Toxic Winds: Mainstream Inertia, Voters' Discontent, and Challenger Success*

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Abstract

This paper investigates how voters react to persistent inaction by mainstream parties in government. We study the illegal burial, dumping, and burning of toxic industrial waste perpetrated by criminal organizations in Southern Italy since the late 1980s. We combine plausibly exogenous geographical variation in pollution exposure from historical wind trajectories with the sudden release of georeferenced information on contaminated sites. Difference-in-differences estimates show that downwind municipalities experience a persistent decline in national-election turnout of roughly 2 percentage points. Using individual-level microdata, we show that pollution exposure reduces perceived local quality of life and trust in national institutions. Finally, exposure to toxic winds increases the vote share of the challenger Five Star Movement (FSM) in national elections, which campaigned against mainstream parties' inaction on the issue. We find no evidence that downwind municipalities receive greater parliamentary attention, intergovernmental transfers from the national government, or EU cohesion funds.

Keywords: Electoral accountability; Organized Crime; Turnout; Challenger parties.
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1 Introduction

Most available evidence on electoral accountability and reactions to shocks comes from settings in which voters receive information about government performance in a timely manner (Ferraz and Finan, 2011; Snyder Jr and Strömberg, 2010) and can turn to alternatives that plausibly offer a different policy response (Autor et al., 2020; Colantone and Stanig, 2018; Fetzer, 2019). Far less is understood about settings in which a persistent problem is known to policymakers but not to voters, and successive mainstream parties fail to address it. When inaction persists across successive administrations possibly led by different parties, responsibility becomes diffuse, weakening electoral accountability. These failures may become politically salient only when new information reveals both the severity of the underlying harm and the extent of prior government inertia. In these circumstances, it remains unclear how voters respond once the problem is revealed and whether their behaviour changes if a viable challenger subsequently emerges.

This paper studies voter reactions to long-run inertia by mainstream political parties when a challenger alternative is not feasible and when it becomes suddenly available. We study the hidden burial, dumping, and open-air burning of illegal toxic waste carried out by criminal organizations in Southern Italy since the late 1980s. Although national authorities had been aware of the large-scale hazard since at least the early 1990s, inaction persisted across multiple governments led by parties across the political spectrum. The exact location of contaminated sites remained largely unkown to residents of affected communities until more than a decade later, when environmental, economic, and health risks had already materialized. Among municipalities close to contaminated sites, we compare those more and less exposed to pollution due to plausibly exogenous historical wind trajectories, before and after the public release of the spatial distribution of illegal pollution sites. Since the health consequences were already widespread in downwind municipalities, the disclosure was more salient to their residents, revealing that the government had neither officially recognized nor addressed the issue for years.

We leverage the direction of wind patterns (Borgschulte et al., 2024; Deryugina et al., 2019; Graff Zivin et al., 2023; Qiu et al., 2024) historically connecting 1,851 contaminated sites to the surrounding municipalities to induce plausibly random variation in exposure to pollutants. To support the identifying assumption, we show that wind exposure is uncorrelated with standard measures of organized-crime activity, including mafia-related homicides, confiscated assets, distance from mafia headquarters, and municipal-council dissolutions for mafia infiltration. We also show that the treatment variable is orthogonal to meteorological, economic, political and demographic variables.

Elections are a key tool to ensure that politicians deliver what is best for voters (Barro, 1973; Besley, 2006; Ferejohn, 1986) during their time in office. Over multiple terms, voters learn about various politicians. When information about a persistent, unaddressed shock

is suddenly realized, voters update their beliefs about the performance of the incumbent government and all their predecessors. Compared to the benchmark case in which the challenger is random, accountability can be severely weakened: if the challenger has proven analogous inability to address the shock, the voter is no longer able to replace the underperforming incumbent when the next election comes. That is, the voters' benefit of participating in elections drops as well as trust in political parties. Our difference-in-differences estimates strongly support this hypothesis: we find a sharp, immediate, and persistent reduction in voter turnout of 2 percentage points in municipalities exposed to toxic winds stemming from illegal disposal sites relative to equally proximate non-exposed municipalities, upon the public geolocation release. We also find that exposure to toxic waste reduces trust in national political institutions (the lower chamber, the upper house, the prime minister, and the president of the republic). This decline does not extend to institutions that we would not expect to be affected, including the police, the armed forces, the judiciary and education systems, the Catholic Church, labor unions, industry confederations, banks, the stock market, and not-for-profit organizations.

When a new challenger party enters the political arena, the accountability function of elections is restored since voters may replace traditional parties with the latest comer. On the one hand, voters cannot evaluate the challenger based on past performance (as in common accountability settings). On the other hand, the challenger may strategically take advantage of predecessors' failure. In turn, the accountability function of elections is restored since voters may replace traditional parties with the latest comer. We exploit the entry in national politics of the Five Star Movement (FSM), which decided to put emphasis at the national level on environmental issues leveraging this very shock. Right after entering the national parliament, FSM organized a widespread grassroots campaign across the affected localities. Their campaign labeled the territory the *Terra dei Fuochi* (Land of Fires) after the predominance of open-air burnings of toxic waste.[1] *Terra dei Fuochi* has since become the main way to refer to this environmental disaster in the public debate and in official government reports. Relying on the plausible exogeneity of wind patterns, we show that exposure to pollutants caused an increase in the national vote share of FSM as well as the probability that FSM participates in local elections. We also find that FSM support is stronger in municipalities with more vulnerable household and labor-market conditions.

A fundamental premise of the theoretical arguments summarized so far is that parties that alternate in power over time failed to address the shock. We document that despite repeated turnover in national governments, no systematic response to the crisis was implemented. To date, only a small fraction of the contaminated sites has undergone

[1]The term was first proposed by a pro-environment NGO ten years before and utilized later in Roberto Saviano's bestseller *Gomorrah*. Still, we find no evidence that this label was popular among the public or the media before the FSM used it to brand their grassroots campaign in 2013.

environmental assessment, and illegal waste fires continue to occur in the region.[2] To document mainstream inertia, we use the universe of parliamentary speeches in the Italian lower chamber (Cova, 2025) and data on intergovernmental transfers from the national government to local communities. We find no evidence that municipalities exposed to toxic waste because of wind patterns received more attention in the Chamber of Deputies or were assigned more financial resources than less exposed municipalities.

Our paper contributes to the literature on retrospective voting and electoral accountability, which studies how elections enable voters to discipline politicians and select representatives based on observed performance. In canonical models, voters use retrospective evaluations to decide whether to retain or replace incumbents, creating incentives for politicians to act in voters' interests (Barro, 1973; Besley, 2006; Ferejohn, 1986). A large empirical literature confirms that voters respond to performance signals and newly available information when making electoral choices. For example, randomized disclosure of corruption reduces incumbent reelection rates (Ferraz and Finan, 2011), improved access to political information strengthens electoral discipline (Snyder Jr and Strömberg, 2010), and adverse economic shocks reduce support for incumbents and increase support for challengers (Autor et al., 2020; Colantone and Stanig, 2018; Fetzer, 2019). Similarly, environmental shocks and exposure to environmental risks have been shown to influence political behaviour and electoral outcomes (Cremaschi et al., 2025; Hazlett and Mildenberger, 2020; Hoffmann et al., 2022; Mehic, 2023). These findings implicitly rely on two key conditions: that voters observe relevant performance information in a timely manner, and that electoral alternatives are perceived as capable of delivering different outcomes. Indeed, several contributions highlight that electoral responses are mediated by incumbent reactions: when governments or representatives credibly mitigate, compensate, or legislatively respond to the shock, exposed voters are less likely to abandon mainstream parties, whereas limited or ineffective responses amplify electoral punishment and the appeal of challengers (Bordignon et al., 2024; Cipullo and Lee, 2025; Guiso et al., 2019). We study a setting in which both conditions are violated. The underlying shock persists for decades but remains largely hidden from voters, and its public disclosure reveals prolonged inaction by successive governments from different parties. As a result, voters update their beliefs not only about the incumbent, but about the effectiveness of electoral replacement itself. This logic builds on theoretical models that allow voters to use past performance of party members to form expectations about the behaviour of future candidates from the same party (Harrington Jr, 1992; Snyder Jr and Ting, 2002). Our findings show that when newly revealed information implicates multiple mainstream parties, retrospective voting may lead to political disengagement rather than electoral turnover, weakening the accountability function of elections. In this regard, our findings complement Bechtel and

[2]European courts have repeatedly sanctioned the Italian government for failures in waste management and environmental protection, further documenting the persistence of institutional inaction.

Hainmueller (2011), who show that electoral benefits enjoyed by effective incumbents are persistent across multiple terms, while we find that the disengagement induced by lack of prompt response is also persistent over time.

Our paper also contributes to the literature on political participation and voter turnout. A large body of research shows that turnout responds to socioeconomic characteristics, political mobilization, and economic conditions, with disadvantaged individuals and communities typically exhibiting lower levels of electoral participation (Kasara and Suryanarayan, 2015; Lijphart, 1997; Schaub, 2021). Another strand shows that shocks and policy interventions can affect turnout by altering voters' incentives to participate and their engagement with the political process (Campante et al., 2018; Hirvonen et al., 2025; Schafer et al., 2022). We propose a complementary mechanism: turnout declines when newly revealed information leads voters to infer that electoral replacement is unlikely to improve outcomes. This mechanism is particularly relevant in our setting, which consists of economically and socially marginalized communities that have experienced prolonged exposure to environmental harm without effective government intervention. In these communities, the public disclosure of prolonged inaction by successive governments leads to a sharp decline in voter turnout and trust in political institutions, consistent with voters disengaging when elections are no longer perceived as an effective tool for accountability.

Our paper also speaks to the literature on challenger parties. A growing body of work shows that economic shocks, institutional failures, and declining trust in mainstream parties can increase support for anti-establishment and populist movements (Algan et al., 2017; Colantone and Stanig, 2018; Funke et al., 2016; Guiso et al., 2019). A key mechanism discussed in recent theoretical work is that challenger parties can act as issue entrepreneurs, strategically politicizing problems that mainstream parties have persistently failed to address (De Vries and Hobolt, 2020). We provide causal evidence consistent with this mechanism. First, toxic winds increase the probability that the FSM runs at local elections by 11.4 percentage points. Second, the FSM benefits from its strategic entry into national politics and its decision to actively campaign on environmental issues. Its vote share in national elections is 2.7 percentage points higher in treated municipalities. This pattern suggests that challenger entry can restore electoral accountability by offering voters an alternative when mainstream parties are collectively associated with prolonged inaction. Our findings highlight how the availability of new political alternatives plays a central role in sustaining electoral accountability and preventing persistent political disengagement.

Finally, we contribute to the literature on the electoral consequences of organized crime. Criminal organizations shape political representation and competition (Acemoglu et al., 2020; Daniele and Geys, 2015) by exchanging electoral support for economic advantages (Accardo et al., 2023; Feo and Luca, 2017) or using violence (Alesina et al., 2019).

They also redirect public spending towards sectors that serve their business interests (Di Cataldo and Mastrorocco, 2022). The adverse effects of criminal activities extend to economic growth (Fenizia and Saggio, 2024; Pinotti, 2015), firm performance (Calamunci and Drago, 2020; Mirenda et al., 2022; Slutzky and Zeume, 2024) and creation (Le Moglie and Sorrenti, 2022), the allocation of public spending (Acconcia et al., 2014) as well as educational outcomes (Sviatschi, 2022). We show how the disclosure of illegal disposal and burning of hazardous waste over three decades by criminal activity undermines electoral participation and trust in national political institutions, while increasing the support for a challenger campaigning against mainstream parties' inaction.

The paper is organized as follows. The next two sections present the institutional background and the data. Section 4 discusses the empirical strategy. Section 5 documents mainstream inertia, while Section 6 presents the main results. Sections 7 and 8 examine potential mechanisms and robustness checks, respectively. Section 9 concludes by discussing the broader implications for electoral accountability and political realignment.

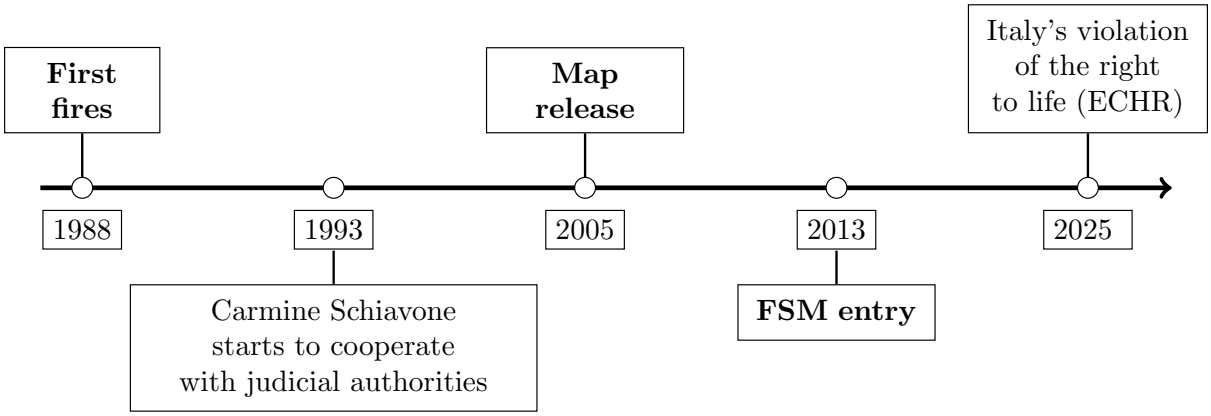
2 Background

The *Terra dei Fuochi*[3] (Land of Fires) is a densely populated area of Campania, north of Naples, where criminal organizations have disposed of, buried, and burned hazardous waste for several decades. The illicit business expanded from the late 1980s onward and became closely associated with the *Casalesi* clan, which exercised territorial control in several municipalities across the provinces of Naples and Caserta.

Illegal waste disposal and health risks. Illegal disposal provides a low-cost alternative to regulated waste management and generates rents on both sides of the market: firms minimize waste disposal costs, while criminal groups use intimidation to operate disposal sites without interference. Firms, mainly from the North, reduce disposal costs by circumventing regulation on waste treatment, safe transportation, traceability, and environmental compliance, while criminal organizations extract economic rents through territorial control and intimidation, exploiting weak state enforcement capacity. Disposal locations are therefore selected to minimize detection and enforcement risk rather than to satisfy environmental or technological constraints. Waste is buried in agricultural land, along roads, near construction sites, as well as in dismissed quarries and other locations where monitoring is limited. It is also frequently burned in the open air, either to destroy

[3]The label *Terra dei Fuochi* first appeared in a 2003 report by an environmental non-profit organization. Nowadays, this name is used to denote the area also in official government reports. The Italian Government recognizes 90 municipalities as being a part of the *Terra dei Fuochi* due to the intensity of contaminated sites in their territory.

Figure 1: Timing (1988–2025)



Notes: This timeline traces the Campania waste emergency over time. According to the repentant mafioso Carmine Schiavone, who started to cooperate with the Italian government and helped to discover many of the hidden disposal sites, the *Camorra* started this activity in 1988. The clan selected dumping sites primarily in areas it controlled or could easily influence, especially agricultural land where waste could be buried without attracting suspicion. The criminal organization relied on local intermediaries and compliant or intimidated landowners to secure access and ensure secrecy. Locations were selected to allow easy transport, concealment underground, and minimal risk of inspection or discovery. In 2005, the Regional Agency for the Protection of the Environment of Campania (ARPAC) released the first official map of contaminated sites. Local communities learnt about years of government inaction, the exact locations of contaminated areas, and whether they were exposed to pollution from these sites. In 2013, the FSM ran in national elections for the first time. In 2025, the European Court of Human Rights ruled that Italy had violated the right to life of residents exposed to toxic dumping (see Elisabetta Povoledo, "Court Ruling Gives Hope for Cleanup in Italy's Land of Fires", *The New York Times*, February 10, 2025, p. A4).

materials directly or to reduce volume prior to burial. These practices generate two distinct exposure channels. Burial contaminates soil and groundwater near disposal sites, while open-air burning releases airborne pollutants that can travel beyond the immediate location of the fire. Epidemiological research has long associated dioxins and heavy metals with severe long-run health risks. These contaminants are highly persistent: they accumulate in soil, groundwater, and the human body, and exposure has been linked to cancers that may emerge only after long latency periods (Bertazzi et al., 2001; Praud et al., 2025). In 2001, the National Institute of Health (ISS) reported a correlation between childhood mortality and proximity to dumping sites in the province of Caserta. Senior and Mazza (2004) later documented higher malignant cancer mortality rates and a greater prevalence of congenital malformations in the "Triangle of Death" around the municipalities of Acerra, Nola, and Marigliano.

Government inaction. Carmine Schiavone, a former leader of the *Casalesi* clan, started to cooperate with judicial authorities and the police in 1993 (Beraldo et al., 2026). His detailed statements are the main source of information about the affected areas, the quantity of illegally buried waste, and the variety of dispersed materials. In a 1997 hearing at the Italian House of Deputies, Mr. Schiavone reported that the clan

had organized illegal waste disposal on a systematic basis since 1988, although some related activities had begun a few years earlier (Italian House of Deputies, 1997). He also declared that his group processed several million tons of waste between 1988 and 1992. Schiavone's statements, including information on the volume of waste handled and the geo-location of disposal sites, were subsequently confirmed by judicial investigations.

In 2005, the Regional Agency for the Protection of the Environment of Campania (ARPAC) released the first official georeferenced information on contaminated sites, allowing voters to assess local exposure and associated health risks that had already materialized (see Figure A1).[4] Until then, rumors and sporadic investigations did not provide a systematic basis for voters to precisely assess local exposure. The information shock has direct implications for residential sorting and policy response. First, before 2005, residents could not systematically sort based on local exposure because the locations of contaminated sites were not publicly known. Second, remediation requires site characterization, legal verification, and coordination across levels of government. This process remains slow even after official recognition: only a small share of contaminated sites has been remediated, while many remain classified as potentially contaminated pending formal verification.[5]

In 2013, the Five Star Movement runs in national elections for the first time.[6] Right after entering the national parliament, it leveraged this very shock organizing grassroots campaign across affected localities and stressing the inaction of successive national governments on both the right and the left.

In 2025, the European Court of Human Rights ruled that Italy had violated the right to life of residents exposed to toxic dumping. Toxic waste is still disposed of and burned in the area. Italian Ministry of Internal Affairs (2023) estimates that around 1,000 illegal fires of waste occurred in 2022, compared to an average of 2,000 fires per year in the previous decade and approximately 4,000 per year until 2013. Figure 1 summarizes the timeline from 1988 to 2025.

Institutional framework. Italy is a parliamentary democracy with a bicameral legislature including the Chamber of Deputies and the Senate (the lower and upper house, respectively). After the collapse of the Christian Democracy (DC) and the dissolution of the Italian Communist Party (PCI) in the early 1990s, Italy experienced repeated alternation between center-right and center-left governments. Center-right governments held office in 2001–06 and 2008–11, while the center-left governed in 2006–08 and 2013–2018.

[4]Figure A3 provides descriptive evidence on the spatial and temporal variation in media coverage.

[5]As of 2023, 86 percent of ongoing cases in the Land of Fires had not yet undergone analytical testing. Among sites with a resolved contamination status by 2022, 69 percent were classified as contaminated or remediated.

[6]The FSM takes its name from the five stars in its logo, which represent five key priorities, including environmental protection.

When the FSM first ran in national elections in 2013, it won 25.6% of the vote in the Chamber of Deputies. This result transformed the Italian electoral competition from a bipolar system into one organized around three main political blocks. Our analysis covers all national elections held between 1972 and 2022.

At the subnational level, Italy is divided into regions (20), provinces (approximately 110, nested within regions), and municipalities (≈ 8,000, nested within provinces). The Campania region is divided into 5 provinces (Naples, Avellino, Benevento, Caserta, and Salerno) and 550 municipalities. Political alternation also occurred at the regional level. In Campania, the center-left governed under Antonio Bassolino in 2000–10, followed by the center-right under Stefano Caldoro in 2010–15 and the center-left under Vincenzo De Luca in 2015–20.

The central government also has the power to take over municipal administrations in cases of Mafia influence. Starting from 1991, a law (D.L. 31/05/1991, n.164) allows for the dissolution of municipal councils when there is clear evidence of Mafia infiltration. This measure empowers the central government to replace the mayor, the executive committee, and the city council with external commissioners who administer the municipality for 24 to 36 months until new elections are held.

Following De Vries and Hobolt (2020), we classify as mainstream political parties those currently in government or with recent governing experience. This group includes both left-wing and right-wing coalitions. On the right, we include *Alleanza Nazionale* ("National Alliance") and *Forza Italia*, founded by Silvio Berlusconi, as well as *Il Popolo della Libertà* ("People of Freedom"), created in 2007 through their merger. We also classify *Fratelli d'Italia* ("Brothers of Italy") as mainstream because it is the direct successor of *Alleanza Nazionale*. By contrast, we exclude the League, which is classified as a far-right populist challenger for most of our sample period (De Vries and Hobolt, 2020).[7] Following the same framework, we define as challenger parties those that never held national executive office during the period under analysis (i.e. FSM).

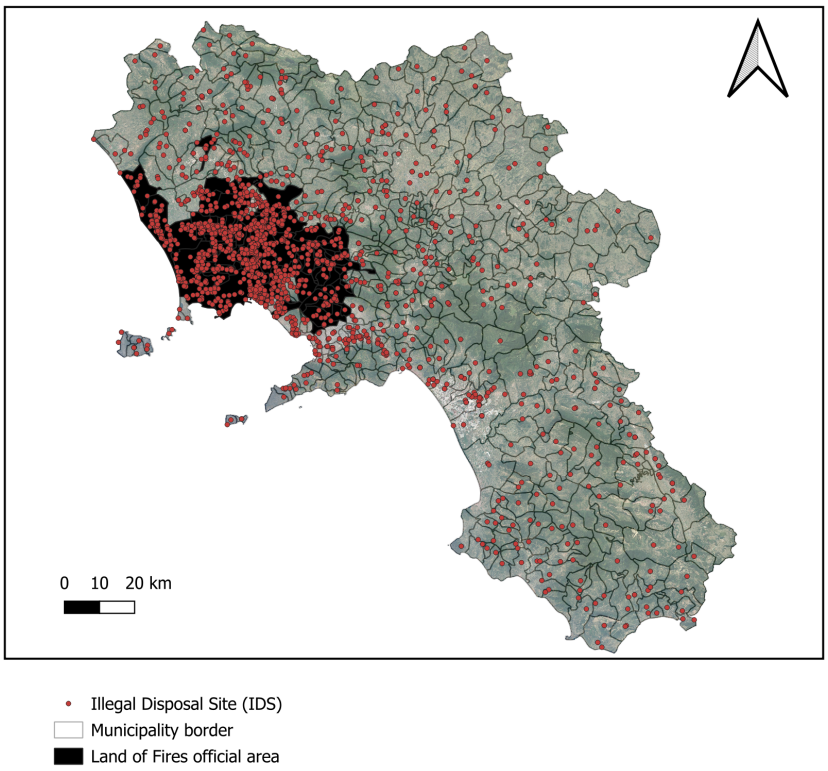
3 Data

Our empirical analysis combines municipality-level data from multiple sources, which we describe below. Descriptive statistics can be found in Tables A1, A2 and A3.

Illegal Disposal Sites (IDS). We use data on IDS from the Regional Agency for the

[7] De Vries and Hobolt (2020) describe the League (formerly the Northern League) as a challenger party that becomes mainstream only in 2018. They note that, during the 2000s, the Northern League served as a minor coalition partner, including the 2001 Berlusconi government alongside *Forza Italia* and *Alleanza Nazionale*. In their framework, a challenger becomes mainstream/dominant once the issues he emphasizes also move to the center of the national political agenda. Since our analysis spans 1996–2022 and the League is classified as a challenger for the large majority of these years, we exclude it from the set of mainstream parties.

Figure 2: Illegal Disposal Sites



Notes: This map plots the 1,851 IDS used in our analysis. The black area marks the perimeter of the "Land of Fires", i.e., the 90 municipalities officially designated by the Italian government in 2013–2015.

Protection of the Environment of Campania (ARPAC). The first official inventory, released in 2005, reports 2,551 georeferenced sites.[8] We use this 2005 cross-section as our baseline exposure measure since its release constitutes the information shock in our analysis. Recorded information includes site typology, pollutant characteristics, a brief description of activities, and exact geographic coordinates. The label "potentially contaminated" reported in the inventory follows the administrative classification used by ARPAC. A site enters the inventory once contamination risk exceeds the threshold that triggers further environmental characterization. It remains classified as "potentially contaminated" until this verification process is completed and remediation can formally begin. In practice, this procedure often lasts several years. The label therefore identifies sites that have crossed the administrative threshold for environmental characterization and potential remediation.[9]

[8]The inventory was updated in 2010, 2013, and yearly from 2016 onward.

[9]A site is classified as potentially contaminated when preliminary investigations identify pollutant concentrations above the relevant legal thresholds. Italian regulation distinguishes between Contamination Threshold Concentrations (CSC) and Risk Threshold Concentrations (CSR). CSC are legal limits for pollutants in soil, subsoil, and groundwater set by the national government. If at least one CSC is exceeded (e.g. PCBs in soil > 5 mg/kg), the location is classified as a Potentially Contaminated Site and undergoes further site characterization. A subsequent health and environmental risk assessment deter-

We restrict the baseline sample to sites plausibly related to the Land of Fires system of illegal waste disposal. Specifically, we exclude sites classified under broad categories likely unrelated to illegal dumping and burning: industrial, commercial, production activity, and other.[10] This restriction removes generic contaminated sites plausibly unrelated to the Land of Fires while preserving the information set available in 2005. The final sample includes 1,851 Illegal Disposal Sites (IDS). Figure 2 shows their geographic distribution. Most IDS are located in municipalities officially recognized by the Italian government as part of the Land of Fires, although some are located elsewhere in the region (see Figure A4).

Weather variables. We obtain daily weather data for the years 2001–2009 from the regional agrometeorological archive of the Campania Department of Agriculture. The dataset covers 47 weather stations located in 45 municipalities. For each station, we observe daily wind direction, wind speed, humidity, and precipitation.

Electoral outcomes. We use administrative data from *Eligendo*, the official election archive of the Italian Ministry of the Interior. For national parliamentary elections, we construct a municipality-level panel covering all general elections from 1972 to 2022. For each municipality–election observation, the data report the number of registered voters, voters who cast a ballot, blank and invalid ballots, and votes received by each party. We use these data to compute turnout and party vote shares. For each election, we focus on the ten most-voted parties. We also use *Eligendo* to collect data on all local elections held in Campania between 2010 and 2024. From these records, we create an indicator equal to one if FSM runs with its own list in a given municipality–election, and zero otherwise.

IPSOS. We use individual-level data from *IPSOS*, a stratified random sample representative of the Italian population. Our sample covers the period 2008–2022.[11] The survey provides information on environmental salience, local quality of life, and trust in national institutions (the lower house, the upper house, the prime minister, and the president of the republic). In particular, respondents are asked which issue they consider to be the most important for the country, with environment and waste among the possible responses. We also use measures of trust in the police, armed forces, judiciary, education system, Catholic Church, labor unions, industry confederations, banks, stock market, and nonprofit organizations as placebo outcomes. Individual characteristics include gender, age, education, employment status, and political attitudes, together with respondents' municipality.

mines site-specific CSR. If these thresholds are exceeded, the site is formally classified as contaminated and remediation is required.

[10] As a robustness check, we replicate the main analysis using the full set of 2,551 sites from the 2005 inventory.

[11] IPSOS is a global market research and public opinion polling firm. The data are proprietary and subject to confidentiality agreements.

Municipal characteristics. We collect municipal-level variables from several sources. We obtain demographic and socio-economic variables from the 2001 population census conducted by ISTAT (Italian National Institute of Statistics), including population density, the shares of residents with tertiary education, employment (including the agriculture and health sectors), large families, daily commuters, and foreign residents, as well as geographic information such as a municipality's surface and altitude. Information on municipal taxable income and the share of low-income taxpayers (with income below €26,000) come from the Ministry of Economy and Finance. We also retrieve from ARPAC an indicator for the presence of groundwater sources in each municipality. We obtain data on confiscated organized-crime assets from the National Agency for the Administration and Destination of Assets Seized and Confiscated from Organized Crime (ANBSC). Data on dissolutions of municipal councils between 1991 and 2022 are from the not-for-profit organization WikiMafia. Finally, data on civilian victims of mafia-related violence over the years 1967–2004 are provided by *Libera*, a civil-society organization that assembles the main national database of innocent victims of organized crime.

4 Empirical strategy

4.1 Exploiting wind trajectories to identify plausibly exogenous variation in exposure to IDS

Dumping locations may reflect geographical characteristics, such as abandoned areas, lakes, or quarries, as well as local organized crime activity, including strategic dumping and corruption. To identify the causal impact of IDS on our outcome of interest, we, therefore, exploit historical wind directions to obtain plausibly exogenous variation in exposure. Conditional on proximity to an IDS, municipalities located downwind are systematically more likely to be exposed to pollutants than municipalities located upwind. Importantly, there is no evidence that wind patterns were considered when selecting the location of new dumping sites.[12] Consistently, Figure A7 provides descriptive evidence against strategic placement of IDS based on historical wind directions. The figure compares total IDS density with upwind IDS density (sites whose historical wind trajectories carry pollutants towards the municipality's demographic centroid). We report these measures for the regional average, the set of municipalities under *Casalesi* control, and the two historical *Casalesi* strongholds of Casal di Principe and San Cipriano d'Aversa. Although overall IDS density is considerably higher in municipalities under *Casalesi* control, the share of upwind IDS remains close to 50 percent (roughly half: 47 percent in

[12]Parliamentary auditions of Carmine Schiavone and his subsequent public statements suggest that sites were chosen according to proximity to highways, distance from urban centers, and availability of flat land, rather than prevailing winds.

the *Casalesi* area versus 54 percent regionally). The fact that IDS are uniformly spread also around the Casalesi's strongholds suggests that dumping locations had been unlikely chosen based on historical wind patterns.

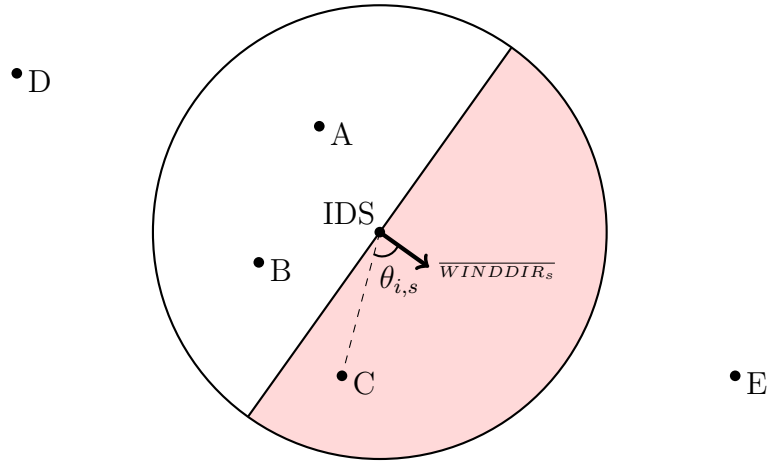
Therefore, our empirical analysis compares municipalities with the same number of nearby IDS but with different exposure to pollutants only due to historical wind patterns.

One may worry that voters do not have precise information about the exact geolocation of contaminated sites surrounding their municipalities even after the publication of the list of IDS. Indeed, it is unlikely that many voters personally access the official list of IDS, where this information is available. More plausibly, voters become aware of nearby IDS through mass media, which for simplicity may report noisy or imprecise information about the exact geolocation. If voters lack precise information about the geolocation of contaminated sites, or if they are unable to reconstruct prevailing wind patterns in their town, how may we expect a political reaction that develops following wind trajectories? As documented by Cipullo et al. (2026), by the time in which the list of contaminated sites was published, cancer mortality was already significantly higher in downwind municipalities than in upwind municipalities. Because cancer death due to dioxin exposure usually occurs at the end of a long disease, we expect that also other health consequences of exposure to pollutants (such as the incidence of sick individuals) were disproportionately more common in downwind municipalities. Therefore, when geolocation of polluted sites was revealed, this information become more salient among individuals living in downwind municipalities.

Because information on wind direction at the exact time of each fire around an IDS is not available, we use long-run daily data on wind direction and speed to approximate historical atmospheric dispersion patterns around each IDS. If winds predominantly blow in a given direction, pollutants that are released when waste is burned are likely to be transported along that direction. For each of the 1,851 IDS, we first retrieve historical wind trajectories by relying on daily records from the network of 47 meteorological stations in the region (see Figure B2). For each disposal site s, meteorological station j and day τ, we retain station-day observations only when the wind observed at j blows in the direction of s. Then, for each (s, τ) we identify the five nearest retained stations and combine their wind directions using normalized inverse-distance weights, giving higher weight to closer stations. Stations that are either too far away – i.e., not among the five nearest neighbors – or experience wind direction that cannot predict wind direction at station s on day τ, are discarded. This yields an estimated daily wind direction at each IDS_s, which we finally average over the entire period of analysis (2001-2009) to retrieve a historical mean wind direction for each IDS_s. Appendix B describes the procedure in detail.

Then, for each IDS, we identify municipalities within a fixed distance and classify them as downwind or upwind based on the angle between the vector connecting the site

Figure 3: Example of municipality's wind exposure to IDS



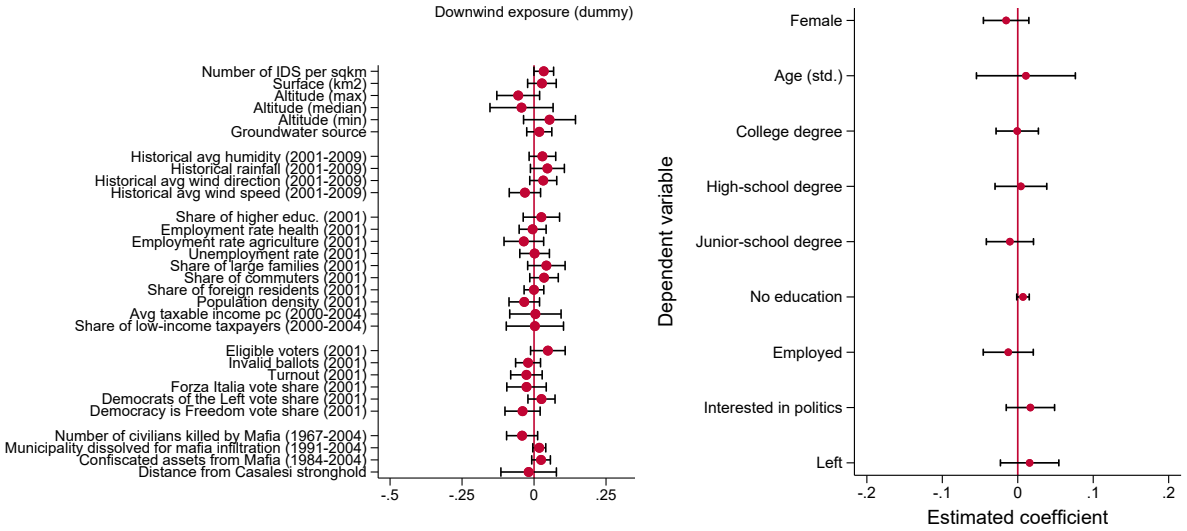
Notes: This figure illustrates how each municipality's demographic centroid is classified as downwind relative to the Illegal Disposal Site (IDS), following Cipullo et al. (2026) and Qiu et al. (2024). This occurs when the angle ($\theta_{i,s}$) between the connection vector (dashed line from the IDS to the demographic centroid) and the historical average wind direction calculated at the IDS ($\overline{WINDDIR_s}$) falls within the range $[0°, 90°]$. In the figure, municipality C is classified as downwind while municipalities A and B are upwind. The acceptable region for downwind classification (shaded area) is defined by the half-space defined by a line orthogonal to the wind direction and passing through the IDS. Of the municipalities that lie near the IDS, this classification allows us to isolate the subset of IDS that are likely to transmit pollutants towards the municipality's population. Municipalities D and E fall outside the 3-kilometer buffer and therefore belong to the control group.

to the municipality and the prevailing wind direction originating from the site.[13] Figure 3 provides a representation of our approach considering a site and three municipalities (A, B, and C) that lie inside the fixed-distance radius. In the example, wind blows from North-West to South-East (solid arrow line centered on IDS). That is, municipalities A and B should not be exposed through wind to the pollutants stemming from the IDS. Municipality C, instead, lies inside the half-space defined by the line orthogonal to the wind direction and passing through the IDS. Therefore, it is plausible that pollutants originating from the IDS will reach municipality C. Municipalities D and E fall outside the 3-kilometer buffer and therefore belong to the control group. Figure A8 displays all spatial buffers used to identify treated units.

To capture population exposure to pollutants, municipalities are geo-located using their urban center (points A, B, C, D and E in Figure 3) rather than the geometric center. To this end, we geo-locate each municipality by computing a demographic centroid based on the population distribution across census blocks. Appendix C provides details on this procedure.

[13] In our main analysis, we use a 3-kilometer radius, consistent with the epidemiological literature on residential exposure to dioxin emissions from combustion sources (Chen et al., 2025; Praud et al., 2025; Rhee et al., 2023; VoPham et al., 2020).

Figure 4: Balance tests (downwind exposure)



(a) Municipal-level variables **(b)** Individual characteristics

Notes: Figure 4a shows WLS estimates of the variable $DownWind_i$ on a wide set of control variables, together with 95% confidence intervals. All covariates have been standardized to have mean zero and unit standard deviation. This specification controls for province and year fixed effects. Standard errors are robust to heteroskedasticity. Figure 4b reports the coefficient on DownWind from separate OLS regressions using different individual characteristics as dependent variables. All specifications include the same set of controls as in Equation 2. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

4.2 Evidence on the plausible exogeneity of wind exposure

Figure 4a examines whether downwind exposure is orthogonal to predetermined municipal characteristics. We estimate a weighted least squares regression in which we control for province fixed effects and a wide set of controls. Covariates are balanced across treated and control municipalities, including geographic characteristics, historical weather, socioeconomic variables, and baseline electoral outcomes. Reassuringly, $DownWind_i$ is orthogonal to proxies for organized-crime presence, such as mafia-related homicides, confiscated assets, distance from mafia headquarters, and municipal-council dissolutions for mafia infiltration. Figure 4b provides complementary evidence using individual-level microdata. Observable respondent characteristics are also balanced across downwind and upwind municipalities. Taken together, these results reduce concerns that cross sectional estimates can be driven by pre-existing municipal characteristics or systematic differences in population composition rather than downwind exposure.

4.3 Specifications

Differences in timing across our two main outcomes shape the empirical strategy. For voter turnout, we observe municipality-level outcomes both before and after the 2005

information shock. This allows us to implement a difference-in-differences design comparing turnout dynamics in downwind and upwind municipalities before and after the disclosure. Studying challenger performance requires a different approach. FSM first contested a national election in 2013, eight years after the information shock. We therefore never observe its vote share before 2005 and cannot estimate an event study or test pre-treatment trends for this outcome. Identification instead relies on cross-municipality variation in downwind exposure after FSM entry. We compare FSM vote shares in downwind and upwind municipalities, conditional on IDS density, province fixed effects, and a rich set of predetermined characteristics.

First, we estimate the following Difference-in-Differences (DiD) model:

$$\begin{aligned} y_{i,t} = \beta DownWind_i \times Post2005_t + \gamma IDS_i^{sqkm} \times Post2005_t \\ + \boldsymbol{X_{i,k-1}} \times \sum_{k \in \tau} \psi_k \times \mathbf{1}(k = t) + \eta_i + \delta_t + \xi_{p(i),t} + \varepsilon_{i,t} \end{aligned} \tag{1a}$$

where $y_{i,t}$ denotes the dependent variable used in our analysis (i.e., share of parliamentary mentions, ratio of current transfers received from the central and regional governments to total municipal revenues, EU cohesion funds per capita, or voter turnout); t denotes the years in which our outcome is observed (1996–2022 for the share of parliamentary mentions, 1998–2022 for the ratio of current transfers to total municipal revenues, 2001–2022 for EU cohesion funds, 1972–2022 for turnout). We define the treatment variable $DownWind_i$ as a dummy that takes value one if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. The post-treatment period is identified by the indicator variable $Post2005_t$, which equals one for all years (share of parliamentary mentions, ratio of current transfers to total municipal revenues, EU cohesion funds per capita) or election years (voter turnout) after the 2005 information shock, and zero otherwise. $DownWind_i$ is interacted with $Post2005$ to quantify the average effect over the full period after the 2005 information shock. We also control for municipality fixed effects (η_i), which account for all time-invariant municipal characteristics, year fixed effects (λ_t), which account for all time-varying shocks common to all municipalities of the Campania region, and province-by-year fixed effects ($\xi_{p(i),t}$), which absorb shocks common to municipalities within the same province in a given year. To distinguish proximity to contaminated sites from actual exposure to pollutants, we also consider IDS density (IDS_i^{sqkm}), which is the total number of IDS per square kilometer within whose 3 km buffer each municipality i falls (see Figure A8). IDS density captures the local concentration of illegal disposal activity, regardless of historical wind direction. This measure is potentially endogenous because dumping locations may reflect local geography and organized-crime activity. By contrast, $DownWind_i$ distin-

guishes municipalities that are similarly close to contaminated sites but differ in whether prevailing winds carry pollutants toward their population.

$\boldsymbol{X_{i,t-1}}$ is a vector of predetermined controls fully interacted with year dummies, including municipality surface, historical average weather variables at the municipality level (rainfall, humidity, wind speed and wind direction), and geographical characteristics (maximum altitude) and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). $\varepsilon_{i,t}$ is the error term, robust to heteroskedasticity and clustering at the municipality level. The model is weighted by the number of eligible voters in each municipality in 2001. Since our object of interest is the effect of treatment exposure on individuals rather than on the average municipality, these weights more closely approximate the corresponding individual-level estimand. Appendix D formalizes this distinction. In order to test the parallel trends assumption, we interact $DownWind_i$ with year indicators:

$$\begin{aligned} y_{i,t} = DownWind_i \times \sum_{k \in \tau} \beta_k \times \mathbf{1}(k = t) + IDS_i^{sqkm} \times \sum_{k \in \tau} \gamma_k \times \mathbf{1}(k = t) \\ + \boldsymbol{X_{i,k-1}} \times \sum_{k \in \tau} \psi_k \times \mathbf{1}(k = t) + \eta_i + \delta_t + \xi_{p(i),t} + \varepsilon_{i,t} \end{aligned} \tag{1b}$$

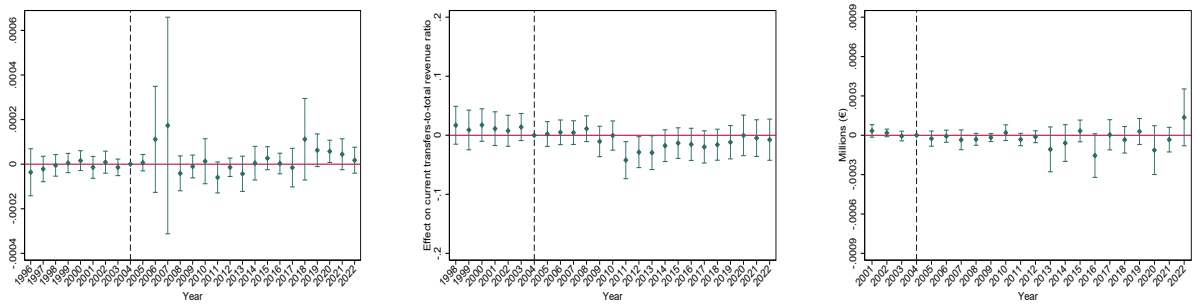
where τ is the set of years in which each outcome is observable (1996–2022 for the share of parliamentary mentions; 1998–2022 for the ratio of current transfers to total municipal revenues; 2001–2022 for EU cohesion funds; 1972–2022 for turnout). The coefficients of interest are β_k. As for the previous equation, η_i, δ_t, and $\xi_{p(i),t}$ denote municipal, year and province-by-year fixed effects, respectively. The coefficient on the latest observed year prior to 2005 is omitted from the estimations where the outcome variables refer to mainstream inertia (i.e., share of parliamentary mentions, ratio of current transfers to total municipal revenues, and EU cohesion funds per capita).

In the second part of our empirical analysis, we focus on the electoral performance of the challenger FSM, which entered into the national party system in 2013, eight years after the information shock. We estimate the following weighted least squares (WLS) specification, using the number of eligible voters as regression weights:

$$VoteShare_{i,t}^{p} = \beta DownWind_i + \gamma IDS_i^{sqkm} + \sigma \mathbf{X_{i,t-1}} + \xi_{pr} + \delta_t + \epsilon_{i,t} \tag{2}$$

where $VoteShare_{i,t}^{p}$ is the vote share for party p in municipality i at national election t. Variables $DownWind_i$ and IDS_i^{sqkm} are defined as in Equation 1a. $\boldsymbol{X_{i,t-1}}$ includes the same set of predetermined controls described in Equation 1a. ξ_{pr} is the province fixed

Figure 5: Mainstream inertia (dynamic specifications)



(a) Effect of toxic winds on parliamentary activity

(b) Effect of toxic winds on the current transfer share

(c) Effect of toxic winds on EU cohesion funds per capita

Notes: Panel 5a plots estimates of the interaction between $DownWind_i$ and year indicators (see Equation 1b). Estimates capture the effect of toxic winds on the number of annual mentions of Campania municipalities by deputies from mainstream parties in the Italian Chamber of Deputies, relative to 2004. The model is weighted by the number of eligible voters in each municipality in 2001, with 95% confidence intervals. Standard errors are clustered at the municipality level.
Panel 5b plots estimates of the interaction between $DownWind_i$ and year indicators (see Equation 1b). Estimates capture the effect of toxic winds on the ratio of current transfers received from the central and regional governments to total municipal revenues, relative to 2004. The model is weighted by the number of eligible voters in each municipality in 2001, with 95% confidence intervals. Standard errors are clustered at the municipality level.
Panel 5c plots estimates of the interaction between $DownWind_i$ and year indicators (see Equation 1b). Estimates capture the effect of toxic winds on EU cohesion funds per capita, relative to 2004. The model is weighted by the number of eligible voters in each municipality in 2001, with 95% confidence intervals. Standard errors are clustered at the municipality level.

effect and δ_t is the election year fixed effect. $\varepsilon_{i,t}$ is the error term, robust to heteroskedasticity and clustering at the municipality level. Estimates are weighted by the number of eligible voters in each municipality in 2001.

5 Mainstream inertia

In this section we examine how mainstream political parties responded to wind exposure to toxic pollutants. We find no change in parliamentary attention after the news shock, while financial resources decline in downwind municipalities. To document this inertia, we first use data on parliamentary speeches from the *ItaParlCorpus* dataset (Cova, 2025). We consider all plenary debates held in the Italian Chamber of Deputies from 1996 to 2022. For each intervention, the data report speaker name, party affiliation, legislature, date, a unique speech identifier, and the full transcript.

Thus, we assess mainstream political parties' responses by estimating Equations 1a and 1b, using either $MentionsShare^{D}_{i,t}$, $TransferShare_{i,t}$ or $EUfund^{pc}_{i,t}$ as dependent variable. The former measures, at the municipality–year level, how frequently mainstream political parties mention municipality i in the national parliament during year t. Using the full corpus of lower-house plenary speeches, we classify a speech as mention-

ing municipality i if its transcript contains the municipality name at least once.[14] For each year t, we then divide the number of speeches by mainstream-party deputies mentioning municipality i by the total number of mainstream-party speeches delivered over the corresponding legislature. This variable captures parliamentary attention devoted to municipality i in time t, scaled by overall speaking activity among mainstream parties.

We also draw transfers from the national government to municipalities, covering 1998–2022.[15] Then, we use geo-referenced project-level data on EU cohesion funds from *OpenCoesione* for 2001–2022. *OpenCoesione* is the transparency portal of the Italian Department for Cohesion Policies and the South. Despite being financed through the EU budget, these funds are managed and allocated by national governments. We aggregate projects to the municipality–year level to construct annual measures of cohesion funds received by each municipality. Our analysis focuses on projects explicitly related to health and environment, which include soil protection, waste management, environmental protection, and public health. We assign total public funds to the year in which each project starts.

$TransferShare_{i,t}$ denotes current transfers received from central and regional governments as a share of total municipal revenues.

$EUfund^{pc}_{i,t}$ measures EU cohesion funds per capita in municipality i and year t. For each health- or environment-related project, we assign total public funding to the beneficiary municipality in the year the project starts. We then aggregate funding across projects and divide the resulting municipality-year total by municipal population, using the 2001 and 2011 censuses.

Figure 5 shows no evidence of an increase in parliamentary attention, government transfer, and cohesion funds to downwind municipalities after 2005. Tables A4, A5, and A6 report the corresponding average effects over the post-shock period (2005–2022). The effect on parliamentary attention is not statistically significant, while both the share of current transfers and EU cohesion funding decline after the disclosure. Taken together, these results provide evidence of a decline in financial support to downwind municipalities following the information shock.

[14] For municipalities whose names coincide with common Italian words, we reduce false matches by imposing a locality marker before the name. Following Cipullo et al. (2025), we require each of these municipality names to be preceded by a single space and an Italian preposition commonly used to introduce place names. The prepositions are *a*, *ad*, *da*, *di*, *per*, *presso*, and *verso*.

[15] Records for 1998–2015 are provided by the Italian Ministry of the Interior's Department for Local Finance, while those from 2016 onward come from the Ministry of Economy and Finance's *OpenBDAP* (*Banca Dati delle Amministrazioni Pubbliche*).

Table 1: Effect of wind exposure to IDS on turnout

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0332***	-0.0324***	-0.0259***	-0.0191**
	(0.00953)	(0.00915)	(0.00855)	(0.00780)
Total number of IDS per sqkm × Post	-0.000772	-0.000274	0.000220	0.000740
	(0.000519)	(0.000476)	(0.000457)	(0.000779)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	7614	7614	7614	7614
Dep var mean	0.782	0.782	0.782	0.782
R-squared	0.927	0.933	0.934	0.941

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

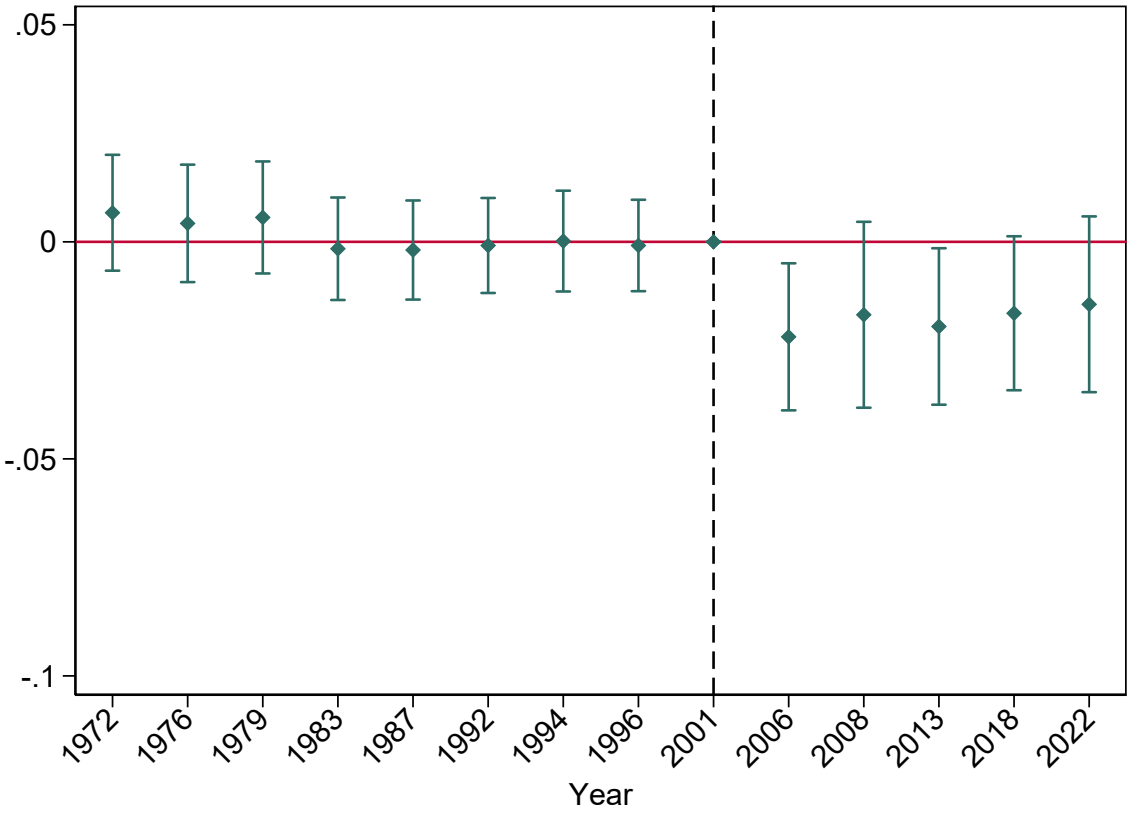
6 Main results

6.1 Voter discontent

In this section, we present our main results on the effect of toxic winds on voters' turnout. For this outcome, we observe every national election from 1972 to 2022. We therefore estimate a two-way fixed-effects (TWFE) model using a municipality-level panel over this period.[16] To ensure that every individual voter is assigned equal weight regardless of the municipality in which they reside, as is customary in the analysis of nationwide elections

[16]The final dataset is harmonized to 1972 municipal boundaries by aggregating later administrative splits back to their 1972 parent municipalities. Since San Marco Evangelista was constituted in 1975 by detaching land from multiple municipalities (Maddaloni and Caserta), our panel includes 543 municipalities up to 1976, and 544 municipalities from 1979 onward.

Figure 6: Effect of wind exposure to IDS on turnout: dynamic specification



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2001 omitted as election year reference. Each point represents the estimated effect of toxic winds on turnout in a given year, relative to 2001. Turnout is defined as the ratio of actual voters to registered electors. This model replicates the main specification reported in Equation 1b. In particular, it includes municipality and election year fixed effects, total number of IDS per square kilometer, as well as covariates interacted with year dummies: municipality surface, province fixed effects, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009), geographical characteristics (maximum altitude), and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). Weights are equal to the number of eligible voters in each municipality in 2001. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

(see, e.g., Autor et al. 2020; Cipullo and Lee 2025), the model is weighted by the number of eligible voters in each municipality in 2001. Table 1 shows that downwind municipalities experience a decline in voters' turnout of roughly 2 percentage points relative to upwind municipalities, once we include the full set of controls from Equation 1a (see column 4).[17]

Figure 6 presents the corresponding event-study estimates from Equation 1b. Pre-shock coefficients are close to zero and show no systematic pattern, providing support for the parallel-trends assumption. After the disclosure, turnout falls sharply in downwind municipalities. The effect reaches about 2 percentage points in 2006 and remains broadly

[17]Turnout is measured as the share of actual voters over registered electors.

Table 2: Effect of wind exposure to IDS on perceived main issue for the country

	(1)	(2)	(3)	(4)
	Environment		Waste	
DownWind	0.0117	0.0128*	0.00918**	0.00954**
	(0.00755)	(0.00763)	(0.00437)	(0.00433)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Socio-demographic controls	✓	✓	✓	✓
Geographical characteristics	✓	✓	✓	✓
Individual characteristics		✓		✓
Observations	12480	12480	12480	12480
Dep var mean	0.0585	0.0585	0.0172	0.0172
R-squared	0.0273	0.0339	0.0242	0.0284
F-stat	14.29	16.75	22.21	28.68

Notes: This table reports OLS estimates of the effect of toxic winds on whether respondents identify the environment or waste as one of the most important national issues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Columns (1)–(2) report estimates for environment and Columns (3)–(4) for waste. Each specification include the full set of controls from Equation 2: total number of IDS per square kilometer, municipality surface, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009), province and year fixed effects, historical average taxable income per capita (2000-2004), population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and maximum altitude. Columns (2) and (4) additionally control for individual characteristics, including gender, age, age squared, education, employment status, and profession. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

stable in subsequent elections.

Table 1 includes both $DownWind_i \times Post2005_t$ and $\gamma IDS_i^{sqkm} \times Post2005_t$. After including the full set of controls, the association between IDS density and turnout becomes close to zero, while the estimated effect of $DownWind_i$ is large and highly significant. This pattern suggests that turnout decline is driven by toxic winds rather than by proximity to contaminated sites alone. It also supports our underlying hypothesis: when information about a persistent, unaddressed shock is suddenly realized, voters update their beliefs about the performance of the incumbent government and all their predecessors. That is, the voters' benefit of participating in elections drops.

Table 3: Effect of wind exposure to IDS on quality of life and institutional trust

	(1)	(2)	(3)	(4)
	Quality of life in your town		Trust in national institutions	
DownWind	-0.0815***	-0.0878***	-0.0267	-0.0322**
	(0.0291)	(0.0289)	(0.0167)	(0.0162)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Socio-demographic controls	✓	✓	✓	✓
Geographical characteristics	✓	✓	✓	✓
Individual characteristics		✓		✓
Observations	12606	12606	44364	44363
Dep var mean	0.486	0.486	0.498	0.498
R-squared	0.0501	0.0630	0.0405	0.0490
F-stat	12.20	18.72	48.53	38.14

Notes: This table reports OLS estimates of the effect of toxic winds on perceived local quality of life and trust in national institutions. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Columns (1)–(2) report estimates for local quality of life and Columns (3)–(4) for institutional trust. Each specification include the full set of controls from Equation 2: total number of IDS per square kilometer, municipality surface, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009), province and year fixed effects, historical average taxable income per capita (2000-2004), population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and maximum altitude. Columns (2) and (4) additionally control for individual characteristics, including gender, age, age squared, education, employment status, and profession. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

6.2 Distrust in institutions

To shed light on the mechanisms behind this sharp decline in turnout, we turn to individual-level survey evidence. We use IPSOS data from 2008–2022, drawn from a stratified survey representative of the Italian population with approximately 1,000 respondents per week.[18] Because respondents are geolocated at the municipality level, we can match each individual to our municipality-level measure of wind exposure. These data allow us to examine whether exposure affects the salience of environmental and waste issues, perceptions of local quality of life and trust in national institutions. Figure A11 provides descriptive evidence on the salience of environmental issues. Respondents

[18]Figure A10 summarizes the availability of IPSOS outcomes and individual characteristics across survey weeks.

living in municipalities with above-median IDS density are more likely to identify both the environment and waste among the most important national issues. This pattern suggests greater environmental salience in municipalities with higher exposure to contaminated sites. Then, we examine whether this descriptive pattern extends to our measure of wind exposure. Table 2 reports estimates from Equation 2 on whether respondents identify the environment or waste as one of the most important national issues.[19] Downwind exposure increases the salience of both issues: respondents living in downwind municipalities are more likely to identify the environment and waste as major national concerns. The effect is particularly large for waste relative to its sample mean. Table A12 reports the corresponding heterogeneity tests.

We then examine whether exposure to toxic winds determines worse perceptions of local quality of life and lower trust in national institutions (the lower chamber, the upper house, the prime minister, and the president of the republic). Table 3 reports estimates for both outcomes. Respondents living in downwind municipalities are less likely to perceive quality of life in their town as better than in the country as a whole. They also report lower trust in national institutions. Both effects remain similar after including individual characteristics.[20] Figure A14 provides a placebo test using trust in the police, armed forces, judiciary, education system, Catholic Church, labor unions, industry confederations, banks, stock market, and not-for-profit organizations. We find no systematic relationship between exposure to toxic winds and these placebo outcomes, suggesting that the trust decline is specific to national political institutions.

Taken together, these findings suggest that exposure to toxic winds is associated not only with greater environmental salience, but also with worse perceptions of local conditions and lower institutional trust.

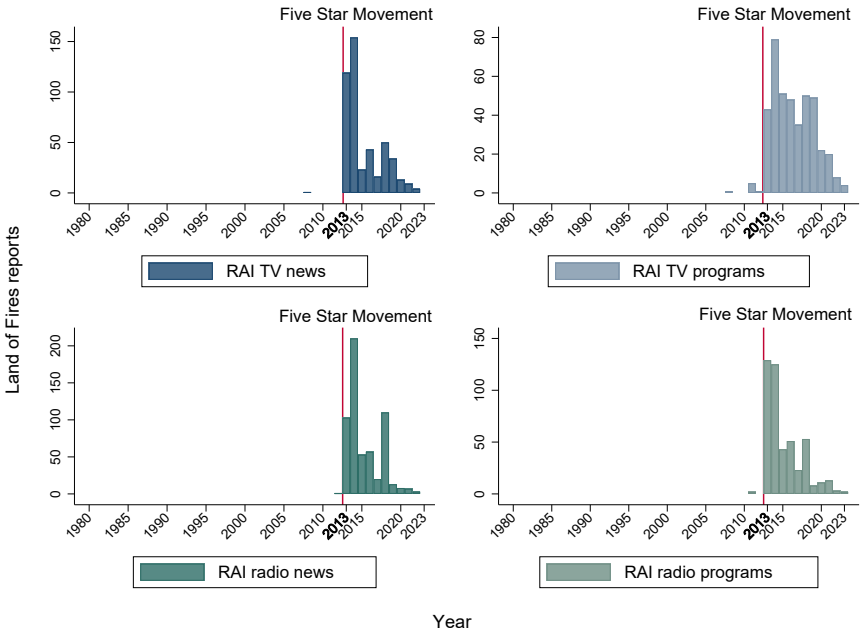
6.3 The Five Star Movement: Environmental challengers in the Land of Fires

In February 2013, the Five Star Movement (FSM) entered national parliament amid an unexpectedly strong electoral result, reshaping the traditional balance between mainstream left- and right-wing parties. FSM is a widely recognized anti-establishment party that emphasized anti-corruption and environmental protection since its inception (see Figures A15 and A16). Indeed, one of the five stars in its name represents environmental protection, a core programmatic pillar of FSM. In summer 2013, FSM launched a broad grassroots campaign across affected municipalities that brought *Terra dei Fuochi* ("Land of Fires") back into the national debate. The campaign renewed attention to widespread

[19] Because the unit of observation is the individual, we estimate the model by OLS rather than weighting municipalities by the number of eligible voters as in the municipality-level specifications.

[20] Figure A13 explores how these effects vary across individual characteristics.

Figure 7: "Land of Fires" media exposure



Notes: The panels show the frequency of reports from 1980 to 2023 featuring the expression "Land of Fires" in national public broadcasting (RAI), across both television and radio, for news and programs. In each panel, a sharp increase is observed in 2013, coinciding with the entry of the FSM into the national political arena. Radio broadcasts are included since RAI transmits parliamentary sessions, making radio data a useful proxy for parliamentary discussions. Data are sourced from RAI teche archives.

open-air burning of toxic waste and to information disclosed in 2005. Later that year, FSM raised the issue in Parliament and introduced a motion to declassify and release the full transcripts of Carmine Schiavone's parliamentary hearings. Parliamentary speeches show a similar pattern: mentions of "Land of Fires" are concentrated after the February 2013 election and are most frequent among FSM deputies (see Figure A17). This renewed attention is also visible in media coverage: Figure 7 documents a sharp increase in the mentions of "Land of Fires" on RAI, Italy's national public broadcaster, beginning in 2013, in both television and radio and across news and other programming.

We first examine the relationship between FSM support and IDS density descriptively. Figure A6 compares the spatial distribution of FSM support in national elections (2013, 2018, and 2022) with IDS density. Figure A6a maps the average FSM vote share across the three elections of interest, while Figure A6b reports the number of IDS per square kilometer. Darker shades indicate higher values in both panels. Municipalities with higher IDS density largely overlap with stronger FSM support. Both are concentrated in northwestern Campania, suggesting a strong positive association between proximity to contaminated sites and support for the Five Star Movement.

We estimate Equation 2 to assess whether exposure to toxic winds increases support for the Five Star Movement. Table 4 reports WLS estimates with progressively richer controls. Results remain stable and show that FSM electoral support is higher in down-

Table 4: Effect of wind exposure to IDS on the challenger FSM (all years)

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0371***	0.0371***	0.0311***	0.0268***
	(0.00689)	(0.00690)	(0.00658)	(0.00642)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1632	1632	1632	1632
Dep var mean	0.370	0.370	0.370	0.370
R-squared	0.151	0.798	0.818	0.822
F-stat	52.25	451.9	302.8	284.8

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

wind municipalities. After including the full set of controls, FSM vote share is about 2.7 percentage points higher in downwind than in upwind municipalities within the same year and province, conditional on IDS density, municipality surface, historical average weather, socio-demographic characteristics (including the number of civilians killed by organized crime), and maximum altitude (see Column 4).

Table A7 reports election-specific effects of toxic winds on party vote shares after FSM entered national politics.[21] We find a small electoral gain for FSM in the February 2013 election, which is consistent with the timing of its *Terra dei Fuochi* campaign, launched only in summer 2013. In later elections, exposure to toxic winds is associated with a higher FSM support, by about 2.5 percentage points in 2018 and about 4.4 percentage

[21] Party-specific coefficients need not sum to zero within each election because the analysis is restricted to the ten most voted parties. Vote shares of the remaining parties are therefore not considered.

points in 2022 relative to upwind municipalities.

Mainstream parties generally lose support in downwind municipalities after FSM's summer 2013 campaign. *Forza Italia* shows a positive coefficients in 2013 and losses in the subsequent election. The estimated coefficient for the League and the Democratic Party remains negative and statistically significant across each election. Brothers of Italy also does not exhibit electoral gains. Far-left/green lists show no statistically significant response to toxic winds.

7 Mechanisms

7.1 Channels of turnout decline

In this section we investigate whether turnout drops more in municipalities where health risks, environmental exposure channels, and socioeconomic vulnerability are more salient. We estimate the main difference-in-differences specification separately for municipality samples split by predetermined characteristics. For continuous variables, we split municipalities at the median. For indicator variables, such as municipal dissolution for mafia infiltration, we compare municipalities with and without the relevant characteristic.

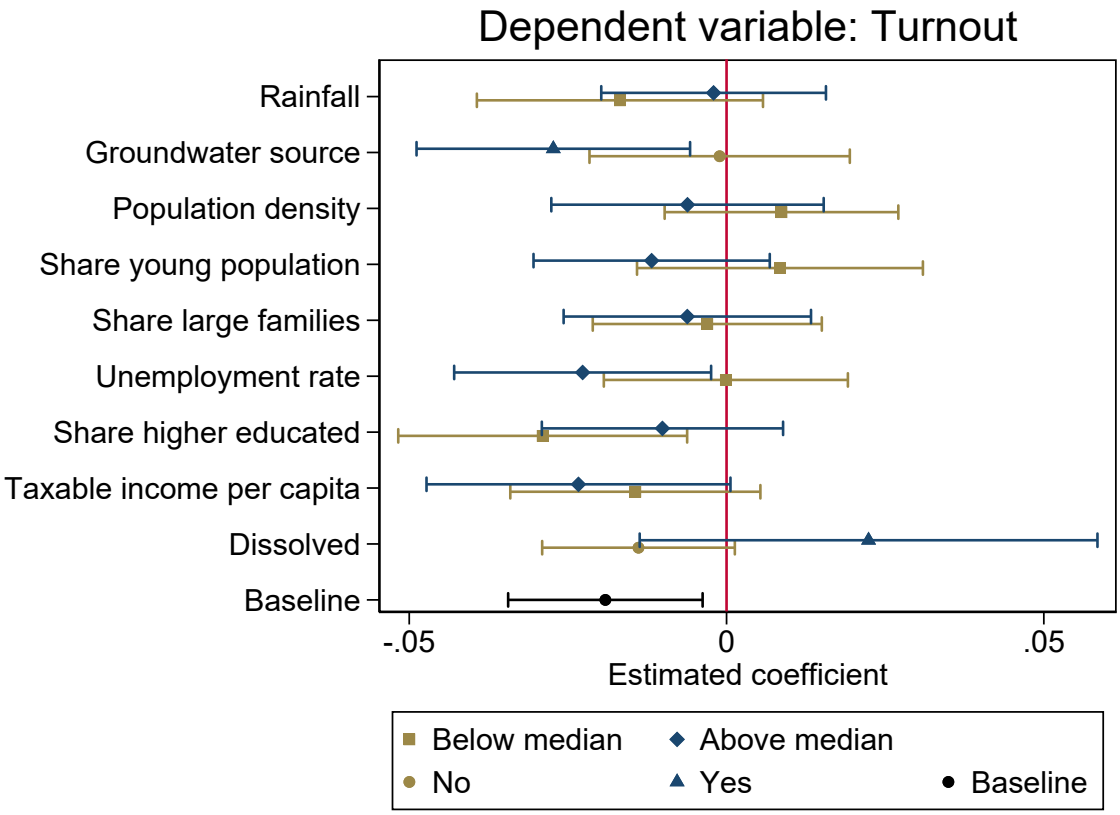
Figure 8 reports the heterogeneous effects. First, we consider environmental conditions. Rainfall may affect both open-air burning and the persistence of airborne pollutants. Turnout declines more in municipalities with below-median rainfall, where conditions are more favorable to burning and atmospheric removal of airborne pollutants is weaker. This pattern suggests bigger effects where exposure to toxic winds is likely to be more severe.

Groundwater sources capture a distinct exposure channel related to waste burial. The indicator equals one if a municipality has at least one groundwater source. We find that turnout falls more sharply in municipalities with groundwater sources. Because illegal disposal also occurs through burial, this heterogeneity analysis captures the potential role of groundwater as an additional exposure channel.

Socioeconomic conditions also shape electoral participation. Turnout falls more in municipalities with above-median unemployment, consistent with larger effects in more economically vulnerable areas.

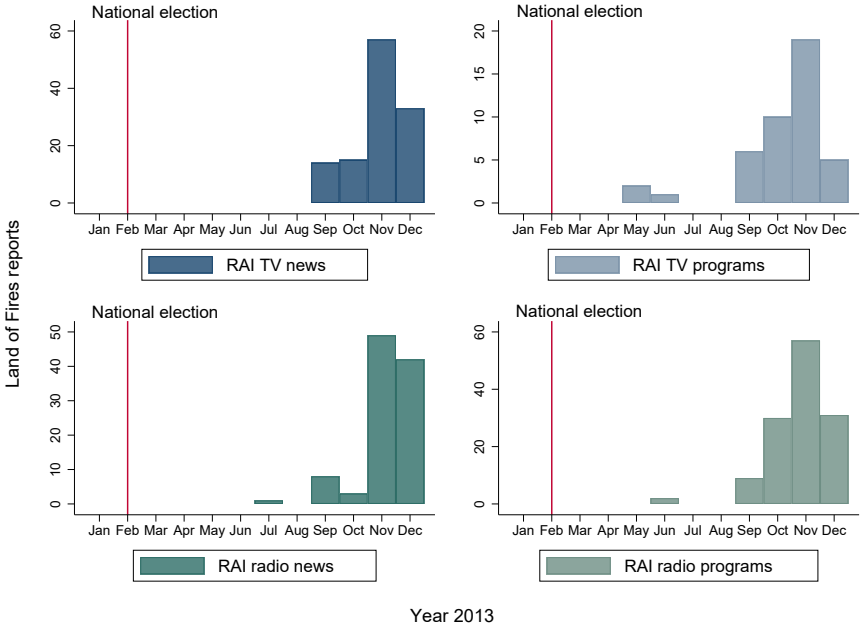
Finally, we consider proxies for organized-crime presence. The effect is concentrated in municipalities that had not been dissolved for mafia infiltration before the news shock. Municipal dissolution may capture prior state intervention and institutional recognition of criminal infiltration, making the disclosure less informative in these municipalities. The effect is therefore larger in municipalities with no prior institutional intervention.

Figure 8: Heterogeneous effects on turnout



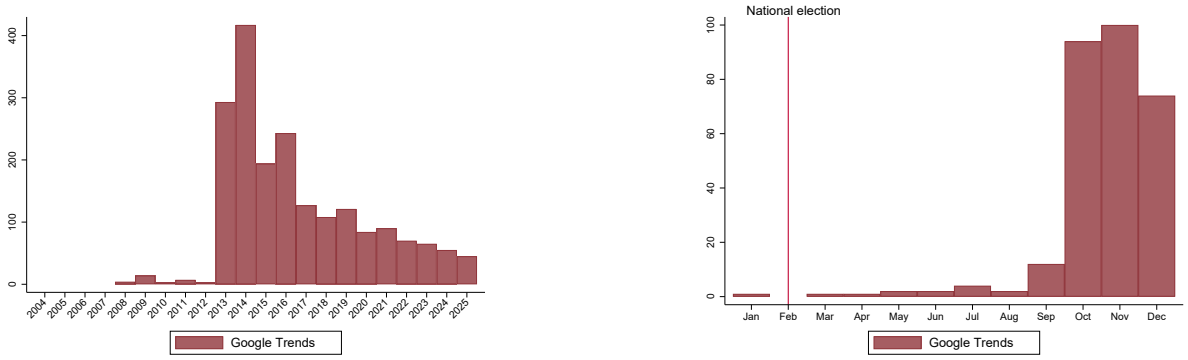
Notes: This figure reports heterogeneity estimates of the effect of toxic winds after the news shock on turnout in national elections. Each regression replicates the main specification reported in Equation 1a and in Column 4 of Table 1. Each coefficient comes from the main specification estimated separately across municipalities split by predetermined characteristics. Continuous variables are split at the median. Indicator variables are split according to the corresponding dummy. The number of cancer deaths is measured cumulatively over 1990–2004. Taxable income per capita is measured over 2000–2004. Population density, unemployment rate and the shares of young population, large families and higher educated individuals refer to the 2001 census. The dissolved-municipality dummy equals one if the municipality was dissolved for mafia infiltration before the news shock. In particular, each regression includes municipality and election year fixed effects, total number of IDS per square kilometer, as well as covariates interacted with year dummies: municipality surface, province fixed effects, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009), geographical characteristics (maximum altitude), and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). All regressions are weighted by the number of eligible voters in each municipality in 2001. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Figure 9: National election (2013) and "Land of Fires" media exposure



Notes: This figure displays the monthly frequency of media reports mentioning the expression "Land of Fires" on RAI, Italy's national public broadcaster, in 2013, across both television and radio, including news and programming. In July 2013, FSM adopted the expression "Land of Fires" for its campaign, drawing it from the final chapter of Roberto Saviano's book "Gomorrah". The campaign used the slogan *"In Movement through the Land of Fires"*, explicitly recalling *Movimento Cinque Stelle* (Five Star Movement). Later that year, FSM introduced a motion in Parliament and organized public rallies. This political mobilization coincides with the sharp increase in media coverage of the "Land of Fires" during the final quarter of 2013. Data are sourced from *RAI teche* archives.

Figure 10: Online salience of "Land of Fires" in Google searches



(a) Google Trends aggregated by year

(b) Google Trends (2013)

Notes: This figure presents Google Trends data on the search term "Land of Fires" in Italy. Panel (a) reports yearly aggregates for the period 2004–2025, where monthly search intensity values (ranging from 1 to 100) are summed within each year. Panel (b) focuses on the year 2013 and displays the monthly distribution of search interest, revealing a sharp increase in the final quarter. This pattern aligns with the surge in media attention documented in Figure 9. Since FSM emerged as an internet-driven political movement, Google search data serve as a proxy for shifts in public attention.

7.2 Channels of environmental challenger success

Section 6.3 shows that downwind municipalities experience lower FSM support in the February 2013 election, before the party launched its *Terra dei Fuochi* campaign. At that stage, downwind municipalities respond primarily through lower turnout rather than greater support for the challenger. This pattern changes after FSM launched a broad grassroots campaign across affected municipalities and raised the issue in Parliament in summer 2013. The relationship increases in later elections: wind exposure is associated with higher FSM support in 2018 and an even stronger effect in 2022. This progression is consistent with FSM gradually converting local dissatisfaction into national electoral support as it established ownership of the issue. Figures A15 and A16 reinforce this interpretation: FSM places substantially greater emphasis on environmental protection and anti-corruption than mainstream political parties.

We next provide descriptive evidence on the evolution of national media coverage. Figure 9 plots monthly mentions of "Land of Fires" on RAI, Italy's national public broadcaster, in 2013, separately for television news, television programs, radio news, and radio programs. Coverage is limited during the first half of the year, including around the February election. Mentions begin to rise in July and increase sharply in the final quarter across all four series. This timing coincides with FSM's adoption of the "Land of Fires" campaign in July, followed later that year by its parliamentary motion to declassify Carmine Schiavone's hearings and by public mobilization. Because RAI radio also broadcasts parliamentary proceedings, the increase in radio coverage also suggests greater parliamentary salience. Although descriptive, the figure shows that national

Table 5: Effect of wind exposure to IDS on FSM running (municipal elections)

	(1)	(2)	(3)	(4)
	FSM running (municipal elections)			
DownWind	0.268***	0.268***	0.143***	0.114***
	(0.0587)	(0.0561)	(0.0395)	(0.0356)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1731	1731	1731	1731
R-squared	0.296	0.357	0.467	0.492
F-stat	23.81	38.91	96.61	124.7

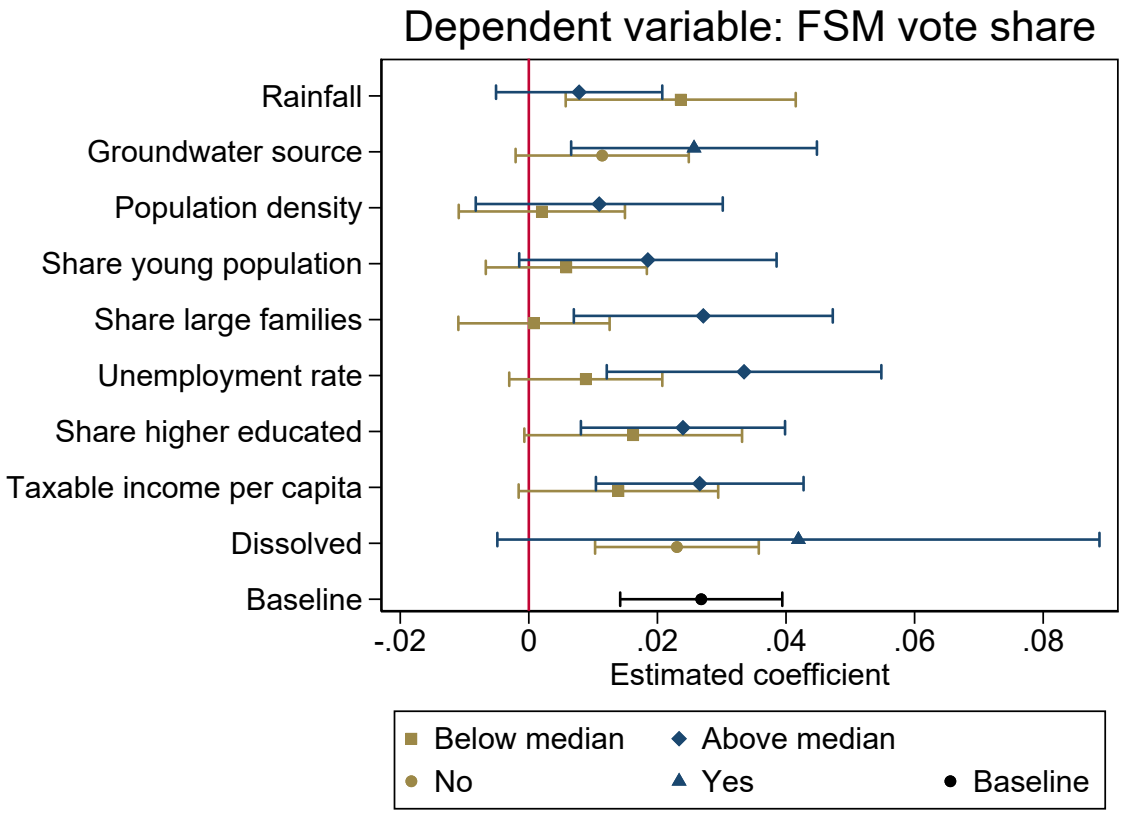
Notes: This table shows WLS estimates of the effect of wind exposure to IDS on FSM running at municipal elections (2010-2022). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

attention to the Land of Fires rose sharply only after FSM began actively campaigning on the issue.

Since FSM emerged as an internet-driven movement, we complement the broadcast evidence with Google search data. Figure 10a plots Google search intensity for "Land of Fires" over 2004–2025. Search activity remains limited until 2012 and rises sharply in 2013. Figure 10b focuses on 2013 and shows virtually no search activity around the February election, followed by a steep increase in the final quarter of the year. This increase coincides with FSM's adoption of the "Land of Fires" campaign and subsequent mobilization, and closely tracks the rise in RAI coverage shown in Figure 9. Figure A18 provides complementary evidence from online news coverage of the "Land of Fires". Taken together, these series show that national attention to the Land of Fires increased sharply only after the 2013 election.

We also examine whether FSM's participation in local elections contributed to its

Figure 11: Heterogeneous effects on FSM



Notes: This figure reports heterogeneity estimates of the effect of toxic winds on FSM success in national elections. Each regression replicates the main specification reported in Equation 2 and in Column 4 of Table 4. Each coefficient comes from the main specification estimated separately across municipalities split by predetermined characteristics. Continuous variables are split at the median. Indicator variables are split according to the corresponding dummy. The number of cancer deaths is measured cumulatively over 1990–2004. Taxable income per capita is measured over 2000–2004. Population density, unemployment rate and the shares of young population, large families and higher educated individuals refer to the 2001 census. The dissolved-municipality dummy equals one if the municipality was dissolved for mafia infiltration before the information shock. In particular, each regression includes province fixed effects, election year fixed effects, total number of IDS per square kilometer, municipality surface, historical weather variables at the municipality level (rainfall, humidity, wind direction and wind speed over 2001-2009), socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia), the historical average taxable income per capita (2000-2004), as well as geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

later success in national elections. We test this using an outcome that equals one when FSM lists a candidate in municipal elections between 2010 and 2022. Table 5 reports the effect of toxic winds on FSM participation in local elections. We find that FSM is more likely to contest municipal elections in downwind municipalities. This evidence supports a local-presence channel: greater participation in affected municipalities may have contributed to FSM's later national success.

Finally, we test heterogeneity in support for FSM. We estimate the main specification separately for municipality samples split by predetermined characteristics. For continuous variables, we split municipalities at the median. For indicator variables, such as municipal dissolution for mafia infiltration, we compare municipalities with and without the relevant characteristic. Figure 11 reports the results. FSM support is higher in downwind municipalities with above-median cumulative cancer deaths over 1990–2004, pointing to stronger challenger support where pre-existing health conditions were more severe. The coefficient is also larger in municipalities with groundwater sources, consistent with greater FSM support where buried waste may contaminate local water systems. FSM support also increases more in low-rainfall municipalities, where drier conditions may facilitate open-air burning and reduce the washout of airborne pollutants.

Finally, demographic and socioeconomic characteristics point in the same direction. FSM support increases more in municipalities with higher shares of young residents and large families, as well as in those with above-median unemployment. Overall, challenger support is stronger where exposure coincides with greater household and labor-market vulnerability.

8 Robustness checks

In this section, we assess the robustness of our main findings along several dimensions. First, we restrict the sample to municipalities whose demographic centroid lies within 3 kilometers of at least one IDS, thereby excluding municipalities such as D and E in Figure 3, which fall outside the IDS buffer (see Tables E1, E10, E19, and E27).

Second, we show that results remain statistically significant when we change the reference period (see Figures E1, E4, and E7).

We then vary the radius used to define exposure around each IDS (see Tables E2, E11, E20, and E28). For the share of current transfers and EU cohesion funds per capita, we find statistically significant effects only within a 3-kilometer radius. For turnout, significance extends up to a 5-kilometer buffer radius, while the increase in FSM support remains statistically significant up to a 10-kilometer buffer radius. Figure E8 reports the corresponding dynamic estimates for turnout.

We also modify both the computation of historical average wind direction at each IDS and the definition of the treatment variable $DownWind_i$. In particular, $WI_{s,j,\tau}$ equals 1 as the angle ($\theta_{s,j,\tau}$) between the connection vector (line from the actual station j to the illegal disposal site s) and the wind direction vector falls within $[0, 30°]$, $[0, 60°]$, $[0, 90°]$ (main specification), or $[0, 120°]$. Then, we classify a municipality as downwind if the angle (θ) between the connection vector (line from the IDS to the demographic centroid) and the historical average wind direction ($\overline{WINDDIR_s}$) falls within the range $[0, 30°]$, $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification

(see Tables E3, E12, E21, and E29).

Next, we use the number of eligible voters in 1996 rather than in 2001 as regression weights (see Tables E4, E13, E22, and E30). Figures E2, E5, and E9 report the corresponding dynamic specifications. We also allow for spatial and serial correlation using Conley HAC standard errors (see Tables E5, E14, E23, and E31). Figure E10 shows the corresponding heatmap for turnout.

Then, we conduct several additional checks for the main electoral and financial outcomes. We exclude municipality fixed effects where applicable (see Tables E6 and E15, and Figure E11) and exclude the five provincial capitals from the sample (see Tables E7, E16, E24, and E32). We also restrict the sample to Naples and Caserta, the two provinces that include all municipalities officially designated as part of the Land of Fires. In this subsample, the decline in turnout, the increase in FSM support, and the reduction in EU cohesion funds are larger in magnitude, while the effect on the share of current transfers is no longer statistically significant (see Tables E8, E17, E25, and E33). For turnout, we also restrict the sample to elections held from 1992 onward (see Figure E12).

Finally, we implement permutation tests that jointly reassign downwind exposure and IDS density across municipalities (see Figures E3, E6, E13, and E14). We also replicate the analysis using all 2,551 sites reported in the 2005 inventory rather than the restricted baseline sample (see Tables E9, E18, E26, and E34). Overall, our main findings remain stable across these robustness checks.

9 Conclusions

We study how voters respond when new information reveals a persistent problem that successive mainstream governments have failed to address, and how this response changes once a challenger emerges. Our setting is the illegal burial, dumping, and burning of toxic waste by criminal organizations in Southern Italy. We exploit plausibly exogenous variation in pollution exposure generated by historical wind trajectories and the 2005 release of georeferenced information on contaminated sites. Following the disclosure, we find no increase in parliamentary attention, while financial support to downwind municipalities declines. At the same time, turnout in national elections falls persistently by roughly 2 percentage points in downwind relative to upwind municipalities. Individual-level evidence further shows worse perceptions of local quality of life and lower trust in national political institutions.

The electoral response changes once a challenger emerges, behaves as a political entrepreneur and actively politicizes the issue. FSM receives only a small electoral gain in downwind municipalities in the February 2013 election, before the launch of the *Terra dei Fuochi* campaign. Its advantage becomes substantially larger in 2018 and 2022, following grassroots mobilization across affected municipalities, parliamentary activity on

the issue, and greater local electoral presence. National media coverage, online news, and Google searches for the "Land of Fires" also increase sharply after the 2013 election. These patterns illustrate how political entrepreneurship works in practice. FSM brought a neglected issue into the national debate, established ownership over it, and converted dissatisfaction with mainstream parties into electoral support.

Our findings also clarify how political challenger behavior with electoral accountability. When new information reveals a failure that spans successive mainstream governments, voters may have little scope to punish one party by switching to another mainstream alternative. In the absence of a credible challenger, citizens may instead disengage from elections and lose trust in political institutions. A political entrepreneur can change this dynamic by bringing a neglected issue into electoral competition and offering voters a credible alternative to mainstream parties. Electoral accountability therefore depends not only on what voters learn, but also on whether credible alternatives emerge with a distinct response to unresolved problems.

This mechanism is particularly relevant for understanding declining electoral participation in liberal democracies. When persistent policy failures become associated with the political establishment as a whole, greater transparency may not be sufficient to sustain participation. Timely disclosure may need to be accompanied by visible institutional responses that give voters reason to believe political action can lead to different outcomes. Political entrepreneurs can re-engage dissatisfied voters by creating such an alternative. However, understanding how political entrepreneurs perform once they become responsible for addressing the problems they politicized is an important direction for future research.

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Appendix

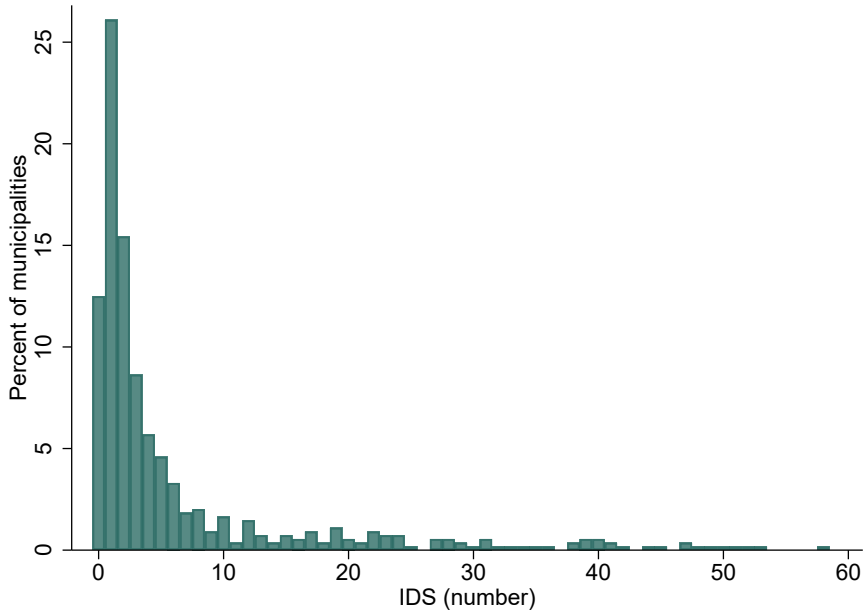
A Additional Tables and Figures

Figure A1: First official map



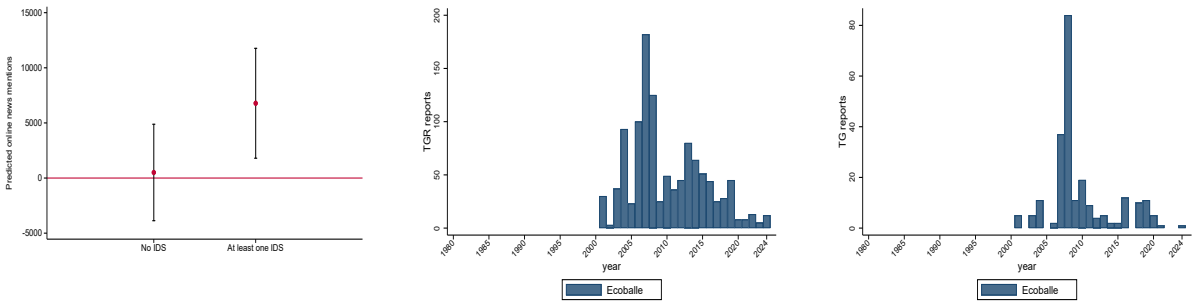
Notes: This figure shows the first official map of 2,551 sites released by the Regional Agency for the Protection of the Environment Campania (ARPAC) in 2005. These sites are defined as areas where there is a possibility that soil, subsoil, surface water, or groundwater contains pollutants at concentrations high enough to pose a risk to public health or the natural environment.

Figure A2: Distribution of IDS across municipalities



Notes: This figure shows the distribution of Illegal Disposal Sites (IDS) across municipalities. The horizontal axis reports the number of IDS, while the vertical axis reports the percentage of municipalities in each bin.

Figure A3: Spatial and temporal variation in media coverage



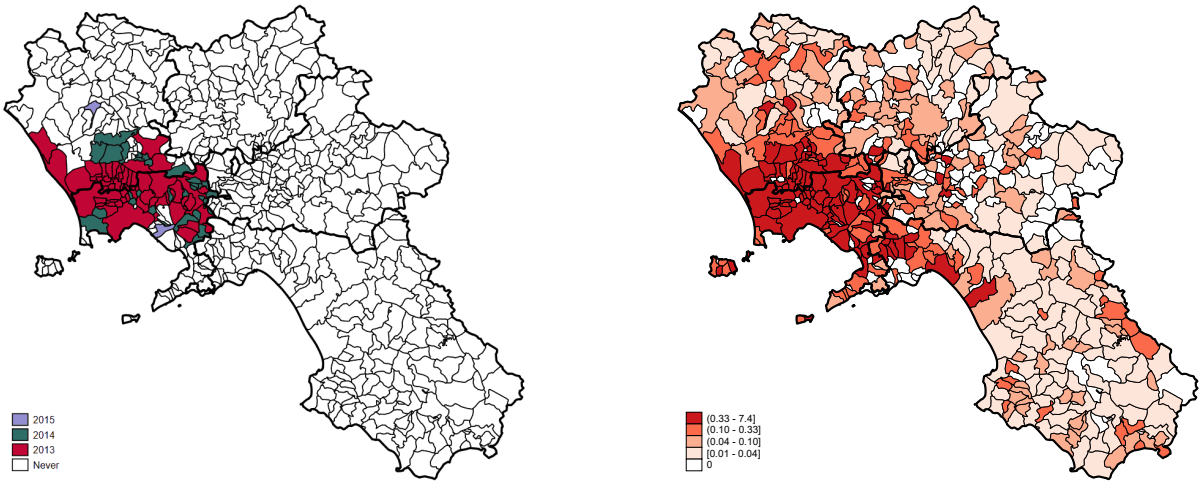
(a) IDS and online news coverage

(b) Regional TV news reports

(c) National TV news reports

Notes: Figure A3a reports predicted online news mentions for Campania municipalities with no Illegal Disposal Sites (IDS) and those with at least one IDS, controlling for municipal surface area. Online news coverage is measured by the number of articles mentioning each municipality between 2007 and 2022 across national and local online news outlets. The underlying corpus contains approximately 15.2 million articles. The model is weighted by the number of eligible voters in each municipality in 2001, with 95% confidence intervals and robust standard errors. Data are available from 2007 onward. Source: MediaCloud. Figure A3b displays the frequency of TV news reports from the national public broadcaster, RAI (*Radio Audizioni Italiane*) at the regional level in Campania (*TGR - Telegiornale Regionale*) that mention the keyword "*Ecoballe*" (large waste disposal units). It suggests some pre-existing local awareness in the early 2000s, plausibly driven by early disclosures from mafia informants. However, these TV reports did not provide precise site locations, so residents could not assess their exposure to pollution. The information shock occurs in 2005, when site geo-locations enter the public domain. Source: *RAI teche* archives. Figure A3c presents the frequency of TV news reports from RAI at the national level for the same keyword. Source: *RAI teche* archives.

Figure A4: Official Land of Fires and IDS density

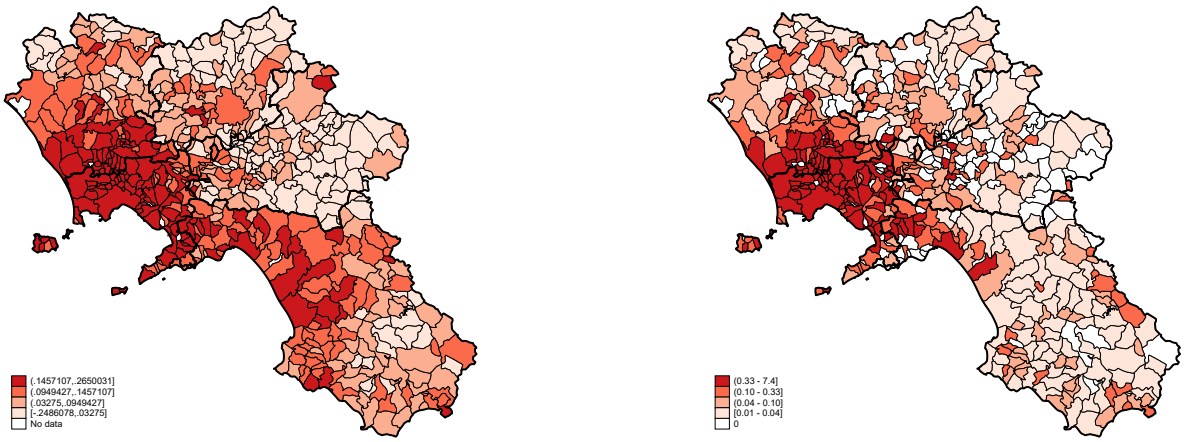


(a) Map of the 90 municipalities officially recognized by the Italian government

(b) Density of IDS per square kilometer at the municipality level

Notes: Figure A4a maps the 90 municipalities officially recognized by the Italian government as part of the Land of Fires in 2013, 2014, and 2015. Figure A4b reports IDS density based on ARPAC inventories, measured as the number of IDS per square kilometer of municipal area. For the empirical analysis, we rely on the IDS data because their geo-location allows us to construct our measure of wind exposure. By contrast, the official government list identifies affected areas only at the municipality level and provides no site-level coordinates, so we use it only for descriptive purposes.

Figure A5: Turnout and pollution exposure

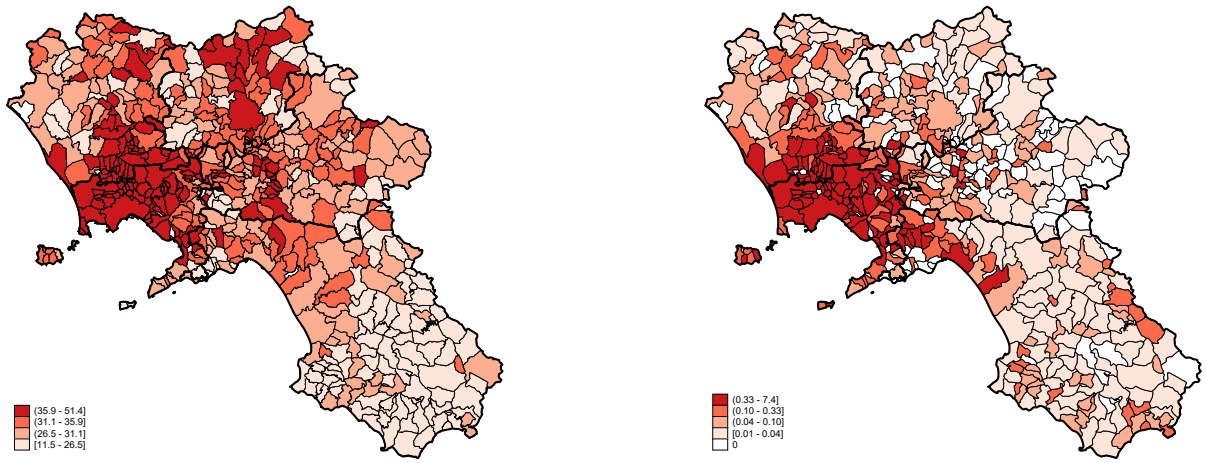


(a) Change in average turnout (1972–2001 vs 2006–2022)

(b) Number of Illegal Disposal Sites (IDS) per square kilometer

Notes: Figure A5a maps the change in average turnout between elections held before and after the 2005 information shock, defined as $\Delta Turnout = \overline{Turnout_{1972-2001}} - \overline{Turnout_{2006-2022}}$. Darker shades indicate larger declines in turnout. Figure A5b maps the number of Illegal Disposal Sites (IDS) per square kilometer. Darker shades indicate higher IDS density.

Figure A6: Five Star Movement and pollution exposure

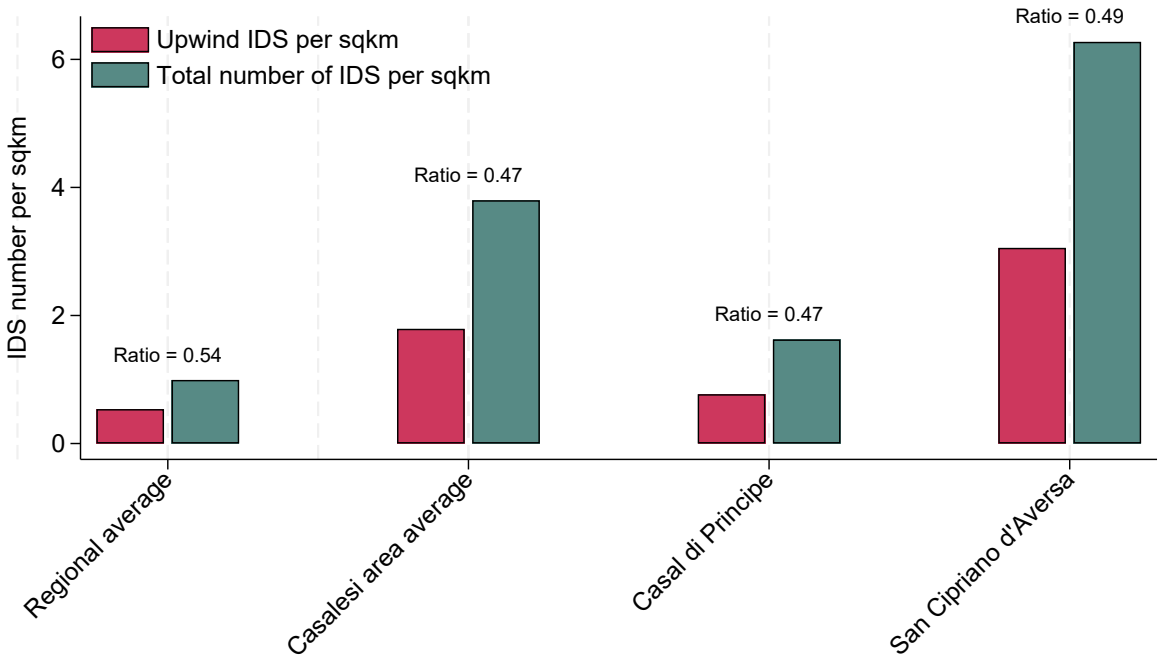


(a) National election Five Star Movement vote share (2013-2018-2022)

(b) Number of Illegal Disposal Sites (IDS) per square kilometer

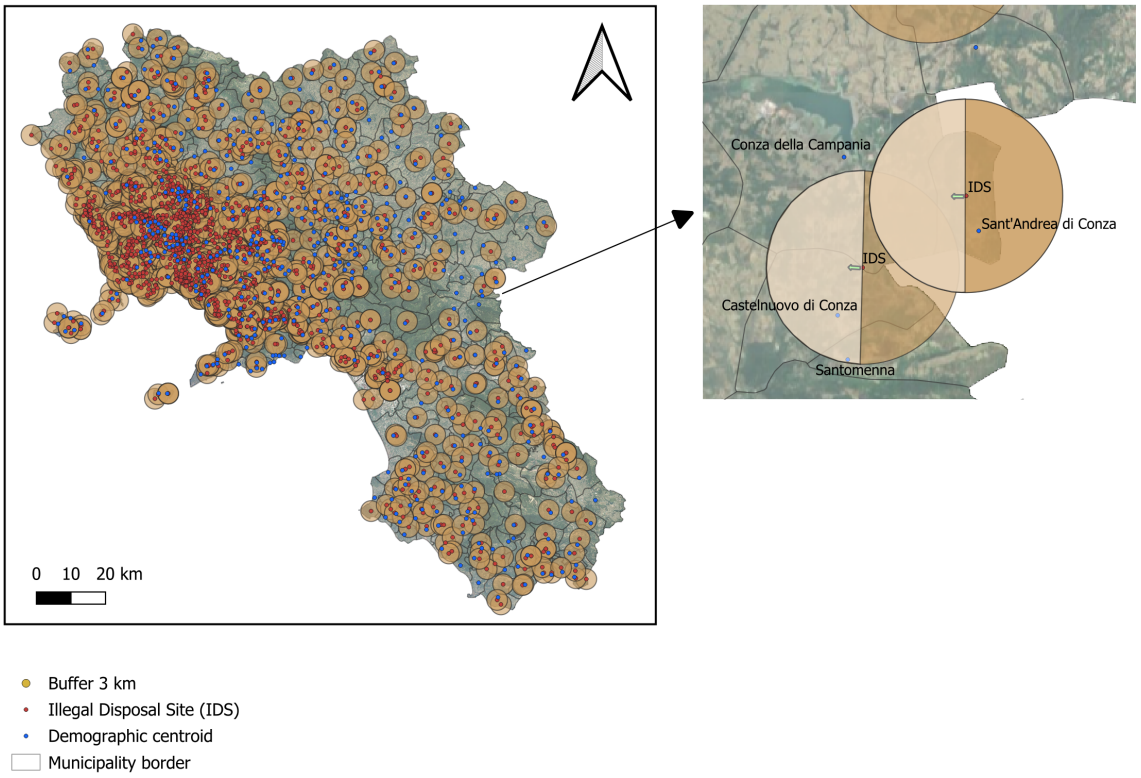
Notes: Figure A6a maps the average FSM vote share in national elections over 2013, 2018, and 2022. Darker shades indicate larger FSM vote shares. Figure A6b maps the number of Illegal Disposal Sites (IDS) per square kilometer. Darker shades indicate higher IDS density.

Figure A7: IDS and toxic winds exposure in the Casalesi stronghold



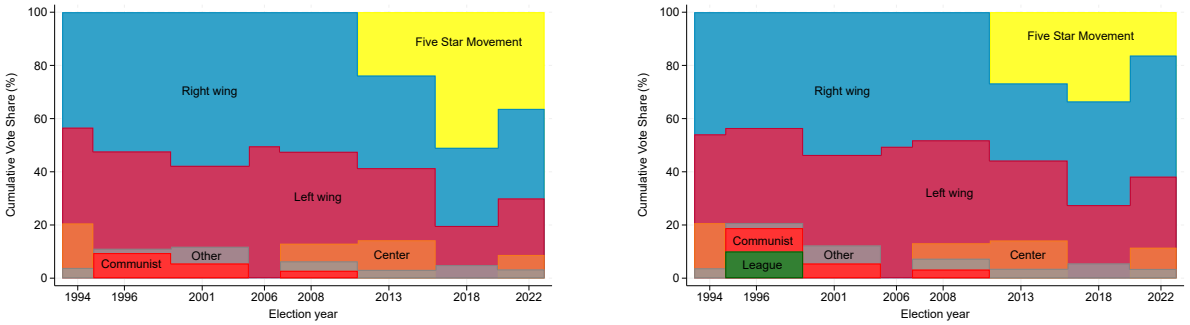
Notes: This figure reports the density of Illegal Disposal Sites (IDS) per square kilometer for (i) the regional average, (ii) the "Casalesi area" average, and (iii) the two historical Casalesi headquarters (Casal di Principe and San Cipriano d'Aversa). The starting set of Casalesi-related municipalities is drawn from the *Report on Organized Crime* published by the Italian Ministry of the Interior in 1999. From that broader list, we restrict our attention to municipalities described as under Casalesi control and exclude those reported as contested with other clans. The resulting sample includes 15 municipalities: Aversa, Capua, Casal di Principe, Frignano, Gricignano di Aversa, Lusciano, Macerata Campania, Parete, Recale, San Cipriano d'Aversa, San Felice a Cancello, San Marcellino, Santa Maria a Vico, Teverola, and Trentola Ducenta. An IDS is classified as upwind if the historical wind trajectory transports pollutants towards the municipality's demographic centroid, while the total number of IDS identifies all illegal sites within a municipality. Densities are computed as the number of IDS divided by municipal surface area (square kilometer).

Figure A8: Buffer 3 km



Notes: This figure displays the spatial buffers used to identify downwind municipalities (i.e., upwind IDS). A municipality is wind exposed to a IDS if the municipality is downwind and the IDS is upwind (i.e., the wind goes from the IDS to the municipality). Each circle represents a 3-kilometer buffer radius centered on each IDS, marked by red dots. Blue dots represent municipal demographic centroids. A municipality is classified as affected by the buffer if any part of its demographic centroid intersects the 3-kilometer buffer circle. To define downwind exposure, this buffer-based classification is combined with the historical average wind direction at each IDS, denoted by $\overline{WINDDIR_s}$. The top-right panel provides a zoomed-in example with two nearby IDS and the surrounding municipalities. Based on $\overline{WINDDIR_s}$ and the 3-kilometer buffer radius, Castelnuovo di Conza and Santomenna fall within the downwind region and are therefore classified as exposed. Sant'Andrea di Conza lies upwind, while Conza della Campania falls outside both buffers.

Figure A9: Historical national elections cumulative vote shares by coalitions



(a) Campania region **(b)** Italy

Notes: This figure illustrates the cumulative vote share received by coalitions in national elections between 1994 and 2022. Figure A9a presents election results for the Campania region, while Figure A9b displays results for Italy. In 2018 and 2022, the Five Star Movement's vote share in Campania was considerably higher than the corresponding national outcome.

Table A1: Descriptive statistics I

	(1)	(2)	(3)	(4)	(5)
	Mean	Std. Dev.	Min	Max	Obs.
Panel A) Sociodemographic census data (2001)					
Share of higher educ.	0.066	0.032	0.010	0.156	7614
Employment rate health	0.055	0.017	0.009	0.192	7614
Employment rate agriculture	0.056	0.061	0.006	0.488	7614
Unemployment rate	0.139	0.037	0.016	0.418	7614
Share of large families	0.157	0.040	0.022	0.302	7614
Share of commuters	0.141	0.071	0.036	0.392	7614
Share of foreign residents	0.007	0.005	0.000	0.049	7614
Population density (2001)	3270.992	3446.651	11.022	13914.620	7614
Avg taxable income pc (2000-2004)	5769.045	1554.058	2589.708	10089.355	7614
Share of low-income taxpayers (2000-2004)	0.902	0.044	0.798	0.992	7614
Panel B) Geographical characteristics					
Municipality surface (km^2)	46.235	44.057	0.105	186.875	7614
DownWind (dummy)	0.892	0.311	0.000	1.000	7614
Total number of IDS per sqkm	1.494	3.292	0.000	28.401	7614
Maximum altitude (km)	0.582	0.447	0.010	1.912	7614
Median altitude (km)	171.075	197.147	2.000	1212.000	7614
Minimum altitude (km)	0.062	0.109	-0.002	0.829	7614
Groundwater source	0.710	0.454	0.000	1.000	7614
Panel C) Meteorological variables (2001–2009)					
Historical avg humidity (%)	74.374	1.711	67.748	78.328	7614
Historical rainfall (mm)	2.526	0.298	1.887	3.104	7614
Historical avg wind direction (°)	219.888	117.823	0.156	359.244	7614
Historical avg wind speed (m/s)	0.617	0.340	0.011	1.531	7614
Panel D) Pre-determined national electoral outcomes					
Eligible voters (2001)	174551.083	317360.328	360.000	849798.000	7614
Invalid ballots (2001)	0.151	0.044	0.062	0.443	7614
Turnout (2001)	0.769	0.081	0.211	0.952	7614
Forza Italia vote share (2001)	0.385	0.080	0.124	0.618	7614
Democrats of the Left vote share (2001)	0.166	0.068	0.004	0.473	7614
Democracy is Freedom vote share (2001)	0.141	0.065	0.041	0.571	7614
Panel E) Organized crime outcomes					
Number of civilians killed by Mafia (1967-2004)	9.165	17.791	0.000	47.000	7614
Municipality dissolved for mafia infiltration (1991-2004)	0.174	0.379	0.000	1.000	7614
Confiscated assets from Mafia (1984-2004)	0.498	0.500	0.000	1.000	7614
Distance from Casalesi stronghold (km)	40.400	30.661	0.000	164.287	7614

Notes: See Section 3 for information about the data sources and the years in which each variable is available.

Table A2: Descriptive statistics II

	(1)	(2)	(3)	(4)	(5)
	Mean	Std. Dev.	Min	Max	Obs.
Panel A) National elections (1972–2022)					
Eligible voters	168098.507	310281.272	207.000	892867.000	7614
Turnout	0.782	0.114	0.051	1.187	7614
Invalid ballots	0.076	0.050	0.000	0.581	7614
Five Star Movement vote share	0.370	0.137	0.056	0.696	1632
Democratic Party vote share	0.232	0.093	0.047	0.694	2720
Forza Italia vote share	0.240	0.108	0.016	0.814	3264
League vote share	0.020	0.030	0.000	0.655	2720
Brothers of Italy vote share	0.084	0.083	0.000	0.525	1632
Far left/green vote share	0.027	0.019	0.000	0.269	2720
Other parties	0.102	0.053	0.000	0.527	1632
Five Star Movement running (municipal elections)	0.225	0.417	0.000	1.000	3975
Panel B) Mainstream inertia					
EU cohesion funds p.c.	58.983	354.391	0.000	40477.312	11968
Mentions ratio (mainstream parties)	0.001	0.003	0.000	0.105	14688

Notes: See Section 3 for information about the data sources and the years in which each variable is available.

Table A3: Descriptive statistics III

	(1)	(2)	(3)	(4)	(5)
	Mean	Std. Dev.	Min	Max	Obs.
Panel A) Perceived main issue for the country					
Perceived main issue for the country: Environment	0.063	0.243	0.000	1.000	13253
Perceived main issue for the country: Waste	0.017	0.129	0.000	1.000	13253
Panel B) Quality of life and trust in national institutions					
High Quality of life in your town	0.495	0.500	0.000	1.000	13356
High Trust in national institutions	0.494	0.500	0.000	1.000	48744
Panel C) Trust in social and economic institutions					
High Trust in police forces	0.739	0.439	0.000	1.000	3681
High Trust in armed forces	0.692	0.462	0.000	1.000	7105
High Trust in judiciary system	0.501	0.500	0.000	1.000	7927
High Trust in education system	0.593	0.491	0.000	1.000	7710
High Trust in Catholic Church	0.493	0.500	0.000	1.000	7890
High Trust in trade unions	0.305	0.460	0.000	1.000	7457
High Trust in employers' associations	0.468	0.499	0.000	1.000	3478
High Trust in banks	0.250	0.433	0.000	1.000	7498
High Trust in stock exchange	0.302	0.459	0.000	1.000	7298
High Trust in nonprofit organizations	0.546	0.498	0.000	1.000	7677
Panel D) Individual-characteristic outcomes					
Female	0.535	0.499	0.000	1.000	72837
Age (std.)	-0.000	1.000	-1.778	3.192	72837
College degree	0.242	0.428	0.000	1.000	72837
High-school degree	0.413	0.492	0.000	1.000	72837
Junior-school degree	0.291	0.454	0.000	1.000	72837
No education	0.054	0.226	0.000	1.000	72837
Employed	0.411	0.492	0.000	1.000	72837
Interested in politics	0.615	0.487	0.000	1.000	59230
Left	0.536	0.499	0.000	1.000	54417

Notes: See Section 3 for information about the data sources and the years in which each variable is available.

Table A4: Effect of wind exposure to IDS on parliamentary activity (all years)

	(1)	(2)	(3)	(4)
	Share of parliamentary mentions			
DownWind × Post	0.000139	0.000180**	0.000139*	0.0000318
	(0.0000953)	(0.0000769)	(0.0000763)	(0.0000355)
Total number of IDS per sqkm × Post	-0.00000407	-0.00000330	-0.00000655	-0.00000292
	(0.00000642)	(0.00000620)	(0.00000590)	(0.00000644)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	14688	14688	14688	14688
Dep var mean	0.00107	0.00107	0.00107	0.00107
R-squared	0.872	0.892	0.894	0.936

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio between the sum of speeches delivered by deputies from mainstream political parties that mention municipality i in year t in the Italian Chamber of Deputies (1996-2022) and the total number of mainstream-party speeches delivered during the entire legislature. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table A5: Effect of wind exposure to IDS on current transfers share

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0213***	-0.0176**	-0.0234***	-0.0215**
	(0.00760)	(0.00771)	(0.00872)	(0.00870)
Total number of IDS per sqkm × Post	-0.00212	-0.00212	-0.00256	0.00131
	(0.00180)	(0.00162)	(0.00168)	(0.00199)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	13391	13391	13391	13391
Dep var mean	0.186	0.186	0.186	0.186
R-squared	0.805	0.812	0.813	0.839

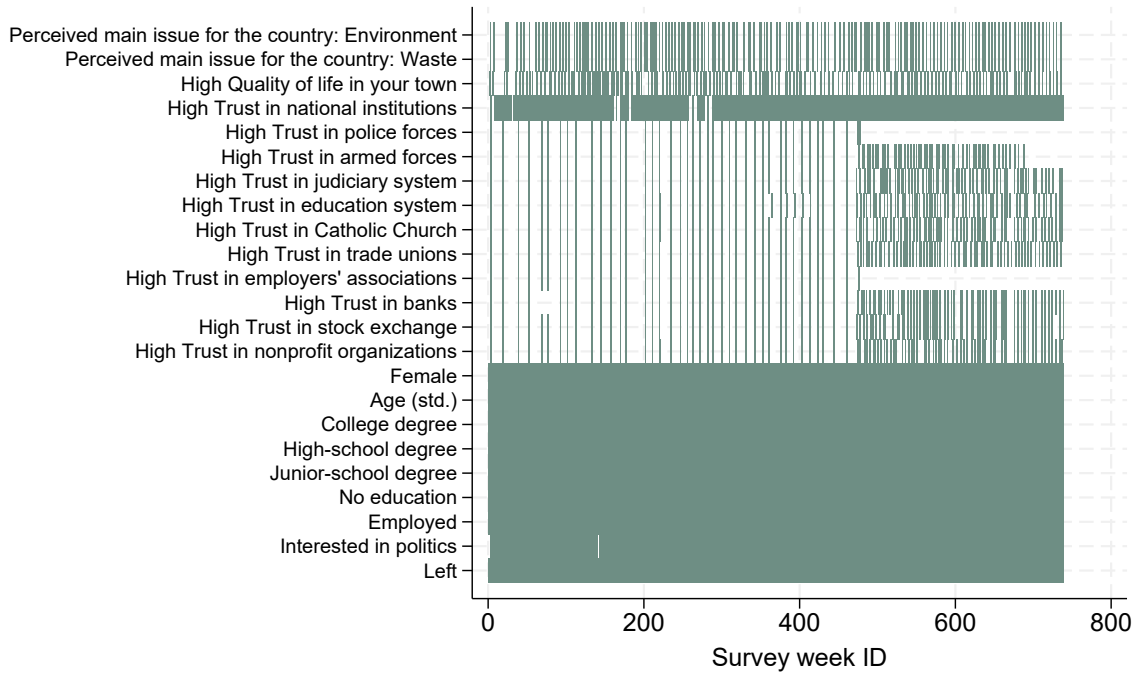
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table A6: Effect of wind exposure on EU cohesion funds (2001-2022)

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-35.02*	-41.58**	-43.00**	-35.78*
	(17.98)	(17.78)	(17.95)	(18.47)
Total number of IDS per sqkm × Post	-1.483	-2.088	-2.196	-0.524
	(1.370)	(1.342)	(1.353)	(1.203)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11968	11968	11968	11968
Dep var mean	58.98	58.98	58.98	58.98
R-squared	0.134	0.168	0.170	0.195
F-stat	34.35	109.0	120.6	201655.3

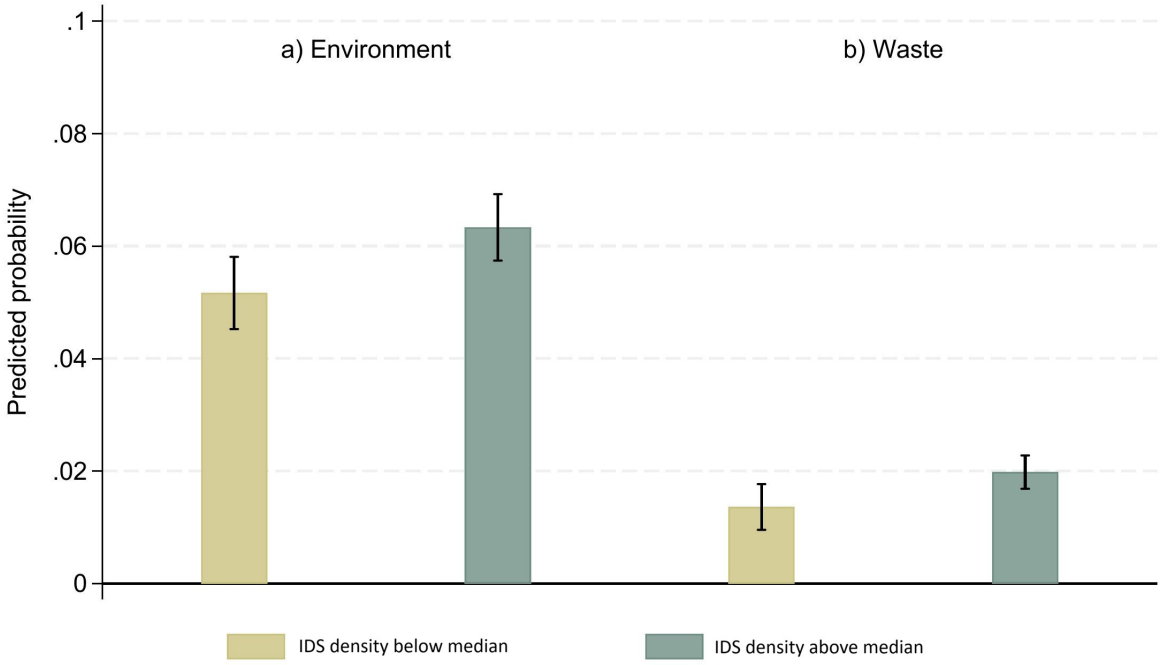
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure A10: IPSOS coverage



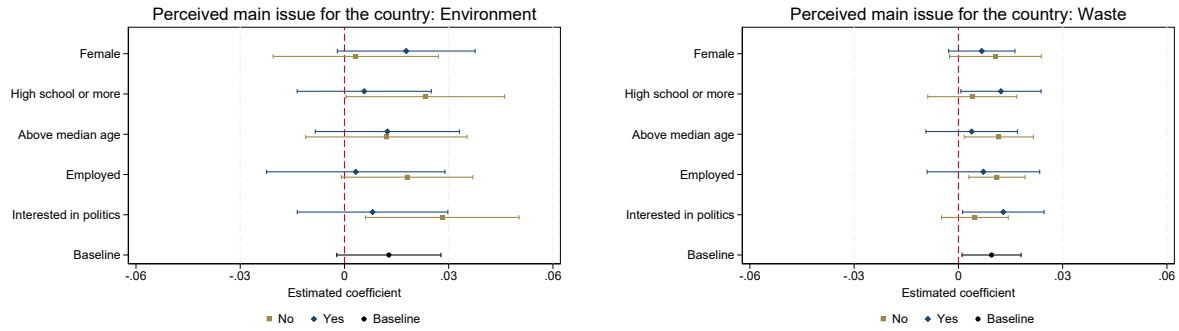
Notes: This figure summarizes the availability of IPSOS outcomes and individual characteristics across survey weeks from 2008 to 2022. Shaded cells indicate survey weeks in which the corresponding variable is observed. Core demographic characteristics are available throughout most of the sample, while several attitudinal outcomes are observed only in selected periods.

Figure A11: Environmental salience and IDS density



Notes: This figure reports predicted probabilities that respondents identify the environment or waste as one of the most important national issues. Municipalities are divided according to whether IDS density, measured as the number of Illegal Disposal Sites per square kilometer, is below or above the sample median. Predicted probabilities are obtained from separate linear probability models for each outcome. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

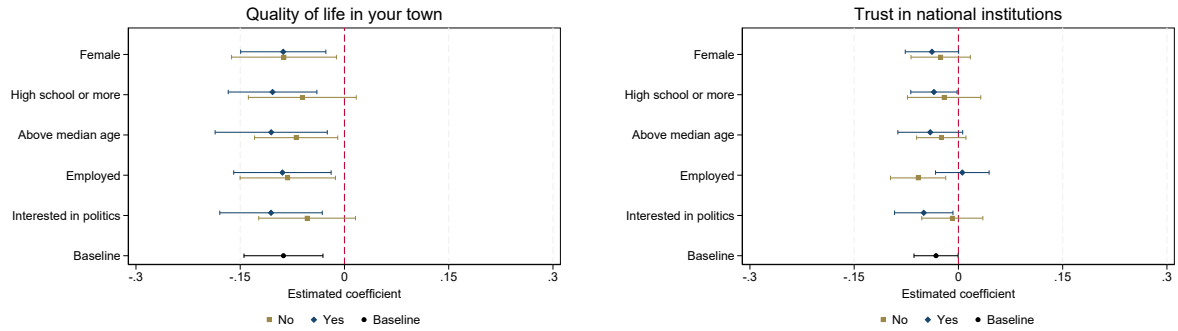
Figure A12: Heterogeneity: perceived main issue for the country (environment and waste)



(a) Environment **(b)** Waste

Notes: This figure reports heterogeneity estimates of the effect of toxic winds on whether respondents identify the environment (Figure A12a) or waste (Figure A12b) as one of the most important national issues. Each regression replicates the main specification reported in Columns 2 and 4 of Table 2. Because the unit of observation is the individual, we estimate each regression by OLS rather than WLS. Each coefficient comes from the baseline estimated separately across municipalities split by predetermined characteristics. Continuous variables are split at the median. Indicator variables are split according to the corresponding dummy. In particular, each regression includes: total number of IDS per square kilometer, municipality surface, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009), province and year fixed effects, historical average taxable income per capita (2000-2004), population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and maximum altitude, as well as individual characteristics, including gender, age, age squared, education, employment status, and profession. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

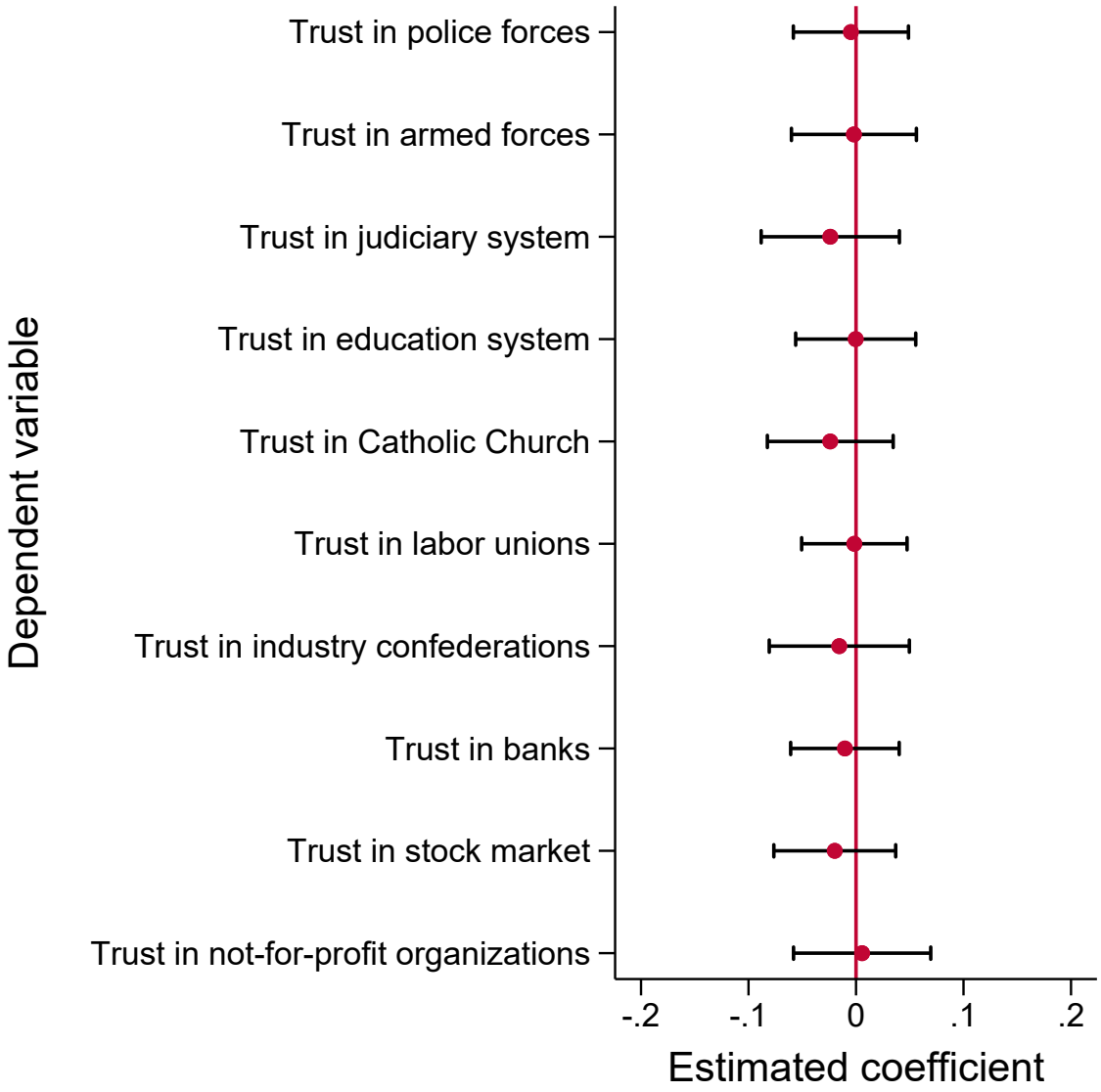
Figure A13: Heterogeneity: quality of life in your town and trust in national institutions



(a) Quality of life in your town **(b)** Trust in national institutions

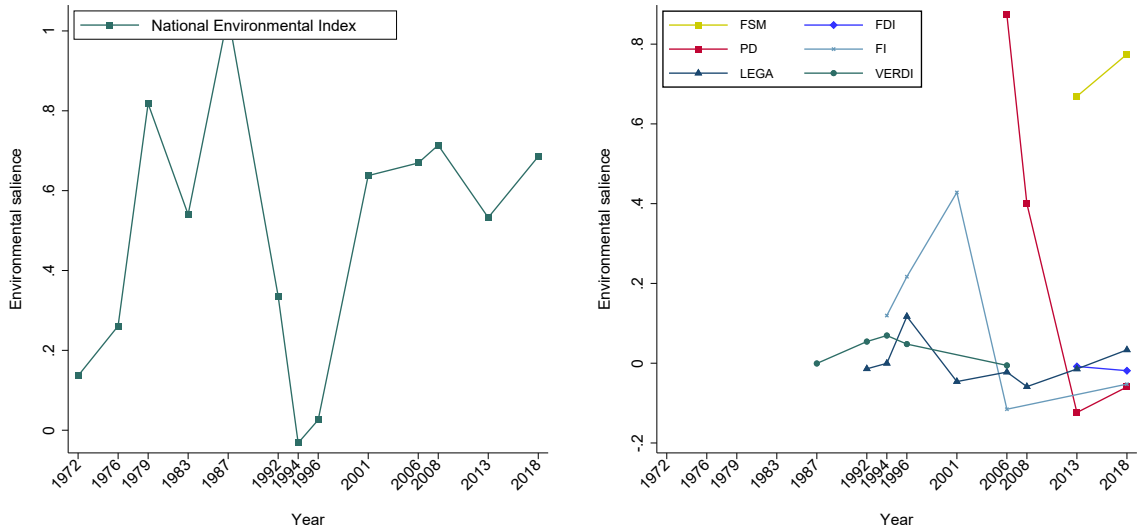
Notes: This figure reports heterogeneity estimates of whether exposure to toxic winds is associated with worse perceptions of local quality of life (Figure A13a) or lower trust in national institutions (Figure A13b). Each regression replicates the main specification reported in Columns 2 and 4 of Table 2. Because the unit of observation is the individual, we estimate each regression by OLS rather than WLS. Each coefficient comes from the baseline estimated separately across municipalities split by predetermined characteristics. Continuous variables are split at the median. Indicator variables are split according to the corresponding dummy. In particular, each regression includes: total number of IDS per square kilometer, municipality surface, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009), province and year fixed effects, historical average taxable income per capita (2000-2004), population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and maximum altitude, as well as individual characteristics, including gender, age, age squared, education, employment status, and profession. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Figure A14: Placebo test: effect of wind exposure to IDS on individual trust



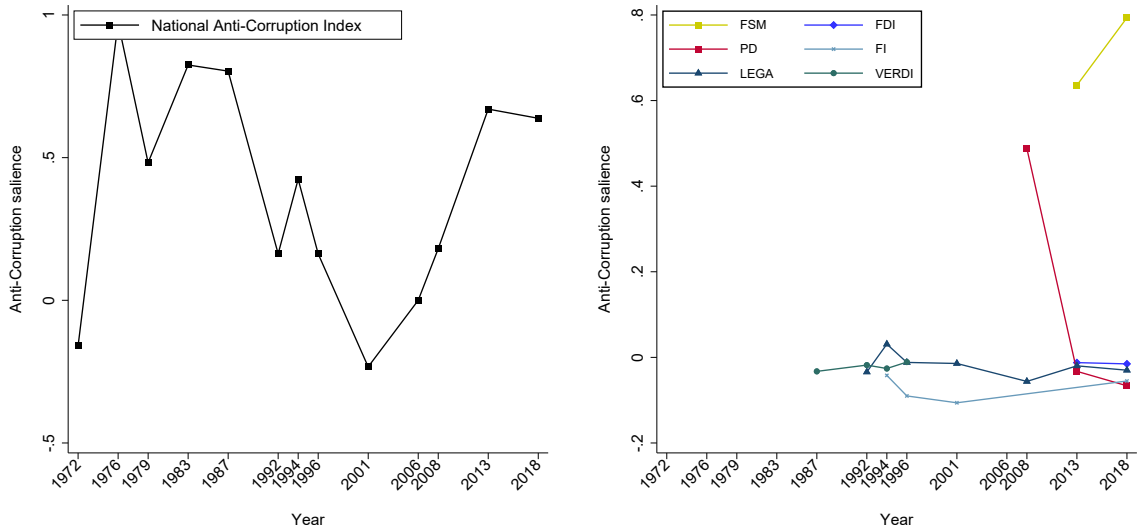
Notes: This figure reports placebo estimates of the effect of toxic winds on trust in other institutions and organizations. Each coefficient comes from a separate OLS regression in which the dependent variable is an indicator for high trust in the institution listed on the vertical axis. Each regression includes the full set of controls from Equation 2, together with the individual characteristics reported in Tables 2 and 3. The treatment variable is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Figure A15: National environmental salience and party-level positioning



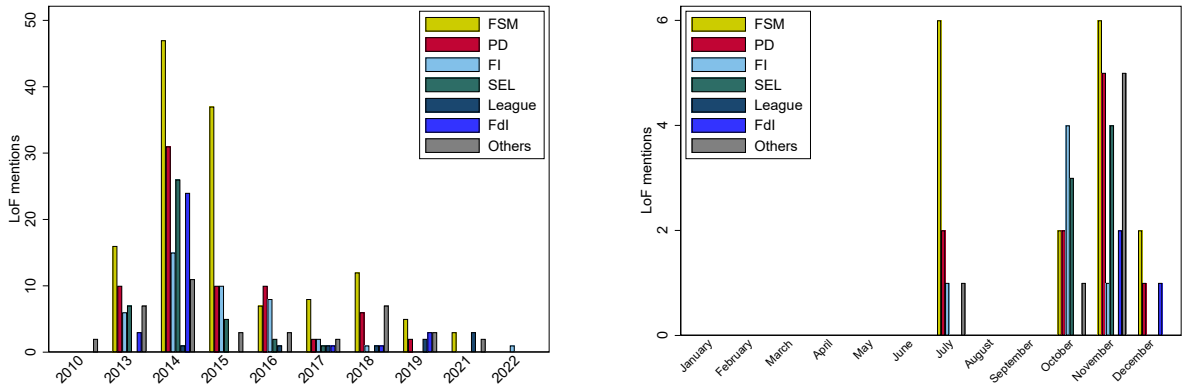
Notes: The left panel shows the National Environmental Index, built as the weighted average of party-level environmental preferences using national vote shares as weights. This index reflects the overall salience of environmental concerns in national politics across electoral years. The right panel shows the environmental score for each party, based on environmental preferences from the Manifesto Project Database ($\sum_{p_t \in S_t} Vote\ Share_{p,t} \times EnvPref^{w}_{p,t}$). Among major parties, only the Five Star Movement (FSM) presents high environmental salience, highlighting its distinctive positioning on ecological issues compared to other political parties.

Figure A16: National anti-corruption salience and party-level positioning



Notes: The left panel shows the National Anti-Corruption Index, built as the weighted average of party-level anti-corruption preferences using national vote shares as weights. This index reflects the overall salience of anti-corruption concerns in national politics across electoral years. The right panel shows the anti-corruption score for each party, based on anti-corruption preferences from the Manifesto Project Database ($\sum_{p_t \in S_t} Vote\ Share_{p,t} \times AntiCorPref^{w}_{p,t}$). Among major parties, only the Five Star Movement (FSM) presents high anti-corruption salience, highlighting its distinctive positioning on this issue compared to other political parties.

Figure A17: Salience of "Land of Fires" in Italy's parliament



(a) Land of Fires mentions by year

(b) Land of Fires mentions (2013)

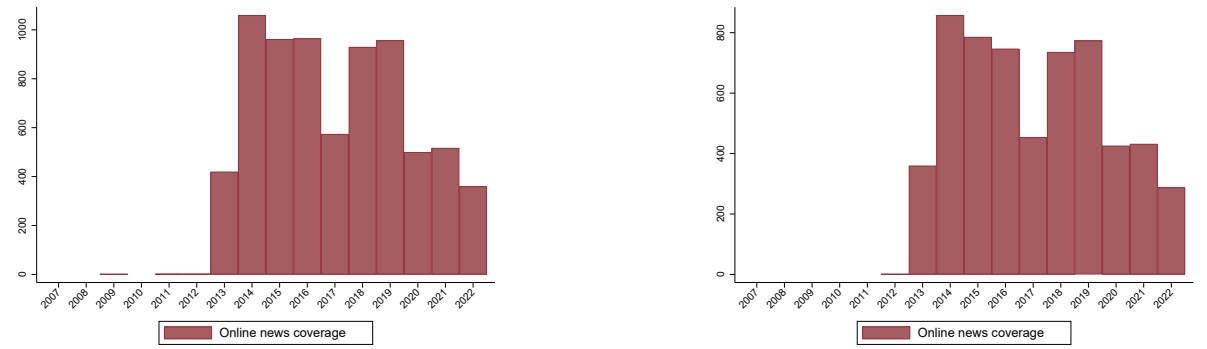
Notes: Figure A17a reports annual raw counts of lower house speeches that contain the expression "Land of Fires", disaggregated by party. FSM denotes the Five Star Movement, PD the Democratic Party, FI refers to *Forza Italia*, SEL stands for *Sinistra Ecologia e Libertà* (Green party), and FdI refers to Brothers of Italy. The series spans 2010–2022; no occurrences appear before 2010 in the *ItaParlCorpus* dataset (1948–2022). Mentions surge in 2013, driven primarily by FSM (with contributions by mainstream parties like PD and FI), and then decline with sporadic activity thereafter. Party labels reflect speaker's affiliation at the time of the speech. Figure A17b reports monthly raw counts of lower house speeches that contain the expression "Land of Fires", disaggregated by party for the year 2013. Source: ItaParlCorpus.

Table A7: Exposure to toxic winds and voting for main political parties (2013-2022)

Party ↓ Election →	2013	2018	2022
Five Star Movement	0.01097**	0.02504***	0.04443***
	(0.00540)	(0.00854)	(0.00953)
Democratic Party	-0.01607**	-0.01961***	-0.01545**
	(0.00749)	(0.00691)	(0.00682)
Forza Italia	0.02006**	-0.00165	0.00012
	(0.00844)	(0.00569)	(0.00571)
League	-0.00032	-0.00656**	-0.01863***
	(0.00126)	(0.00258)	(0.00502)
Brothers of Italy	-0.01011*	-0.00375	-0.00277
	(0.00548)	(0.00371)	(0.00562)
Far Left/Green	-0.00142	0.00237	0.00083
	(0.00229)	(0.00251)	(0.00140)
Other parties	-0.00387	0.00344	-0.00966**
	(0.00635)	(0.00488)	(0.00380)

Notes: This table reports the effect of toxic winds on the vote share of the main Italian political parties (rows) across the three national elections held between 2013 and 2022 (columns). Each entry shows the estimated effect of toxic winds, based on the main specification reported in Equation 2, excluding election-year fixed effects since each regression is estimated separately by election year. In particular, it includes province fixed effects, IDS number per square kilometer, municipality surface, historical weather variables at municipality level (average humidity, rainfall, wind direction, and wind speed over 2001-2009), socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, historical average taxable income per capita over 2000-2004), and geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Standard errors are robust to heteroskedasticity. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure A18: Online news coverage of the "Land of Fires" (2007-2022)



(a) National news outlets **(b)** Local news outlets

Notes: This figure reports the annual number of online news articles mentioning the "Land of Fires" in Italy between 2007 and 2022. Panel A18a reports coverage by national news outlets. Panel A18b presents coverage by local news outlets. This pattern aligns with the surge in media attention documented in Figure 9. Since FSM emerged as an internet-driven political movement, online news coverage offers an additional measure of media attention to the issue. Source: MediaCloud.

B Estimation of wind direction at each IDS

This section outlines the procedure adopted to approximate historical wind direction at each of the 1,851 Illegal Disposal Sites (IDS) located in the Campania region based on records from the 47 meteorological stations located in the region and daily measures for the period 2001–2009. Figure B2 plots meteorological stations location.

First, for each IDS_s, meteorological station j, and day τ, we compute the angle between the wind direction vector ($WINDDIR_{j,\tau}$) and the vector linking the meteorological station to the IDS (the connection vector), following Qiu et al. (2024). We denote the angle between the connection vector and wind direction as $\theta_{s,j,\tau}$. Second, we define the binary indicator $WI_{s,j,\tau}$ as equal to 1 if $\theta_{s,j,\tau}$ falls within the range $[0°, 90°]$. This area represents the *acceptable* region for our purposes, as it is the half-space delimited by a line orthogonal to the wind direction vector and passing through the meteorological station j (see Figure B1). Intuitively, meteorological station j does not provide information about wind direction at IDS_s if the wind originating from j does not bear towards s.

Since wind direction is an angular variable, it cannot be averaged directly in degrees. We therefore first express each daily wind observation as two signed orthogonal components.[22] To aggregate information from *acceptable* wind stations into one single direction vector per each $s\tau$ pair, we implement a spatial matching technique inspired by the K-Nearest-Neighbors methodology. Each day, we consider as valid nearest neighbors the five nearest meteorological stations for which $WI_{s,j,\tau} = 1$ and weight wind direction in station j on day τ proportionally to the (inverse of) the distance between station j and IDS_s.[23] In this way, closer actual stations receive higher weights whereas farther actual stations receive lower weights. Stations that are either too far away – i.e., not among the five nearest neighbors – or experience wind direction that cannot predict wind direction at station s in day τ are discarded. For each selected neighboring station, the weighted orthogonal components are computed as $X^W_{s,j,\tau} = \alpha_{s,j,\tau} \times WI_{s,j,\tau} \times X_{j,\tau}$ and $Y^W_{s,j,\tau} = \alpha_{s,j,\tau} \times WI_{s,j,\tau} \times Y_{j,\tau}$. These are then aggregated across the selected stations to obtain the synthetic daily component vector. We recover wind direction as a mathematical angle from the aggregated Cartesian components using the two-argument arc-tangent, $\text{atan2}(Y, X)$, and then normalize the resulting angle to the interval $[0, 360)$. Hence, angles are measured relative to the Cartesian x-axis, rather than as meteorological azimuths measured clockwise from North. This convention is adopted consistently throughout the

[22] For each meteorological station j and day τ, we define our project's internal coordinate system as $X_{j,\tau} = -WINDSPEED_{j,\tau} \sin\big(WINDDIR^{rad}_{j,\tau}\big)$ and $Y_{j,\tau} = -WINDSPEED_{j,\tau} \cos\big(WINDDIR^{rad}_{j,\tau}\big)$, where $WINDDIR^{rad}_{j,\tau}$ denotes wind direction expressed in radians.

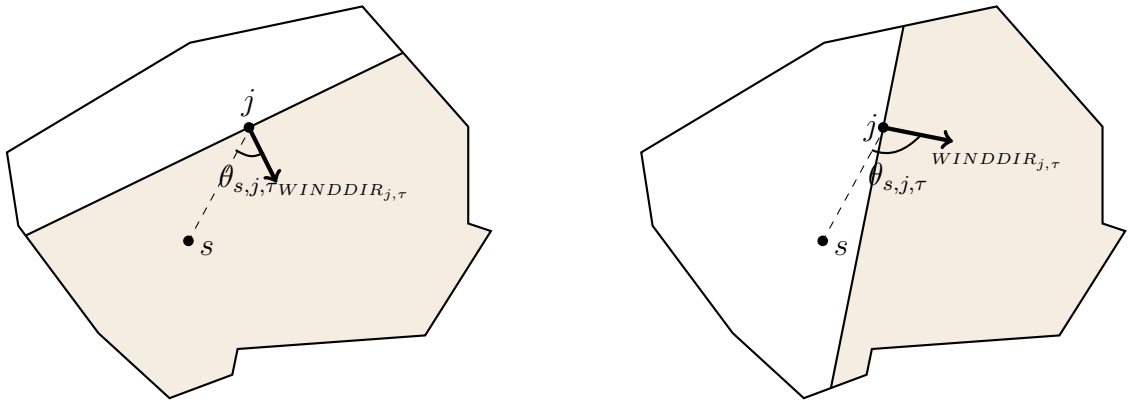
[23] We define the inverse distance as $Dist^{inv}_{s,j} = \frac{1}{d_{s,j}}$ where $d_{s,j}$ represents the distance (in km) between IDS_s and station j. Then, we compute the total inverse distance within the five nearest neighbors as $TotDist^{inv}_{s,\tau} = \sum_{j \in \mathbf{J_{s,\tau}}} Dist^{inv}_{s,j}$, where $\mathbf{J_{s,\tau}}$ denotes the set of nearest neighbors. The weights are then defined as $\alpha_{s,j,\tau} = \frac{Dist^{inv}_{s,j}}{TotDist^{inv}_{s,\tau}}$.

entire analysis. In particular, we adopt the same Cartesian convention also to compute the vector linking each meteorological station to the corresponding IDS, as well as the vector linking each IDS to the municipality falling within the buffer. The wind direction at IDS_s on day τ is therefore recovered by applying the two-argument arc-tangent to the aggregated components: $WINDDIR^{rad}_{s,\tau} = \text{atan2}\left(\sum_{j=1}^{5} Y^W_{s,j,\tau}, \sum_{j=1}^{5} X^W_{s,j,\tau}\right)$. We then convert the resulting angle into degrees: $WINDDIR_{s,\tau} = WINDDIR^{rad}_{s,\tau} \cdot \frac{180}{\pi}$. Hence, the wind direction at IDS_s on day τ ($WINDDIR_{s,\tau}$) is obtained from the weighted orthogonal components of the selected stations:

$$WINDDIR_{s,\tau} = \text{atan2}\left(\sum_{j=1}^{5} Y^W_{s,j,\tau}, \sum_{j=1}^{5} X^W_{s,j,\tau}\right) \cdot \frac{180}{\pi}.$$

Finally, we compute the historical average wind direction at each IDS ($\overline{WINDDIR_s}$) over the entire period 2001-2009. Figure B3 reports the estimated directions at each IDS.

Figure B1: Wind influence dummy ($WI_{i,j}$)



(a) $WI_{s,j,\tau} = 1$ **(b)** $WI_{s,j,\tau} = 0$

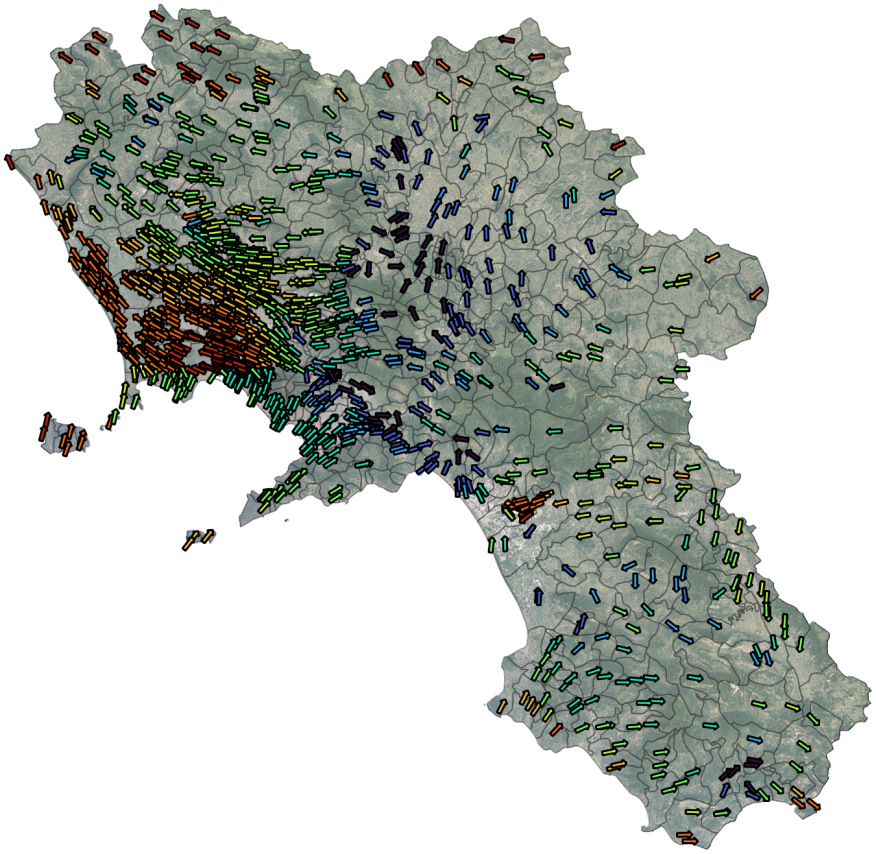
Notes: Panel (a) shows an example in which $WI_{s,j,\tau} = 1$ since the angle between the connection vector (dashed line from station j to IDS_s) and the wind direction vector falls within $[0°, 90°]$. Panel (b) shows an example in which $WI_{s,j,\tau} = 0$. The wind exposed region is defined by the half-space delimited by a line orthogonal to the wind direction vector and passing through the meteorological station j.

Figure B2: Meteorological stations distribution map



Notes: This map shows the geographic distribution of the 47 meteorological stations used to measure the weather variables employed in the empirical analysis.

Figure B3: Historical average wind direction at each IDS



Notes: This figure displays the estimated historical average wind direction (2001-2009) at each of the 1,851 IDS. Color intensity denotes wind speed (darker red arrows correspond to higher average wind speeds).

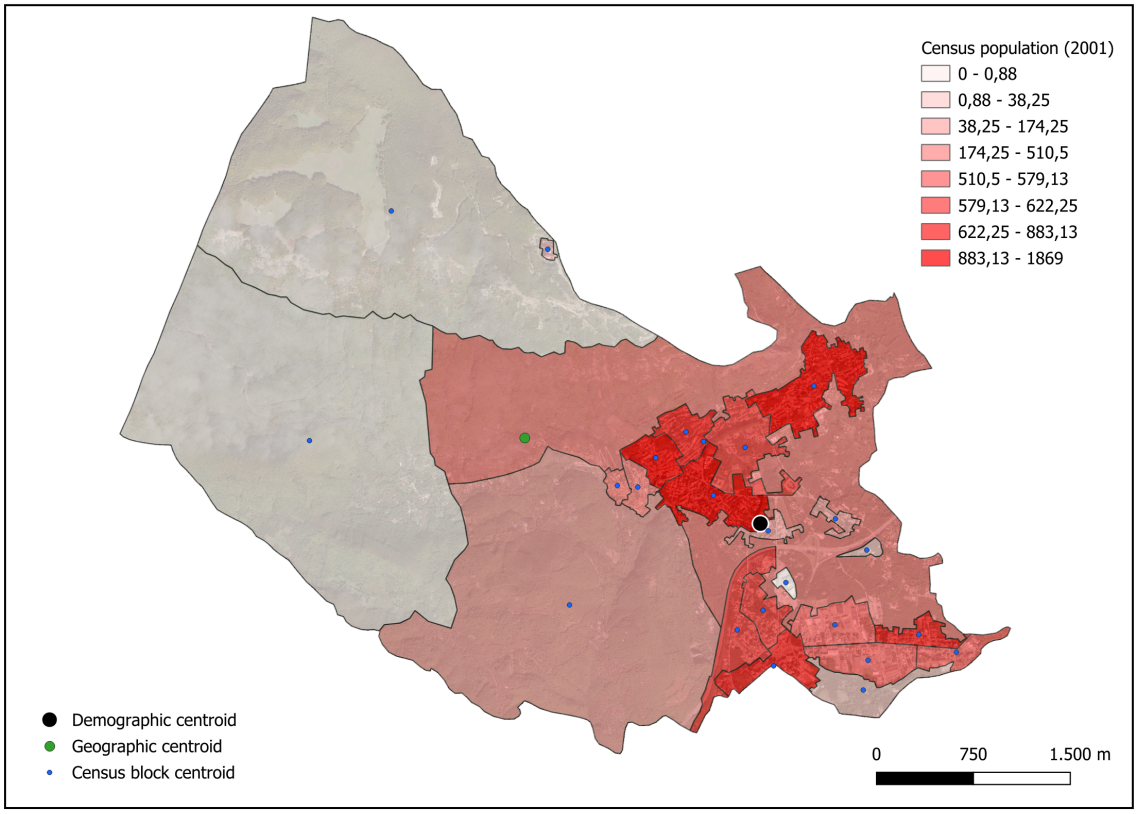
C Calculation of population-weighted municipality "demographic" centroids

To identify wind trajectories between the contaminated site and individuals that are exposed to pollutants, it is essential to geo-locate each municipality taking into account that the urban center may not necessarily be the geographical center (i.e., the centroid) of the municipality. We utilize population data and the exact location of each census block of the Campania region (approximately 20,000 census blocks, equivalent to an average of circa 40 census blocks per municipality) as of the 2001 population census. Then, we define the "demographic" centroid of each municipality i – which we use as our proxy for the geo-location of individuals that live in the municipality – as the weighted average of all the geometric centroids of each municipality's census blocks $b(i)$, where the weight on each block's centroid depends on the share of the municipality's population that lives in that block, $\frac{Pop_{b(i)}}{Pop_i}$.[24]

Intuitively, if all individuals who live in a municipality are concentrated within one census block, what really matters for assessing their exposure to IDS is the position of that census block rather than the position of the geographical centroid of the municipality. Formally, we define the coordinates of the "demographic" centroid (x_i, y_i) as $x_i = \sum_{b=1}^{B} \left(\frac{Pop_{b(i)}}{Pop_i} \times x_{b(i)} \right)$ and $y_i = \sum_{b=1}^{B} \left(\frac{Pop_{b(i)}}{Pop_i} \times y_{b(i)} \right)$, where the pair $(x_{b(i)}, y_{b(i)})$ identifies the coordinates of the geographical centroid of census block b. Figure C1 clarifies why identifying the "demographic" centroid is essential for our purposes. The geographic centroid would not yield an accurate representation of where people live in this municipality while the "demographic" centroid offers a more accurate proxy.

[24] Notice that census blocks are nested into municipalities.

Figure C1: Example of demographic centroid



Notes: This figure displays the demographic and geographic centroids for the municipality of Mercogliano (province of Avellino), which consists of 24 census blocks. Shaded polygons represent census blocks, with darker tones denoting higher 2001 census population. Blue dots mark the geographic centroids of each census block. The green dot is the municipality's geographic centroid, whereas the black dot is the demographic centroid. The latter is computed as the population–weighted average of census block centroids using 2001 census data. Since wind exposure is measured over 2001–2009, the 2001 census provides the closest snapshot of the spatial distribution of residents in this period. The underlying satellite image shows that the western part of Mercogliano is largely uninhabited, while residential areas are concentrated at east. Consistently, the demographic centroid lies in the populated eastern area rather than at the geometric center of the municipality, making it a more suitable proxy for individual exposure to pollution.

D Weighting and the individual-level estimand

Our main electoral outcome is voter turnout, measured as the share of eligible voters who cast a ballot. The econometric question is therefore how municipality-level observations should be weighted when the object of interest is the effect of treatment exposure on *individual* electoral participation. An unweighted regression assigns the same importance to every municipality, regardless of electorate size. By contrast, weighting municipalities by the number of eligible voters more closely preserves equal weighting across individuals. This distinction concerns aggregation rather than identification and corresponds to the distinction between unit-weighted and population-weighted estimands in grouped-data regressions discussed by Solon et al. (2015).

We begin with a multi-period model of individual electoral participation with heterogeneous treatment effects, common treatment timing, and binary exposure. We first establish the individual-level benchmark and show that, in a balanced panel, the multi-period estimator collapses exactly to a comparison of average pre- and post-treatment outcomes. We then move to municipality-level turnout and study how aggregation across municipalities affects the estimand. We show that (i) turnout aggregates individual voting decisions; (ii) equal municipality weights generally recover the effect for the average municipality rather than for the average eligible voter; (iii) weighting by pre-treatment electorate size more closely approximates individual-level weighting; and (iv) under heterogeneous treatment effects, the unweighted specification generally fails to recover the effect for the average voter unless treatment heterogeneity is unrelated to municipality size. We characterize the difference between the weighted and unweighted estimators as an observable covariance between electorate size and pre/post changes in turnout. The argument concerns aggregation rather than identification and would arise even under random assignment.

D.1 Individual-level model and target estimand

Let i index eligible voters and $t = 1, \ldots, T$ national elections. Treatment is adopted at a common date, with $Post_t$ equal to one for elections held after the 2005 information shock. Let $D_i \in \{0, 1\}$ indicate that voter i resides in a treated municipality, and let $y_{it} \in \{0, 1\}$ indicate whether voter i casts a ballot in election t. In potential-outcomes notation,

$$y_{it} = y_{it}(0) + D_i Post_t \delta_{it}, \tag{1}$$

where $\delta_{it} = y_{it}(1) - y_{it}(0)$ denotes the individual treatment effect on electoral participation. Under parallel trends on untreated outcomes, the corresponding individual-level specification is

$$y_{it} = \alpha_i + \lambda_t + \delta_{it} D_i Post_t + \varepsilon_{it}. \tag{2}$$

Define individual i's treatment effect as the average of δ_{it} over the post-treatment elections,

$$\delta_i \equiv \frac{1}{T_1} \sum_{t \geq t^*} \delta_{it}. \tag{3}$$

The natural estimand for our analysis is the average effect on treated voters,

$$\delta^{ind} = \frac{1}{N_T} \sum_{i \in \mathcal{T}} \delta_i, \tag{4}$$

where $\mathcal{T}$ denotes the set of treated voters and N_T its size. Each *individual* therefore receives equal weight in Equation 4. This property is important when treatment effects may vary systematically across municipalities of different sizes.

D.2 Exact collapse to pre- and post-treatment means

For expositional purposes, we first consider a benchmark balanced individual-level panel in which the same set of eligible voters is observed across elections. With a common treatment date, the multi-period structure can be collapsed into pre- and post-treatment averages. Define individual i's mean electoral participation before and after the information shock and their difference as

$$\bar{y}_i^{pre} = \frac{1}{T_0} \sum_{t < t^*} y_{it}, \qquad \bar{y}_i^{post} = \frac{1}{T_1} \sum_{t \geq t^*} y_{it}, \qquad \Delta y_i = \bar{y}_i^{post} - \bar{y}_i^{pre}. \tag{5}$$

In this benchmark setting, a balanced individual panel with common treatment timing and no additional covariates yields a coefficient on $D_i\, Post_t$ that is exactly equal to the two-period difference-in-differences estimator based on individual pre- and post-treatment averages (Bertrand et al., 2004):

$$\widehat{\delta}^{ind} = \frac{1}{N_T} \sum_{i \in \mathcal{T}} \Delta y_i - \frac{1}{N_C} \sum_{i \in \mathcal{C}} \Delta y_i, \tag{6}$$

where $\mathcal{C}$ denotes the set of control individuals and $N_C = |\mathcal{C}|$. Under parallel trends, taking expectations in Equation 6 gives $\mathbb{E}[\widehat{\delta}^{ind}] = \delta^{ind}$. Heterogeneous treatment effects are therefore averaged over post-treatment elections within individuals and then equally across treated individuals. Equation 6 provides the benchmark for the aggregation argument below. Its denominators are numbers of *individuals*, rather than numbers of municipalities. Hence, any municipality-level specification intended to recover the corresponding individual-level estimand should preserve this weighting across voters.

The same pre/post collapse applies to the municipality-level specifications considered below because treatment also varies only at the municipality×period level. Empirically, however, electorate size changes across elections. We therefore distinguish below between the exact individual-level benchmark and our empirical weighting scheme, which fixes municipality weights at the number of eligible voters in 2001, before the information shock.

D.3 Unweighted municipality-level turnout

Let j index municipalities and let V_{jt} denote the number of eligible voters who cast a ballot in municipality j at election t. Let E_{jt} denote the number of eligible voters. Municipality turnout is

$$R_{jt} = \frac{V_{jt}}{E_{jt}}. \tag{7}$$

Because R_{jt} is an average of individual voting decisions, an unweighted regression in turnout assigns the same total weight to every municipality. Consider

$$R_{jt} = \alpha_j + \lambda_t + \delta_R^{UW} D_j Post_t + u_{jt}. \tag{8}$$

With a common treatment date, the corresponding estimator can be written as a difference between average pre/post changes in treated and control municipalities,

$$\widehat{\delta}_R^{UW} = \frac{1}{J_T} \sum_{j=1}^{J_T} \Delta R_{Tj} - \frac{1}{J_C} \sum_{j=1}^{J_C} \Delta R_{Cj}, \tag{9}$$

where J_T and J_C denote the numbers of treated and control municipalities.

This estimator gives every municipality equal weight. A voter living in a small municipality therefore has greater influence on the aggregate coefficient than a voter living in a large municipality. The resulting estimand is the treatment effect for the average municipality rather than for the average eligible voter.

D.4 Eligible-voter-weighted turnout

To better approximate individual-level weighting, our preferred specification weights each municipality by its number of eligible voters before treatment. Let E_j^0 denote the number of eligible voters in municipality j in 2001, the last national election before the information shock. The weighted estimator is

$$\widehat{\delta}_R^{W} = \frac{\sum_{j=1}^{J_T} E_{Tj}^0 \Delta R_{Tj}}{\sum_{j=1}^{J_T} E_{Tj}^0} - \frac{\sum_{j=1}^{J_C} E_{Cj}^0 \Delta R_{Cj}}{\sum_{j=1}^{J_C} E_{Cj}^0}. \tag{10}$$

This specification gives larger municipalities greater weight in proportion to the number of individuals eligible to vote before treatment. It therefore targets a baseline-electorate-weighted average treatment effect rather than an equally weighted average across municipalities.

The use of pre-treatment electorate size is deliberate. Weighting by the contemporaneous number of eligible voters would allow post-treatment changes in population, migration, or electorate composition to affect the regression weights themselves. Using the 2001 electorate instead fixes the weighting scheme before the information shock. As a robustness check, we obtain similar results when weights are based on the number of eligible voters in 1996.

D.5 Weighted versus unweighted estimands

The difference between the weighted and unweighted estimators can be expressed as follows. For any municipality-level variable x_j and positive weights E_j^0,

$$\frac{\sum_{j=1}^{J} E_j^0 x_j}{\sum_{j=1}^{J} E_j^0} - \frac{1}{J}\sum_{j=1}^{J} x_j = \frac{\widehat{\mathrm{Cov}}_J\big(E_j^0,\, x_j\big)}{\bar{E}^0}, \qquad \widehat{\mathrm{Cov}}_J\big(E_j^0,\, x_j\big) \equiv \frac{1}{J}\sum_{j=1}^{J}\big(E_j^0 - \bar{E}^0\big)\Big(x_j - \tfrac{1}{J}\textstyle\sum_k x_k\Big). \tag{11}$$

Applying this identity to the pre/post change in turnout separately within treated and control municipalities gives

$$\widehat{\delta}_R^{W} - \widehat{\delta}_R^{UW} = \frac{\widehat{\mathrm{Cov}}_J(E_{Tj}^0, \Delta R_{Tj})}{\bar{E}_T^0} - \frac{\widehat{\mathrm{Cov}}_J(E_{Cj}^0, \Delta R_{Cj})}{\bar{E}_C^0}. \tag{12}$$

Hence, the weighted and unweighted estimators coincide if and only if the scaled covariance between baseline electorate size and the pre/post change in turnout is the same in treated and control municipalities.

To interpret this difference in terms of treatment-effect heterogeneity, suppose in addition that untreated changes in turnout are unrelated to baseline electorate size within treated and control municipalities. Let $\bar{\delta}_{Tj}$ denote the average treatment effect on turnout in treated municipality j. Under this condition and parallel trends, the expected difference between the weighted and unweighted estimators is determined by the covariance between baseline electorate size and municipality-level treatment effects:

$$\mathbb{E}\left[\widehat{\delta}_R^{W} - \widehat{\delta}_R^{UW}\right] = \frac{\mathrm{Cov}_J\left(E_{Tj}^0, \bar{\delta}_{Tj}\right)}{\bar{E}_T^0}. \tag{13}$$

Equation (13) makes the distinction between the two estimands explicit. The unweighted regression recovers the baseline-electorate-weighted effect only if municipality-level treatment effects are unrelated to baseline electorate size. Otherwise, the two spec-

ifications answer different questions: the unweighted regression targets the effect for the average municipality, whereas the weighted regression gives greater influence to municipalities with larger pre-treatment electorates and therefore targets a baseline-electorate-weighted effect.

Equation (12) also shows that this distinction is observable in the data. The difference between the weighted and unweighted estimators is exactly determined by the covariance between baseline electorate size and changes in turnout within treated and control municipalities. A non-negligible difference between the two specifications therefore indicates that equal municipality weights and baseline-electorate weights aggregate observed turnout changes differently. This is precisely the type of weighting distinction emphasized by Solon et al. (2015).

D.6 Empirical choice

Our baseline regressions therefore weight municipalities by the number of eligible voters in 2001. This choice does not affect the identifying assumptions of the difference-in-differences design. It determines how municipality-specific treatment effects are aggregated. Under treatment-effect heterogeneity, equal municipality weights and eligible-voter weights generally recover different quantities. The former estimate the effect for the average municipality, whereas the latter give greater weight to municipalities with larger pre-treatment electorates and are therefore more closely aligned with the individual-level estimand motivating our analysis.

E Robustness checks

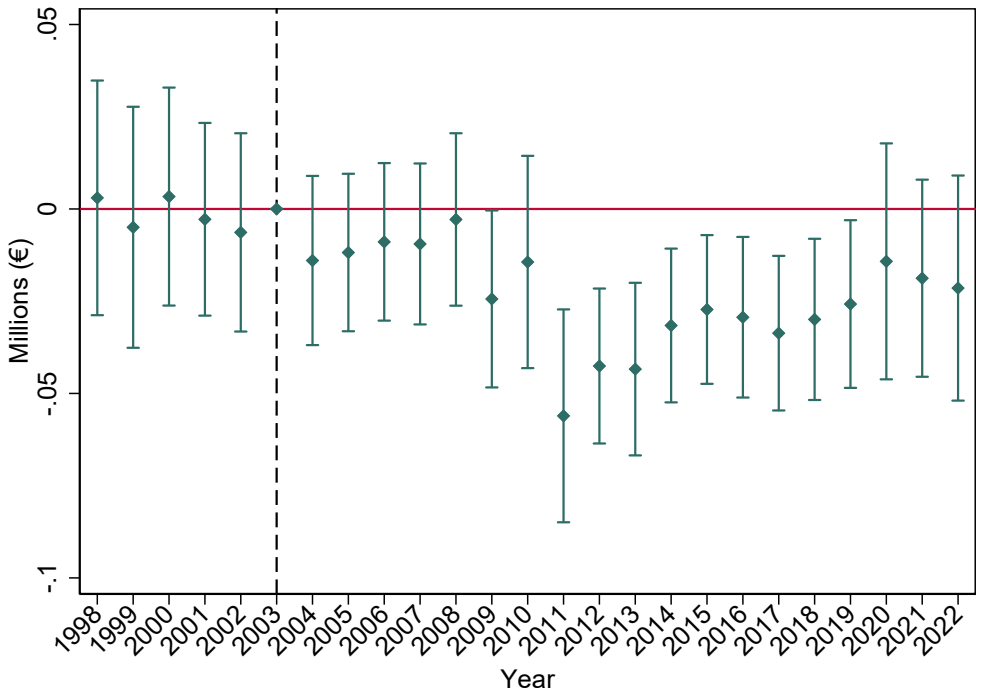
E.1 Ratio of current transfers to total revenues

Table E1: Robustness test I: restricting the sample to municipalities within buffers

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0281***	-0.0237***	-0.0301***	-0.0262***
	(0.00896)	(0.00830)	(0.00942)	(0.00879)
Total number of IDS per sqkm × Post	-0.00210	-0.00218	-0.00268	0.00120
	(0.00180)	(0.00162)	(0.00169)	(0.00201)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11703	11703	11703	11703
Dep var mean	0.188	0.188	0.188	0.188
R-squared	0.813	0.820	0.822	0.848

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The sample is restricted to municipalities whose demographic centroid lies within 3 km of at least one IDS, excluding those that never fall within a IDS buffer. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E1: Robustness test II: choice of reference year



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between $DownWind_i$ and year indicators, with 2003 omitted as the reference year. Each point represents the estimated effect of toxic winds on the ratio of current transfers from the central and regional governments to total municipal revenues, relative to 2003. The model replicates the main dynamic specification reported in Equation 1b, replacing the baseline reference year with 2003. In particular, it includes municipality and year fixed effects, total number of IDS per square kilometer, as well as covariates interacted with year dummies: municipality surface, province fixed effects, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009), geographical characteristics (maximum altitude), and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). Weights are equal to the number of eligible voters in each municipality in 2001. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Table E2: Robustness test III: alternative buffers

	Dep. variable: Ratio of current transfers to total revenues		
	(1)	(2)	(3)
Buffer radius	3 km	5 km	10 km
DownWind × Post	-0.0215**	-0.0117	-0.0154
	(0.00870)	(0.0124)	(0.0146)
Municipality FE	✓	✓	✓
Year FE	✓	✓	✓
IDS number per sqkm	✓	✓	✓
Year FE × Surface	✓	✓	✓
Year FE × Province FE	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓
Observations	13391	13391	13391
Dep var mean	0.186	0.186	0.186
R-squared	0.839	0.839	0.839

Notes: This table shows WLS estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column controls for the main specification reported in Equation 1a and in Column 4 of Table A5, while varying the buffer radius from the IDS center (see Figure A8). The post-treatment period is defined by the indicator variable *Post*, which equals 1 for all years after 2004, and 0 otherwise. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E3: Robustness test IV: alternative definition of $WI_{s,j,\tau}$ and $DownWind_i$

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
	$\theta = 30°$	$\theta = 60°$	$\theta = 90°$	$\theta = 120°$
DownWind × Post	0.0158	0.00487	-0.0215**	-0.0157*
	(0.0107)	(0.0130)	(0.00888)	(0.00914)
Total number of IDS per sqkm × Post	0.000978	0.00125	0.00131	0.00129
	(0.00201)	(0.00204)	(0.00204)	(0.00204)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓	✓
Observations	13391	13391	13391	13391
Dep var mean	0.186	0.186	0.186	0.186
R-squared	0.839	0.838	0.839	0.839

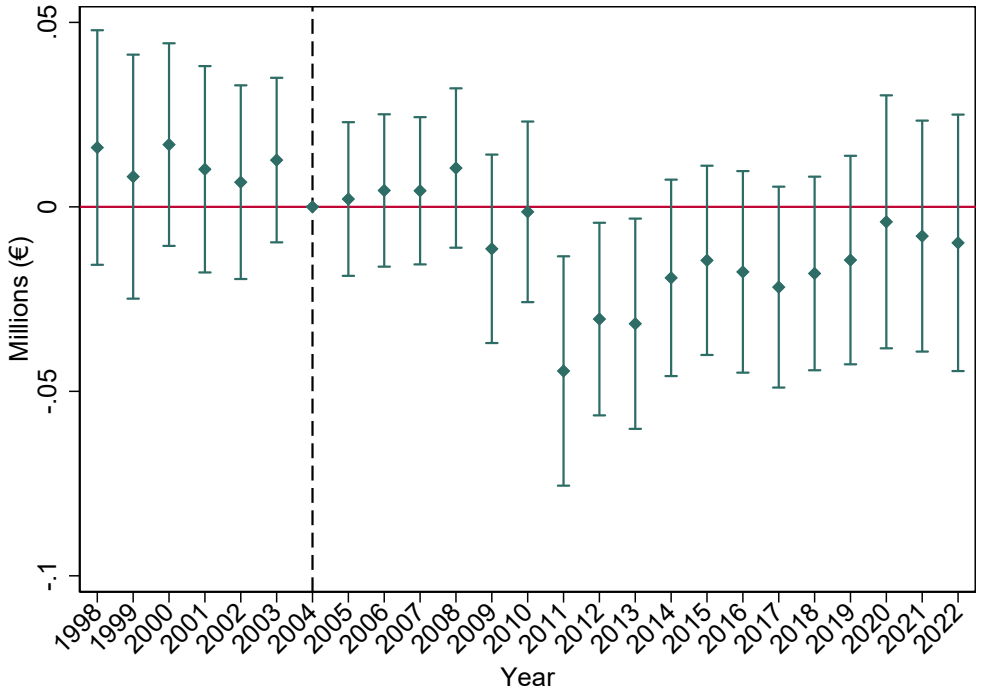
Notes: This table shows WLS estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center, while varying both the computation of historical average wind direction at each IDS and $DownWind_i$. $WI_{s,t,\tau}$ equals 1 as the angle ($\theta_{s,j,\tau}$) between the connection vector (line from the illegal disposal site s to the actual station j) and the wind direction vector falls within $[0, 30°]$ $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. A municipality is classified as downwind if the angle (θ) between the connection vector (line from the IDS to the demographic centroid) and the historical average wind direction ($\overline{WINDDIR_s}$) falls within the range $[0, 30°]$, $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. Each column replicates the main specification reported in Equation 1a and in Column 4 of Table A5. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E4: Robustness test V: alternative weights based on eligible voters

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0348	-0.0202	-0.0329	0.0166
	(0.0220)	(0.0214)	(0.0239)	(0.0231)
Total number of IDS per sqkm × Post	-0.00189	-0.00236	-0.00297	0.00105
	(0.00194)	(0.00185)	(0.00203)	(0.00221)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	4686	4686	4686	4686
Dep var mean	0.200	0.200	0.200	0.200
R-squared	0.857	0.866	0.868	0.898

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column replicates the specifications reported in Table A5, and uses the number of eligible voters in 1996 rather than in 2001 as weights. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 1996. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E2: Robustness test V: alternative weights based on eligible voters (dynamic specification)



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2004 omitted as the reference year. Each point represents the estimated effect of toxic winds on the ratio of current transfers from the central and regional governments to total municipal revenues. This figure replicates the main specification reported in Equation 1b and in Figure 5b, and uses the number of eligible voters in 1996 rather than in 2001 as weights. 95% confidence intervals are shown. Standard errors are clustered at the municipality level.

Table E5: Robustness test VI: Conley HAC standard errors

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0213***	-0.0176***	-0.0234***	-0.0215***
	(0.00646)	(0.00665)	(0.00738)	(0.00735)
Total number of IDS × Post	-0.00212	-0.00212	-0.00256*	0.00131
	(0.00152)	(0.00138)	(0.00143)	(0.00166)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	13391	13391	13391	13391
R-squared	0.203	0.229	0.235	0.340

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column replicates Table A5 while computing Conley-HAC standard errors with maximum cutoffs of 300 km for spatial distance and 25 years for temporal lags. Heteroskedasticity and Conley HAC standard errors at the municipality level are in parentheses. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period is identified by the indicator variable *Post*, which equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E6: Robustness test VII: excluding municipality fixed effects

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0220***	-0.0181**	-0.0239***	-0.0221**
	(0.00775)	(0.00778)	(0.00881)	(0.00873)
Total number of IDS per sqkm × Post	-0.00210	-0.00213	-0.00258	0.00127
	(0.00180)	(0.00162)	(0.00168)	(0.00201)
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	13391	13391	13391	13391
Dep var mean	0.186	0.186	0.186	0.186
R-squared	0.719	0.726	0.728	0.781

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes municipality fixed effects. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with year fixed effects to account for common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E7: Robustness test VIII: excluding provincial capitals

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0242***	-0.0200**	-0.0245***	-0.0194**
	(0.00833)	(0.00845)	(0.00934)	(0.00858)
Total number of IDS per sqkm × Post	-0.00187	-0.00224	-0.00263*	0.00110
	(0.00176)	(0.00154)	(0.00160)	(0.00212)
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	13267	13267	13267	13267
Dep var mean	0.180	0.180	0.180	0.180
R-squared	0.639	0.654	0.656	0.712

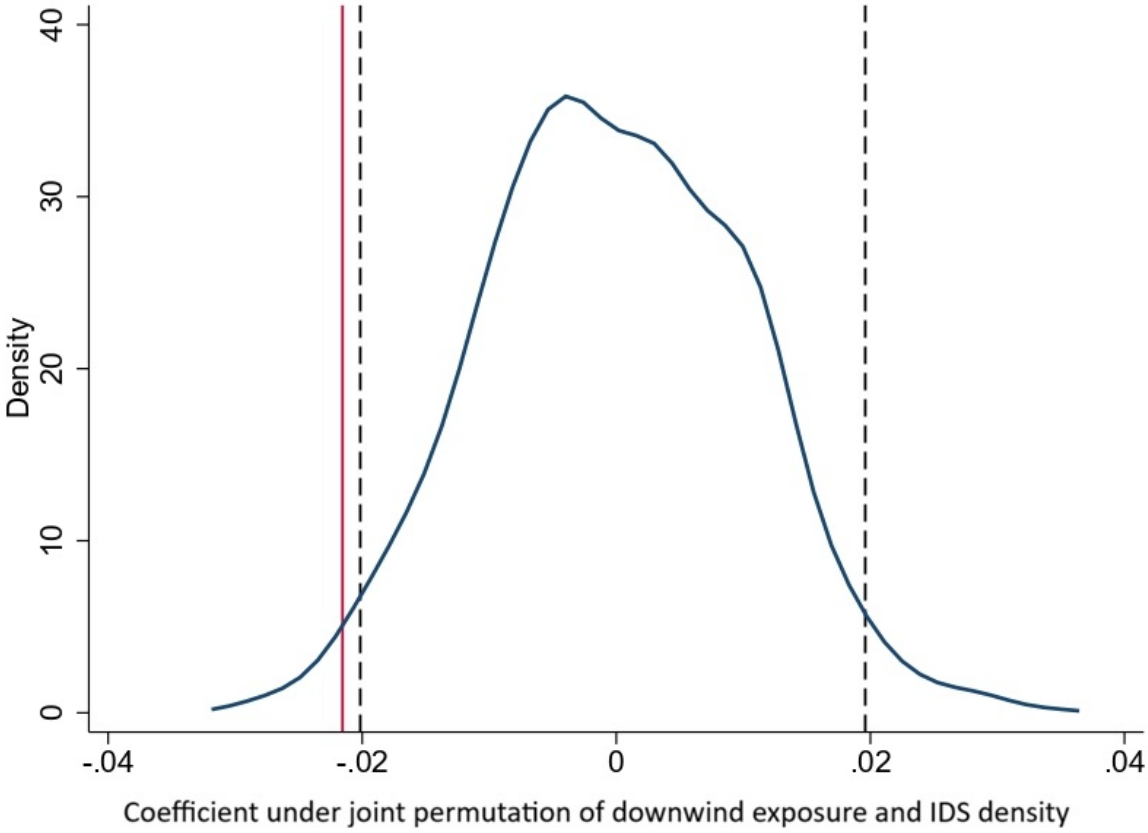
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes the five provincial capitals: Avellino, Benevento, Caserta, Naples and Salerno. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E8: Robustness test IX: official Land of Fires provinces (Naples and Caserta)

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0346	-0.0181	-0.0304	0.0182
	(0.0216)	(0.0204)	(0.0230)	(0.0224)
Total number of IDS per sqkm × Post	-0.00196	-0.00255	-0.00313	0.000690
	(0.00187)	(0.00177)	(0.00194)	(0.00221)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	4686	4686	4686	4686
Dep var mean	0.199	0.199	0.199	0.199
R-squared	0.854	0.864	0.865	0.895

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification is restricted to municipalities in the provinces of Naples and Caserta. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E3: Robustness test X: permutation test



Notes: This figure displays the distribution of the ratio of current transfers to total revenues coefficients obtained from 1,000 permutation draws. In each permutation, we jointly reassign downwind exposure ($DownWind_i$) and the total number of IDS per square kilometer (IDS density) across municipalities, preserving their joint distribution. The reassigned values are held fixed across election years, and the main ratio of current transfers to total revenues specification (Equation 1a) is re-estimated on the baseline estimation sample. The curve reports a Gaussian kernel density estimate of the resulting coefficients on $DownWind_i \times Post_t$. The solid red line shows the coefficient estimated using the observed data, while the dashed black lines mark the 2.5th and 97.5th percentiles of the permutation distribution.

Table E9: Robustness test XI: including all sites from the 2005 inventory

	(1)	(2)	(3)	(4)
	Ratio of current transfers to total revenues			
DownWind × Post	-0.0190**	-0.0150*	-0.0208**	-0.0197**
	(0.00767)	(0.00791)	(0.00890)	(0.00903)
Total number of IDS per sqkm × Post	-0.00223*	-0.00209*	-0.00253**	0.000429
	(0.00128)	(0.00113)	(0.00113)	(0.00152)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	13391	13391	13391	13391
Dep var mean	0.186	0.186	0.186	0.186
R-squared	0.806	0.812	0.813	0.839

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on the ratio of current transfers from the central and regional governments to total municipal revenues. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). We include all 2,551 georeferenced sites reported in the 2005 inventory. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

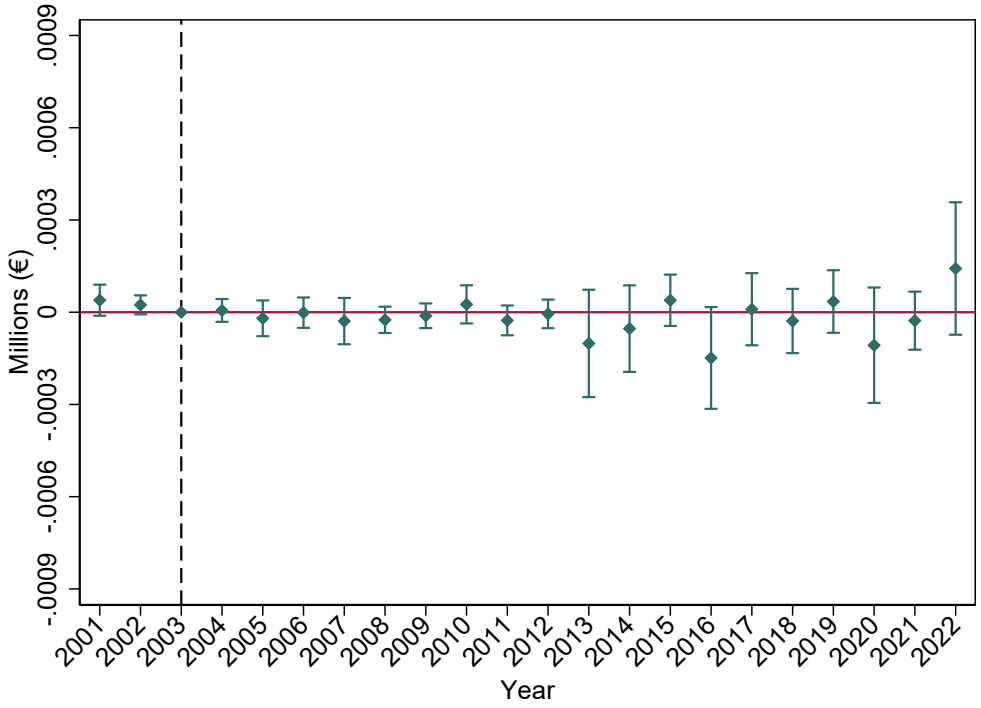
E.2 EU cohesion funds

Table E10: Robustness test I: restricting the sample to municipalities within buffers

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-48.34**	-56.96**	-57.71**	-53.35**
	(24.39)	(24.47)	(24.81)	(25.96)
Total number of IDS per sqkm × Post	-1.380	-2.024	-2.082	-0.625
	(1.369)	(1.334)	(1.357)	(1.216)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	10472	10472	10472	10472
Dep var mean	57.26	57.26	57.26	57.26
R-squared	0.136	0.175	0.177	0.203
F-stat	41.50	222.5	233.2	.

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The sample is restricted to municipalities whose demographic centroid lies within 3 km of at least one IDS, excluding those that never fall within a IDS buffer. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E4: Robustness test II: choice of reference year



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between $DownWind_i$ and year indicators, with 2003 omitted as the reference year. Each point represents the estimated effect of toxic winds on EU cohesion funds per capita in a given year, relative to 2003. The model replicates the main dynamic specification reported in Equation 1b, replacing the baseline reference year with 2003. In particular, it includes municipality and year fixed effects, total number of IDS per square kilometer, as well as covariates interacted with year dummies: municipality surface, province fixed effects, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009), geographical characteristics (maximum altitude), and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). Weights are equal to the number of eligible voters in each municipality in 2001. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Table E11: Robustness test III: alternative buffers

	Dep. variable: EU cohesion funds per capita		
	(1)	(2)	(3)
Buffer radius	3 km	5 km	10 km
DownWind × Post	-35.78**	-28.26	-11.94
	(18.03)	(22.29)	(42.50)
Municipality FE	✓	✓	✓
Year FE	✓	✓	✓
IDS number per sqkm	✓	✓	✓
Year FE × Surface	✓	✓	✓
Year FE × Province FE	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓
Observations	11968	11968	11968
Dep var mean	58.98	58.98	58.98
R-squared	0.195	0.195	0.195

Notes: This table shows WLS estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column controls for the main specification reported in Equation 1a and in Column 4 of Table A6, while varying the buffer radius from the IDS center (see Figure A8). The post-treatment period is defined by the indicator variable *Post*, which equals 1 for all years after 2004, and 0 otherwise. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E12: Robustness test IV: alternative definition of $WI_{s,j,\tau}$ and $DownWind_i$

	(1)	(2)	(3)	(4)
	EU cohesion funds per capita			
	$\theta = 30°$	$\theta = 60°$	$\theta = 90°$	$\theta = 120°$
DownWind × Post	-34.72**	-20.22	-35.78*	-16.62
	(15.40)	(15.45)	(18.47)	(19.16)
Total number of IDS per sqkm × Post	-0.000533	-0.585	-0.524	-0.581
	(1.239)	(1.211)	(1.203)	(1.223)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓	✓
Observations	11968	11968	11968	11968
Dep var mean	58.98	58.98	58.98	58.98
R-squared	0.195	0.195	0.195	0.195

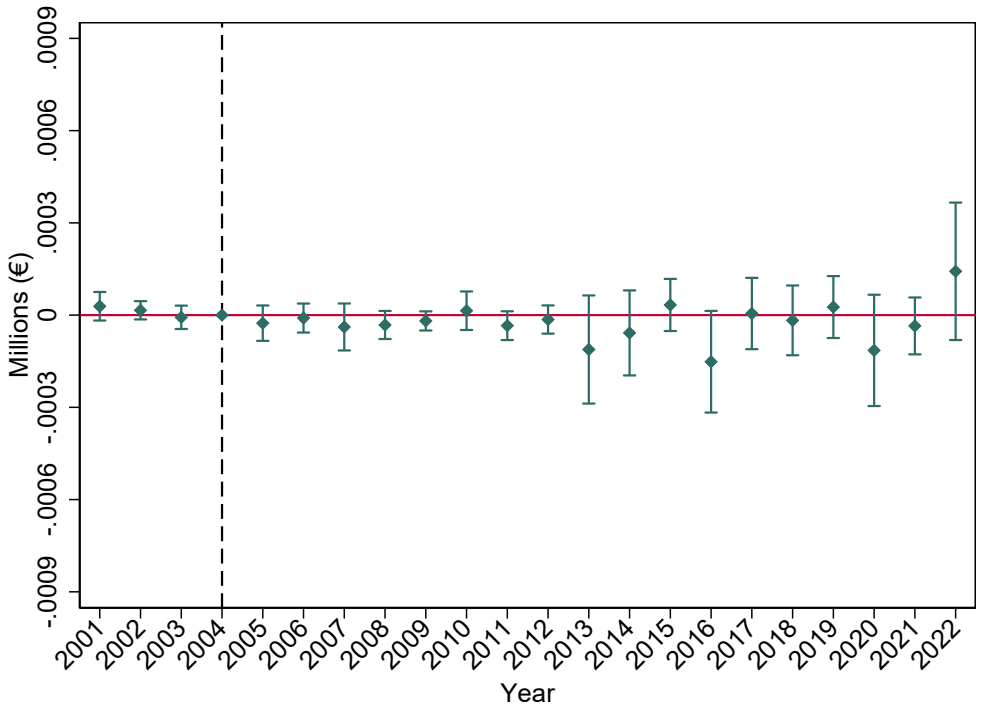
Notes: This table shows WLS estimates of the effect of toxic winds after the news shock on EU funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center, while varying both the computation of historical average wind direction at each IDS and $DownWind_i$. $WI_{s,t,\tau}$ equals 1 as the angle ($\theta_{s,j,\tau}$) between the connection vector (line from the illegal disposal site s to the actual station j) and the wind direction vector falls within $[0, 30°]$ $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. A municipality is classified as downwind if the angle (θ) between the connection vector (line from the IDS to the demographic centroid) and the historical average wind direction ($\overline{WINDDIR_s}$) falls within the range $[0, 30°]$, $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. Each column replicates the main specification reported in Equation 1a and in Column 4 of Table A6. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E13: Robustness test V: alternative weights based on eligible voters

	(1)	(2)	(3)	(4)
	EU cohesion funds per capita			
DownWind × Post	-46.52*	-54.97**	-55.20**	-50.65*
	(24.37)	(24.61)	(24.92)	(26.06)
Total number of IDS per sqkm × Post	-1.374	-2.123	-2.142	-0.692
	(1.368)	(1.368)	(1.394)	(1.247)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	10472	10472	10472	10472
Dep var mean	58.07	58.07	58.07	58.07
R-squared	0.140	0.184	0.186	0.213

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to the specifications reported in Table A6, and uses the number of eligible voters in 1996 rather than in 2001 as weights. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 1996. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E5: Robustness test V: alternative weights based on eligible voters (dynamic specification)



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2004 omitted as the reference year. Each point represents the estimated effect of toxic winds on EU cohesion funds per capita in a given year, relative to 2004. This figure replicates the main specification reported in Equation 1b and in Figure 5c, and uses the number of eligible voters in 1996 rather than in 2001 as weights. 95% confidence intervals are shown. Standard errors are clustered at the municipality level.

Table E14: Robustness test VI: Conley HAC standard errors

	(1)	(2)	(3)	(4)
	EU cohesion funds per capita			
DownWind × Post	-35.02**	-41.58***	-43.00***	-35.78**
	(15.78)	(15.38)	(15.46)	(15.78)
Total number of IDS × Post	-1.483	-2.088*	-2.196*	-0.524
	(1.231)	(1.185)	(1.184)	(1.071)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11968	11968	11968	11968
R-squared	0.0472	0.0843	0.0867	0.114

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column replicates Table A6 while computing Conley-HAC standard errors with maximum cutoffs of 300 km for spatial distance and 22 years for temporal lags. Heteroskedasticity and Conley HAC standard errors at the municipality level are in parentheses. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period is identified by the indicator variable $Post$, which equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E15: Robustness test VII: excluding municipality fixed effects

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-35.02**	-41.58**	-43.00**	-35.78**
	(17.57)	(17.37)	(17.54)	(18.05)
Total number of IDS per sqkm × Post	-1.483	-2.088	-2.196*	-0.524
	(1.338)	(1.311)	(1.322)	(1.175)
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11968	11968	11968	11968
Dep var mean	58.98	58.98	58.98	58.98
R-squared	0.0687	0.103	0.106	0.132
F-stat	15.16	37.85	43.69	2392.2

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes municipality fixed effects. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with year fixed effects to account for common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E16: Robustness test VIII: excluding provincial capitals

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-40.46**	-44.16**	-44.85**	-40.37**
	(17.43)	(17.09)	(17.42)	(17.49)
Total number of IDS per sqkm × Post	-1.958	-2.646**	-2.707**	-1.530
	(1.298)	(1.279)	(1.313)	(1.254)
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11858	11858	11858	11858
Dep var mean	56.98	56.98	56.98	56.98
R-squared	0.0445	0.0558	0.0568	0.0733
F-stat	4.179	4.513	5.607	36.61

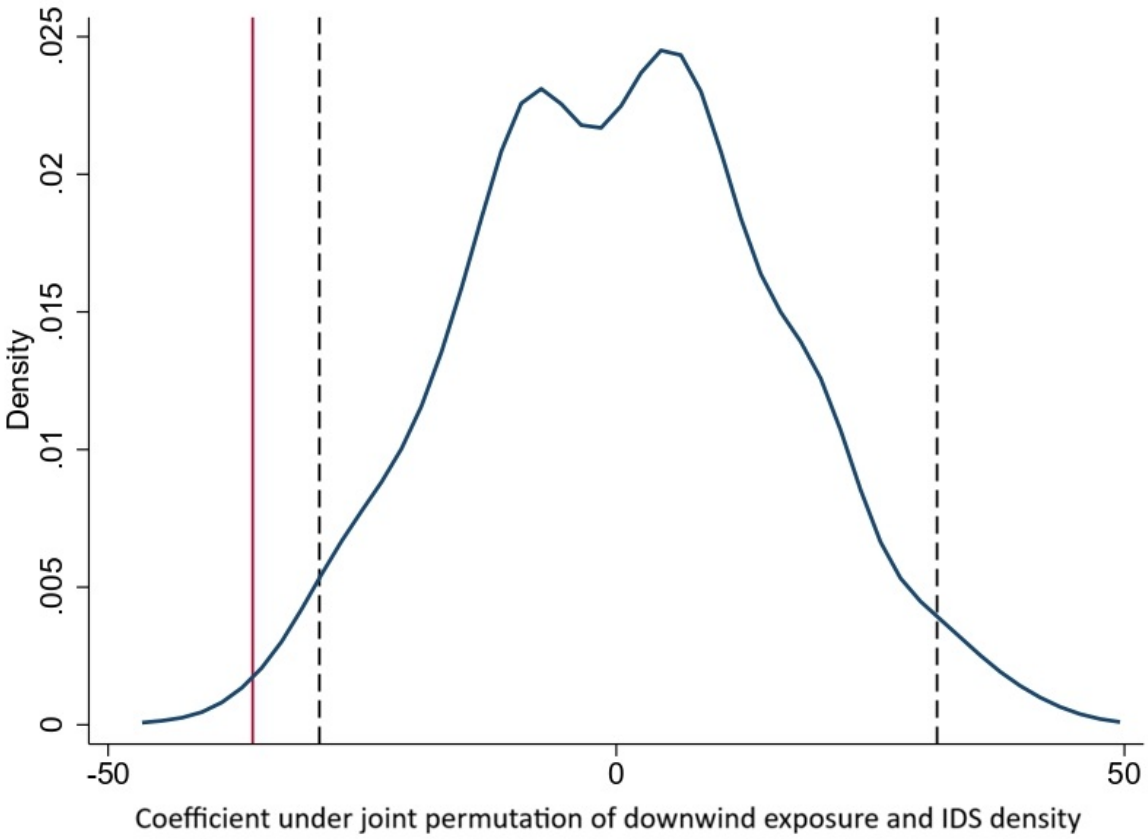
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes the five provincial capitals: Avellino, Benevento, Caserta, Naples and Salerno. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E17: Robustness test IX: official Land of Fires provinces (Naples and Caserta)

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-85.86	-125.4**	-129.5**	-122.1**
	(54.96)	(52.89)	(55.05)	(61.78)
Total number of IDS per sqkm × Post	-1.346	-1.270	-1.456	-1.469
	(1.447)	(1.263)	(1.371)	(1.150)
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	4202	4202	4202	4202
Dep var mean	43.46	43.46	43.46	43.46
R-squared	0.0684	0.134	0.137	0.200
F-stat	56.49	2229.0	11064.1	.

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification is restricted to municipalities in the provinces of Naples and Caserta. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E6: Robustness test X: permutation test



Notes: This figure displays the distribution of EU cohesion funding per capita coefficients obtained from 1,000 permutation draws. In each permutation, we jointly reassign downwind exposure ($DownWind_i$) and the total number of IDS per square kilometer (IDS density) across municipalities, preserving their joint distribution. The reassigned values are held fixed across election years, and the main EU cohesion funding per capita specification (Equation 1a) is re-estimated on the baseline estimation sample. The curve reports a Gaussian kernel density estimate of the resulting coefficients on $DownWind_i \times Post_t$. The solid red line shows the coefficient estimated using the observed data, while the dashed black lines mark the 2.5th and 97.5th percentiles of the permutation distribution.

Table E18: Robustness test XI: including all sites from the 2005 inventory

	(1)	(2)	(3)	(4)
	EU cohesion funding per capita			
DownWind × Post	-40.59**	-48.02**	-49.61***	-41.00**
	(18.57)	(18.61)	(18.75)	(19.37)
Total number of IDS per sqkm × Post	-1.172	-1.614*	-1.733*	-0.00841
	(1.039)	(0.942)	(0.930)	(1.236)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	11968	11968	11968	11968
Dep var mean	58.98	58.98	58.98	58.98
R-squared	0.134	0.168	0.170	0.195
F-stat	34.49	110.0	122.1	193334.3

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on EU cohesion funds per capita from 2001 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). We include all 2,551 georeferenced sites reported in the 2005 inventory. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid. (extensive margin). The post-treatment period equals 1 for all years after 2004, and 0 otherwise. Column (1) presents a baseline model with municipality and year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

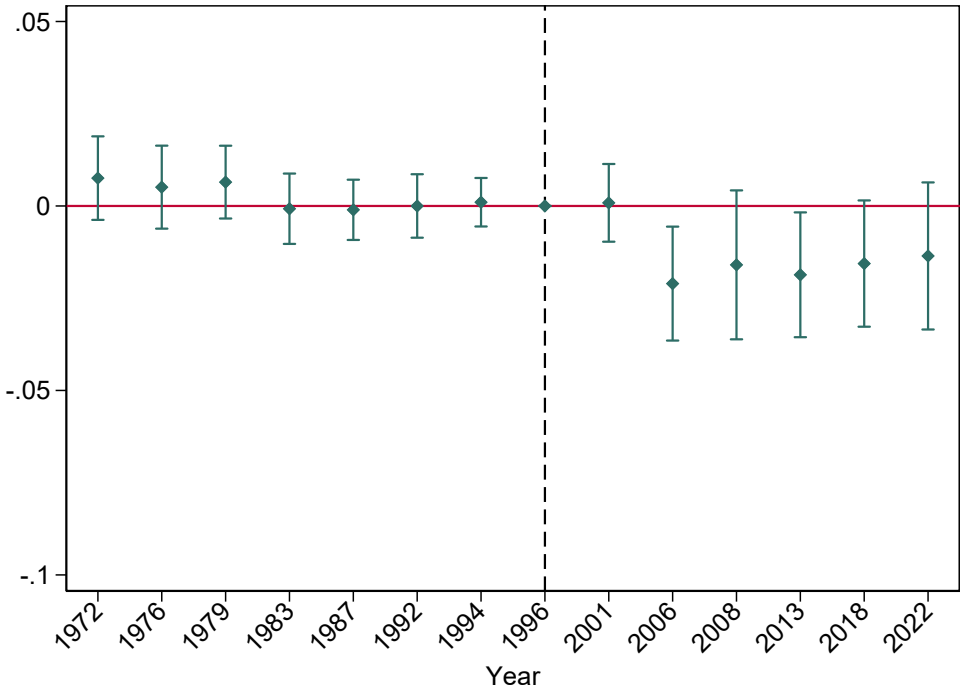
E.3 Turnout

Table E19: Robustness test I: restricting the sample to municipalities within buffers

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0288***	-0.0277***	-0.0210**	-0.0155*
	(0.0103)	(0.00977)	(0.00921)	(0.00877)
Total number of IDS per sqkm × Post	-0.000834	-0.000351	0.000166	0.000690
	(0.000521)	(0.000479)	(0.000459)	(0.000774)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	6662	6662	6662	6662
Dep var mean	0.784	0.784	0.784	0.784
R-squared	0.934	0.939	0.941	0.948

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The sample is restricted to municipalities whose demographic centroid lies within 3 km of at least one IDS, excluding those that never fall within a IDS buffer. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E7: Robustness test II: choice of reference year



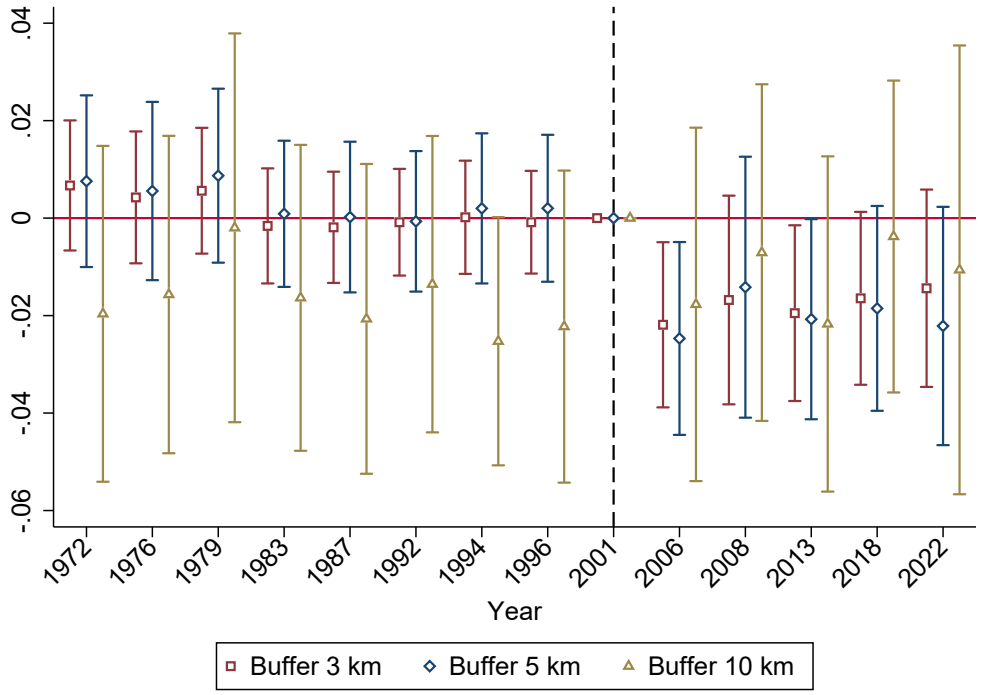
Notes: This figure reports coefficients from a dynamic specification estimating the interaction between $DownWind_i$ and election-year indicators, with 1996 omitted as the reference year. Each point represents the estimated effect of wind exposure on turnout in a given election year, relative to 1996. The model replicates the main dynamic specification reported in Equation 1b, replacing the baseline reference year with 1996. In particular, it includes municipality and year fixed effects, total number of IDS per square kilometer, as well as covariates interacted with year dummies: municipality surface, province fixed effects, historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009), geographical characteristics (maximum altitude), and socio-demographic controls (population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita). Weights are equal to the number of eligible voters in each municipality in 1996. This figure shows 95% confidence intervals. Standard errors are clustered at the municipality level.

Table E20: Robustness test III: alternative buffers

	Dep. variable: Turnout		
	(1)	(2)	(3)
Buffer radius	3 km	5 km	10 km
DownWind × Post	-0.0191**	-0.0230**	0.00287
	(0.00780)	(0.00919)	(0.0135)
Municipality FE	✓	✓	✓
Year FE	✓	✓	✓
IDS number per sqkm	✓	✓	✓
Year FE × Surface	✓	✓	✓
Year FE × Province FE	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓
Observations	7614	7614	7614
Dep var mean	0.782	0.782	0.782
R-squared	0.941	0.941	0.940

Notes: This table shows WLS estimates of the effect of wind exposure to IDS on turnout at national elections (1972-2022). Each column controls for the main specification reported in Equation 1a, while varying the buffer radius from the IDS center (see Figure A8). The post-treatment period is defined by the indicator variable *Post*, which equals 1 for all election years after 2001, and 0 otherwise. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E8: Robustness test III: alternative buffers (dynamic specification)



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2001 omitted as the reference election year. Each point represents the estimated effect of wind exposure on turnout in a given year, relative to 2001. Turnout is defined as the ratio of actual voters to registered electors. Coefficients are shown separately by election year and buffer radius from the IDS center (3, 5, and 10 km). This figure replicates the main specification reported in Equation 1b. Bars represent 95% confidence intervals, with standard errors are clustered at the municipality level.

Table E21: Robustness test IV: alternative definition of $WI_{s,j,\tau}$ and $DownWind_i$

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
	$\theta = 30°$	$\theta = 60°$	$\theta = 90°$	$\theta = 120°$
DownWind × Post	-0.0140**	-0.0159**	-0.0191**	-0.0169**
	(0.00561)	(0.00641)	(0.00780)	(0.00823)
Total number of IDS per sqkm × Post	0.000937	0.000716	0.000740	0.000729
	(0.000763)	(0.000806)	(0.000779)	(0.000787)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables	✓	✓	✓	✓
Year FE × Geographical characteristics	✓	✓	✓	✓
Year FE × Socio-demographic controls	✓	✓	✓	✓
Observations	7614	7614	7614	7614
Dep var mean	0.782	0.782	0.782	0.782
R-squared	0.941	0.941	0.941	0.941

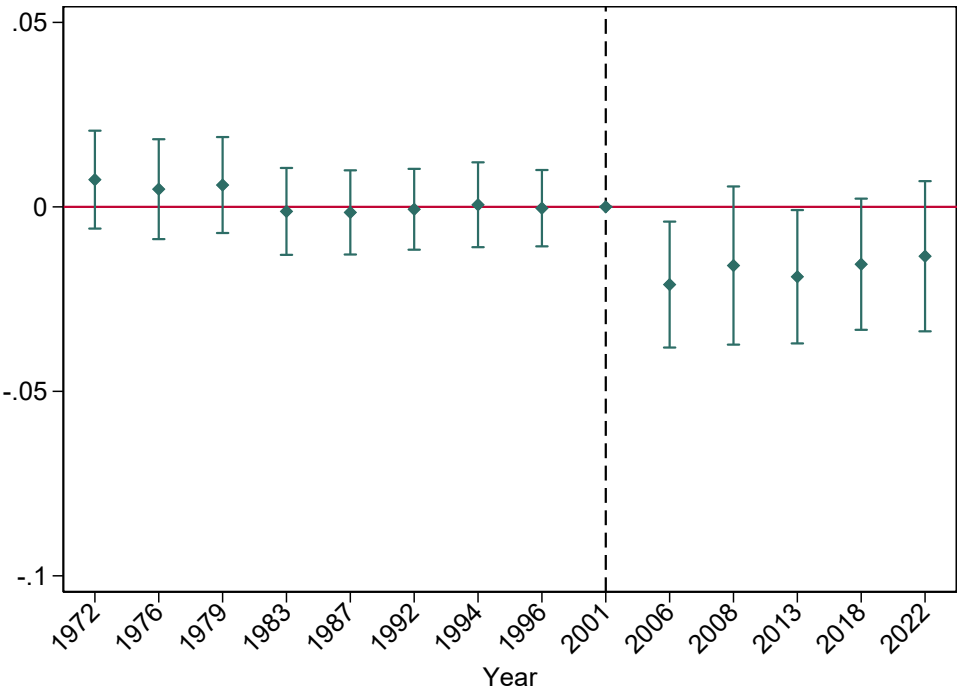
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center, while varying both the computation of historical average wind direction at each IDS and $DownWind_i$. $WI_{s,t,\tau}$ equals 1 as the angle ($\theta_{s,j,\tau}$) between the connection vector (line from the illegal disposal site s to the actual station j) and the wind direction vector falls within $[0, 30°]$ $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. A municipality is classified as downwind if the angle (θ) between the connection vector (line from the IDS to the demographic centroid) and the historical average wind direction ($\overline{WINDDIR_s}$) falls within the range $[0, 30°]$, $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. Each column replicates the main specification reported in Equation 1a and in column 4 of Table 1. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E22: Robustness test V: alternative weights based on eligible voters

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0328***	-0.0317***	-0.0253***	-0.0186**
	(0.00968)	(0.00934)	(0.00872)	(0.00793)
Total number of IDS per sqkm × Post	-0.000798	-0.000292	0.000230	0.000674
	(0.000524)	(0.000485)	(0.000466)	(0.000804)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	7614	7614	7614	7614
Dep var mean	0.781	0.781	0.781	0.781
R-squared	0.927	0.932	0.934	0.941

Notes: This table shows WLS estimates of the effect of toxic winds after the news shock on voter turnout at national elections (1972-2022). Each column refers to the specifications reported in Table 1, and uses the number of eligible voters in 1996 rather than in 2001 as weights. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 1996. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E9: Robustness test V: alternative weights based on eligible voters (dynamic specification)



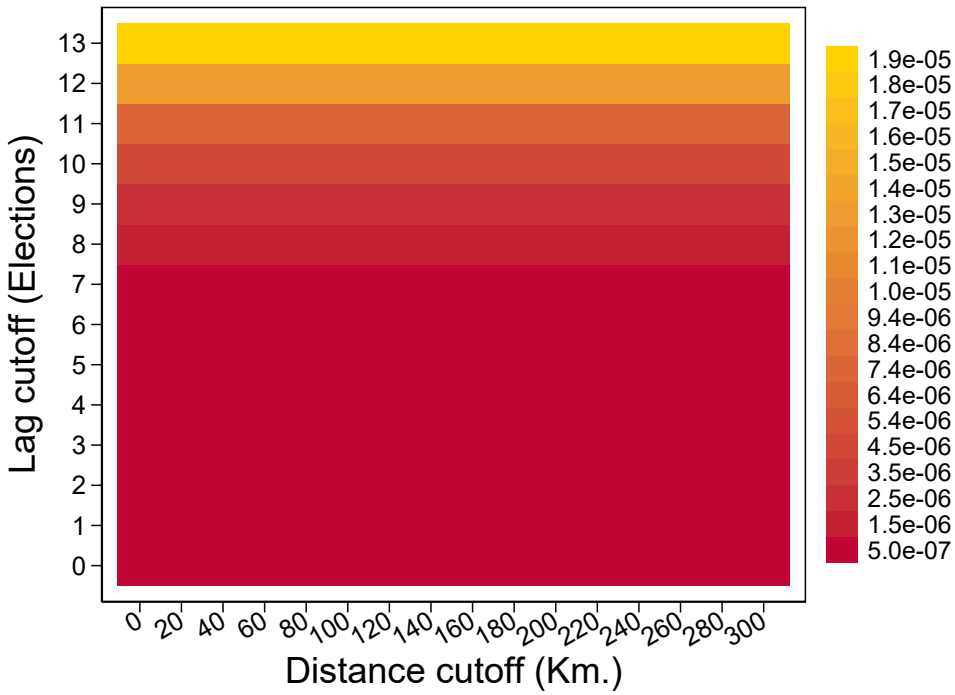
Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2001 omitted as the reference election year. Each point represents the estimated effect of wind exposure on turnout in a given year, relative to 2001. This figure replicates the main specification reported in Equation 1b, and uses the number of eligible voters in 1996 rather than in 2001 as weights. 95% confidence intervals are shown. Standard errors are clustered at the municipality level.

Table E23: Robustness test VI: Conley HAC standard errors

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0332***	-0.0324***	-0.0259***	-0.0191***
	(0.00561)	(0.00533)	(0.00502)	(0.00457)
Total number of IDS × Post	-0.000772**	-0.000274	0.000220	0.000740
	(0.000365)	(0.000351)	(0.000344)	(0.000513)
Municipality FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Year FE × Surface	✓	✓	✓	✓
Year FE × Province FE	✓	✓	✓	✓
Year FE × Historical weather variables		✓	✓	✓
Year FE × Geographical characteristics			✓	✓
Year FE × Socio-demographic controls				✓
Observations	7614	7614	7614	7614
R-squared	0.430	0.471	0.486	0.537

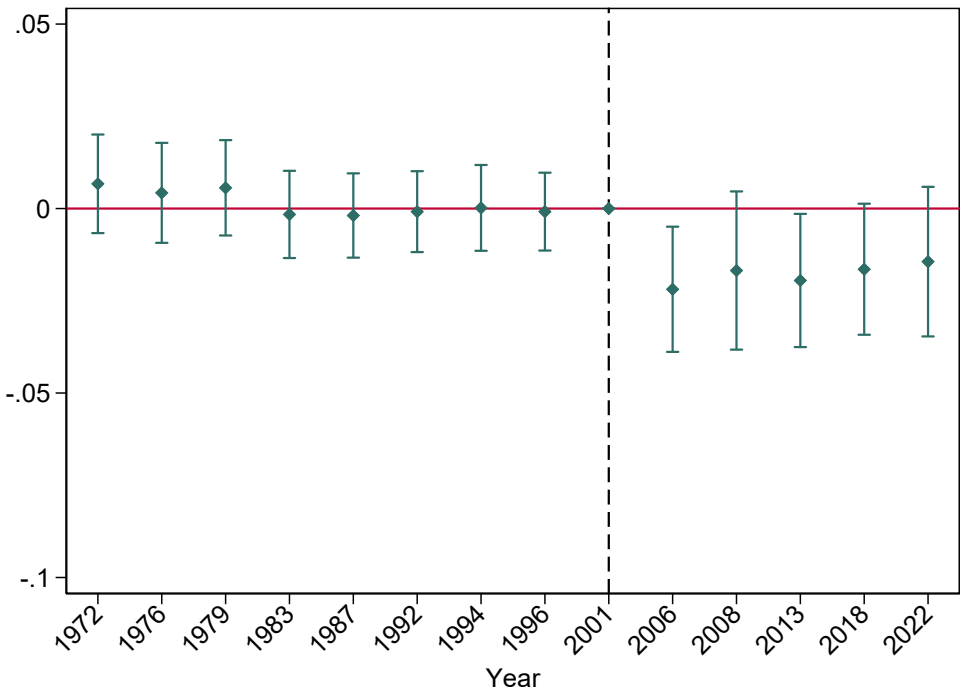
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column replicates Table 1 while computing Conley-HAC standard errors with maximum cutoffs of 300 km for spatial distance and 14 election years for temporal lags. Heteroskedasticity and Conley HAC standard errors at the municipality level are in parentheses. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E10: Robustness test VI: Conley HAC standard errors (heatmap)



Notes: The figure displays p-values from estimating the main specification reported in Equation 1a across a series multiple regressions exploiting Conley HAC standard errors. Spatial and temporal cutoffs are sequentially expanded from their minimum to their maximum feasible values. Each iteration increases the spatial cutoff by 20 km or the temporal cutoff by one electoral cycle. Confidence intervals are based on standard errors that are robust to serial and spatial correlation and computed imposing maximum cutoff for both spatial and time lags.

Figure E11: Robustness test VII: excluding municipality fixed effects



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2001 omitted as the reference election year. Each point represents the estimated effect of wind exposure on turnout in a given year, relative to 2001. This figure replicates the main specification reported in Equation 1b, while excluding municipality fixed effects. 95% confidence intervals are shown. Standard errors are clustered at the municipality level.

Table E24: Robustness test VIII: excluding provincial capitals

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0214***	-0.0213***	-0.0180**	-0.0144*
	(0.00769)	(0.00804)	(0.00786)	(0.00776)
Total number of IDS per sqkm × Post	-0.000632	0.0000629	0.000350	0.00107
	(0.000517)	(0.000472)	(0.000455)	(0.000674)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	7544	7544	7544	7544
Dep var mean	0.788	0.788	0.788	0.788
R-squared	0.912	0.917	0.918	0.924

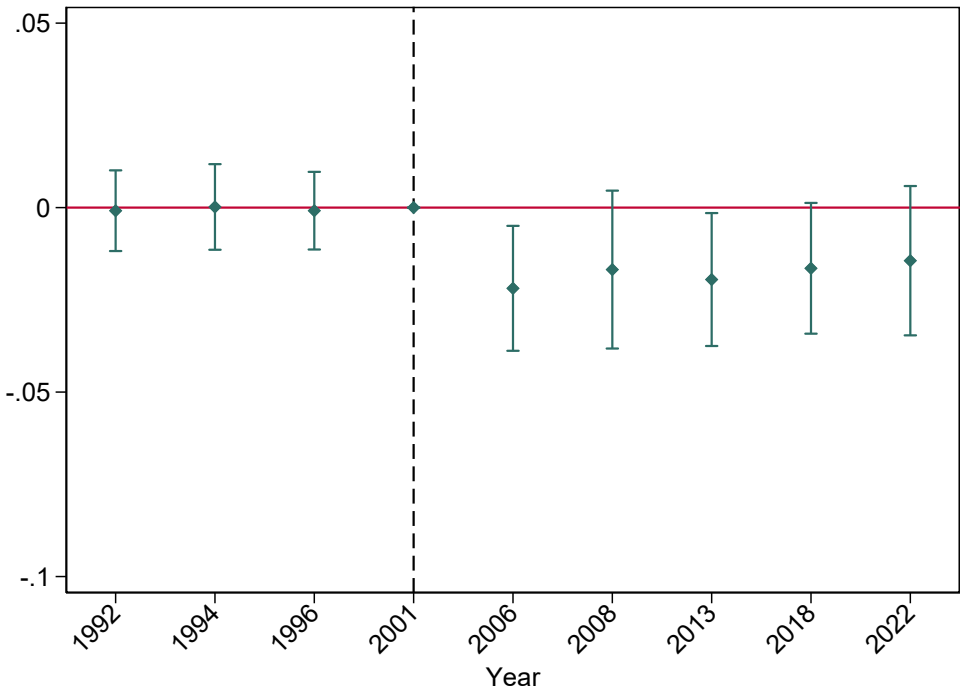
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes the five provincial capitals: Avellino, Benevento, Caserta, Naples and Salerno. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E25: Robustness test IX: official Land of Fires provinces (Naples and Caserta)

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0676***	-0.0691***	-0.0632***	-0.0586***
	(0.0179)	(0.0170)	(0.0166)	(0.0182)
Total number of IDS per sqkm × Post	-0.000270	0.000751**	0.00102***	0.000510
	(0.000430)	(0.000360)	(0.000386)	(0.000613)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	2672	2672	2672	2672
Dep var mean	0.780	0.780	0.780	0.780
R-squared	0.956	0.962	0.963	0.970

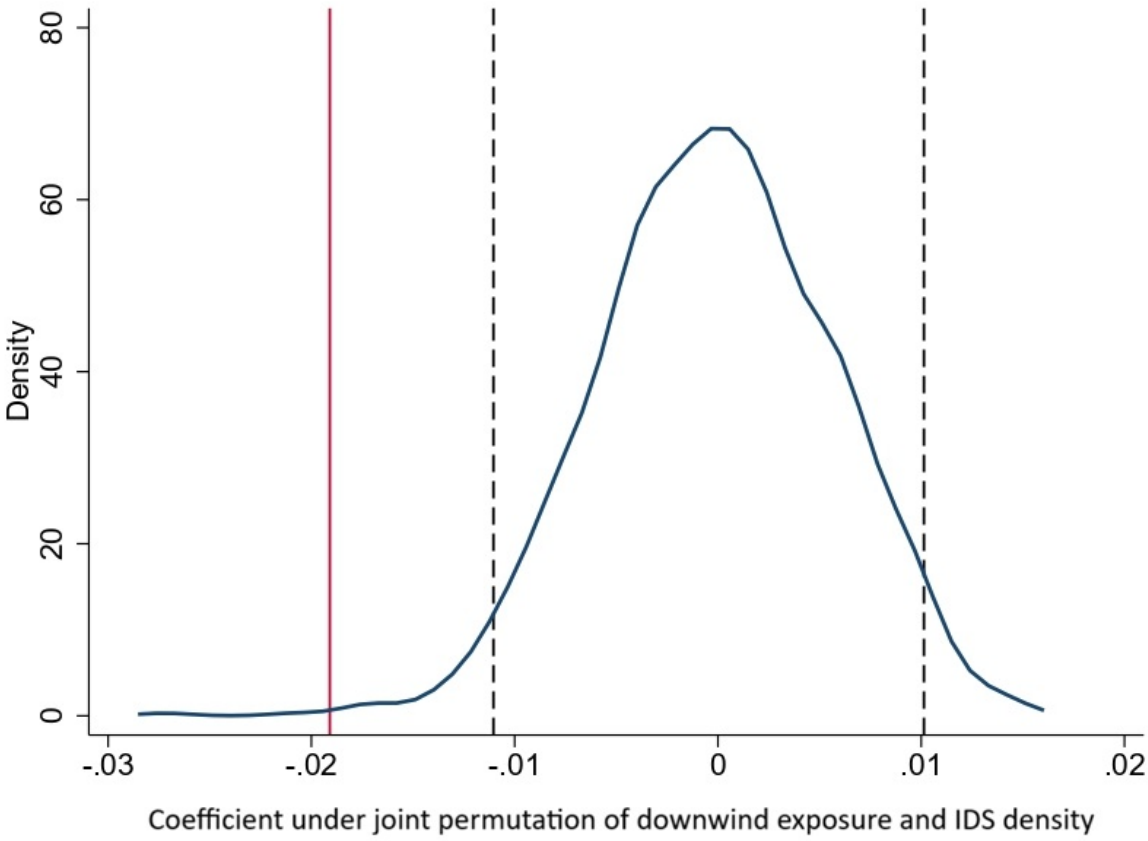
Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification is restricted to municipalities in the provinces of Naples and Caserta. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E12: Robustness test X: restricting the sample to elections from 1992 onward



Notes: This figure reports coefficients from a dynamic specification estimating the interaction between the treatment variable $DownWind_i$ and year indicators, with 2001 omitted as the reference election year. Each point represents the estimated effect of wind exposure on turnout in a given year, relative to 2001. This figure replicates the main specification reported in Equation 1b, while restricting the sample to national elections held from 1992 onward. 95% confidence intervals are shown. Standard errors are clustered at the municipality level.

Figure E13: Robustness test XI: permutation test



Notes: This figure displays the distribution of turnout coefficients obtained from 1,000 permutation draws. In each permutation, we jointly reassign downwind exposure ($DownWind_i$) and the total number of IDS per square kilometer (IDS density) across municipalities, preserving their joint distribution. The reassigned values are held fixed across election years, and the main turnout specification (Equation 1a) is re-estimated on the baseline estimation sample. The curve reports a Gaussian kernel density estimate of the resulting coefficients on $DownWind_i \times Post_t$. The solid red line shows the coefficient estimated using the observed data, while the dashed black lines mark the 2.5th and 97.5th percentiles of the permutation distribution.

Table E26: Robustness test XII: including all sites from the 2005 inventory

	(1)	(2)	(3)	(4)
	Turnout (national elections)			
DownWind × Post	-0.0348***	-0.0340***	-0.0279***	-0.0205***
	(0.00947)	(0.00904)	(0.00843)	(0.00776)
Total number of IDS per sqkm × Post	-0.000792*	-0.000390	0.0000663	0.000749
	(0.000447)	(0.000411)	(0.000387)	(0.000723)
Municipality FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
IDS number per sqkm	✓	✓	✓	✓
Election year FE × Surface	✓	✓	✓	✓
Election year FE × Province FE	✓	✓	✓	✓
Election year FE × Historical weather variables		✓	✓	✓
Election year FE × Geographical characteristics			✓	✓
Election year FE × Socio-demographic controls				✓
Observations	7614	7614	7614	7614
Dep var mean	0.782	0.782	0.782	0.782
R-squared	0.927	0.933	0.934	0.941

Notes: This table shows WLS difference-in-differences estimates of the effect of toxic winds after the news shock on voter turnout in national elections from 1972 to 2022. Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). We include all 2,551 georeferenced sites reported in the 2005 inventory. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). The post-treatment period equals 1 for all election years after 2001, and 0 otherwise. Column (1) presents a baseline model with municipality and election year fixed effects to account for time-invariant unobserved heterogeneity at the local level and common time shocks. It also includes the total number of IDS per square kilometer, municipality surface, and province fixed effects (interacted with election year dummies). Columns (2)–(4) progressively introduce additional controls fully interacted with election year dummies. Column (2) adds historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001-2009). Column (3) includes geographical characteristics (maximum altitude). Column (4) further adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

E.4 Five Star Movement

Table E27: Robustness test I: restricting the sample to municipalities within buffers

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0368***	0.0368***	0.0331***	0.0285***
	(0.00832)	(0.00833)	(0.00797)	(0.00799)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1428	1428	1428	1428
Dep var mean	0.374	0.374	0.374	0.374
R-squared	0.138	0.801	0.822	0.826
F-stat	40.29	385.6	263.4	245.3

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). The sample is restricted to municipalities whose demographic centroid lies within 3 km of at least one IDS, excluding those that never fall within a IDS buffer. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E28: Robustness test II: alternative buffers

	Dep. variable: FSM vote share (national elections)		
	(1)	(2)	(3)
Buffer radius	3 km	5 km	10 km
DownWind	0.0268***	0.0282***	0.0274**
	(0.00642)	(0.00755)	(0.0129)
IDS number per sqkm	✓	✓	✓
Municipality surface	✓	✓	✓
Historical weather variables	✓	✓	✓
Province FE	✓	✓	✓
Election year FE	✓	✓	✓
Socio-demographic controls	✓	✓	✓
Geographical characteristics	✓	✓	✓
Observations	1632	1632	1632
Dep var mean	0.370	0.370	0.370
R-squared	0.822	0.821	0.819
F-stat	284.8	283.9	291.4

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column controls for the main specification reported in Equation 2 and in Column 4 of Table 4, while varying the buffer radius from the IDS center (see Figure A8). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E29: Robustness test III: alternative definition of $WI_{s,j,\tau}$ and $DownWind_i$

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
	$\theta = 30°$	$\theta = 60°$	$\theta = 90°$	$\theta = 120°$
DownWind	0.00915	-0.000174	0.0268***	0.0241***
	(0.00651)	(0.00932)	(0.00642)	(0.00652)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE	✓	✓	✓	✓
Socio-demographic controls	✓	✓	✓	✓
Geographical characteristics	✓	✓	✓	✓
Observations	1632	1632	1632	1632
Dep var mean	0.370	0.370	0.370	0.370
R-squared	0.820	0.819	0.822	0.821
F-stat	277.8	277.6	284.8	285.8

Notes: This table shows WLS estimates of the effect of wind exposure to IDS on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center, while varying both the computation of historical average wind direction at each IDS and $DownWind_i$. $WI_{s,t,\tau}$ equals 1 as the angle ($\theta_{s,j,\tau}$) between the connection vector (line from the illegal disposal site s to the actual station j) and the wind direction vector falls within $[0, 30°]$ $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. A municipality is classified as downwind if the angle (θ) between the connection vector (line from the IDS to the demographic centroid) and the historical average wind direction ($\overline{WINDDIR_s}$) falls within the range $[0, 30°]$, $[0, 60°]$, $[0, 90°]$, or $[0, 120°]$ respectively. $[0, 90°]$ corresponds to our main specification. Each column replicates the main specification in 2 and in Column 4 of Table 4. All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E30: Robustness test IV: alternative weights based on eligible voters

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0355***	0.0355***	0.0297***	0.0258***
	(0.00706)	(0.00707)	(0.00666)	(0.00648)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1632	1632	1632	1632
Dep var mean	0.369	0.369	0.369	0.369
R-squared	0.150	0.797	0.817	0.821
F-stat	48.66	464.4	314.6	299.3

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to the specifications reported in Table 4 and uses the number of eligible voters in 1996 rather than in 2001 as weights. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 1996. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E31: Robustness test V: Conley HAC standard errors

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0341***	0.0349***	0.0289***	0.0247***
	(0.0106)	(0.00592)	(0.00551)	(0.00554)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1632	1632	1632	1632
R-squared	0.898	0.976	0.978	0.978

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8), while computing Conley-HAC standard errors with maximum cutoffs of 300 km for spatial distance and 3 election years for temporal lags. Heteroskedasticity and Conley HAC standard errors at the municipality level are in parentheses. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E32: Robustness test VI: excluding provincial capitals

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0340***	0.0340***	0.0246***	0.0219***
	(0.00691)	(0.00692)	(0.00639)	(0.00615)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1617	1617	1617	1617
Dep var mean	0.363	0.363	0.363	0.363
R-squared	0.150	0.776	0.810	0.813
F-stat	38.14	391.1	355.7	335.3

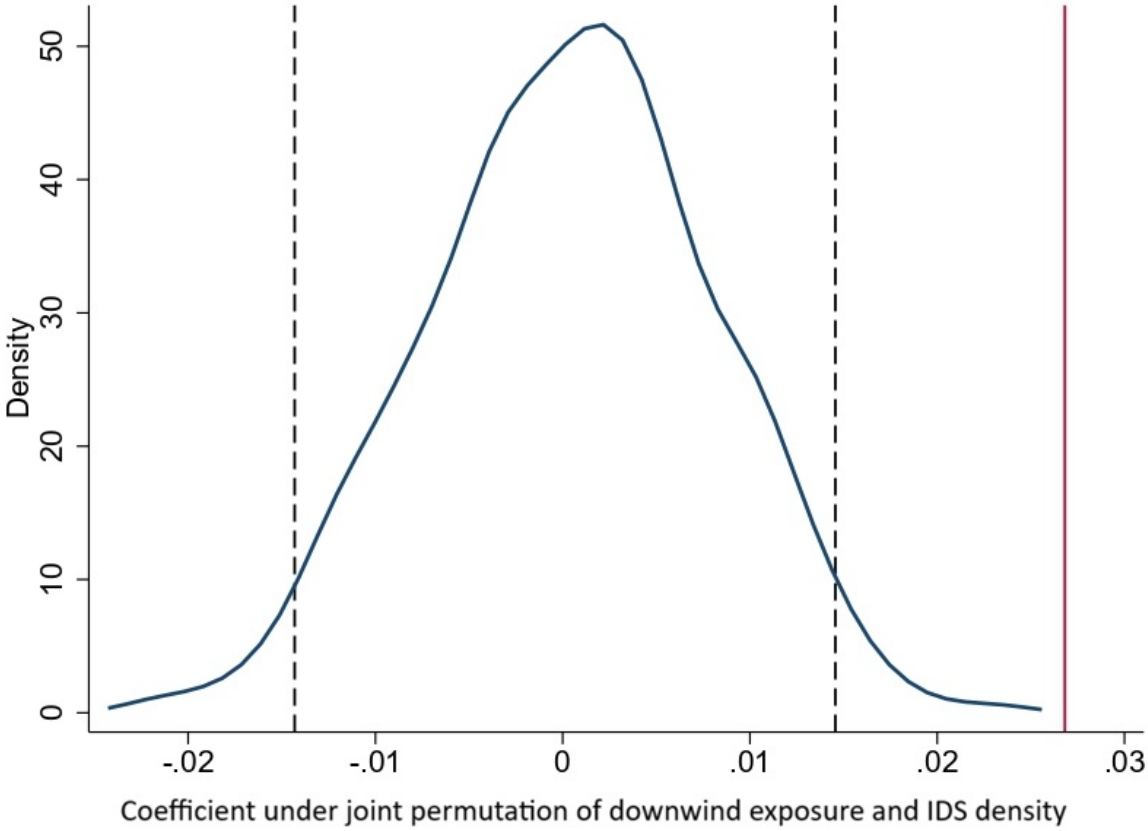
Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification excludes the five provincial capitals: Avellino, Benevento, Caserta, Naples and Salerno. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Table E33: Robustness test VII: official Land of Fires provinces (Naples and Caserta)

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0733***	0.0733***	0.0538***	0.0497***
	(0.0145)	(0.0145)	(0.0151)	(0.0140)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	573	573	573	573
Dep var mean	0.402	0.402	0.402	0.402
R-squared	0.0608	0.844	0.875	0.877
F-stat	22.99	332.3	185.2	179.2

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). Each specification is restricted to municipalities in the provinces of Naples and Caserta. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

Figure E14: Robustness test VIII: permutation test



Notes: This figure displays the distribution of Five Star Movement vote share in national elections coefficients obtained from 1,000 permutation draws. In each permutation, we jointly reassign downwind exposure ($DownWind_i$) and the total number of IDS per square kilometer (IDS density) across municipalities, preserving their joint distribution. The reassigned values are held fixed across election years, and the main turnout specification (Equation 2) is re-estimated on the baseline estimation sample. The curve reports a Gaussian kernel density estimate of the resulting coefficients on $DownWind_i \times Post_t$. The solid red line shows the coefficient estimated using the observed data, while the dashed black lines mark the 2.5th and 97.5th percentiles of the permutation distribution.

Table E34: Robustness test IX: including all sites from the 2005 inventory

	(1)	(2)	(3)	(4)
	FSM vote share (national elections)			
DownWind	0.0359***	0.0359***	0.0294***	0.0254***
	(0.00705)	(0.00706)	(0.00670)	(0.00652)
IDS number per sqkm	✓	✓	✓	✓
Municipality surface	✓	✓	✓	✓
Historical weather variables	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Election year FE		✓	✓	✓
Socio-demographic controls			✓	✓
Geographical characteristics				✓
Observations	1632	1632	1632	1632
Dep var mean	0.370	0.370	0.370	0.370
R-squared	0.152	0.799	0.818	0.821
F-stat	55.54	442.9	299.4	280.5

Notes: This table shows WLS estimates of the effect of toxic winds on FSM vote share at national elections (all years). Each column refers to a 3 km buffer radius from the IDS center (see Figure A8). We include all 2,551 georeferenced sites reported in the 2005 inventory. The treatment is given by $DownWind_i$, defined as a binary indicator equal to 1 if municipality i has at least one IDS whose prevailing wind carries pollutants towards its demographic centroid (extensive margin). Column (1) presents a baseline specification with historical weather variables at the municipality level (wind direction, wind speed, humidity, and rainfall over 2001–2009) and province fixed effects to account for time-invariant unobserved heterogeneity at the province level. It also includes municipality surface and the total number of IDS per square kilometer. Column (2) introduces election year fixed effects to control for common time shocks. Column (3) adds socio-demographic controls: population density, share of higher-educated individuals, employment rate in the health sector, share of daily commuters, share of foreign residents, number of civilians killed by Mafia, and the historical average taxable income per capita (2000-2004). Column (4) further includes geographical characteristics (maximum altitude). All regressions are weighted by the number of eligible voters in each municipality in 2001. Heteroscedasticity and cluster-robust standard errors at the municipality level are in parentheses. Stars indicate significance levels (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).