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Giovanni Gualtieri
National Research Council, Institute of BioEconomy

Marcella Nicolini
University of Pavia

Fabio Sabatini
Sapienza University of Rome and IZA

Marco Ventura
Sapienza University of Rome

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Shaken Politics: The Electoral Outcomes of Disasters and Social Capital*

We study the electoral repercussions of the L'Aquila earthquake in 2009, one of Italy's most catastrophic post-WWII seismic events. We construct a unique municipality-level dataset, combining high-resolution data on the ground acceleration recorded during the earthquake with European election results and social capital metrics. Our findings indicate that the intensity of the shock positively influenced support for the incumbent national government but provided no electoral advantage to local incumbents. Analyzing potential transmission mechanisms, we find that relief measures did not automatically translate into political rewards. Instead, social capital played a pivotal role in shaping post--disaster electoral outcomes. The national government's electoral gains were concentrated in municipalities with a low density of civic organizations, where citizens relied predominantly on political institutions for assistance. Individual level evidence from survey data further supports our findings. Nonetheless, the impact of the earthquake was not enduring. In the subsequent elections, the incumbent government experienced a decline in support in the very municipalities where it had initially gained favor following the disaster.

JEL Classification: D72, H10, H12, Q54, Z1

Keywords: elections, relief spending, redistribution, social capital, natural disasters, Italy, Silvio Berlusconi

Corresponding author:
Fabio Sabatini
Sapienza Università di Roma
via del Castro Laurenziano 9
00161, Roma
Italy
E-mail: fabio.sabatini@uniroma1.it

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1 Introduction

Natural disasters create a sudden demand for aid, a situation that incumbent governments can exploit for electoral gain (Betchel & Hainmueller, 2011). All else being equal – such as the capacity of local administrations to advocate for assistance – exposure to an exogenous shock may result in the quasi-random allocation of redistributive transfers. Among natural catastrophes, earthquakes are uniquely suited to generate plausibly random exposure to shocks –and the corresponding need for institutional aid– in areas near the epicenter with comparable seismic risk. This randomness arises because seismic waves do not propagate uniformly across the terrain. Instead, their intensity is shaped by the geomorphological structures they encounter beneath the surface, introducing significant variability in exposure even within close proximity to the epicenter (Chapman, 2010). Nevertheless, to reliably ascertain whether relief measures in the aftermath of a catastrophe enhance support for incumbents, a natural disaster would need to occur shortly before an election.

This study leverages a unique natural experiment: the earthquake that devastated the city of L'Aquila, Italy, just two months prior to the European elections of 2009. At the time, the Italian government, a center-right coalition, focused its electoral campaign on the promise of rapid recovery through substantial relief efforts. Given the proximity of the elections, the promise of significant transfers can be seen as a form of redistributive politics, characterized as short-term redistributive measures detached from any programmatic redistribution (Dixit & Londregan, 1996). Yet, were these promises enough to sway voters? And if so, did the effect persist beyond the immediate aftermath of the disaster? Did the earthquake's impact vary across affected areas based on specific local characteristics?

To answer these questions, we match data on the peak ground acceleration (PGA) recorded throughout the National Strong Motion Network on April 6, 2009, with electoral data for the European Elections that took place between 2004 and 2014. The resultant dataset associates a continuous measure of the acceleration felt by inhabitants during the

earthquake in each Italian municipality with the local electoral results observed before and after the shock. This combination allows us to assess how the national and local incumbents' performance changed with the intensity of the shock between the two elections.

We compare the treated municipalities to three primary control groups. For consistency with our micro–level survey–based analysis, the first control group includes all Italian municipalities that experienced a PGA below a minimum threshold of 5 cm/s^2. A PGA value exceeding 5 cm/s^2 is significant enough to be distinctly felt by individuals and can even cause loss of balance. This threshold excludes areas that were only marginally affected by the earthquake. The second control group includes municipalities that experienced a slightly lower yet still clearly perceptible level of seismic activity, with a PGA ranging between 3 and 5 cm/s^2. The third control group consists of municipalities located within a 30 kilometer bandwidth from the border of the epicentral area (defined as the area with a PGA exceeding the threshold). These control groups are designed to include municipalities that are similar to the treated ones but were randomly spared from high-intensity seismic waves. In Section 4, we provide evidence that the treated and control groups are well–balanced across key characteristics. To ensure the robustness of our results, we conduct additional analyses by varying the bandwidths. These include expanding the PGA intervals in the second control group and adjusting the distance from the epicentral border in the third group. As part of these robustness checks, we also narrow the control group by focusing on municipalities within a 30 km radius of the epicentral border that shared the same seismic risk level as those in the epicentral area at the time of the earthquake.

To delve into the underlying mechanisms that may explain the treatment effects, we augment our dataset with a variety of municipality-level social capital metrics and information related to the allocation and actual disbursement of recovery funds.

When assessing the impact of the seismic event, we delineate the national incumbent as the coalition supporting the central government, headed by Silvio Berlusconi. His electoral campaign centered entirely on promises of rapid recovery, advocating for the executive to take direct responsibility for disaster management, effectively sidelining local administrations. To

ensure comparability, we evaluate the post-disaster electoral performance relative to the previous European elections, and we define the local incumbent as the coalition that secured the majority in each municipality during the last European ballot. This approach accounts for the inherent differences between national elections, which typically focus on specific, tangible interests, and European ballots, which generally address broader political issues of general interest, resulting in a significant difference in voters' behavior between these two types of elections. This discrepancy becomes even more pronounced when comparing local administrative elections to European elections. Local elections are typically more focused on immediate, localized concerns, making it inappropriate to compare voter preferences in these elections with those in European ballots (Reif & Schmitt, 1980; Hobolt & Spoon, 2012).

Our results paint a complex picture that adds insights to the existing evidence on the electoral outcomes of massive transfers enacted in proximity of an electoral competition. Voter turnout significantly decreased with the PGA. The shock benefited the center-right, national incumbent, for which the differential in the vote share between the two elections increased with the ground acceleration. The heterogeneity of the effects implies that the impact of the earthquake shock varied significantly with the prevailing political leaning of municipalities. In left-leaning municipalities, the national incumbent's performance significantly improved with the increase in PGA. In contrast, in municipalities favoring the center-right, the performances of both local and national incumbents did not exhibit statistically significant changes with the intensity of the shock. This pattern suggests that the government reaped greater electoral advantage in areas that had not traditionally been its strongholds.

Given the critical role of social capital in bolstering resilience and post-disaster recovery (Aldrich, 2012), we then explore how the earthquake's impact varied across municipalities with different social capital levels. Our findings reveal that in municipalities abundant in social capital, where civil society organizations actively addressed the crisis, the electoral impact of the earthquake was statistically insignificant. Conversely, in municipalities scarce in civic organizations, where citizens depended solely on political institutions for emergency relief, the incumbent government's electoral performance notably increased with the ground

acceleration. These results suggest that the active response of civic organizations to a disaster can influence the electoral reactions of citizens in the aftermath.

Our heterogeneity analysis further reveals that the correlation between the incumbent government's performance and ground acceleration does not align with the distribution of relief funds. Instead, receiving a lump-sum transfer from the government appears to have had no significant impact on electoral outcomes.

To corroborate our findings, we use micro-level data drawn from the Post-electoral Survey that the European Commission's Eurobarometer program conducted one week following the ballots. The results support our municipality-level evidence on voter turnout and the incumbent's performance. Specifically, as the intensity of the shock escalates, the probability of voting decreases. Among citizens who participated in prior elections—those not characteristically abstaining—the likelihood of abstaining increased with the earthquake's intensity. These correlations solely held in areas with low levels of social capital. In regions leaning towards the left, the probability of respondents voting for the incumbent rose with the PGA. Similarly, in these regions, the likelihood of survey participants stating they decided not to abstain specifically to support the government also increased with the earthquake's intensity.

When we extend our analysis with data from the Eurobarometer Civil Protection survey conducted six months after the earthquake, we find evidence that in areas with lower social capital, the belief that the EU should support civic organizations for coping with future disasters increases with the intensity of the ground acceleration experienced during the earthquake. This finding underscores the realization of the importance of social capital in mitigating disaster impacts and hastening recovery processes.

To assess the persistence of the earthquake's effect, we expand our analysis to the 2014 European elections. We observe that, between 2009 and 2014, the incumbent government's consensus significantly decreased with the ground acceleration recorded in April 2009. In left-leaning municipalities, where the government's electoral gains were strongly correlated with the PGA in the post-disaster ballots, support for the right-wing coalition significantly decreased with the PGA in 2014. Conversely, in right-leaning municipalities, the right-wing

coalition's electoral support increased in relation to the PGA experienced five years prior. In municipalities with low social capital, where the incumbent government's support increased with the PGA after the earthquake, we find that, in 2014, the vote share for the right-wing coalition significantly decreased with the intensity of the shock. Overall, this evidence seems to depict a narrative of disillusionment. The right-wing coalition appears to have lost support in the types of municipalities where it had initially gained it in the aftermath of the disaster. This finding aligns with reports suggesting that while the immediate measures were swift and widely publicized, the medium-term policy response fell short. Promises for recovery were largely unfulfilled, and corruption scandals linked to reconstruction surfaced (Alexander, 2010a; 2010b).

Our contribution is nested in the literature on the electoral outcomes of environmental disasters. The empirical evidence suggests that voters rarely value preventive measures, instead basing their decisions on the quality of post-disaster relief. Healy & Malhotra (2009) showed that U.S. voters reward the incumbent presidential party for delivering disaster relief spending but not for investing in disaster preparedness. Similarly, Gagliarducci *et al.* (2019) found that congress members who advocated for climate change policies post-hurricane faced a decline in campaign contributions and vote shares. Hazlett & Mildenberger (2020) found the incumbent's political affiliation crucial, with increased support for climate-related measures following wildfires in Democratic voting areas, but not in Republican-leaning counties. In a paper close in spirit to ours, Betchel & Hainmueller (2011) evaluated the electoral gains resulting from extensive relief funds that the German government distributed following the 2002 Elbe flood. They discovered that the flood response notably increased the vote share for the incumbent party in affected areas, with some of this increase persisting into the next electoral cycle before disappearing (Betchel & Hainmueller, 2011).

Our findings align with the conclusions of Betchel & Hainmueller (2011). However, the insights obtained from the L'Aquila earthquake allow us to uncover additional elements of this intricate picture. First, we identify a significant difference in the electoral performance of the national incumbent, who can leverage national budget resources for relief efforts, and

the local incumbent. Secondly, our findings suggest that relief measures do not automatically guarantee electoral advantages for the government. Factors such as social capital and the intensity of the shock significantly impact post-disaster electoral dynamics. Our results about the role of social capital interweave in a particularly intriguing way with the evidence provided by Cerqua *et al.* (2023) and Masiero & Santarossa (2021). Cerqua *et al.* (2023) documented that regions struggling to recover from an earthquake exhibit a higher propensity to vote for right-wing and populist parties. In contrast, these parties gain no noticeable electoral advantage in regions that successfully recover. Our work introduces an additional layer of complexity to this pattern, identifying the presence of robust social capital as a potentially mitigating factor against this trend. Despite severely experiencing the seismic shock, municipalities rich in civic organizations did not display a shift towards right-wing parties. This evidence suggests that social capital, especially when manifesting in the form of participatory organizations engaged in relief and recovery activities, can act as a buffer against the societal unrest and uncertainty that can fuel the rise of populist narratives. Masiero & Santarossa (2021) explored the impact of earthquakes on municipal elections in Italy from 1993 to 2015, finding that seismic events generally increase the likelihood of the incumbent mayor and their party being re-elected. This effect is largely attributed to the increased media exposure of the mayors and the municipal government's ability to manage relief funds. Our study extends these findings by analyzing a specific earthquake in which the central government had full control over relief resources and deliberately excluded municipal administrations from disaster management. We present evidence suggesting that, under such circumstances, disasters may bolster support for the national government while providing little to no benefit to local administrations, especially those opposed to the ruling coalition at the time of the disaster. Among other distinctions, we expand upon the findings of Masiero & Santarossa (2021) by employing a different definition of the local incumbent in the context of the impending European elections, highlighting the distinct nature of municipal versus European electoral dynamics, as established in the political science literature (Reif & Schmitt (1980); Hobolt & Spoon (2012). Our analysis concentrates on how the coalition that

held the majority in each municipality in the preceding election performed in the subsequent ballots post-disaster. This approach is crucial as it helps to clarify how a municipality's political orientation, as expressed in a general election focused on broader political issues rather than local concerns, interacts with the performance of the national incumbent who centered their campaign on promises of comprehensive and swift recovery. Additionally, our analysis complements Masiero and Santarossa's work by delving into the impact of social capital. We explore how the social dynamics and community cohesion of disaster-affected areas can play a critical role in shaping the electoral outcomes. Our findings highlight the importance of local social structures in potentially moderating or amplifying the political consequences of natural disasters.

Our study sets itself apart from previous research also by employing a continuous measure to gauge the intensity of the shock, specifically through PGA. Several studies employ the Mercalli scale to gauge the intensity of seismic events. This metric assesses the damage caused by earthquakes but is subject to endogeneity concerns, as damage levels can also reflect the preparedness and socio-economic conditions of the affected areas. Conversely, the PGA provides a more refined measure of an earthquake's intensity. It quantifies the actual force felt during tremors, independent of the subsequent damage, offering a clearer, unbiased indicator of the seismic activity experienced by residents.

More generally, we connect to empirical studies on the outcomes of "tactic" redistribution, intended as the deployment of targeted transfers shortly before an election independently of the prevailing ideological beliefs about inequality and redistribution (Dixit & Londregan, 1996; 1998a; 1998b). This body of literature does not offer conclusive evidence but instead suggests that the outcomes of redistributive politics are highly context–dependent. Some authors find that voters do not necessarily like high spending before the elections. In some cases, the vote share of incumbents decreases with the level of government spending observed before the elections (e.g. Brender, 2003; Brender & Drazen, 2008). In other cases, voters rewarded the incumbent for redistributive spending in proximity of the elections (e.g., Levitt & Snyder, 1997; Manacorda *et al.*, 2011). Our study contributes to this literature by offering

evidence on voters' reactions to relief spending following a natural disaster.

Our work also aligns to the multidisciplinary literature on the impacts of social capital. Emergency situations like disaster relief require collective action and pro-social behavior, which can be challenging to prompt in crisis contexts. A handful of studies have documented that informal networks, widespread trust, and civic organizations aid afflicted regions in managing disasters (Aldrich, 2012; Cao *et al.*, 2022; Liu *et al.*, 2022). Our findings, showing that municipalities abundant in social capital displayed less gratitude towards the incumbent, align with this earlier research suggesting that civic organizations can play a vital role in disaster relief.

Lastly, our work connects with the burgeoning literature on the economic determinants of electoral outcomes. Prior research has focused on factors such as trade exposure (Autor *et al.*, 2020), corruption (Aassve *et al.*, 2023), and perceptions of unfair redistribution (Albanese *et al.*, 2022). We contribute to this literature by examining the short-term electoral impacts of a particular form of economic insecurity - the fear of material losses and the aspirations for a quick recovery associated with experiencing an extraordinary ground acceleration during the earthquake.

The rest of the paper is organized as follows: Section 2 provides detailed information about the data used in our empirical examination. Our case study and empirical methodology are laid out in Sections 3 and 4. We present our econometric analysis and engage in a discussion about our findings in Section 5. Complementary, individual-level evidence is presented in Section 6. In Section 7, we discuss the persistence of the earthquake's effect in light of the 2014 elections results. We wrap up the paper with a summary and some concluding remarks in Section 8.

2 Data

For each election, we collect information about the number of eligible and actual voters, invalid votes, and the votes received by each party.

In April 2009, the central government was ruled by a coalition including *Il Popolo della Libertá* (The People of Freedom), born from the merger of two right-wing entities, *Forza Italia* (literally "Let's go Italy") and *Alleanza Nazionale* (National Alliance), the *Lega Nord* (Northern League), and minor parties, such as *La Destra* (The Right), *Pensionati* (Pensioners' Party), and the *Alleanza di Centro* (Alliance of the Center).

Our primary dependent variable is the change in vote share, calculated as the incumbent's total vote count divided by the overall number of votes cast. We define the national incumbent as *Il Popolo delle Libertá* and the Northern League, forming the governmental coalition in power in Italy at the time of the earthquake. [1]

In evaluating the impact of the seismic event, we consider the results of two consecutive European elections to ensure comparability and provide a consistent basis for assessing shifts in voter preferences. Specifically, we identify the national incumbent as the coalition supporting the central government, led by Mr. Berlusconi in 2009, and define the local incumbent as the coalition that secured the majority of votes in each municipality during the previous European ballot (2004). The national incumbent's vote share in 2004 is calculated as the combined vote shares of *Forza Italia*, *Alleanza Nazionale*, and the Northern League.

This approach is motivated by evidence that voters behave differently in European Parliament elections compared to national or local administrative elections due to their distinct stakes and nature. European elections are considered "second-order" elections, focusing on broad political issues, which generally reflect overall political preferences rather than the more specific, localized concerns central to national or local elections (Reif & Schmitt, 1980; Hobolt & Spoon, 2012). Consequently, directly comparing European election results to those from national or local elections would be misleading, given the significant variation in voter motivations across these contexts. By using European elections as a point of comparison, we aim to account for these differences and better capture the shifts in voter behavior post-disaster.

We utilize data on municipal (log)population and density, income per capita (euros),

[1] Table A.1 in the Appendix provides an overview of the parties that participated in the elections, along with their position regarding the incumbent government, specifically, the Berlusconi IV Cabinet.

shares of net migration, elderly population (over 65) and young population (18-24), share of people with secondary education, average building age and average real estate price per squared meter, and elevation provided by the National Institute of Statistics (Istat) as controls at the municipality level. Furthermore, we introduce a set of province dummy variables to control for consistent characteristics within each province.

To measure social capital, we follow the literature and focus on the so-called Putnam's instrument, i.e., the density of associations (Putnam *et al.*, 1993; Knack & Keefer, 1997; Geraci *et al.*, 2022), which approximates the probability of being a member of a civil society organization. We build the indicators of associations density as the number of organizations in a municipality per 100 inhabitants. Information on the number of active organizations is taken from the Census of nonprofit organizations conducted by the Istat every ten years. We take into account two indicators: 1) The density of associations of any kind, including those focusing on education, research, health, development and housing, law, advocacy and politics, international cooperation, and religion, as well as trade unions and professional organizations. 2) The density of civic organizations dealing with the provision of social services, the prevention and management of disasters, and the provision of aid and relief in situations of emergency. This type of association has been involved directly in the disaster relief effort (Alexander, 2010a).

To assess how the relationship between ground acceleration and the incumbent government's electoral performance varied depending on the receipt of relief funds, we leverage information on municipalities eligible for lump–sum transfers, as specified in decrees issued by the government's delegate for disaster management.[2]

Lastly, we utilize survey data to provide individual-level evidence that corroborates our findings. We extract information on voting behavior from the Post-electoral survey conducted a week after the European elections in June 2009 as part of the European Commission's Eurobarometer program. This survey is designed to explore the motivations behind European

[2]On April 6, 2009, Prime Minister Berlusconi appointed the head of the Civil Protection Department to serve as the government's delegate for emergency management. His decrees subsequently dictated the allocation of relief funds and determined the eligibility of municipalities for various types of financial assistance.

citizens' voting and abstention decisions. Additionally, we gather information about citizens' perceptions of natural disaster-related risks and their opinions regarding civic organizations focused on disaster management from the Eurobarometer's Civil Protection Survey conducted in September and October 2009.

3 The L'Aquila earthquake and its aftermath

We collect information on the L'Aquila earthquake from ITACA, the ITalian ACcelerometric Archive of waveforms, a publicly accessible repository managed by the Italian Civil Protection Department under the Presidency of the Council of Ministers. ITACA collects strong motion records from several major sources, including the National Accelerometric Network (*Rete Accelerometrica Nazionale*), operated by the Italian Civil Protection Department - Presidency of the Council of Ministers, the National Seismic Network (*Rete Sismica Nazionale*), operated by the *Istituto Nazionale di Geofisica e Vulcanologia* (INGV), and regional and international networks operated by various providers. In 2009, 1,337 accelerometric stations were operational in the network, with an average distance of roughly 20 km between stations (Gorini *et al.*, 2010). Accelerometric stations measure peak ground acceleration (PGA, cm/s^2), which is the highest acceleration recorded at a location during a seismic event. Unlike the Richter and moment magnitude scales, the PGA does not quantify the total energy released by the earthquake. Rather, it gauges the intensity of surface shaking at a particular geographic point, providing an unbiased gauge of the strength of the tremors as perceived by the residents (Douglas, 2003).

On April 6 2009, 01:32:40 UTC, an earthquake of moment magnitude $M_W = 6.3$ occurred near L'Aquila, a town of 68,500 inhabitants in Central Italy. The hypocenter was located at a depth of 8.3 km along a NW-SW normal fault with SW dip (i.e., the angle formed by the fault plane and the horizontal direction). A total of 19 weaker (M_L between 4.0 and 5.4) yet again surface (H $\leq$ 17.1 km) shocks were recorded by a radius of 15-20 km around the main

shock"s epicenter during the same day and the following three days (Luzi *et al.*, 2017).[3]

The seismic event caused severe devastation, resulting in the loss of around 300 lives and leaving 1,500 people wounded. The impact on infrastructure was extensive, with over 60,000 buildings suffering significant damage, including key facilities such as the regional hospital and the university housing. The collapse of residential buildings left nearly 70,000 individuals without shelter. The authorities took action to provide temporary accommodation, with roughly one-third of those displaced being housed in coastal hotels in Abruzzo. The remainder of the displaced population was split, with a third accommodated in 171 tent camps located in and around the city of L'Aquila, and the final third arranging their own housing solutions (Alexander, 2010b).

In our empirical analysis, we focus on the main shake of the earthquake registered on April 6, 2009. Figure **??** shows the PGA values locally recorded by the accelerometric stations throughout Italy during the first shake. The maximum PGA value was measured at a distance of 4.9 km from the epicenter. The minimum positive PGA value (0.94 cm/s^2) was recorded at a distance of 275.2 km from the epicenter. As in Gualtieri *et al.* (2019), we spatially interpolate the PGA values recorded by each station to trace the variation of the ground motion in the epicentral area. Data interpolation was performed using the Kriging algorithm (Davis & Sampson, 1986), which predicts unknown values using variograms to express the spatial variation and minimizes the error of predicted values.

As shown in the close-up map of Figure 1, we graphically set a PGA minimum threshold of 5 cm/s^2 to filter out those areas affected to a marginal extent by the event. A PGA value above 5 can be significant enough to not only be distinctly felt by individuals on the ground but also potentially cause people to lose their balance. This affected an estimated 9,376,446 residents. Furthermore, accelerometric stations registered a PGA greater than 0 in 2,136 municipalities, encompassing a population of approximately 20,814,024 inhabitants. It is worth noting that the shakes do not spread evenly throughout the terrain. Instead, the paths of the vibrations are significantly affected by the geomorphological structures they

[3]Table A.2 in the Appendix reports the metadata of the L'Aquila earthquake.

encounter beneath the surface during their propagation (Chapman, 2010). Accelerometric stations registered the maximum PGA within the surface projection of the fault. However, the contours of PGA are stretched in a North-South direction, with ground acceleration decreasing unevenly as distance from the epicenter increases, and with a more rapid attenuation rate towards the West (Ameri *et al.*, 2009). The spatial interpolation allows us to accurately reconstruct the ground acceleration felt in each municipality of the epicentral area and to combine it with the electoral data and the municipality-level controls.

Table 1 reports some descriptive statistics of the variables included in the analysis. On average, we observe a slight increase in voter turnout, an 11% increase in the share of votes for the right-wing coalition that was governing Italy in 2009, and a decrease by 2% of the share of votes for the local incumbent. The econometric analysis will qualify these average outcomes, looking at the impact of the earthquake that took place a few weeks before the elections.

The policy response was fast and received wide media coverage.[4] The government deliberately leveraged the relief effort to raise media attention and shift the focus of the electoral campaign on disaster recovery measures (Alexander, 2010b). For example, the Prime Minister decided to host in L'Aquila a Cabinet meeting and the G8 summit initially planned to take place in Sardinia in July. On April 28, the Parliament approved several measures to support disaster-torn areas, including the immediate transfer of 70M for relief spending, and an income support scheme entailing a monthly transfer of up to 400 euros per each household resident in the area, the suspension of mortgage payments for four months, and the suspension of all utilities' bills for two months. The government kept local administrations out of the planning and managing of recovery measures (Alexander, 2010b; Bock, 2017). The Civil Protection, a department for on-the-field interventions that responds to the Prime Minister, led the interventions using a command-and-control approach, top-down planning, and emergency powers.

[4]Note that the media coverage goes against our results: an electoral outcome in favor of the governing coalition could spread also to areas not directly affected by the shake.

Figure 1: PGA spatially interpolated contours based on PGA values recorded by the ITACA accelerometric stations during the main shake of the L'Aquila earthquake (IT-2009-0009)

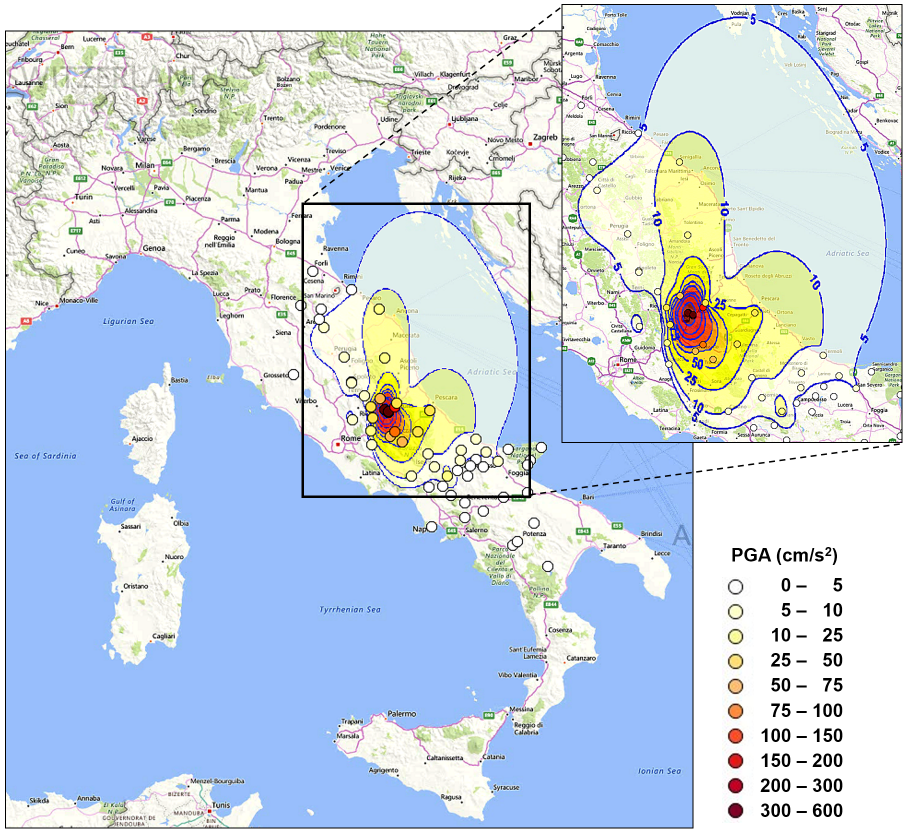


Table 1: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Variation in voter turnout	8,098	-6.353	9.798	-76.500	51.908
Variation in local incumbent share	8,098	5.528	9.263	-63.987	46.609
Variation in national incumbent share	8,098	8.304	7.091	-38.682	60.574
PGA (cm/s^2)	8,098	5.532	22.884	0.000	443.970
Altitude	8,098	358	298	0	2035
Income per capita (euro 2007)	7,441	16345	3823	6005	48876
Population (log)	7,441	7.872	1.324	3.497	14.762
Population density	7,441	295	628	1	12383
Share of elderly population (over 65)	7,441	0.223	0.061	0.048	0.625
Share of net migration	7,437	-0.002	0.020	-0.337	0.170
Share of young population (18 - 24)	7,439	0.070	0.016	0.009	0.164
Average building age	7,441	1955	12	1919	1988

Notes: Municipality data are for 2008. Average building age is for 2001.

4 Empirical strategy

To evaluate the impact of the L'Aquila earthquake on voting behavior, we match peak ground acceleration (PGA) data recorded by the National Strong Motion Network on April 6, 2009, with electoral data from European elections spanning 2004 to 2014. This includes the elections held just two months after the seismic event (June 6-7, 2009) as well as the preceding election cycle (June 13, 2004). The resulting dataset links the intensity of the acceleration experienced during the main shock across Italian municipalities to electoral outcomes observed before and after the event.

This setup allows us to assess the electoral outcomes of the shock using three distinct control groups. First, to maintain comparability with our individual-level, survey-based analysis, we include all municipalities with a PGA below 5, which were only marginally affected by the earthquake. Second, we compare how changes in electoral outcomes over time differed between the affected municipalities and areas that experienced mild shaking, defined by a PGA ranging from 2 to 5. Third, we construct an additional control group by selecting municipalities located within a 30-kilometer radius from the borders of the epicentral area depicted in Figure 1 – that is, the treated area that recorded a PGA of 5 or higher.

The second and third control groups are located in areas that closely mirror the epicentral area (i.e., the treated group) across several key characteristics. It is important to note that the propagation of seismic waves is highly irregular, as it is largely shaped by the underlying geomorphological structures, which can vary significantly even within a localized area (Chapman, 2010). This irregularity implies that the shock affected municipalities in both the treated group and the second and third control groups in an essentially random manner. As a result, individuals had no opportunity to self-select into these groups based on their preferences or personal characteristics. Figures 2 and 3 focus on the third control group, which encompasses municipalities within a 30-kilometer bandwidth from the border of the epicentral area. Figure 2 shows that a substantial share of both treated and control municipalities falls within the same seismic risk categories, Levels 1 and 2, as assessed at

the time of the earthquake. This similarity suggests that the statistical probability of an earthquake occurring in these regions was effectively equivalent. It is worth noting that the city of L'Aquila and its surrounding areas were classified as being in seismic risk Zone 2 (indicated in orange), as were the majority of municipalities in the control group.

As an additional robustness check, we restrict the comparison to treated municipalities and those within the control group located in seismic risk Zones 1 and 2 (see Figure A.2 in the Appendix). Figure 3 shows that the pre-earthquake political leaning was consistent across both treated and control municipalities, further underscoring the substantial similarity between these groups. In robustness checks, we also extend the minimum PGA threshold to levels of 2 and 1 in the second control group and adjust the radius to 30 kilometers in the third control group.

Equation (1) represents our baseline estimation:

$$\Delta elect_i = \alpha + \beta PGA_i + x_i'\gamma + \delta_p + \epsilon_i \tag{1}$$

where $\Delta elect_i$ is the variation between the 2004 and the 2009 measures of our electoral outcomes, i.e., voter turnout, local incumbent and national incumbent performance, for the municipality i; PGA_i is a measure of the shock occurred in April 2009, given by the peak ground acceleration registered during the main shake of the L'Aquila earthquake at the centroid of municipality i; x_i' is a row vector containing pre-treatment and time invariant municipality-specific characteristics described in Section 2, and δ_p is a set of province dummies. Given that PGA is "as if"' randomly assigned, conditional on the covariates, then ϵ_i satisfies conditional mean independence and the OLS estimator of β in equation (1) is unbiased. We use the PGA recorded by accelerometric stations during the first and strongest shake of the L'Aquila earthquake that occurred on April 6, whose contours are illustrated in Figure 1. Heteroskedasticity is accounted for by robust standard errors clustered at the province level.

The random occurrence of the earthquake helps us overcome potential endogeneity issues

often associated with the analysis of voting behavior. In some cases, exposure to natural disasters could be affected by personal choices. For instance, people may opt to move away from regions frequently subjected to severe weather conditions to reduce risk, as demonstrated by research showing a pattern of relocation away from areas regularly hit by tornadoes in the United States (Boustan *et al.*, 2012). However, there is no evidence suggesting that such migration triggered by extreme events occurs in Europe, particularly regarding earthquakes, which are less frequent and unpredictable (e.g., Halliday, 2006). The propagation of seismic waves follows an irregular path, influenced by the subsurface structures they encounter (Chapman, 2010).

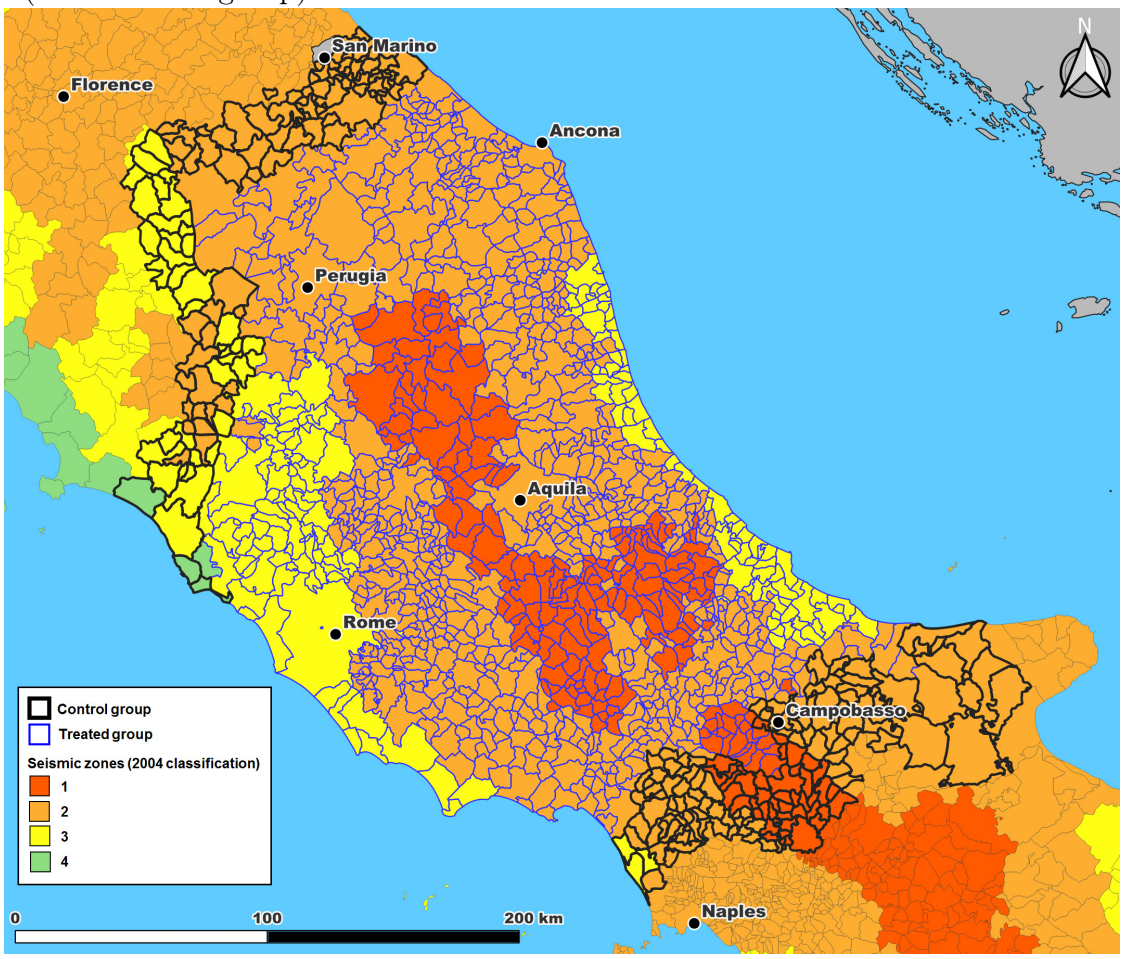
As a result, areas near the epicenter can experience significantly different levels of shaking, making it virtually impossible for individuals to self-select into the treated or the control groups. This randomness is further underscored by the seismic risk classification provided by the INGV, which shows that the epicentral area, including the city of L'Aquila and its surroundings, falls into seismic zone 2–a category shared by a substantial portion of the Italian territory, corresponding to about 27% of Italian municipalities including nearly all municipalities in the second and third control groups.

Additionally, several factors suggest that the population did not self-select into the earthquake's epicenter based on particular individual traits. Firstly, the region experienced no seismic activity for 20 years preceding the disaster. An earthquake occurred in 1985 in the L'Aquila province, but it was non-destructive, causing no casualties or injuries. Also, according to the Italian National Institute of Geophysics and Volcanology (INGV), this earthquake did not change the seismic classification of the epicentral area, which had been classified as a zone 2 region since 1927. Furthermore, the demographic and migration balances in the epicentral area and neighboring provinces remained steady for the next two decades, suggesting no precautionary migration occurred following the disaster (Istat, 2013a; 2013b).

The Province of L'Aquila had a long-standing tradition of favoring left-leaning parties in the two decades preceding the 2009 earthquake. During the 2004 European elections, the center-left coalition secured the majority of votes in the municipalities within the epicentral

area. This historical trend indicates that voters were unlikely to have self-selected into the epicentral area based on right-leaning political preferences.

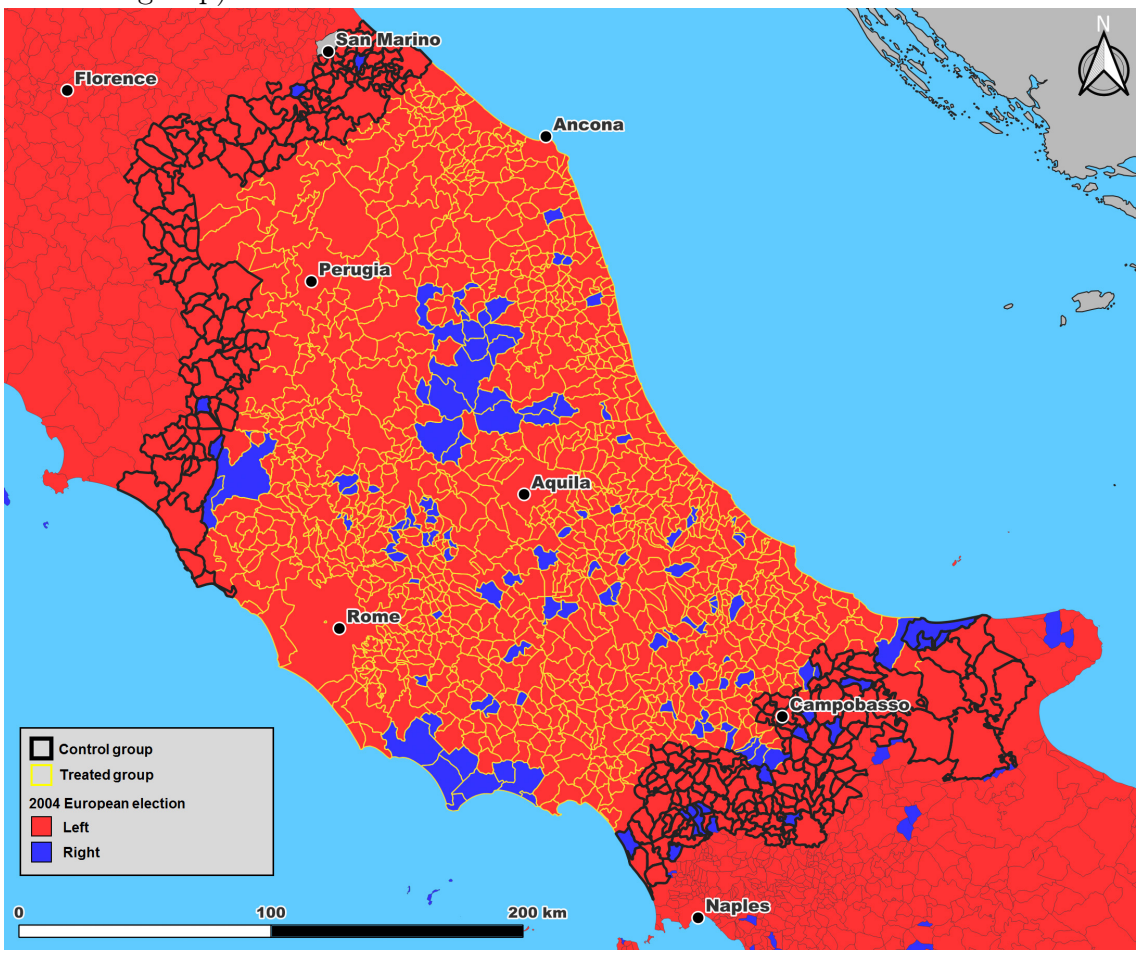
Figure 2: Seismic classification of municipalities in the treated group and in a 30 km bandwidth (third control group)



The control group includes municipalities within a 30 kilometer bandwidth from the epicentral border. Source: Authors' elaboration based on INGV data.

Figure 3 illustrates the balance in political leaning between the treated municipalities and those in the third control group, defined as municipalities located within a 30 km radius of the epicentral border. This balance indicates that both groups exhibit similar political leaning before the event.

Figure 3: Political leaning of municipalities in the treated group and in a 30 km bandwidth (third control group)



The control group includes municipalities within a 30 kilometer bandwidth from the epicentral border. Source: Authors' elaboration based on INGV and electoral data.

Additionally, Figure A.3 provides a visualization of the political leaning of local incumbents across Italian municipalities. Blue areas represent municipalities where the coalition supporting the national government, led by Mr. Berlusconi, received the majority of votes in the 2004 European elections, while red areas correspond to municipalities where the opposition coalition held majority support.

We also address local factors that may confound the precise determination of the earthquake's effect on voting patterns. We integrate municipal-level controls and province dummy variables to handle these elements.

Table A.3 in the Appendix shows that there are no significant pre-trends within our sample. The affected municipalities exhibit no significant changes in the outcome variables considered in the analysis compared to non-affected municipalities in the electoral rounds preceding the earthquake.

Finally, to exclude the potential for our findings to be reflections of spurious correlations, we create a series of placebo earthquakes mirroring the primary L'Aquila shake (IT-2009-0009) in intensity and propagation but centered in the centroid of the 5,964 municipalities where the accelerometric stations registered a zero PGA during the actual earthquake. By duplicating the real shake's spread pattern, we can simulate how the shock would have been experienced in each municipality within the fabricated epicentral area.

The purpose of this test is to determine the frequency at which the placebo estimates, based on a randomly generated treatment, closely resemble the actual estimates. A comprehensive explanation of how this test is conducted can be found in Section 5.4.

5 Results

In this section, we first illustrate the relationship between exposure to the shock and the outcomes of the elections, i.e., voter turnout, and the electoral performance of the local and the national incumbent. In Sections 5.2 and 5.3, we assess the heterogeneity of the treatment effects to shed light on the potential transmission mechanisms. In Section 5.4, we test the robustness of results through a series of placebo tests. In Section 6, we present ancillary evidence at the individual level. In Section 7, we test the persistence of the treatment effects extending our analysis to the 2014 ballots results. To ease the interpretation and comparability of results, all the variables on the right-hand-side of equation (1) have been standardized. The dependent variable is measured as the difference between the 2009 and 2004 values of a share. It follows that an estimated coefficient of any of our *elect* variables must be interpreted as the increase in the share due to a standard deviation increase in X.

5.1 Main results

In Table 2, we report the estimates of Model (1) when we consider as the dependent variable the difference in voter turnout between the 2004 and 2009 ballots (Column 1), the variation in the vote share of the local incumbent between 2004 and 2009 (Column 2), and the same variation for the national incumbent, i.e., the center–right coalition that was ruling Italy when the earthquake occurred (Column 3).

As an initial step in our analysis, we compare the variation in electoral outcomes between the treated municipalities and the first control group, which includes all municipalities with a PGA below the threshold. We find that voter turnout significantly decreased as the peak ground acceleration experienced by residents in each municipality increased. The magnitude of the coefficient implies that a one standard deviation increase in the PGA decreased voter turnout by 0.79 percentage points, which corresponds to a striking -12% in voter turnout. The performance of the local incumbent improved with the PGA, but not in a statistically significant way. Instead, the vote share of the national incumbent recorded a significant increase with the ground acceleration felt by inhabitants. The magnitude of the coefficient implies that a one standard deviation increase in the PGA results in a 0.5 percentage point increase in the vote share of the national incumbent, implying an additional 5% increase in the vote share, on top of an average 8.75% increase in preferences recorded between 2004 and 2009 for the governing coalition. As reported in Table 2, these findings remain robust across alternative definitions of the control group, with coefficients displaying comparable magnitude and statistical significance.

Table 2: The electoral outcomes of the L'Aquila earthquake

	(1) Voter turnout	(2) Local incumbent performance	(3) National incumbent performance
Panel A: Italy			
PGA	-0.791***	0.099	0.467***
	(0.189)	(0.259)	(0.087)
N	7,435	7,435	7,435
R2	0.573	0.184	0.354
Panel B: PGA >=2			
PGA	-0.794***	0.055	0.495***
	(0.200)	(0.219)	(0.109)
N	1,601	1,601	1,601
R2	0.465	0.084	0.323
Panel C: 30 Km radius			
PGA	-0.789***	0.089	0.516***
	(0.206)	(0.206)	(0.117)
N	1,269	1,269	1,269
R2	0.528	0.088	0.314
Panel D: 30 Km radius and seismic zones 1-2			
PGA	-0.786***	0.079	0.508***
	(0.208)	(0.204)	(0.123)
N	1,231	1,231	1,231
R2	0.535	0.088	0.309

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

To get more insights from these results, we assess the heterogeneity of the effects across the political spectrum. To this end, we divide our sample into municipalities where the

incumbent was either the right-wing coalition (accounting for 29.9%) or the left-wing coalition (representing 70.1%).[5]

Table 3 presents our findings. In left-leaning municipalities, voter turnout significantly decreased with the PGA. Conversely, right-leaning municipalities witnessed an increase in voter participation in relation to the intensity of the shock (Columns 1 and 2). Changes in the vote share for local incumbents proved statistically insignificant independently on the initial political leaning. However, support for the incumbent government in left-leaning municipalities significantly rose with the ground acceleration (Column 5). This result suggests that the greater the shock intensity, the higher the electoral benefit the government received in areas previously not aligned with it. Instead, in right-leaning municipalities, we do not notice any significant electoral premium for the national incumbent (Column 6). A potential reason for this outcome could be linked to political saturation. In municipalities with a center-right inclination, the government coalition already secured the votes from centrist, contestable voters. Given the strong polarization of the political debate, the coalition seemingly approached its maximum support level and found it challenging to appeal to the core group of leftist voters. As a result, little room existed for notable gains (Mancini, 2013). On the other hand, in left-leaning municipalities, centrist, potential "swing voters" that were initially less supportive of the incumbent government could have been influenced by relief actions. Nonetheless, these hypotheses would need to be tested with further data, especially at the individual level, and supplementary qualitative research to fully understand the nuances of this electoral behavior. As shown in Table 3, these results hold regardless of the control group considered, with coefficients consistent in both size and significance. Table A.4 in the Appendix shows that our results remain robust when we consider an additional control group, comprising municipalities within a 30 km radius of the epicentral border that were classified as seismic risk zones 1 and 2 by the INGV at the time of the earthquake. This robustness

[5]We define a municipality as right-wing leaning when the majority of voters supported right-wing parties in the previous ballot. We operationalize this definition as a dummy equal to one if more than 50% of the valid votes in the 2004 election went to right-wing parties (i.e., AN, *Fiamma Tricolore*, *Forza Italia*, *Lega Nord*, *Lega Lombarda*, and *Pensionati Italiani*), irrespective of the coalitions in place at that time.

check ensures that the population did not self-select into the treated or control group based on characteristics influencing their propensity to avoid environmental risks and their political leaning. In Section 5, we will use Eurobarometer data to present some individual-level evidence on voting behavior that supports our municipality-level results. In the next section, we address the potential mechanisms of transmission of the treatment effects by delving deeper in the role of social capital and the disbursed and promised relief funds.

Table 3: Treatment effects across the political spectrum

	(1)	(2)	(3)	(4)	(5)	(6)
	Voter turnout		Local incumbent performance		National incumbent performance	
	left	right	left	right	left	right
PGA	-0.878***	1.486***	0.123	0.357	0.540***	0.357
	(0.176)	(0.370)	(0.270)	(0.413)	(0.060)	(0.413)
N	5,143	2,292	5,143	2,292	5,143	2,292
R2	0.610	0.349	0.157	0.316	0.403	0.316

Notes: OLS estimates. Estimates on Italy, for the results on the subsample of municipalities with PGA>2, within a radius of 30km; and within a radius of 30 km and in seismic zones 1 and 2, see Table A.4 in the Appendix. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'left' columns (1, 3, and 5) consider the subsample of municipalities with a center-left incumbent in 2004, the 'right' columns (2, 4, and 6) consider the subsample of municipalities with a center-right incumbent in 2004. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

5.2 The role of social capital

In this section, we shed light on the transmission mechanism of the effects by assessing their heterogeneity across the municipal levels of social capital. Table 4 reports the results. As explained in Section 1, we align to the literature in measuring social capital as the density of civic organizations (Putnam *et al.*, 1993). In panel A, we consider all associations alike with no distinction based on their purposes. Panel B, instead, focuses on civic organizations specifically devoted to emergency prevention and management or providing social services,

which were involved in the disaster relief effort directly. In the following discussion, we label these associations as "emergency social capital".

Table 4: The role of social capital

	(1)	(2)	(3)	(4)	(5)	(6)
	Voter turnout		Local incumbent performance		National incumbent performance	
Panel A: Overall SC	low	high	low	high	low	high
PGA	-0.745***	-0.988***	0.179	0.040	0.544***	0.295***
	(0.193)	(0.184)	(0.316)	(0.133)	(0.076)	(0.104)
N	3,738	3,531	3,738	3,531	3,738	3,531
R2	0.579	0.581	0.175	0.277	0.308	0.508
Panel B: Emergency SC	low	high	low	high	low	high
PGA	-0.695***	-0.967***	0.114	0.061	0.651***	-0.015
	(0.243)	(0.107)	(0.268)	(0.215)	(0.079)	(0.121)
N	4,391	2,878	4,391	2,878	4,391	2,878
R2	0.577	0.588	0.176	0.264	0.325	0.480

Notes: OLS estimates. Estimates on Italy, for the results on the subsample of municipalities with PGA>2, within a radius of 30km; and within a radius of 30 km and in seismic zones 1 and 2, see Table A.5 in the Appendix. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'low' columns (1, 3, and 5) consider the subsample of municipalities with below-median number of associations, the 'high' columns (2, 4, and 6) consider the subsample of municipalities with above-median number of associations. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

When we consider all associations alike, we do not find statistically significant differences in the relationship between the ground acceleration felt by inhabitants during the shock, voter turnout, and the incumbent government's performance across varying levels of social capital. Both in municipalities with low and high levels of social capital, voter turnout decreased with the intensity of the shock, while the national incumbent's consensus improved with the PGA.

However, when we account for variations in emergency-specific social capital, notable differences emerge. The national incumbent only gained vote share with the PGA in munic-

ipalities where civic organizations specifically dealing with emergency prevention and relief were scarce. These estimates remain robust across all three control groups, with coefficients consistently similar in size and significance. Table A.5 in the Appendix confirms that our results remain robust when we consider the additional control group, consisting of municipalities within a 30 km radius of the epicentral border that were classified as seismic risk zones 1 and 2 by the INGV at the time of the earthquake. Once again, this robustness check ensures that the population did not self-select into the treated or control group based on characteristics that could influence their propensity to avoid environmental risks and their political leaning.

A potential explanation for this finding hinges on the interplay between governmental efforts and the presence or absence of local civic organizations. In areas deficient in social capital, citizens primarily relied on governmental efforts for disaster relief and recovery. As a result, these areas likely exhibited greater voter gratitude towards the incumbent government, given its more visible and vital role in managing the disaster aftermath. Conversely, in municipalities rich in social capital, civic organizations played a role in disaster management and recovery, by rapidly mobilizing local resources and providing support to affected individuals (Alexander, 2010a). As a result, the government's relief efforts could have appeared less salient in the eyes of the voters, thereby dampening any potential electoral advantage accrued from disaster management. This result suggests that the presence of civic organizations can influence how voters perceive and evaluate the performance of incumbent governments in disaster management.

5.3 The role of relief funds

In this section, we investigate the potential influence of relief funds on the incumbent's electoral performance. We draw information on eligible municipalities from decrees issued by the government's delegate for disaster management. Initially, 49 municipalities qualified to receive funds. This list was later expanded to 57 municipalities in subsequent decrees.

In these qualified areas, displaced households received an immediate relief amount of up to €400 each. Provisional shelters for displaced citizens were provided by the civil protection department, which also established the allocation of funds for the renovation and reconstruction of private properties and public buildings. Although many schools and public buildings were damaged and unfit to host polling stations, the Civil Protection Department ensured voting accessibility via mobile, temporary polling stations.

To ascertain the influence of financial aid on electoral outcomes, we compare the 57 municipalities that were initially entitled to receive such transfers to all other communes that experienced similar ground acceleration during the earthquake, i.e., a PGA level that was at least equal to that experienced by the eligible municipalities. This exercise narrows our sample to 314 municipalities with comparable seismic experiences. As per the results reported in Table 5, the receipt of a lump-sum transfer from the government appeared to have no significant effect on electoral outcomes.

Taken together, our findings suggest that redistributive measures alone do not bestow an electoral advantage to the incumbent government in the aftermath of the disaster. Rather, it appears that municipalities that experienced the earthquake with greater intensity became more responsive to such measures. Conversely, when financial aid was not linked to the intensity of the shock, it did not confer any statistically significant electoral benefit to the government. This suggests that the degree of shock exposure, quantified through the actual ground acceleration experienced by inhabitants, could be a crucial factor in eliciting voter gratitude.

Table 5: The impact of PGA and lump sum transfers

	(1) Voter turnout	(2) Local incumbent performance	(3) National incumbent performance
PGA	-0.316	-0.534	0.394
	(0.644)	(0.388)	(0.317)
transfer	-2.398	1.648	0.616
	(4.410)	(1.757)	(1.564)
PGA*transfer	-0.351	0.211	0.196
	(0.785)	(0.314)	(0.369)
N	303	303	303
R2	0.713	0.171	0.376

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

5.4 Placebo tests

In order to verify the robustness of our findings, we carry out a placebo test in the same vein as Abadie *et al.* (2010) and Belloc *et al.* (2016). We simulate placebo earthquakes by assuming a different epicenter and computing the peak ground acceleration (PGA) of the shakes that would impact each municipality in the false epicentral region. We base the imputation of the municipality-level PGA values on the relationship between the distance from the epicenter and the ground acceleration observed in the main shake of the L'Aquila earthquake (IT-2009-0009).

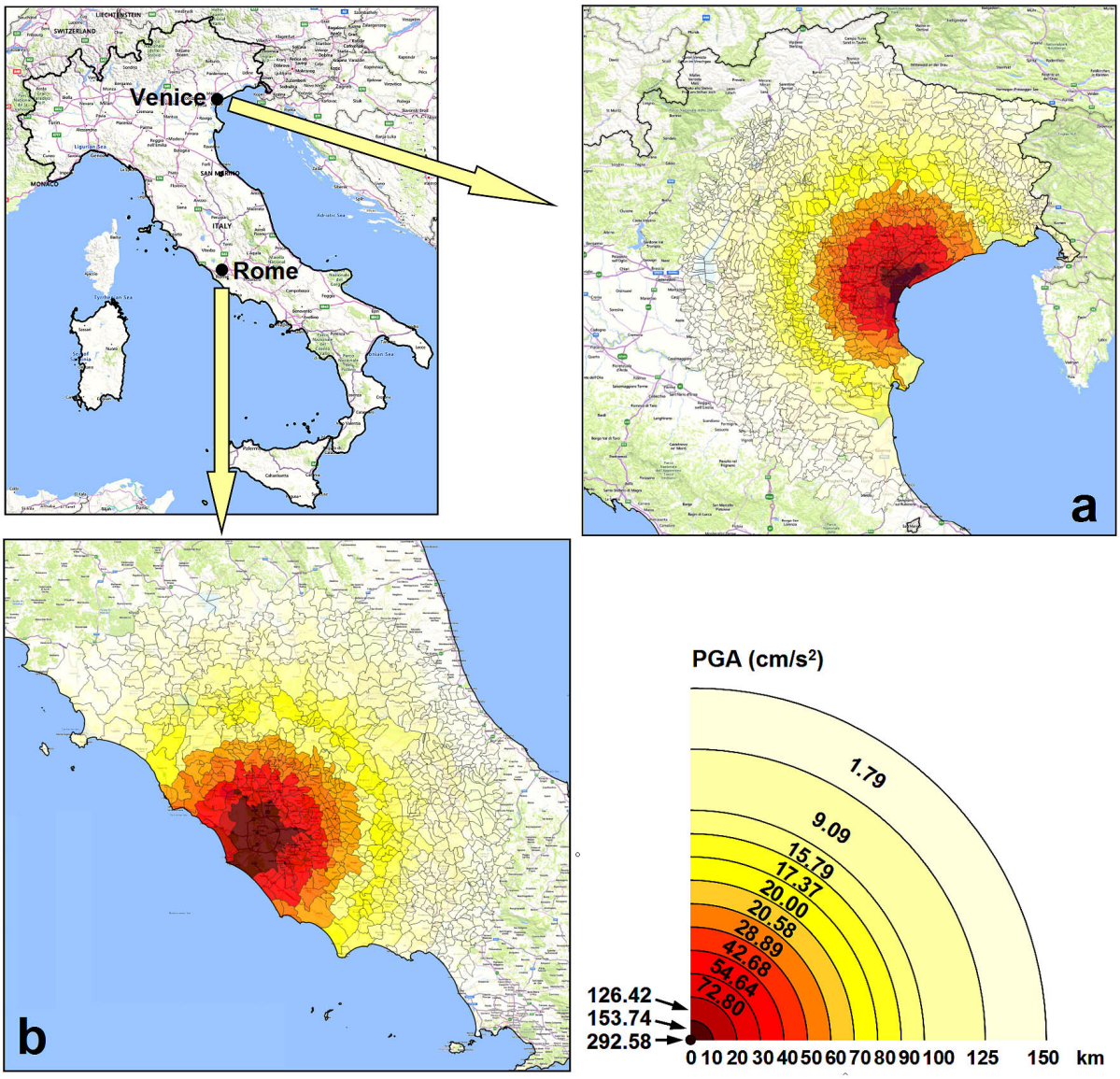
We construct a set of fake earthquakes that possess the same magnitude and propagation pattern as the IT-2009-0009 tremor but with their epicenters situated at the centroid of each of the 5,964 Italian municipalities outside the actual epicentral area, i.e., municipalities in which the strong motion network recorded a null PGA during the real earthquakes. To create the fake shakes, we adopt a three-stage process. First, we determine the average PGA recorded by the accelerometric stations in each municipality during the IT-2009-0009 event.

This step enables us to attribute a singular PGA value to municipalities covered by more than one accelerometric station. Second, we produce an idealized version of the real shock by compelling the artificial tremors to propagate through the ground with the same intensity documented during the real tremor. This process allows the PGA values to alter as a result of the radial distance from the epicenter. As a result, the counterfeit epicentral areas have a circular shape and are partitioned into 12 circular sectors, each of which has a specific value of the PGA depending on the distance from the false epicenter. Finally, after assigning the PGA value of the actual epicenter to the municipality, we determine the PGA values of each circular sector by averaging the PGA values of the municipalities included in that particular radial bin, i.e., by taking into account the radial distance of those municipalities' centroid from the centroid of the epicenter municipality. Figure 4 illustrates an example by showing the spreading pattern of two counterfeit earthquakes with their epicenters in Venice (Panel A) and Rome (Panel B), respectively.

The aim of this test is to assess the frequency with which the randomly generated placebo estimates are too similar to the actual estimates. For instance, assume that we were mistakenly rejecting the null hypothesis that the coefficient of interest in the third column of Table 3 is identical to 0 in our results (i.e., we were ascribing an impact to the shocks that does not exist in reality). In that circumstance, we would observe placebo coefficients near our authentic estimate, which is depicted by the vertical line in Figure 5. This figure illustrates the probability density function of 20,000 repetitions of the estimates, obtained by randomly selecting one of the 5,964 distinct fake shocks each time.

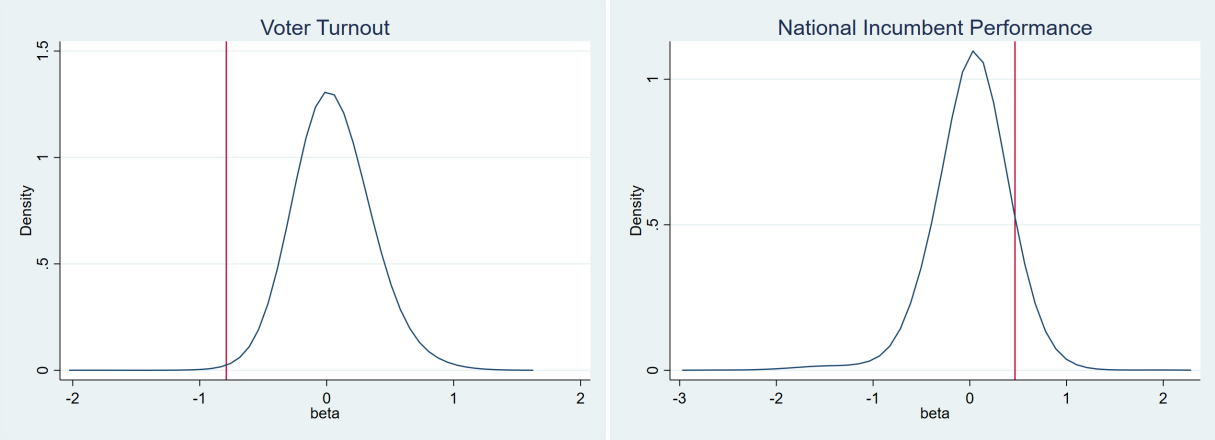
The left and right panels of Figure 5 present the placebo test outcomes for voter turnout and national incumbent performance, respectively. Examining the voter turnout, we observe that the estimates generated through the simulation are predominantly situated to the right (i.e., greater in value) of the actual estimated coefficient of -0.791. Conversely, the estimates produced in the national incumbent performance test are mainly located to the left (i.e., lesser in value) of the actual estimated coefficients of 0.467.

Figure 4: Examples of the application of the placebo test based on the IT-2009-0009 shake to the municipalities of: (a) Venice; (b) Rome



In both scenarios, the coefficients of the 5,964 counterfeit earthquakes are scattered around zero. The counterfeit estimated coefficient is statistically significant at the 10% level in 0.07% and 6.19% of cases for voter turnout and national incumbent performance, respectively. Taken together, these findings imply that our results on the link between the genuine intensity of the shocks and the support for the ruling party (Table 3, column 3) are not influenced by the possibly correlated nature of our treatment variable with the error term.

Figure 5: Kernel density function of the placebo point estimates (20,000 reps)



6 Micro–level evidence

While the municipal-level analysis can offer the overall figures about the impact of the earthquake, it may not fully capture the nuances of individual citizen choices. To delve deeper into the behavior of voters, we turn to survey data, using the Eurobarometer survey 71.3 on European elections conducted in June and July 2009. This survey collected responses from a sample of 1036 Italian citizens, focusing on their voting behavior in the recent European elections and the previous political elections held on April 9, 2006. In this section, we estimate the impact of the earthquake on individual voting behavior and opinions controlling for an array of individual characteristics and using robust standard errors.

The individual-level estimates reported in Table 6 validate our primary conclusion regarding voter turnout discussed in Sections 5.1 and 5.2.

Table 6: Individual turnout and new abstentionism

Dep. Variable:	(1) Individual turnout	(2) New abstension	(3) Individual turnout low E.S.C.	(4) Individual turnout high E.S.C.	(5) New abstension low E.S.C.	(6) New abstension high E.S.C.
PGA	-0.071**	0.096***	-0.127***	0.008	0.133***	0.059
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
N	1,036	1,036	522	514	522	514
R2	0.009	0.012	0.016	0.013	0.024	0.006

Notes: OLS estimates. All estimates include individual-level controls, i.e., age and gender of the respondent. The table reports standardized beta coefficients and robust standard errors in parentheses. The 'low SC' columns consider the subsample of respondents located in regions where the population-weighted number of associations is below the median, the 'high SC' columns consider the subsample of respondents located in regions where the population-weighted number of associations is above the median. Results are presented for the Emergency Social Capital measure. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

The probability of voting decreased in areas more severely affected by the earthquake. This decrease primarily stemmed from new abstentions — respondents who voted in 2006 but opted not to vote in 2009. We further investigate these data by examining whether the earthquake influenced voting behavior differently in areas distinguished by low versus high levels of social capital.[6] In this regard, the individual-level evidence is consistent with our findings detailed in Table 5: the negative association between voters' participation and PGA is driven by areas with a deficiency in social capital. In those areas, abstaining voters were less likely to be usual abstainers, i.e., they had participated in the previous ballot.

To corroborate our evidence on the electoral performance of the local and national incumbents, we use questions regarding respondents' support for the government and the party they voted for. However, these questions received a substantially lower response rate, with less than half of the sample providing answers. Consequently, we should interpret these supplementary results with caution.

[6]In this table, we consider two indicators of social capital, i.e. "overall social capital", considering all associations alike, and "emergency social capital", only accounting for associations devoted to disaster management and relief. However, our results on general social capital are robust to the use of alternative indicators involving different aggregations of associations across their main aims.

As illustrated in Table 7, in this subsample, the PGA does not appear to have significantly affected the inclination to vote for the government coalition or the likelihood to declare to have voted for supporting the government. However, when we split the sample into respondents living in left-leaning versus right-leaning areas, our findings align with the results discussed in Table 3. In formerly left-leaning areas, the likelihood of having supported the government in the European election significantly increased with the PGA. This nuanced pattern is consistent with the interpretation that the PGA played a role in swaying political allegiances in areas initially leaning towards the opposition, underscoring the complexity of electoral dynamics in the aftermath of the earthquake. We provide further evidence based on respondents' self-reported political orientation from the Eurobarometer survey in Table A.6 in the Appendix. Predictably, respondents who identified as right-wing were more likely to state their decision to vote (instead of abstaining) was primarily to show support for the incumbent government, and were also more likely to have voted in favor of the incumbent.

To gain a deeper understanding of citizens' perceptions of disaster management and civil protection, we resort to individual-level data derived from the Eurobarometer Civil Protection survey conducted in September 2009, five months after the earthquake. It is important to mention that various Eurobarometer surveys are administered independently, hence prohibiting the combination of information across different waves. Table A.7 in the Appendix reveals a significant correlation between the intensity of the ground acceleration experienced during the seismic event and the subsequent heightened perception of earthquake risk, increased feelings of inadequate information about preventive measures, and a sense of unpreparedness to cope with disasters. This finding offers additional validation for our treatment measure, suggesting that the shock was perceived as significant by those responding to the Eurobarometer survey.

We also break down the sample between left-leaning and right-leaning areas and between areas with low and high levels of social capital in Table A.8 in the Appendix. The results show that the perception of earthquake risk significantly increased with the PGA in both left and right-leaning regions. However, in right-leaning areas, citizens' perception of being

adequately informed about preventive measures and prepared for emergencies decreased significantly with PGA, while there are no significant effects in left-leaning areas. Though this finding does not directly tie to our primary results, it is noteworthy as it resonates with the political and environmental economics literature suggesting that right-leaning parties tend to downplay climate and environmental issues, such as those related to disaster prevention, in their political programs and campaigns (Egan & Mullin, 2012; Gagliarducci *et al.*, 2019; Carlsson *et al.*, 2021).

We then assess the correlation between the severity of the shock experienced during the earthquake and the belief that the EU should support civic organizations for disaster management, relief, and recovery. Estimates in Table 8 reveal a significant increase in the belief that the EU should support civic organizations as the ground acceleration rises (Column 1).

Table 7: Individual support for the incumbent government

Dep. Variable:	(1) Support the Government	(2) Voted for National Incumbent	(3) Support the Government left	(4) Voted for National Incumbent left	(5) Support the Government right	(6) Voted for National Incumbent right
PGA	0.086	0.069	0.122*	0.202***	0.128	-0.061
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
N	486	486	298	298	188	188
R2	0.009	0.006	0.015	0.042	0.025	0.009

Notes: OLS estimates. All estimates include individual-level controls, i.e., age and gender of the respondent. The table reports standardized beta coefficients and robust standard errors in parentheses. Columns 3 and 4 consider the subsample of respondents located in regions where the share of population living in municipalities with a center-right incumbent in 2004 is below the median, columns 5 and 6 consider the subsample of respondents located in regions where the share of population living in municipalities with a center-right incumbent in 2004 is above the median. The variable 'Support the government' is a dummy variable assigned a value of 1 if respondents explicitly stated that their decision to vote was motivated by a desire to support the incumbent government. The variable 'Vote for the national incumbent' is defined as per the previous sections of this analysis. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

This finding aligns with a substantial amount of anecdotal evidence suggesting that in the

aftermath of the earthquake, these organizations were integral in emergency response, aid distribution, and community rebuilding efforts. Their increased visibility might have enhanced citizens' recognition of their significance, reinforcing our municipality-level conclusions.

Table 8: Opinions about the EU and Emergency SC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Political spectrum		Overall SC		Emergency SC	
	full sample	left	right	low	high	low	high
PGA	0.086***	0.192***	0.007	0.050	0.115***	0.095***	0.058
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	1,003	531	472	551	452	510	493
R2	0.009	0.042	0.000	0.004	0.017	0.009	0.014

Notes: OLS estimates. The dependent variable 'EU support for Emergency SC' is a dummy variable equal to 1 if respondents affirm that the EU should support civic organization for disaster management, relief, and recovery, and 0 if they affirm that the EU should not provide support to these organizations. All estimates include individual-level controls, i.e., age and gender of the respondent. The table reports standardized beta coefficients and robust standard errors in parentheses. Column 2 considers the subsample of respondents located in regions where share of population living in municipalities with a center-right incumbent in 2004 is below the median, column 3 considers the subsample of respondents located in regions where share of population living in municipalities with a center-right incumbent in 2004 is above the median. The 'low SC' columns (4 and 6) consider the subsample of respondents located in regions where the population-weighted number of associations is below the median, the 'high SC' columns (5 and 7) consider the subsample of respondents located in regions where the population-weighted number of associations is above the median. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

The relationship between the PGA and the perceived importance of associations is driven by left-leaning areas (Column 2), while the correlation is noticeably absent in right-leaning regions (Column 3). This contrast may be rooted in the ideological frameworks of the two contrasting coalitions within the Italian context. Traditionally, left-leaning areas tend to support civil society organizations, ascribing to them a crucial role in promoting collective welfare (Putnam *et al.*, 1993).

The different treatment effects in areas with low and high levels of emergency social capital also align with our principal findings regarding the role of civic organizations in driving the electoral impact of the earthquake through their post-disaster relief and recovery

efforts (Columns 4 and 5). Specifically, in regions lacking robust emergency social capital, increased ground acceleration correlates with a stronger belief that the EU should financially support civic organizations devoted to managing disasters and driving recovery. This finding may be related to the fact that, in areas where civic organizations were sparse, citizens directly experiencing the shock could recognize their acute need for the support that civic organizations provide.

7 The long-run impact of the earthquake

To evaluate the persistence of the earthquake's impact, we extend our analysis to encompass the 2014 European elections. During this time, Italy was governed by Matteo Renzi, supported by a broad coalition inclusive of his Democratic Party, the New Center-Right, and two center-leaning parties (the Union of the Center and Civic Choice), but notably excluding the parties that were in power during the earthquake. In Table 9, we present estimates of equation (1), wherein our dependent variable is the change in the incumbent government's vote share at the time of the earthquake between 2004 and 2014 (Column 4) and between 2009 and 2014 (Column 5).

The first three columns recapitulate the results regarding the impact of the ground acceleration on voter turnout (Column 1), as well as the local and national incumbent's vote shares between 2004 and 2009 (columns 2 and 3). Despite the slight change in our sample owing to the merger of a few municipalities between 2009 and 2014, these columns essentially reaffirm the estimates initially presented in Table 2.

The estimates in Column 4 reveal that the treatment effect did not persist into the subsequent European election. Rather, the incumbent government saw its consensus significantly diminish with the PGA, as experienced by citizens five years prior, between 2009 and 2014.

Table 9: The impact of the earthquake on 2014 elections

	(1) Voter turnout 2004/09	(2) Local incumbent performance 2004/09	(3) Natl incumbent performance 2004/09	(4) Natl incumbent performance 2004/14	(5) Natl incumbent performance 2009/14
PGA	-0.791***	0.099	0.467***	0.174	-0.304***
	(0.189)	(0.259)	(0.088)	(0.129)	(0.086)
N	7,428	7,428	7,428	7,430	7,430
R2	0.573	0.183	0.353	0.384	0.454

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels. The first three columns reiterate estimates presented in Table 2, with a slightly different sample size due to the merger of several municipalities between 2009 and 2014.

The heterogeneity of treatment effects, as detailed in Table 10, reveals compelling electoral dynamics across the political spectrum. In left-leaning municipalities, where the incumbent government's electoral gains were significantly associated with the PGA (Column 1), support for the right–wing coalition declined over time with the intensity of the ground acceleration experienced in April 2009 (Column 5). Compared to the 2004 elections (held before the seismic event), we observe a small but marginally significant (at the 10 per cent level) increase in the center–right vote share with higher PGA in left–leaning municipalities, suggesting that the electoral boost seen in 2009 still persisted to a limited extent (Column 3). However, Column 4 shows that, relative to the 2009 elections–held in the immediate aftermath of the earthquake–the national incumbent's performance significantly and substantially declined with the severity of the tremors in left–leaning municipalities, particularly in the very municipalities where it had initially gained support. In contrast, and consistent with the patterns observed in the 2009 election, we find no statistically significant treatment effects in right-leaning municipalities, except for a slightly significant increase in the center-right vote share in 2014.

Table 10: Treatment effects across the political spectrum in 2014

	(1) Natl incumbent performance 2004/09 left	(2) Natl incumbent performance 2004/09 right	(3) Natl incumbent performance 2004/14 left	(4) Natl incumbent performance 2004/14 right	(5) Natl incumbent performance 2009/14 left	(6) Natl incumbent performance 2009/14 right
PGA	0.540***	0.357	0.186*	1.146	-0.369***	0.742*
	(0.060)	(0.413)	(0.103)	(0.706)	(0.099)	(0.440)
N	5,140	2,288	5,141	2,289	5,141	2,289
R2	0.403	0.316	0.364	0.384	0.428	0.392

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'left' columns (1, 3, and 5) consider the subsample of municipalities with a center-left incumbent in 2004, the 'right' columns (2, 4, and 6) consider the subsample of municipalities with a center-right incumbent in 2004. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table 11 delves into variations in the incumbent government's consensus across different social capital levels. As done in the primary analysis, we use a measure of associational density that regards all associations without distinctions ("overall SC) and a measure of "emergency social capital", which solely encompasses associations involved in providing social services, disaster prevention and management, as well as emergency aid and relief provision. In municipalities marked by lower social capital, where the incumbent government's support increased with the PGA in the aftermath of the disaster, the vote share declined significantly with the intensity of the shock experienced five years earlier.

Taken together, this evidence seems to paint a picture of growing disillusionment. The right-wing coalition appears to have lost its foothold in the very municipalities where it had previously gained support following the disaster, namely, left-leaning municipalities and those with low social capital. The observed patterns suggest that in the immediate aftermath of the earthquake, the government's swift and effective response resonated with the affected municipalities, especially those leaning left and those characterized by lower levels of social capital. The severity of the disaster, as indicated by the ground acceleration (PGA), likely made these citizens more appreciative of the incumbent government's efforts, granting it an electoral premium.

Table 11: Treatment effects and social capital in 2014

	(1)	(2)	(3)	(4)	(5)	(6)
	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf
Panel A:	2004/09	2004/09	2004/14	2004/14	2009/14	2009/14
Overall SC	low	high	low	high	low	high
PGA	0.544***	0.295***	0.162	0.110	-0.388***	-0.191
	(0.076)	(0.104)	(0.100)	(0.217)	(0.077)	(0.149)
N	3,736	3,526	3,738	3,526	3,738	3,526
R2	0.308	0.507	0.330	0.500	0.391	0.609
	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf	Natl incmb perf
Panel B:	2004/09	2004/09	2004/14	2004/14	2009/14	2009/14
Emergency SC	low	high	low	high	low	high
PGA	0.651***	-0.015	0.206*	0.114	-0.455***	0.117
	(0.079)	(0.121)	(0.104)	(0.181)	(0.093)	(0.089)
N	4,387	2,875	4,389	2,875	4,389	2,875
R2	0.324	0.479	0.354	0.492	0.415	0.586

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'low' columns (1, 3, and 5) consider the subsample of municipalities with below-median number of associations, the 'high' columns (2, 4, and 6) consider the subsample of municipalities with above-median number of associations. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

However, as time progressed, the medium-term policy response failed to meet the expectations set by the immediate reaction. The government's efforts did not translate into a successful recovery strategy, which led to a growing sense of dissatisfaction and disillusionment. In municipalities where the PGA was higher, the effects of the earthquake were likely more severe and long-lasting (Alexander, 2010b; 2010a). Consequently, the disappointment with the perceived inadequacy of the recovery process could have been more palpable, leading to a significant and substantial decline in support for the center-right coalition in these regions. This interpretation is consistent with reports indicating that while initial measures were prompt and widely publicized, the medium-term policy response was notably weak, attracting extensive criticism in political and academic debates. A year after the disaster, the reconstruction of L'Aquila's historic center lagged, the local economy stagnated, and public

dissatisfaction over the lack of political vision and urban planning for the city's reconstruction grew. Promises of recovery were largely unmet, and corruption scandals associated with the reconstruction emerged (Alexander, 2010b; 2010a; 2013; Özerdem & Ruffini, 2013). In the medium-term, the government's transitional shelter policy contributed to isolation, social fragmentation, and deprivation of services (Alexander, 2013).

In addition, even if the earthquake had significant negative and persistent impacts on the employment rate of the local labour market areas involved, no initiatives were implemented to boost employment (Basile *et al.*, 2024). Financial hardships amplified the difficulties of relocation. Many displaced individuals were compelled to continue paying local taxes and mortgages on their demolished properties (Alexander, 2010b).[7] It appears that the center-right coalition's initial success in gaining support in the wake of the disaster set high expectations that were not met in the following years. The government's failure to fulfill recovery promises, stagnation of the local economy, corruption scandals linked to the reconstruction, and the adverse effects of their transitional shelter policy likely drove a loss of consensus. Regrettably, our data does not enable us to quantify the misallocation of resources or provide measures of the unmet needs stemming from the recovery initiatives. Additionally, we cannot conclusively determine if any potential misuse of funds caused the drop in electoral support for the 2009 incumbent government with the PGA. However, the observed declining relationship between the 2014 electoral consensus and the PGA recorded in 2009, is striking.

8 Discussion and conclusions

Expanding our understanding of the electoral outcomes of natural disasters is critical, as voters' short-term focus may encourage the incumbents to skew policies towards short-term goals, such as relief transfers, instead of preventive measures and strategic investments. Furthermore, as the adverse impacts of climate change manifest in increased frequency of

[7] While the government temporarily suspended taxes until 2010, it later demanded that the deferred taxes be repaid. Following public uproar, the repayment period was extended from five to ten years (Alexander, 2010b).

catastrophes such as droughts, floods, hurricanes, and earthquakes (Bender *et al.*, 2010; Nicholls & Cazenave, 2010; McGuire, 2012), it becomes imperative to examine how the magnitude of such shocks might influence electoral dynamics. Our research bridges the gap between these considerations by delving into the electoral repercussions following the 2009 L'Aquila earthquake, one of the most significant natural disasters to hit Italy since the end of World War II.

Collectively, our results imply that the disaster presented the national incumbent with a chance to harness the policy response for gaining political support. The government effectively excluded local administrations from crisis management, tapping entirely into fiscal resources to deliver relief spending and income support to disaster-stricken areas shortly before the elections (Alexander, 2010b; Bock, 2017). However, the incumbent's consensus did not grow uniformly distributed across the nation. Rather, the earthquake's intensity, as experienced by the residents, played a pivotal role in shaping the increase in the government's vote share. Specifically, support for the center-right government increased significantly in areas that experienced greater ground acceleration. This result suggests that exposure to the disaster might have heightened voters' sensitivity to the government's relief efforts, with their inclination to back the national incumbent amplifying in line with the intensity of the shock.

The heterogeneity of the effects implies that the impact of the earthquake shock varied significantly with the prevailing political orientation of municipalities. In left-leaning municipalities, the national incumbent's performance significantly improved with the increase in PGA. In contrast, in municipalities that were already favoring the center-right coalition, the incumbent government's performance did not improve with the PGA in a statistically significant way. Taken together, these findings imply that the earthquake may have presented an opportunity for the government to sway voters.

The influence of social capital on disaster response and recovery added another layer of intricacy to this multifaceted scenario. Specifically, civic organizations appear to have played a role in shaping the earthquake's electoral aftermath. In municipalities with abundant

"emergency social capital," the shock did not yield any statistically significant electoral benefit for the incumbent government. Conversely, in municipalities where civic organizations were sparse or non-existent, the national incumbent's vote share increased significantly with the ground acceleration experienced by the residents.

The differential electoral impact of the earthquake highlights the dynamic interplay between government action, civic participation, and citizens' perception of relief and recovery efforts. In municipalities lacking civic organizations, citizens' only recourse for post-disaster relief and recovery is the government. In these contexts, governmental action is highly visible and becomes the primary, if not sole, avenue for obtaining aid and support. When the government intervenes and provides much-needed assistance in the aftermath of a disaster, the electorate perceives this aid as a direct result of the incumbent government's actions. This heightened visibility and direct attribution can translate into a tangible electoral premium for the incumbents in subsequent elections, as citizens tend to reward those whom they perceive as their benefactors during trying times. This dynamic can boost the electoral consensus for the incumbent government in correlation with the severity of the earthquake.

On the other hand, in municipalities abundant with civic organizations, these entities play an instrumental role in emergency response, aid distribution, and community rebuilding (Aldrich, 2012). Their active participation and contribution to relief efforts not only increase their visibility but also enhance citizens' appreciation of their pivotal role in disaster management. Furthermore, the existence of vibrant civic organizations cultivates a more discerning perspective among citizens towards the actions of political institutions (Putnam *et al.*, 1993). This heightened awareness and appreciation can potentially overshadow the contributions of the incumbent government, altering the dynamics of electoral rewards. In other words, the presence and active involvement of civic organizations can shift citizens focus away from the government, tempering the "reward mechanism" frequently seen in electoral dynamics following disasters (Betchel & Hainmueller, 2011).

From a broader perspective, these contrasting dynamics underscore the importance of both governmental and non-governmental actors in disaster management, and how their

presence and perceived contributions can significantly influence electoral outcomes in the aftermath of major disasters such as earthquakes. This conclusion connects with the early debate on the complementarity of social capital and public institutions, which suggests that civil society organizations may complement public action to mitigate state failures, while public institutions should nurture synergies with citizens' organizations based on complementarity (e.g., Evans, 1996; Woolcock & Narayan, 2000; Bowles & Gintis, 2002).

Our study also adds to the debate on "tactic redistribution" by pointing out that simply providing relief measures does not automatically secure electoral benefits for the government. Specifically, in municipalities that were initially declared eligible for larger aid allocations, including lump-sum transfers to households, there was no significant electoral gain for the government in comparison to municipalities that endured similar seismic activity but did not qualify for such funding.

More broadly, these findings enhance the discourse on the electoral implications of redistributive politics, where resources are channeled towards loyal constituents or potential swing voters around election time (Myerson, 1993; Dixit & Londregan, 1996), underscoring the value of examining this topic within a natural experimental framework. Complementing prior studies that found no consistent relationship between pre-election fiscal adjustments and the incumbent government's electoral success (Alesina *et al.*, 1998), our research illustrates that redistributive politics can yield different results when citizens are unexpectedly exposed to a shock that intensifies their sensitivity towards redistribution. In our case study, this result especially holds true under specific circumstances such as the absence of social capital.

Individual level evidence from Eurobarometer's post-electoral surveys supports our municipality level findings. Our empirical analysis indicates that the propensity to support the government in European elections notably increased with the PGA in areas that traditionally leaned left. This observation aligns with our hypothesis that the intensity of the seismic event influenced voting patterns in regions initially favoring the opposition, adding another layer to the multifaceted dynamics of post-disaster political landscapes.

The treatment effect did not persist up to the next European election. Instead, the center-right coalition witnessed its vote share significantly decline with the PGA from 2009 to 2014. In municipalities leaning to the left and those lacking social capital, places where the incumbent government's electoral gains were significantly correlated with the 2009 PGA, the support for the right-wing coalition declined as the ground acceleration increased. This series of events seems to illustrate an emerging pattern of disenchantment. It appears that the right-wing coalition lost traction in the kinds of municipalities where it had initially gained popularity in the wake of the disaster - specifically, those with left-leaning tendencies and low social capital.

From a policy perspective, our findings align with the argument that incumbents have an incentive to prioritize immediate interventions over long-term investments put forth by Betchel & Hainmueller (2011). Moreover, our study corroborates the previously established correlation between the incumbent's policy response to a disaster and its electoral consequences. When voters perceive relief efforts and redistributive measures as effective, they often reward the incumbent government (Healy & Malhotra, 2009; Chen, 2013). Conversely, citizens might hold authorities accountable for inadequate prevention or mismanagement post-disaster, resulting in electoral punishment for the incumbent (Gasper & Reeves, 2011; Heersink *et al.*, 2017).

Our main contribution to this debate lies in the nuanced understanding of the role that disaster intensity and social capital play in shaping perceptions of an incumbent government's response following a disaster. By uncovering these dynamics, our research not only deepens our knowledge of post-disaster electoral behavior but also highlights the importance of considering the societal context in which policy responses are deployed. This insight offers an advancement in the discourse around disaster management and electoral politics, emphasizing the need for a more comprehensive approach to policy design and evaluation in the wake of adverse shocks that aligns with the policy analysis conducted by OECD (2013) after the earthquake. The OECD report proposed that earthquake-stricken areas, particularly those with a paucity of civic organizations, struggle with the absence of formal avenues for citizens

to express their views on the relief and reconstruction effort. In these contexts, the scarcity of social capital obliterates the potentially beneficial dialogue between civil society and public institutions, thereby amplifying citizens' gratitude towards the incumbent government.

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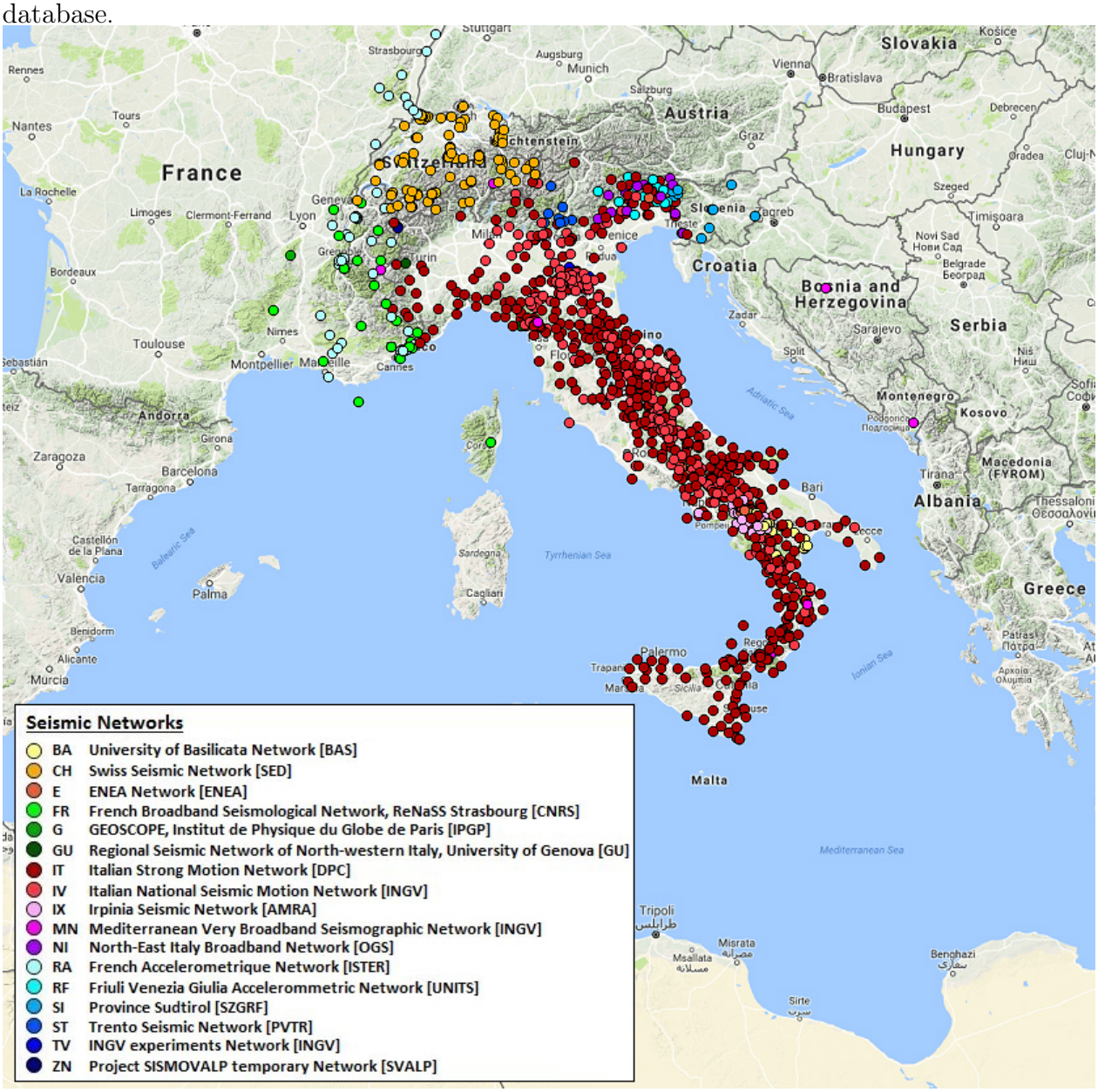
Appendix

Figure A.1: Map of the seismic networks included in the ITACA v. 2.3 strong motion database.



Source: Authors' elaboration on data described in the text.

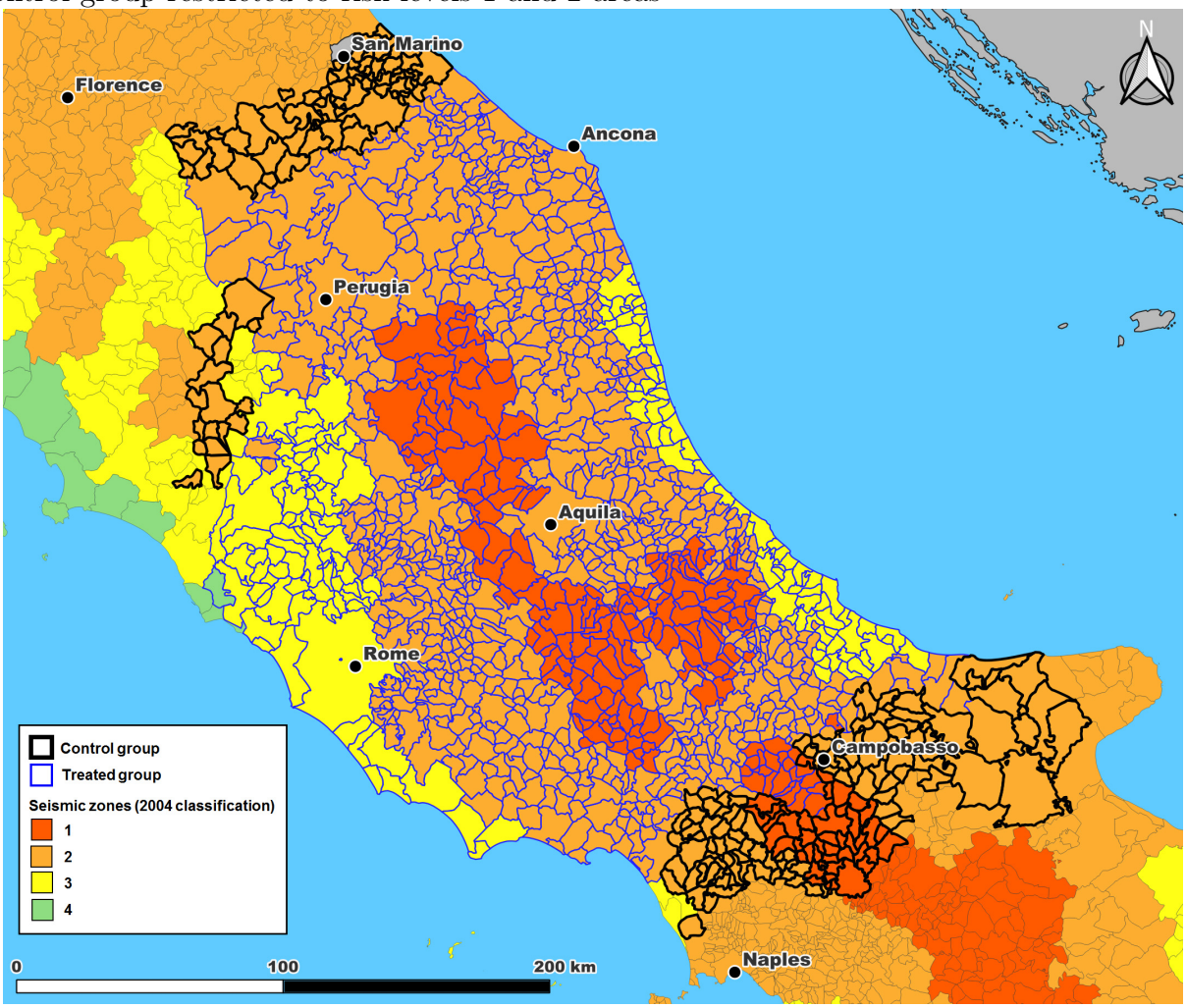
Table A.1: Main parties running for the 2009 European elections

	Support for Berlusconi IV
The People of Freedom (*Popolo della libertà*)	Yes
Northern League (*Lega Nord*)	Yes
Movement for the Autonomies - The Right (*Movimento per le Autonomie - La Destra*)	Yes
Democratic Party (*Partito Democratico*)	No
Union of the Center (*Unione di Centro*)	No
Italy of Values (*Italia dei Valori*)	No
Language minorities (*Minoranze linguistiche*)	No
Communist Party (*Partito Comunista*)	No
Communist Refoundation Party (*Partito della Rifondazione Comunista*)	No
Left Ecology Freedom (*Sinistra, Ecologia e Libertà*)	No
Radical Party (*Lista Bonino-Pannella*)	No

Table A.2: Metadata of the shake as reported in the ITACA database

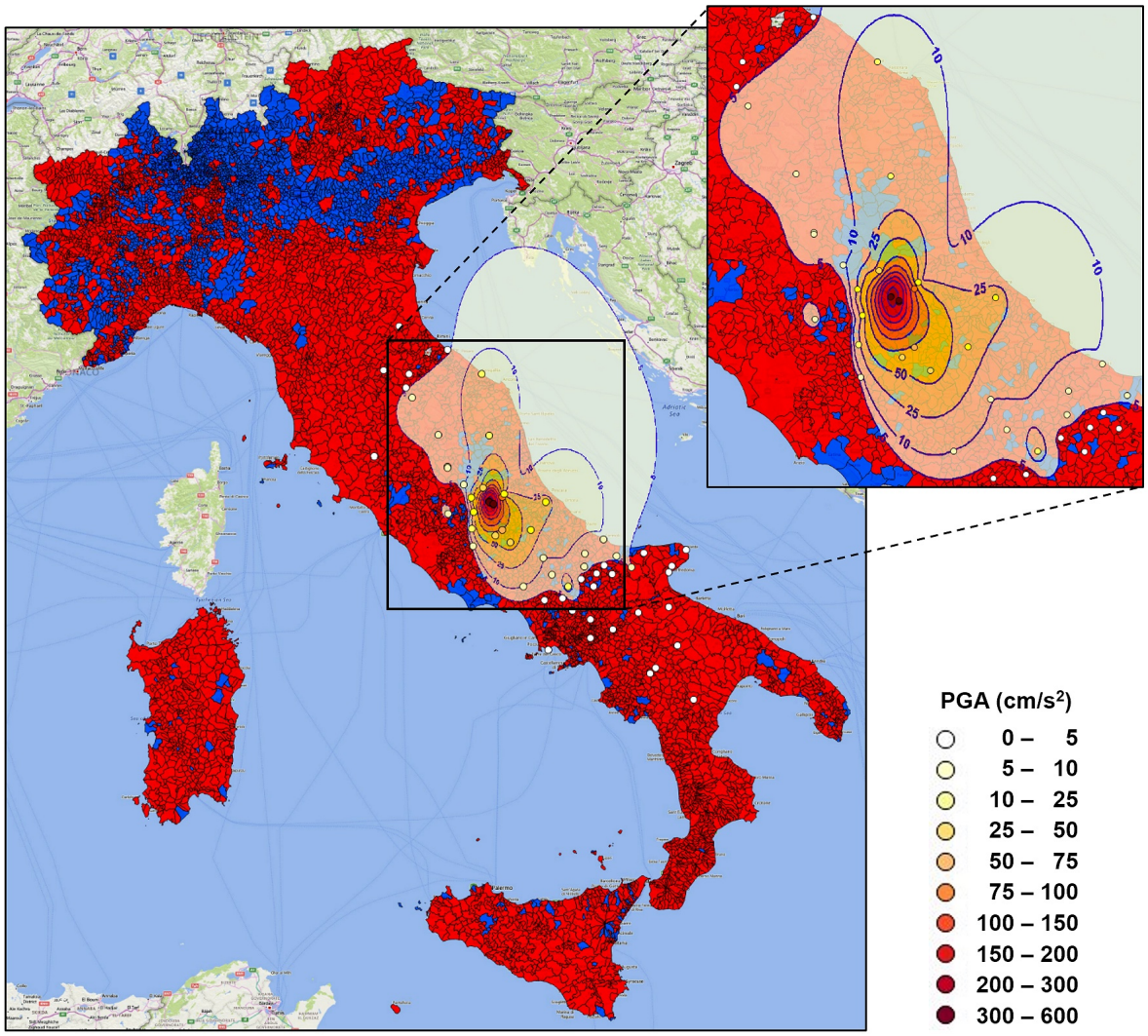
ID	IT-2009-0009
Date	06/04/2009
Time	01:32 UTC
Latitude (decimal degree N)	43.342
Longitude (decimal degree E)	13.38
Hypocentral depth, H (km)	8.3
Local magnitude, M_L	5.9
Moment magnitude, M_W	6.3
N of recording stations	62

Figure A.2: Seismic risk of municipalities in the treated group and the third control group –i.e., municipalities within a 30 kilometer bandwidth from the epicentral border– with the control group restricted to risk levels 1 and 2 areas



Source: Authors' elaboration based on INGV data.

Figure A.3: Local incumbent in the epicentral area



Blue areas represent municipalities where the coalition supporting the national government, led by Mr. Berlusconi, received the majority of votes in the 2004 European elections, while red areas correspond to municipalities where the opposition coalition held majority support. Source: Authors' elaboration based on electoral data provided by the Ministry of Interior.

Table A.3: Pre-trends

Panel A: Voter turnout	(1) 1999/2004	(2) 2004/2009	(3) 2009/2014
PGA	0.138	-0.791**	0.489*
	(0.230)	(0.204)	(0.229)
N	7,430	7,428	7,430
R2	0.119	0.573	0.303
Panel B: National incumbent performance			
PGA	-0.481	0.467***	-0.304**
	(0.279)	(0.018)	(0.098)
N	7,205	7,428	7,430
R2	0.279	0.353	0.454

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors are clustered at the electoral constituency in parentheses. During this period, Italian provinces underwent several administrative changes, including mergers and the creation of new provinces. As a result, the clustering approach used in the rest of the analysis could not be directly applied at the province level in this table. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table A.4: Treatment effects across the political spectrum - Different control groups

	(1)	(2)	(3)	(4)	(5)	(6)
	Voter turnout		Local incumbent performance		National incumbent performance	
Panel A: PGA >2	left	right	left	right	left	right
PGA	-0.863***	0.540	0.072	0.470*	0.560***	0.470*
	(0.178)	(0.374)	(0.233)	(0.252)	(0.081)	(0.252)
N	1,473	128	1,473	128	1,473	128
R2	0.483	0.595	0.083	0.495	0.342	0.495
Panel B: 30 km radius						
PGA	-0.857***	0.645	0.105	0.421	0.576***	0.421
	(0.186)	(0.426)	(0.222)	(0.251)	(0.089)	(0.251)
N	1,153	116	1,153	116	1,153	116
R2	0.543	0.614	0.086	0.487	0.335	0.487
Panel C: 30 km radius and seismic zones 1-2						
PGA	-0.856***	0.585	0.097	0.415	0.569***	0.415
	(0.190)	(0.381)	(0.220)	(0.254)	(0.092)	(0.254)
N	1,117	114	1,117	114	1,117	114
R2	0.545	0.615	0.087	0.487	0.328	0.487

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'left' columns (1, 3, and 5) consider the subsample of municipalities with a center-left incumbent in 2004, the 'right' columns (2, 4, and 6) consider the subsample of municipalities with a center-right incumbent in 2004. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table A.5: The role of social capital - Different control groups

	(1)	(2)	(3)	(4)	(5)	(6)
	Voter turnout		Local incumbent performance		National incumbent performance	
Panel A: PGA >2	left	right	left	right	left	right
Overall SC						
PGA	-0.769***	-1.031***	0.154	-0.033	0.569***	0.280**
	(0.195)	(0.171)	(0.283)	(0.149)	(0.095)	(0.131)
N	880	686	880	686	880	686
R2	0.512	0.417	0.084	0.161	0.328	0.416
Emergency SC						
PGA	-0.740***	-0.949***	0.123	-0.141	0.683***	-0.052
	(0.257)	(0.103)	(0.220)	(0.223)	(0.103)	(0.160)
N	1,005	561	1,005	561	1,005	561
R2	0.505	0.397	0.090	0.175	0.346	0.380
Panel B: 30 km radius						
Overall SC						
PGA	-0.764***	-1.047***	0.178	-0.043	0.598***	0.319**
	(0.202)	(0.182)	(0.272)	(0.160)	(0.101)	(0.131)
N	743	493	743	493	743	493
R2	0.542	0.555	0.083	0.212	0.326	0.417
Emergency SC						
PGA	-0.747***	-0.998***	0.171	-0.170	0.707***	-0.014
	(0.264)	(0.108)	(0.216)	(0.214)	(0.114)	(0.151)
N	852	384	852	384	852	384
R2	0.549	0.508	0.092	0.276	0.334	0.435
Panel C: 30 km radius and seismic zones 1-2						
Overall SC						
PGA	-0.769***	-1.022***	0.169	-0.055	0.590***	0.313**
	(0.200)	(0.196)	(0.270)	(0.159)	(0.106)	(0.133)
N	731	467	731	467	731	467
R2	0.543	0.581	0.083	0.211	0.321	0.414
Emergency SC						
PGA	-0.751***	-0.968***	0.160	-0.172	0.699***	-0.019
	(0.263)	(0.123)	(0.213)	(0.206)	(0.119)	(0.160)
N	836	362	836	362	836	362
R2	0.550	0.536	0.093	0.278	0.329	0.428

Notes: OLS estimates. All estimates include municipality-level controls and province dummies. Standardized beta coefficients are reported, and standard errors clustered at the province level in parentheses. The 'low' columns (1, 3, and 5) consider the subsample of municipalities with below-median number of associations, the 'high' columns (2, 4, and 6) consider the subsample of municipalities with above-median number of associations. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table A.6: Support for the Government and personal political views

Dependent Variable:	Support the Government	Voted for National Incumbent
PGA	0.016	0.178***
	(0.001)	(0.003)
right orientation	0.159***	0.747***
	(0.030)	(0.035)
PGA*right orientation	0.128	-0.082
	(0.003)	(0.003)
N	450	450
R2	0.058	0.524

Notes: OLS estimates. All estimates include individual-level controls, i.e., age and gender of the respondent. The companion Supplementary materials document contains the complete set of coefficient estimates. The table reports standardized beta coefficients and robust standard errors in parentheses. The dummy right is constructed from self-reported political orientation on a 1-10 scale, with values between 1 and 5 coded as left-wing personal orientation, and values between 6 and 10 coded as right-wing personal orientation. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table A.7: Attitude towards natural disasters

Dependent Variable:	Risk	Prevention	Prepared	Response
PGA	0.147***	-0.050*	-0.050*	-0.050*
	(0.001)	(0.001)	(0.001)	(0.001)
N	1,040	1,017	1,017	1,017
R2	0.022	0.012	0.012	0.012

Notes: OLS estimates. All estimates include individual-level controls, i.e., age and gender of the respondent. The companion Supplementary materials document contains the complete set of coefficient estimates. Risk is equal to 1 if the respondent indicates the earthquake among the top three natural or man-made distructive events that she feels as a menace. Prevention is equal to 1 if the respondent says it believes to be well or fairly well informed on disaster prevention in Italy, i.e. preventive measures to minimize the potential impact of the disaster. Prepared is equal to 1 if the respondent says it believes to be well or fairly well informed on being prepared to disasters in Italy, i.e., existence of emergency squads, organization of disaster simulations, instrumentation maintenance. Response is equal to 1 if the respondent says it believes to be well or fairly well informed on reaction to disasters in Italy, i.e., emergency interventions capacity, by envoying specialized squads, or sending search and rescue teams. The table reports standardized beta coefficients and robust standard errors in parentheses. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels.

Table A.8: Attitude towards natural disasters: heterogeneity

Panel A:								
Dep. Var.:	Risk		Prevention		Prepared		Response	
Political spectrum	left	right	left	right	left	right	left	right
PGA	0.095**	0.191***	0.004	-0.125***	0.004	-0.125***	0.004	-0.125***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
N	551	489	539	478	539	478	539	478
R2	0.014	0.039	0.014	0.023	0.014	0.023	0.014	0.023
Panel B:								
Dep. Var.:	Risk		Prevention		Prepared		Response	
Emergency SC	low	high	low	high	low	high	low	high
PGA	0.198***	0.050	-0.115***	0.036	-0.115***	0.036	-0.115***	0.036
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
N	528	512	517	500	517	500	517	500
R2	0.040	0.011	0.028	0.008	0.028	0.008	0.028	0.008
Panel C:								
Dep. Var.:	Risk		Prevention		Prepared		Response	
Overall SC	low	high	low	high	low	high	low	high
PGA	0.206***	0.015	-0.129***	0.048	-0.129***	0.048	-0.129***	0.048
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
N	570	470	557	460	557	460	557	460
R2	0.044	0.006	0.029	0.009	0.029	0.009	0.029	0.009

Notes: OLS estimates. All estimates include individual-level controls, i.e., age and gender of the respondent. The companion Supplementary materials document contains the complete set of coefficient estimates. Risk is equal to 1 if the respondent indicates the earthquake among the top three natural or man-made distructive events that she feels as a menace. Prevention is equal to 1 if the respondent says it believes to be well or fairly well informed on diaster prevention in Italy, i.e. preventive measures to minimize the potential impact of the disaster. Prepared is equal to 1 if the respondent says it believes to be well or fairly well informed on being prepared to disasters in Italy, i.e., existence of emergency squads, organization of disaster simulations, instrumentation maintenance. Response is equal to 1 if the respondent says it believes to be well or fairly well informed on reaction to disasters in Italy, i.e., emergency interventions capacity, by envoying specialized squads, or sending search and resque teams. The table reports standardized beta coefficients and robust standard errors in parentheses. ***, **, and * denote, respectively, 1%, 5%, and 10% significance levels