effects in each relative time period from when a grid switches to being downwind. The estimated coefficients show a negative effect of a grid switching to polluting mostly its own constituency on the number of fires taking place in that grid. This effect correspond to a 12% reduction in fires with respect to baseline. The result is mainly driven by rice-producing areas where we observe 30% less

fires with respect to baseline (Figure B.5). This indicates that politicians are significantly more likely to reduce fires when pollution affects their own constituency.

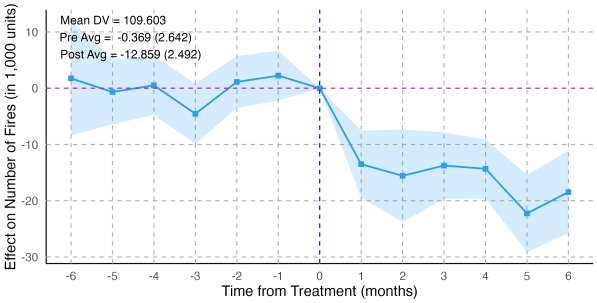
Robustness: We start by testing whether the findings are robust to adopting different definitions of treatment. In Table B.1, we define a grid-cell as treated when most of the population of the constituency (rather than most of its area) lives downwind from the grid, finding effects of similar magnitudes and significance (column 2); we standardize the independent variable, instead of dichotomizing it, so that the treatment coefficient can be interpreted as the effect of a one standard deviation increase in the size of the downwind area (column 3); we adopt two other continuous definitions of treatment, the share of assembly constituency area that is downwind (column 4) and the difference between downwind and upwind area (column 5). In Table B.2 we vary the definition of the dependent variable, replacing the count of fires with a dummy equal to one when any fire took place in the grid-cell (column 1); with the natural logarithm of the count of fires plus one (column 2); and with a continuous variable capturing the average brightness of fires in a grid-month, a measure of fire intensity (column 3). Results are robust in all cases. When we disaggregate the analysis by year, the effect remains significant in each of the 10 years in our sample, except for smaller and more imprecisely estimated effects in 2022 (Table B.3). When we subset by state, the magnitude of the effect varies in line with expectations: the drop in fires is largest in Haryana (10%), Uttar Pradesh and Punjab (6 and 3% respectively), where agriculture is most prevalent and crop burning salient, while there is no detectable effect in Bihar (Table B.4). We test the importance of differential pre-trends in Figure B.7(a) following the approach by Dustmann et al. (2022). We show that the negative effect on fires is still present, even when pre-trends are significant and going in the opposite direction to treatment effects. We follow Dustmann et al. (2022) in also conducting sensitivity analyses for violations of the pre-trends assumption using the smoothness restriction (Rambachan and Roth, 2023), showing that findings are robust to violations of parallel trends up to 0.75

Figure 3: **Effect of constituency exposure to smoke on number of fires**

(a) Main Table

	(1)	(2)	(3)	(4)
	Number of Fires (in 1,000 units)			
Down > Up	-9.538***	-10.611***	-8.891***	-7.340***
	(1.740)	(1.453)	(1.230)	(1.228)
Observations	11,584,200	11,584,200	11,583,360	11,583,360
N Assembly Constituencies	827	827	827	827
Month-Year FE	N	Y	N	N
AC FE	N	Y	N	N
AC x Month-Year FE	N	N	Y	Y
Grid FE	N	N	N	Y
Mean DV	160.3	160.3	160.3	160.3

(b) Event-study relative to exposure



(c) Effect of constituency and district exposure to smoke on N Fires

	(1)	(2)	(3)	(4)	(5)
	Number of Fires (in 1,000 units)				
Down> Up Bureaucrat	-26.077***	-22.873***	-4.679**	1.707	-18.460***
	(2.433)	(3.151)	(2.317)	(2.264)	(2.910)
Down> Up Politician	-11.608***	-16.553***	-16.566***	-8.385***	-5.951***
	(2.528)	(2.382)	(1.889)	(1.717)	(1.853)
Down> Up Pol. × Down> Up Bur.	15.182***	19.497***	13.854***	0.996	7.494***
	(3.341)	(2.989)	(2.380)	(2.090)	(2.386)
Observations	11,584,200	11,584,200	11,583,360	11,583,360	11,584,200
Month-Year fe	N	Y	N	N	N
AC fe	N	Y	N	N	N
AC x Month-Year fe	N	N	Y	Y	Y
Grid fe	N	N	N	Y	Y
Mean DV	172.004	172.004	172.004	172.004	172.004

Notes: *(a)* Results from Equation 1 of the effect of constituency exposure to smoke on the number of fires (in thousands) in a grid-cell and month. The treatment indicator *Down>Up* is a dummy equal to one in months and grids from which most of the assembly constituency area is exposed to smoke (i.e. when the area of the constituency downwind is larger than the area upwind from the grid). The The table reports the mean of the dependent variable when treated grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level. *(b)* Results from Equation 2 after de-trending for the pre-treatment period linear trend following Dustmann et al. (2022). The reference category is t=0, i.e. the month of the switch. We restrict the analyses to a 6 months window around the switch to maximize support. The regression includes grid and assembly constituency × month-year fixed effects and controls for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level. *(c)* Results from Equation 1 with the additional interaction with a dummy (*Down > Up Bureaucrat*) equal to one in months and grids from which most of the district area is exposed to smoke, i.e. the area of the district downwind is larger than the area upwind from the grid. The table reports the mean of the dependent variable in grids that are upwind with respect to the borders of both the constituency and the district. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and district × month-year level.

times the size of the observed pre-trend deviations.

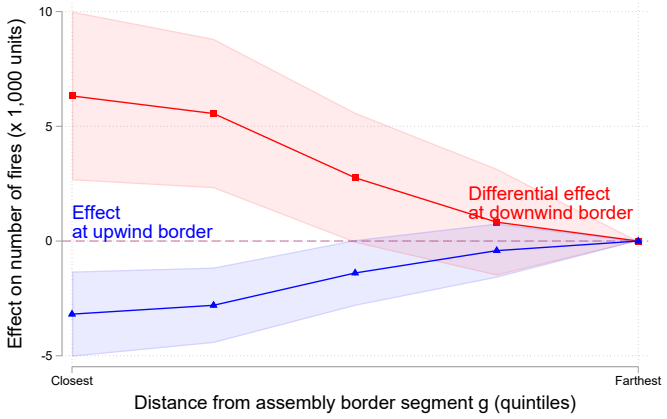
Strategic action and inaction near constituency borders: Our next question is whether the main effect, a reduction in crop-related fires when constituents are exposed, is driven by politicians becoming more active where pollution harms their own constituency, by politicians becoming less active where pollution is displaced onto neighboring constituencies, or by both. To answer this question, we examine how fire activity varies with strategic considerations about pollution exposure.

When burning occurs close to an upwind border, a larger share of the smoke remains within the politician's own constituency, strengthening incentives to intervene. When burning occurs close to a downwind border, the smoke is shifted into a neighboring constituency, weakening incentives to act. To test if politicians respond to both these incentives, we construct a new dataset at the level of grid-cell and each assembly constituency-border pair. Because wind direction varies over time, the same border can be downwind in some periods and upwind in others. We calculate the distance from each grid-cell to each relevant border and use this time-varying proximity to examine whether politicians adjust their behavior strategically as opportunities to internalize or externalize pollution become stronger.

The results in Figure B.6 reveal two patterns. First, fires decline monotonically as one approaches the upwind border, consistent with politicians acting to reduce fires when a larger share of their own constituency would bear the pollution costs. Second, fires increase as one approaches the downwind border, consistent with reduced effort when pollution can be offloaded onto neighboring constituencies.

Together, these results show that politicians behave strategically along both margins: they increase effort when their own constituents are more exposed, and they relax effort when the costs can be shifted elsewhere. Additionally, politicians are also acting strategically in increasing the intensity of their action (and inaction) depending on the intensity of pollution exposure – distance to the border.

Figure 4: **Effect of grid distance to the upwind (in blue) and downwind (in red) border on number fires**



Notes: (Blue) Effect of being close to an upwind border with another constituency, where smoke would affect the politicians' assembly constituency. (Red) Differential effect (from the upwind border) of being close to a downwind border, where smoke would travel to the neighboring jurisdiction. All effects are plotted by quintiles of distance to the border, and the 5th quintile, the farthest, is used as omitted category. The regression includes grid and border × month-year fixed effects and control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

3.3.1 Alternative Interpretations

Farmers' Pro-sociality: A first alternative explanation is that fires may be reduced by farmers themselves, rather than by politicians, because farmers behave prosocially toward nearby residents who would be exposed to the resulting pollution. Under this account, farmers would care about neighbors as such, regardless of whether they belong to the same electoral constituency, since the constituency is an administrative unit with no obvious social or cultural meaning.

To assess this possibility, we construct a placebo measure of exposure based on farmers' local social environment rather than political boundaries. Specifically, around each grid we draw a placebo circle with a radius of 13 km, corresponding to the median size of an assembly constituency, and use it to approximate the set of nearby residents potentially relevant to farmers' prosocial concerns. Figure B.4 illustrates this strategy. In this analysis, a grid is coded as treated when the population living downwind within the placebo circle is larger

than the population living upwind.

Table B.5 reports the estimated treatment effect for the full sample (column 1), for locations that are treated both in the placebo specification and from the politician's perspective (column 2), and for locations that are treated in the placebo-farmer specification but are control areas from the politician's perspective (column 3). We find no evidence consistent with farmer prosociality. The reduction in fires appears only in locations where politicians have incentives to act, while in places where politicians have weak or no incentives, the estimated effect is even positive. This pattern suggests that the reduction in fires is not driven by farmers concern for downwind residents, but by political incentives operating through constituency boundaries.

Bureaucratic action: A second alternative explanation is that the main results are driven by bureaucrats rather than by politicians. To assess this possibility, we examine whether the effect of pollution visibility depends on whether exposure is concentrated only within the politician's constituency or also within the jurisdiction of the relevant bureaucratic authority. In other words, we test whether politicians still reduce fires when the same pollution would affect not only to their own constituents but also district residents.

The results are reported in Table 3c. We continue to find that fires fall when wind would carry smoke into a politician's own constituency. However, this effect disappears when the same area generates exposure for both the politician's constituency and the bureaucrat's jurisdiction. This pattern suggests that the politician's incentive to reduce visible pollution is weakened once responsibility is shared with the bureaucracy. One interpretation is a coordination failure: when both political and administrative authorities are implicated, each may expect the other to bear the costs of enforcement, resulting in less action overall. More broadly, the results indicate that, far from results being driven by bureaucrats, overlapping institutional responsibility can blunt environmental enforcement, and that politicians are less able to translate constituency pressure into fire reductions when control is jointly held

with bureaucrats.

4 Countervailing Incentives

The first part of the paper provided evidence that there are prospects for environmental accountability. In this second part, we consider how accountability can weaken or break down with two fundamental levers that can act as countervailing incentives: organized lobbying, and adverse political selection.

4.1 Lobbying

From June 2020 to December 2021, India experienced the largest protest movement in the world history: 25 million farmers mobilized in large-scale protests against agricultural laws that aimed to deregulate the sale of farm produce, allow contract farming, and remove stockholding limits. One key reason for mobilization was the fight against strict penalties for crop burning, including high fines and jail terms (The Guardian, 2020). Farmers staged demonstrations, road blockades, and sit-ins, particularly in Punjab, Haryana, and at the borders of New Delhi. The demonstrations were successful: they led to the repeal of the laws and to the depenalization of stubble burning. This section analyzes the impact of all 530 farmers' protests events on crop burning, and asks whether those counteract accountability incentives.

4.1.1 Data

We gather information on the date and location of each protest event related to the Farmers' Movement from June 2020 to December 2021 from ACLED. We identifyfarmers' protests by searching for any conjugation of the word "farm" in the event description, considering both type and participants to the event. We validate this process by reading the full description for a random sample of events. Figure C.1 shows the temporal distribution of protest occurrence,

highlighting a peak in late 2020 after the passage of the farm laws (September 2020). Protests were highly prevalent in Punjab but widesperead across all ares in our sample (Figure C.2).

4.1.2 Empirical Strategy

Treatment Definition: We code proximity to a farmer protest by drawing a 5km-radius buffer areas around the location of the 530 protests occurring between June and December 2020. We code a grid-cell as treated if it falls within at least one buffer area, from the month-year when a protest first occurs until the end of our sample period.[20] Figure C.3 provides a visual illustration of the grids coded as treated in a constituency.

Estimation Strategy: We estimate the impact of proximity to a protest event using a stacked-design following Cengiz et al. (2019). For each event-time cohort in our data, defined as the month-year a location first experience a protest, we build one cohort specific dataset. Each dataset includes only never treated units –grids that never experienced a protest– and units first treated in that event-time –grids experiencing their first protest, eliminating the problematic comparison in case of heterogeneous treatment effects. We then stack these cohort-specific datasets into a pooled database. For grid i in constituency j in province p, relative time from treatment (in years) t and electoral cycle s in cohort-dataset c, we estimate:

$$\text{Number of Fires}_{ict} = \beta \text{Post} \times \text{Protest}_{ict} + \alpha_{ic} + \gamma_{tc} + \theta_{ps} + X_{ipt} + \epsilon_{it} \tag{3}$$

where the dependent variable is the number of fires in 1,000 units. We include a comprehensive set of fixed effects which account for cohort-specific and constituency specific factors. First, α_{ic} are grid $\times$ cohort fixed effects that absorb time-invariant factors for each grid in our sample within each sub-experiment. Second, γ_{tc} are relative time from treatment $\times$

[20] We consider as treated grids that fall within a buffer area regardless of whether they fall inside or outside the constituency boundaries. Grids located in overlapping buffer areas are assigned to the buffer associated with the earliest protest.

cohort fixed effects that account for time-varying shocks at the national level. Third, θ_{ps} are province-specific electoral cycles fixed effects that account for differences across cycles within a province. X is a vector of controls that includes province linear time trends, average wind speed and direction. Standard errors are clustered at the buffer area level.

4.1.3 Results

After the first protest occurs in a given area, we observe 0.046 more fires per grid-month, a 12% increase with respect to an average of 0.382 fires in treated areas before any protest occurs (Table C.2). This result is in line with politicians relaxing environmental control in response to concentrated farmer pressure. Figure 5a plots the de-trended event-study results showing an increase in the number of fires after the first protest. This effect corresponds to 51% more fires with respect to baseline. This indicates that politicians relax environmental enforcement in response to farmers organized protests.

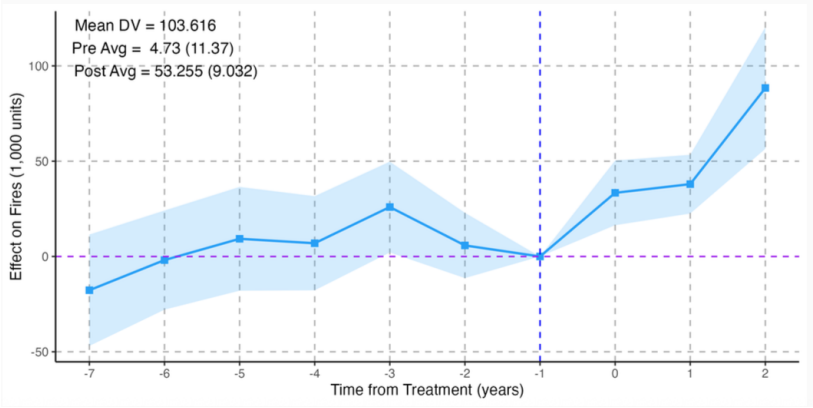
Erosion of Accountability Incentives: Organized pressure from farmer lobbies might contribute to influence the accountability incentives we document in the previous section: do politicians continue reducing fires when smoke would impact their constituents, even after farmers' protests pressure them to stop sanctioning them for crop burning? Figure 5b explores this question by interacting the two treatments, the effect of a grid becoming a source of exposure for its constituency, and protests.Before protests, areas whose pollution burden falls on their own constituents experience fewer fires relative to areas that would pollute neighboring jurisdictions, in line with the accountability mechanism.

In protest-affected areas, the accountability effect disappears entirely after protests begin: fires increase significantly, offsetting the reductions in crop burning otherwise associated with political accountability. In places without protests, the accountability effect weakens, but this does not translate into higher crop-related fires relative to baseline. This pattern is consistent with organized lobbying increasing fires directly where protests occur, while also

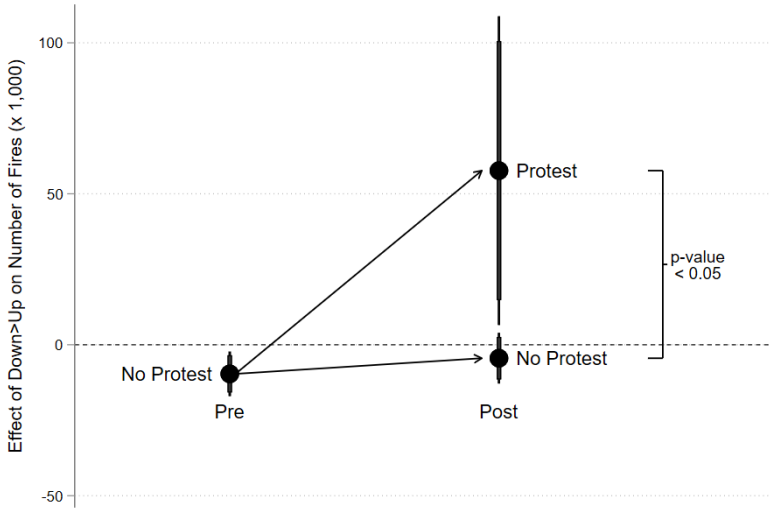
weakening politicians' incentives for environmental enforcement beyond the protest locations themselves.

Figure 5: **Effect of farmers' protests occurrence on number of fires**

(a) By relative time period



(b) By constituency exposure to smoke



Notes: *(a)* Event-Study results from Equation 3 after de-trending for the pre-treatment period linear trend following Dustmann et al. (2022). The reference category is t=0, the year of protest occurrence. The regression includes grid-cohort, and province electoral cycle fixed effects, and controls for province linear time trends, average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level. *(b)* Results from Equation 3 interacted with$Down > Up$, a dummy equal to one in months and grids from which most of the assembly constituency area is exposed to smoke (see Section 3.2 for details). Plotted coefficients report the effect of being in a constituency exposed to smoke in the pre- vs. post-protest period, separately for constituencies that did and did not experience protests. The reference category is non-protest areas, before protests when they are upwind ($Down > Up$=0). Table C.2 reports the corresponding regression coefficients. The regression includes grid-cohort, year-cohort and province electoral cycle fixed effects, and controls for province linear time trends, average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level.

4.2 Adverse Selection

In India, candidates with direct ties to agriculture are often elected to state legislatures, especially in rural constituencies where farming remains economically and politically central. Once in office, these politicians may use their authority to pursue policies that are more aligned with the interests of their sector than with those of other constituents. We therefore examine whether the selection of politicians with agricultural ties shapes the incidence of fires after elections, and whether it alters the accountability incentives documented in the first part of the paper.

4.2.1 Data

We build new data on the sectoral identity of elected politicians in each Assembly Constituency in our sample by scraping information about politicians' profession and properties from Myneta.info. The website provides background information on candidates contesting elections from 2008, including profession, and details on movable and immovable assets. To capture politicians' self-interest in agriculture, we classify whether each politician's self-reported occupation is agriculture-related, using a large language model (GPT)[21] (See Section A.1 for additional details.). Our sample comprises 2,565 politicians, of whom 1,102 (43%) have agricultural professions.

4.2.2 Empirical Strategy

Treatment Definition: A comparison of constituencies that ever elect agriculturalist politicians versus not would conflate politician characteristics with place characteristics. Rural localities with strong agricultural ties may be more likely both to elect agriculturalists and to experience more agricultural fires. To isolate the effect of electing an agriculturalist from underlying place characteristics, we exploit within-location variation of winning politi-

[21] Most politicians in our sample report holding agricultural assets, leaving little variation to exploit. We therefore rely on self-reported profession as our primary measure of self-interest in crop burning.

cians. We compare crop related fires before and after the same constituency switches from electing a non-agriculturalist to electing an agriculturalist.

Estimation Strategy: We estimate the impact of a constituency switching to electing an agriculturalist politician using a stacked design (Cengiz et al., 2019). We build one cohort-specific dataset spanning 10 years (2 elections) around the election of an agriculturalist politician, using never treated as controls. To avoid compositional changes that might bias our estimates, each dataset is a balanced panel, including only units that we observe for the entire 10 year period. We then stack these cohort-specific datasets into a pooled database. For a 5km^2 grid-cell i in constituency j in province p, relative time from treatment t, election s in cohort-dataset c, we estimate:

$$\text{Number of Fires}_{ict} = \beta\ \text{Post}\times\text{Agriculturalist}_{ict} + \alpha_{ic} + \gamma_{tc} + \theta_{ps} + X_{ipt} + \epsilon_{ict} \qquad (4)$$

where the dependent variable is the number of fires times 1,000 units; *Post* is a dummy that takes value one from the cohort-specific year; *Agriculturalist* is a dummy equal to one after the election of a politician with agricultural ties. We include the same set of fixed effects as in the protest specification, which account for cohort-specific and electoral factors. Standard errors are clustered at the assembly constituency $\times$ election year level.

4.2.3 Results

When a constituency switches to electing an agriculturalist politician, fires increase by 14% with respect to baseline, corresponding to about 7 additional fires per grid-year as shown in Table D.1, Column 3. The effect is driven by rice-producing areas, where we observe 30% increase following the election of a politician with agricultural ties (Figure D.1). The de-trended event study in Figure 6a confirm this pattern: fires are 14% higher after a constituency switches into the electoral term of a agriculturalist politician, relative to the control group. Politicians with agricultural ties behave in line with the interest of their professional

group,avoiding enforcement pressure on environmental damage.

Erosion of accountability: Figure 6b examines whether the election of an agriculturalist politician erodes the accountability incentives documented above by estimating the joint interaction of the two treatments. Before elections, fires fall in areas where politicians' own constituents bear the pollution burden, consistent with the baseline accountability pattern. After elections, however, the effect depends on who is elected. In constituencies that continue electing non-agriculturalists, fires remain lower when pollution affects the politician's own constituents. In constituencies that switch to an agriculturalist, instead, fires increase relative to the control group. These results suggest that politicians with personal ties to agriculture undermine the responsiveness to constituent exposure documented in the first part of the paper, consistent with the selection of politicians whose private incentives are misaligned with those of the majority of their constituents.

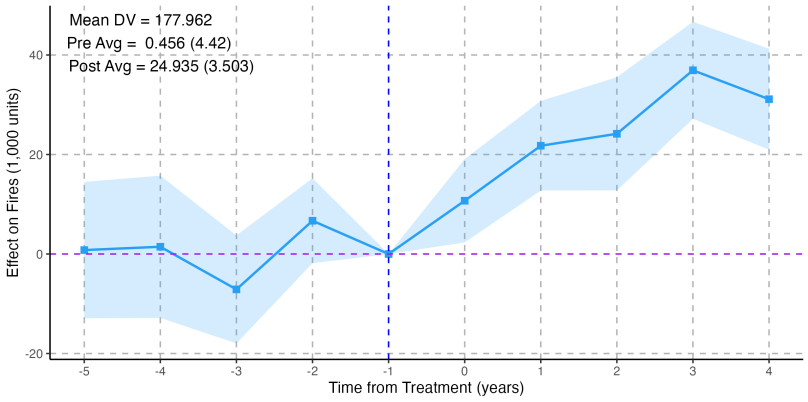
5 Conclusions

Environmental governance is a hard case for democratic accountability: pollution generates concentrated benefits and diffuse harms, and voters rarely prioritize the environment. Against this backdrop, we find that politicians do curb fires, when wind patterns shift smoke toward their own constituents. This is, to our knowledge, among the first large-scale evidence that accountability incentives can generate environmental protection even in a setting with millions of dispersed polluters and limited monitoring.

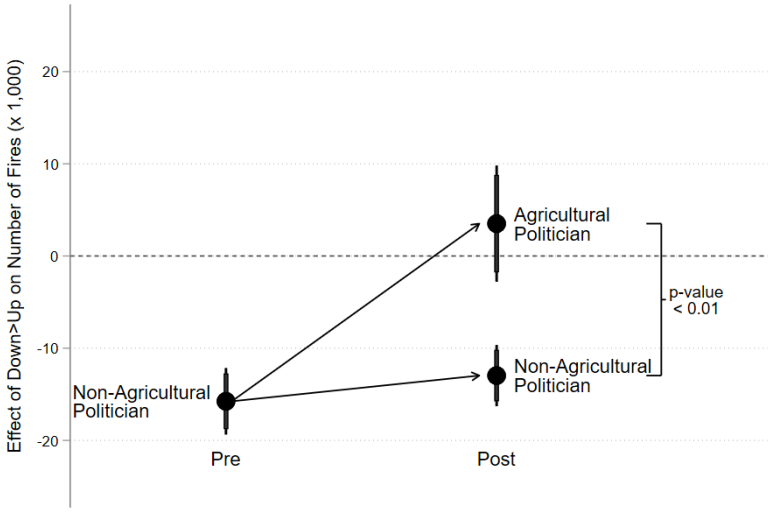
Accountability, however, does not hold to the competing pressure of concentrated interests and adverse selection. We show that organized lobbying by the farmers' movement increased burning, overriding politicians' responsiveness to their own constituents' welfare. In addition, we document that the election of politicians with private agricultural interests increases burning, even where accountability incentives would otherwise reduce it. Taken together, these results show that democratic accountability can produce environmental reg-

Figure 6: **Effect of switching to an agriculturalist politician on number of fires**

(a) By relative time period



(b) By constituency exposure to smoke



Notes: *(a)* Event-Study Results from Equation 4 after de-trending for the pre-treatment period linear trend following Dustmann et al. (2022). The reference category is t=-1, the year of protest occurrence. The regression includes grid-cohort, and electoral cycle fixed effects, and controls for province linear time trends, average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level. *(b)* Results from Equation 4 with the additional interaction for constituency exposure to smoke. $Down > Up$ is a dummy equal to one in months and grids from which most of the assembly constituency area is exposed to smoke (see Section 3.2 for details). Plotted coefficients report the effect of being in a constituency exposed to smoke in the pre- vs. post-protest period, separately for constituencies that did and did not experience protests. The reference category is non-protest areas, before protests when they are upwind ($Down > Up$=0). Table D.1 reports the corresponding regression coefficients. The regression includes grid-cohort, relative time-cohort and electoral cycle fixed effects, and controls for province linear time trends, average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level.

ulation, but concentrated interests that benefit from pollution can undermine it.

These findings speak to institutional design. Whether anti-burning policy works in India depends not only on national mandates and enforcement capacity but also on political incentives. Interventions that sharpen the link between pollution exposure and political responsibility, such as real-time air quality monitoring and transparent attribution of pollution to specific jurisdictions, could strengthen the accountability channel we document. But the erosion we find from organized interests and adverse selection suggests that electoral mechanisms alone might not be enough to confront the large challenge of air pollution.

Finally, our results inform a broader question about whether democracies can manage environmental externalities. The evidence from South Asia's air pollution crisis is that the capacity for accountability exists: politicians respond when their constituents pay the costs of pollution. The challenge is that this response is easily overwhelmed by the political economy forces arrayed against it. Sustaining environmental protection in democracies requires not just accountability but institutions that can withstand the pressures that erode it.

References

Balboni, Clare, Robin Burgess, Anton Heil, Jonathan Old, and Benjamin A Olken, "Cycles of fire? politics and forest burning in Indonesia," in "AEA Papers and Proceedings," Vol. 111 2021, pp. 415–19.

Baragwanath, Kathryn and Saad Gulzar, "Democracy and the Environment," 2025. Prepared for the *Annual Review of Political Science* (under review).

_ **and Xixi Zheng**, "The Greener Gender: Women Politicians and Deforestation in Brazil," Technical Report, Working Paper 2024.

Bhuvaneshwari, Subashini, Hiroshan Hettiarachchi, and Jay N Meegoda, "Crop residue burning in India: policy challenges and potential solutions," *International journal of environmental research and public health*, 2019, *16* (5), 832.

Bikkina, Srinivas, August Andersson, Elena N Kirillova, Henry Holmstrand, Suresh Tiwari, Atul K Srivastava, Deewan S Bisht, and Örjan Gustafsson, "Air quality in megacity Delhi affected by countryside biomass burning," *Nature Sustainability*, 2019, *2* (3), 200–205.

Bragança, Arthur and Ricardo Dahis, "Cutting special interests by the roots: Evidence from the Brazilian Amazon," *Journal of Public Economics*, 2022, *215*, 104753.

Buntaine, Mark T, Michael Greenstone, Guojun He, Mengdi Liu, Shaoda Wang, and Bing Zhang, "Does the squeaky wheel get more grease? The direct and indirect effects of citizen participation on environmental governance in China," *American Economic Review*, 2024, *114* (3), 815–850.

Burgess, Robin, Matthew Hansen, Benjamin A Olken, Peter Potapov, and Stefanie Sieber, "The political economy of deforestation in the tropics," *The Quarterly Journal of Economics*, 2012, *127* (4), 1707–1754.

Cao, Xun, Genia Kostka, and Xu Xu, "Environmental political business cycles: the case of PM2. 5 air pollution in Chinese prefectures," *Environmental science & policy*, 2019, *93*, 92–100.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer, "The effect of minimum wages on low-wage jobs," *The Quarterly Journal of Economics*, 2019, *134* (3), 1405–1454.

Chesler, Angela, Debra Javeline, Kimberly Peh, and Shana Scogin, "Is Democracy the Answer to Intractable Climate Change?," *Global Environmental Politics*, 2023, *23* (4), 201–216.

Dandona, Rakhi, G Anil Kumar, Nathaniel J Henry, Vasna Joshua, Siddarth Ramji, Subodh S Gupta, Deepti Agrawal, Rashmi Kumar, Rakesh Lodha, Matthews Mathai et al., "Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–17," *The Lancet*, 2020, *395* (10237), 1640–1658.

Dechezleprêtre, Antoine, Adrien Fabre, Tobias Kruse, Bluebery Planterose, Ana Sanchez Chico, and Stefanie Stantcheva, "Fighting climate change: International attitudes toward climate policies," *American Economic Review*, 2025, *115* (4), 1258–1300.

Deryugina, Tatyana, Garth Heutel, Nolan H Miller, David Molitor, and Julian Reif, "The mortality and medical costs of air pollution: Evidence from changes in wind direction," *American Economic Review*, 2019, *109* (12), 4178–4219.

Dipoppa, Gemma and Saad Gulzar, "Bureaucrat incentives reduce crop burning and child mortality in South Asia," *Nature*, 2024, *634* (8036), 1125–1131.

Dustmann, Christian, Attila Lindner, Uta Schönberg, Matthias Umkehrer, and Philipp Vom Berge, "Reallocation effects of the minimum wage," *The Quarterly Journal of Economics*, 2022, *137* (1), 267–328.

Fearon, James D., *Electoral Accountability and the Control of Politicians: Selecting Good Types versus Sanctioning Poor Performance* Cambridge Studies in the Theory of Democracy, Cambridge University Press,

Gagliarducci, Stefano, M Daniele Paserman, and Eleonora Patacchini, "Hurricanes, climate change policies and electoral accountability," Technical Report, National Bureau of Economic Research 2019.

Garg, Teevrat, Maulik Jagnani, and Hemant K. Pullabhotla, "Rural Roads, Farm Labor Exits, and Crop Fires," *American Economic Journal: Economic Policy*, 2023.

González, Juan Pablo and Hye Young You, "Money and cooperative federalism: evidence from EPA civil litigation," *The Journal of Law, Economics, and Organization*, 2024, p. ewae018.

Grossman, Guy, Audrey Sacks, and Alice Xu, "The Politics of Climate Change in the Developing World," *Annual Review of Political Science*, 2026.

Grover, Dheeraj, Paramjit Kaur, and Harkesh Raj Sharma, "Crop residue burning in Punjab, India: Causes and remedy," *Environmental Science and Pollution Research*, 2015, *22*, 8342–8350. Also cited in later crop burning literature as Grover et al. 2017.

Gulzar, Saad, Apoorva Lal, and Benjamin Pasquale, "Representation and forest conservation: Evidence from India's scheduled areas," *American Political Science Review*, 2024, *118* (2), 764–783.

Harding, Robin, Mounu Prem, Nelson A Ruiz, and David L Vargas, "Buying a blind eye: Campaign donations, regulatory enforcement, and deforestation," *American Political Science Review*, 2024, *118* (2), 635–653.

Heo, Seonmin Will, Koichiro Ito, and Rao Kotamarthi, "International spillover effects of air pollution: evidence from mortality and health data," Technical Report, National Bureau of Economic Research 2023.

Hersbach, H., B. Bell, P. Berrisford, G. Biavati, A. Horányi, J. Muñoz Sabater, J. Nicolas, C. Peubey, R. Radu, I. Rozum, D. Schepers, A. Simmons, C. Soci, D. Dee, and J.-N. Thépaut, "ERA5 monthly averaged data on pressure levels from 1940 to present," 2023. Accessed 2025-10-14.

Hsiao, Allan and Nicholas Kuipers, "Climate crisis and policy inaction in Indonesia," *American Journal of Political Science*, 2025.

III, James E Monogan, David M Konisky, and Neal D Woods, "Gone with the wind: Federalism and the strategic location of air polluters," *American Journal of Political Science*, 2017, *61* (2), 257–270.

Jack, B Kelsey, Seema Jayachandran, Namrata Kala, and Rohini Pande, "Money (not) to burn: payments for ecosystem services to reduce crop residue burning," *American Economic Review: Insights*, 2025, *7* (1), 39–55.

Jaganathan, Suganthi, Massimo Stafoggia, Ajit Rajiva, Siddhartha Mandal, Shweta Dixit, Jeroen de Bont, Gregory A Wellenius, Kevin J Lane, Amruta Nori-Sarma, Itai Kloog, Dorairaj Prabhakaran, Poornima Prabhakaran, Joel Schwartz, and Petter Ljungman, "Estimating the effect of annual PM2.5 exposure on mortality in India: A difference-in-differences approach," *The Lancet Planetary Health*, 2024, *8* (12), e987–e996.

Jagnani, Maulik and Meera Mahadevan, "Women leaders improve environmental outcomes: Evidence from crop fires in India," *Journal of Public Economics*, 2025, *248*, 105443.

Jitendra, Shreeshan Venkatesh, Ishan Kukreti, Kundan Pandey, Deepanwita Gita Niyogi, and Polash Mukerjee, "India's burning issue of crop burning takes a new turn," 2017.

Kahn, Matthew E, Pei Li, and Daxuan Zhao, "Water pollution progress at borders: the role of changes in China's political promotion incentives," *American Economic Journal: Economic Policy*, 2015, *7* (4), 223–42.

Kumar, Parveen, Suresh Kumar, and Laxmi Joshi, "Crop residue management challenges under rice–wheat cropping system for food and environmental security," 2015.

Kumar, Vijay, Hanuman S Jat, Parbodh C Sharma, Mahesh K Gathala, Ram K Malik, Brar R Kamboj, Ashok K Yadav, Jagdish K Ladha, Anandhi Raman, Dharminder K Sharma, and Andrew McDonald, "Emerging Issues and Potential Opportunities in the Rice–Wheat Cropping System of North-Western India," *Frontiers in Plant Science*, 2022, *13*, 832683.

Lan, Ruoyu, Sebastian D Eastham, Tianjia Liu, Leslie K Norford, and Steven RH Barrett, "Air quality impacts of crop residue burning in India and mitigation alternatives," *Nature communications*, 2022, *13* (1), 6537.

Lee, Haillie N. and Erik Voeten, "Transboundary Air Pollution and Hazy Accountability: Evidence from South Korea and China," June 8 2023. Available at SSRN: `https://ssrn.com/abstract=4473693`.

Lelieveld, Jos, John S Evans, Mohammed Fnais, Despina Giannadaki, and Andrea Pozzer, "The contribution of outdoor air pollution sources to premature mortality on a global scale," *Nature*, 2015, *525* (7569), 367–371.

Lipscomb, Molly and Ahmed Mushfiq Mobarak, "Decentralization and pollution spillovers: evidence from the re-drawing of county borders in Brazil," *The Review of Economic Studies*, 2016, *84* (1), 464–502.

List, John A and Daniel M Sturm, "How elections matter: Theory and evidence from environmental policy," *The Quarterly Journal of Economics*, 2006, *121* (4), 1249–1281.

Mangonnet, Jorge, Jacob Kopas, and Johannes Urpelainen, "Playing politics with environmental protection: the political economy of designating protected areas," *The Journal of Politics*, 2022, *84* (3), 1453–1468.

Maue, Casey Campbell, *Climate, Agriculture, and Economic Development: Theories and Methods for Agricultural Productivity Analysis*, Stanford University, 2021.

Mavisakalyan, Astghik and Yashar Tarverdi, "Gender and climate change: Do female parliamentarians make difference?," *European Journal of Political Economy*, 2019, *56*, 151–164.

McAlexander, Richard J and Johannes Urpelainen, "Elections and policy responsiveness: evidence from environmental voting in the US congress," *Review of Policy Research*, 2020, *37* (1), 39–63.

Myllyvirta, Lauri, "Quantifying the economic costs of air pollution from fossil fuels," *Centre for Research on Energy and Clean Air*, 2020.

NASA and NOAA, "Visible Infrared Imaging Radiometer Suite (VIIRS) Instrument Overview," 2025. Suomi NPP and NOAA-20/JPSS platforms; Accessed 2025-10-14.

Nixon, Rob, *Slow Violence and the Environmentalism of the Poor*, Cambridge, MA: Harvard University Press, 2013.

Pandey, Anamika, Michael Brauer, Maureen L Cropper, Kalpana Balakrishnan, Prashant Mathur, Sagnik Dey, Burak Turkgulu, G Anil Kumar, Mukesh

Khare, Gufran Beig et al., "Health and economic impact of air pollution in the states of India: The Global Burden of Disease Study 2019," *The Lancet Planetary Health*, 2021, *5* (1), e25–e38.

Pullabhotla, Hemant K, Mustafa Zahid, Sam Heft-Neal, Vaibhav Rathi, and Marshall Burke, "Global biomass fires and infant mortality," *Proceedings of the National Academy of Sciences*, 2023, *120* (23), e2218210120.

Rambachan, Ashesh and Jonathan Roth, "A more credible approach to parallel trends," *Review of Economic Studies*, 2023, *90* (5), 2555–2591.

Sahai, S, Chandra Sharma, D P Singh, C K Dixit, N Singh, P Sharma, K Singh, S Bhatt, S Ghude, V Gupta et al., "A study for development of emission factors for trace gases and carbonaceous particulate species from in situ burning of wheat straw and rice straw/paddy residue in India," *Atmospheric Environment*, 2011, *45* (28), 5913–5923.

Sanford, Luke, "Democratization, elections, and public goods: the evidence from deforestation," *American Journal of Political Science*, 2023, *67* (3), 748–763.

Schiavina, Marcello, Michele Melchiorri, and Martino Pesaresi, "GHS-SMOD R2023A — GHS Settlement Layers, Application of the Degree of Urbanisation Methodology (Stage I) to GHS-POP R2023A and GHS-BUILT-S R2023A, Multitemporal (1975–2030)," 2026. Dataset.

Shen, Shiran Victoria, *The political regulation wave: a case of how local incentives systematically shape air quality in China*, Cambridge University Press, 2022.

Shyamsundar, Priya, NP Springer, Heather Tallis, Stephen Polasky, Mangi Lal Jat, Harminder S Sidhu, PP Krishnapriya, Natalya Skiba, William Ginn, Vikram Ahuja et al., "Fields on fire: Alternatives to crop residue burning in India," *Science*, 2019, *365* (6453), 536–538.

Sidhu, H S, Manpreet Singh, Elizabeth Humphreys, Yadvinder Singh, Balwinder Singh, S S Dhillon, J Blackwell, V Bector, M Singh, and Sarabjeet Singh, "The Happy Seeder enables direct drilling of wheat into rice stubble," in "Advances in Agronomy," Vol. 131, Elsevier, 2015, pp. 1–54.

Sigman, Hilary, "International spillovers and water quality in rivers: do countries free ride?," *American Economic Review*, 2002, *92* (4), 1152–1159.

Singh, Ramesh P and Dimitris G Kaskaoutis, "Crop residue burning: a threat to South Asian air quality," *Eos, Transactions American Geophysical Union*, 2014, *95* (37), 333–334.

Singh, Shikhar and Tariq Thachil, "Why Citizens Don't Hold Politicians Accountable for Air Pollution," 2023. Working Paper, OSF Preprints.

Singh, Siddharth, *The Great Smog of India*, Penguin Random House India Private Limited, 2018.

Stokes, Leah Cardamore, *Short circuiting policy: Interest groups and the battle over clean energy and climate policy in the American States*, Oxford University Press, 2020.

Tripathi, Ashutosh, Ashok K Mishra, and Gopal Verma, "Impact of Preservation of Subsoil Water Act on groundwater depletion: Evidence from Punjab, India," in "Proceedings of the International Society for Ecological Economics" 2016.

World Bank, "Cleaning India's Air: Costs and Benefits of Reducing Air Pollution," Technical Report, World Bank Group, Washington, DC 2014.

Xu, Alice Z, "Bureaucratic Packing in the Brazilian Amazon: How Political Competition Drives Deforestation," *The Journal of Politics*, 2025, *87* (4), 1350–1364.

Supplementary Information

A Data Construction

A.1 Personal Interest

We scraped Myneta webpage to collect politicians' characteristics, including their asset declarations and their descriptions. The dataset also lists each politician's profession as well as the profession of the spouse.

To identify agricultural ties, we employed a large language model (GPT). A temperature of 0 is used for inference, as this reduces variance in the generation and helps reduce hallucinations. We supplied each profession description to the model and recorded whether it described agricultural work; if so, the politician was classified as having an agricultural profession. Formally, a politician is coded as being an agriculturalist if the profession description refers to a profession related to agricultural (for the politician).

We construct these indicators for every winning candidate and use them as treatment variables in the subsequent empirical analysis.

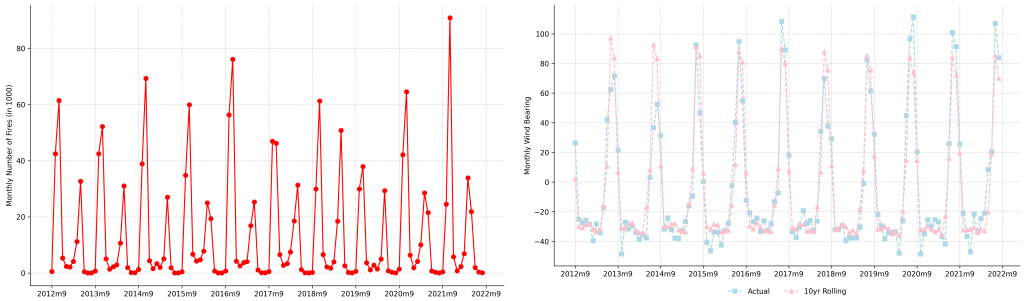
B Politicians' Incentives to Control Fires

B.1 Empirical Strategy: Event-Study

We follow the approach by Dustmann et al. (2022), which applies a neutral transformation to the . Specifically, we account for the possibility that treated and control units' outcomes may have evolved along different paths in the pre-treatment period. First, we fit a linear time trend using our estimated coefficients from the pre-treatment period, anchored at zero in the omitted category, and then we extrapolate this trend into the post-treatment period. By plotting the deviations of our estimated coefficients from these predicted trends, we can assess whether deviations from the linear trends after treatment implementation are large enough to explain away the treatment effects we observe, i.e. whether the breaks in outcome trends are substantial for the estimated treatment effect on fires to be reduced to zero.

B.2 Descriptives

Figure B.1: Patterns of Seasonality in Fires Data



Notes: (Left) Total number of fires per month. (Right) District-average actual and 10 year rolling average wind direction. All data refer to our sample of states in the period September 2012 - August 2022.

Figure B.2: Rice Areas in Northern Indian Subcontinent

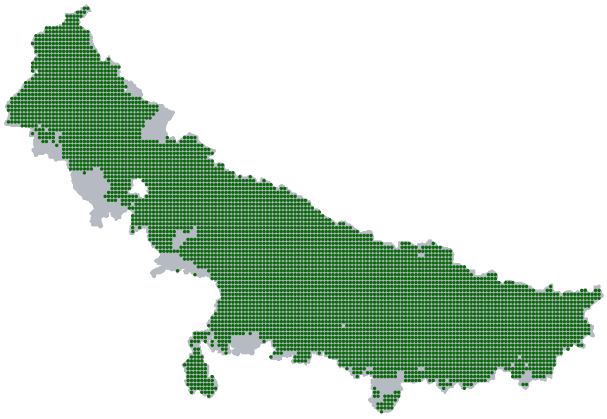


Figure B.3: Number of observations per relative time period from treatment

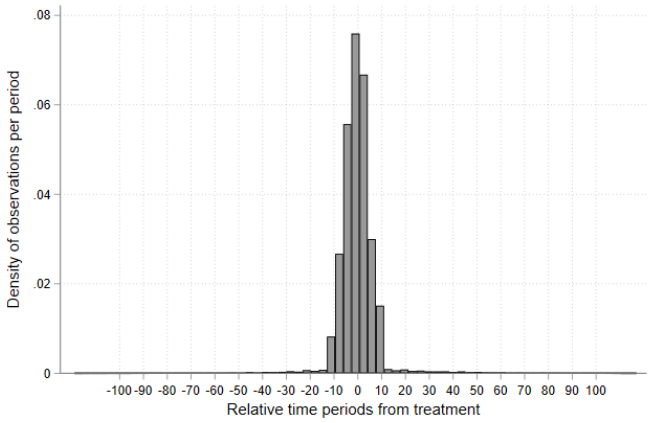
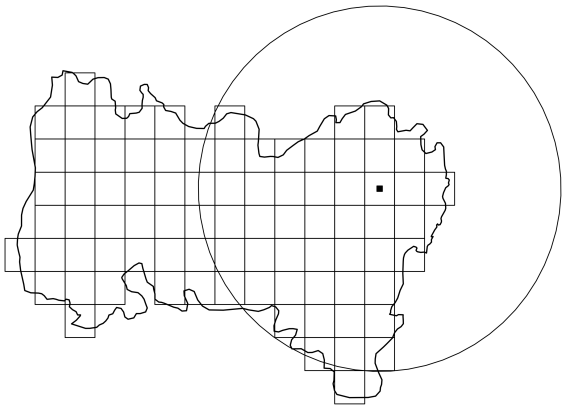


Figure B.4: Placebo border (circle) against the true constituency border for one grid



B.3 Robustness

Table B.1: Effect of constituency exposure to smoke on number of fires, robustness by treatment indicator

	(1)	(2)	(3)	(4)	(5)
	Number of Fires (in 1,000 units)				
Down>Up	-7.3384***				
	(1.2283)				
Down>Up Population		-6.7703***			
		(1.1609)			
Down>Up by 1std			-8.8782***		
			(2.2769)		
Downwind over total area				-0.1671***	
				(0.0251)	
Down-Up Percent					-0.0836***
					(0.0126)
Observations	11,583,240	11,583,360	11,583,360	11,583,360	11,583,360
Assembly	827	827	827	827	827
Grid FE	Y	Y	Y	Y	Y
Assembly × Month-Year FE	Y	Y	Y	Y	Y
Mean DV	160.3	152.2	168.2	140.9	140.9

Notes: Results from Equation 1 considering different treatment indicators: a dummy for whether the downwind area is larger than the upwind area (as in the main specification) in Column 1; a dummy for whether the downwind population, rather than the area, is larger than the upwind population in Column 2 ; the a dummy for whether the downwind area is larger than the upwind area by one standard deviation or more in column 3; the share of downwind over total area in Column 4; the percentage difference between down and upwind area in Column 5. The dependent variable is the number of fires in a 5 squared km grid-cell and month. The table reports the mean of the dependent variable when grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Table B.2: Effect of constituency exposure to smoke on number of fires, robustness by dependent variable

	(1) Any Fire	(2) Log (N) Fires	(3) Mean Brightness
Down > Up	-0.0020***	-0.0027***	-0.6602***
	(0.0002)	(0.0003)	(0.0784)
Observations	11,583,360	11,583,360	11,583,360
Assembly	827	827	827
Grid FE	Y	Y	Y
Assembly × Month-Year FE	Y	Y	Y
Mean DV	0.0509	0.0615	17.02

Notes: Results from Equation 1 using alternative dependent variables: a dummy for whether any fire took place (Column 1), the natural logarithm of the number of fires plus 1 (Column 2) and the average brightness of fires in a grid-month – brightness is equal to zero when there are no fires (Column 3). The table reports the mean of the dependent variable when ever treated grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Table B.3: Effect of constituency exposure to smoke on number of fires, robustness by year

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Number of Fires (in 1,000 units)									
	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Down>Up	-6.921**	-10.498***	-7.550**	-6.789**	-10.412***	-8.763***	-9.993***	-5.117**	-5.246	-2.118
	(3.339)	(3.205)	(3.563)	(3.459)	(3.915)	(3.288)	(3.185)	(2.225)	(3.236)	(3.443)
Observations	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336	1,158,336
N Assembly Constituencies	827	827	827	827	827	827	827	827	827	827
Grid FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Assembly x Month-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mean DV	159.34	149.72	154.41	155.81	187.58	157.51	171.76	111.60	171.49	183.78

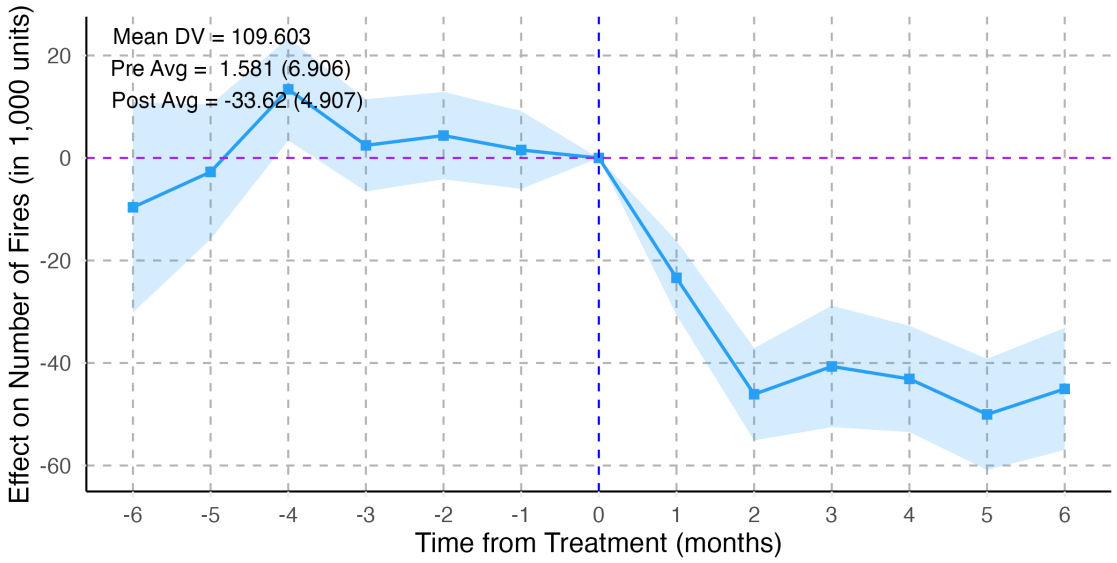
Notes: Results from Equation 1 subsetting by year, from each September to the following August. The table reports the mean of the dependent variable in each year when ever treated grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Table B.4: Effect of constituency exposure to smoke on N Fires, robustness by province

	(1)	(2)	(3)	(4)
	Number of Fires (x 1,000 units)			
	Bihar	Haryana	Punjab	Uttar Pradesh
Down>Up	0.587	-18.249***	-22.745***	-3.020***
	(1.228)	(5.336)	(5.265)	(0.851)
Observations	2,423,160	1,232,280	1,404,000	6,523,920
N Assembly Constituencies	240	88	110	389
Grid FE	Y	Y	Y	Y
Assembly × Month-Year FE	Y	Y	Y	Y
Mean DV	32.899	176.426	758.630	48.055

Notes: Results from Equation 1 subsetting by province. The table report the mean of the dependent variable in each province when ever treated grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Figure B.5: Effect of constituency exposure to smoke on number of Fires, by constituency agricultural characteristics



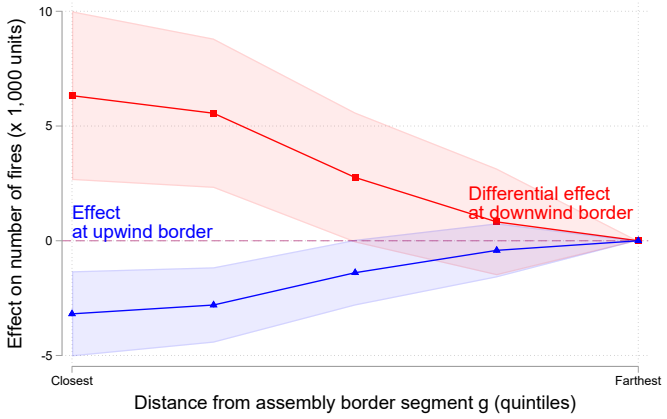
Notes: Results as in Figure 3b with additional interactions by constituency agricultural characteristics. The figure plots the interaction term between treatment and an indicator for constituencies with above-median rice production, after de-trending for the pre-treatment period linear trend following Dustmann et al. (2022). The reference category is t=0, i.e. the month of the switch. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Table B.5: Effect of exposing the population in a placebo area to smoke on number of fires

	(1)	(2)	(3)
	Number of Fires (in 1,000 units)		
	Full Sample	Treated for Politicians	Control for Politicians
Down>Up (Placebo)	1.958***	-0.7228	2.860***
	(0.7432)	(0.9856)	(0.9670)
Observations	12,030,480	6,041,523	5,988,957
N Assembly Constituencies	853	853	853
Grid FE	Y	Y	Y
Assembly × Month-Year FE	Y	Y	Y
Mean DV	140.7	148.4	133.9

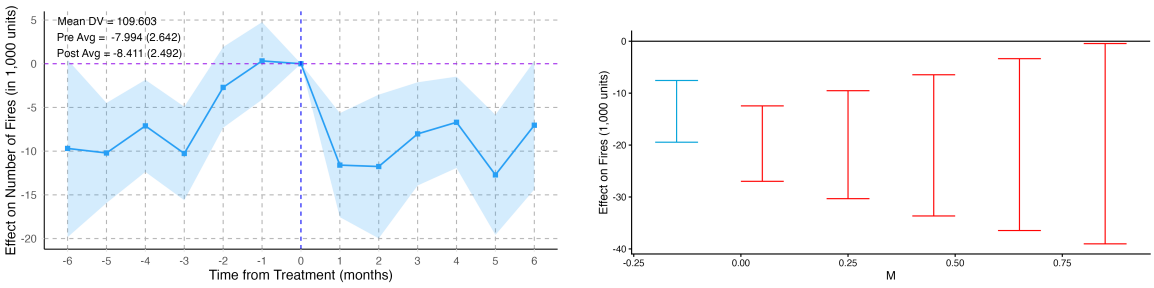
Notes: Results from Equation 1 considering a different treatment indicator: a dummy equal to one in months and grids from which the population downwind is larger than the population upwind in a 13km radius circle around each grid (median size of an assembly constituency). Column 1 considers the entire sample; Column 2 restricts to areas that are treated both for the farmer and the politician, i.e. downwind both in the placebo area and in the constituency; Column 3 restricts to areas that are treated for the farmer only, i.e. downwind in the placebo area but upwind in the constituency. The table reports the mean of the dependent variable when treated grids are upwind. All regressions control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Figure B.6: Effect of distance to the upwind (in blue) and downwind (in red) border on number fires



Notes: (Blue) Effect of being close to an upwind border with another constituency, where smoke would affect the home assembly constituency. (Red) Differential effect (from the upwind border) of being close to a downwind border, where smoke would travel to the neighboring jurisdiction. All effects are plotted by quintiles of distance to the border, and the 5th quintile, the farthest, is used as omitted category. The regression includes grid and border × month-year fixed effects and control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Figure B.7: Effect by relative time period from exposure



(a) Event-Study (b) Honest DiD

Notes: (a) Results from Equation 2. (b) Sensitivity analysis for the average post-treatment effect allowing for violations of parallel trends (Rambachan and Roth, 2023). The reference category is $t = 0$,i.e. the month of the switch. All regressions include grid and assembly constituency $\times$ month-year fixed effects and control for average wind speed and direction. Standard errors are clustered at the grid and assembly constituency $\times$ month-year level.

C Lobbying

C.1 Empirical Strategy

Figure C.1: Number of Protest Over Time

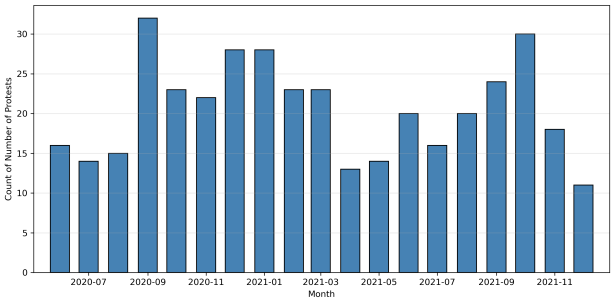
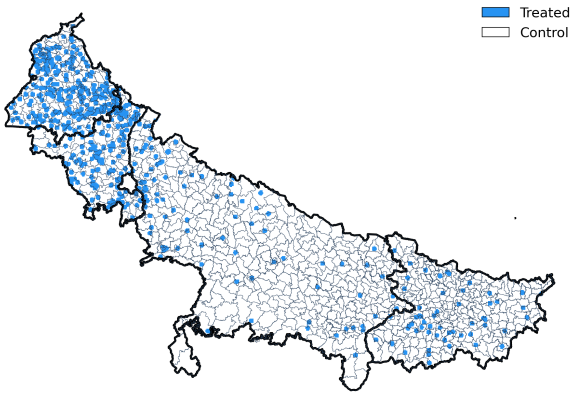
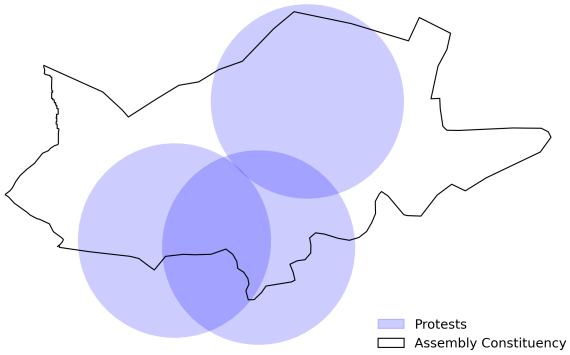


Figure C.2: Protest occurrence by location



Notes: The map shows treated (blue) and control (white) grid-cells. A grid-cell is coded as treated if it falls within 5km-radius buffer areas around protest locations. Treatment begins in the month-year of the first protest within each buffer area. Control grid-cells are located outside all buffer areas.

Figure C.3: Protest Buffer Area against Assembly Constituency border



Notes: The map plots the borders of Jind Assembly constituency (black line). Three protests occurred in this constituency during the sample period. Around each protest location, we construct 5km-radius buffer areas (blue shaded). We classify grid-cells falling within these buffer areas as treated, regardless of whether they fall inside or outside the assembly constituency boundaries. Grid-cells located in overlapping buffer areas (darker shaded) are assigned to the buffer associated with the earliest protest.

C.2 Robustness

Table C.1: Effect of Protests occurrence on number of Fires, simple DiD

	(1)	(2)	(3)
	Number of Fires (in 1,000 units)		
Post × Protest	14.524**	65.803***	46.320***
	(7.389)	(10.066)	(9.747)
Observations	184,558,651	184,558,651	184,558,651
Assembly	827	827	827
Grid FE	Y	Y	Y
Time FE	Y	Y	Y
Election FE	N	Y	Y
Province Trend FE	N	N	Y
Mean DV	382.643	382.643	382.643

Notes: Results from a simple Difference-in-Differences of the effect of protests occurrence on the number of fires. *Protest* is a dummy equal to one if a grid-cell falls within a 5km radius buffer around a protest location, and zero otherwise. *Post* is a dummy equal to one from the month-year when the first protest occurs within the buffer area until the end of the sample, and zero otherwise. The table reports the mean of the dependent variable in grids that never experiences a protest and in grids that experienced protest before protest occurrence. All regressions control for average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level.

C.3 Additional Results

Table C.2: Effect of Protest Occurrence on number of fires, by constituency exposure to smoke

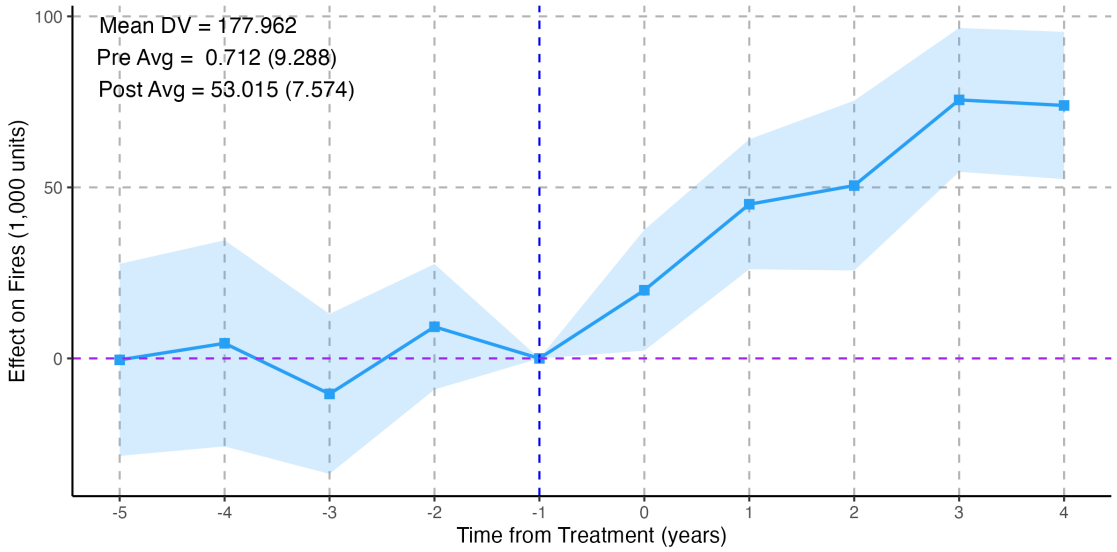
	(1)	(2)	(3)	(4)	(5)	(6)
	Number of Fires (in 1,000 units)					
Post × Protest	14.524**	65.803***	46.320***	16.737*	68.904***	49.524***
	(7.389)	(10.066)	(9.747)	(9.596)	(11.875)	(11.560)
Down > Up				-9.586**	-9.642**	-9.641**
				(3.777)	(3.751)	(3.751)
Post × Down > Up				5.080**	5.129**	5.186**
				(2.303)	(2.317)	(2.296)
Protest × Down > Up				19.032	19.003	18.954
				(23.927)	(23.717)	(23.673)
Post × Protest × Down > Up				-4.424	-6.145	-6.353
				(11.334)	(11.421)	(11.331)
Observations	184,558,651	184,558,651	184,558,651	184,558,651	184,558,651	184,558,651
N Assembly Constituencies	827	827	827	827	827	827
Grid FE	Y	Y	Y	Y	Y	Y
Relative Time FE	Y	Y	Y	Y	Y	Y
Election FE	N	Y	Y	N	Y	Y
Province Trend FE	N	N	Y	N	N	Y
Mean DV	382.643	382.643	382.643	382.643	382.643	382.643
Mean DV2 (Down>Up=1)				380.411	380.411	380.411

Notes: (Columns 1-3) Results from Equation 3 of the effect of protest occurence on fires. (Columns 4-6) Results from Equation 3 with the additional interaction for pollution visibility. $Down > Up$ is a dummy equal to one in months and grids from which most of the assembly constituency area is exposed to smoke (see Section 3.2 for details). The table reports the mean of the dependent variable in control grids before the cohort event-time. All regressions control for average wind speed and direction. Standard errors are clustered at the buffer area × assembly constituency level.

D Adverse Selection

D.1 Additional Results

Figure D.1: Effect of switching to an agriculturalist politician, by constituency agricultural characteristics



Notes: Results from Equation 4 with an additional interaction for the constituency agricultural characteristics. The dummy *Above Median Rice Production* takes value 1 for constituencies with above median rice production. All regressions include grid-cohort, month-year and government term-year fixed effects and control for province linear time trends, average wind speed and direction. Standard errors are clustered at the grid and assembly constituency × month-year level.

Table D.1: Effect of switching to an agriculturalist politician, by constituency exposure to smoke

	(1)	(2)	(3)	(4)	(5)	(6)
	Number of Fires (in 1,000 units)					
Post × Agriculturalist	25.880***	5.578**	6.498***	26.875***	6.515**	7.318***
	(3.177)	(2.466)	(2.444)	(3.413)	(2.782)	(2.783)
Down > Up				-11.950***	-12.055***	-15.758***
				(1.787)	(1.781)	(1.835)
Post × Down > Up				2.815	3.047*	2.789
				(1.759)	(1.757)	(1.782)
Agriculturalist × Down > Up				8.955***	8.835***	10.790***
				(2.793)	(2.788)	(2.828)
Post × Agriculturalist × Down > Up				-1.981	-1.865	-1.628
				(2.692)	(2.686)	(2.712)
Observations	28,263,234	28,263,234	28,263,234	28,263,234	28,263,234	28,263,234
N Assembly Constituencies	676	676	676	676	676	676
Grid FE	Y	Y	Y	Y	Y	Y
Relative Time FE	Y	Y	Y	Y	Y	Y
Electoral Cycle FE	N	Y	Y	N	Y	Y
Province Linear Time Trend FE	N	N	Y	N	N	Y
Mean DV	106.194	106.194	106.194	106.194	106.194	106.194
Mean DV (Down > Up=1)	106.194	106.194	106.194	106.458	106.458	106.458

Notes: (Columns 1-3) Results from Equation 4 of the effect of switching to electing a politician with agricultural ties on fires. (Columns 4-6) Results from Equation 4 with the additional interaction for constituency exposure to smoke. $Down > Up$ is a dummy equal to one in months and grids from which most of the assembly constituency area is exposed to smoke (see Section 3.2 for details). The table reports the mean of the dependent variable in control grids before the cohort event-time. All regressions control for average wind speed and direction. Standard errors are clustered at the assembly constituency × election year level.