Networks and Political Participation after Conflict*

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Abstract

This paper builds on the network model of Galeotti et al., 2010 to examine how the destruction of local infrastructure shapes social capital. In the model, voting is a coordination game with strategic complementarities, implying that denser social networks foster higher turnout. We test these predictions in the context of the 1937 attack on civilians during the Spanish Civil War, which destroyed a major coastal road and isolated nearby towns. Using proximity to the bombed road—instrumented by distance to deep water, ruggedness, and elevation, as suggested by witness reports—we show that the most affected towns subsequently displayed higher electoral participation forty years later. Ruling out alternative channels linked to economic development, we show—consistent with the model— that the effect operates through tighter social networks, with isolation emerging as the key mechanism sustaining long-term civic engagement.

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1 Introduction

Wars have lasting effects on the societies that experience them. Besides destroying physical and human capital, conflicts also shape how people cooperate and participate in public life. The social consequences of war, however, are ambiguous. On the one hand, wars have been shown to erode trust and reinforce hostility among groups, as illustrated by ethnic conflict in Uganda (Rohner et al., 2013). On the other hand, exposure to violence has been associated with higher levels of collective action, greater participation in local organizations, and increased altruism among community members (see Bauer et al., 2016, for a comprehensive review). These findings suggest that shared traumatic experiences may strengthen social bonds within affected communities.

Understanding the long-term effects of war on social cohesion has proven challenging for at least two reasons. First, much of the existing evidence relies on self-reported survey data. While such data provide valuable insights, they capture individuals' perceived experiences rather than objective measures of how war affects communities as a whole. Second, most studies examine wars as a single, aggregate event, which complicates causal identification because conflict intensity and exposure may vary non-randomly across regions and over time.

In this paper, we explore the long-term effects of exposure to violence on electoral participation by addressing both challenges. We adopt a network-based approach by applying the network game developed by Galeotti et al., 2010. The model predicts that more connected communities (*i.e.*, those with denser social networks) will exhibit higher voter turnout if individual voting decisions are strategic complements—that is, if the payoff from voting increases with the number of neighbors who also turn out to vote. We bring this framework to a historical setting by examining the bombing of a major road during the Spanish Civil War. We consider this episode an ideal setting due to the sudden and geographically concentrated nature of the attack, which effectively isolated nearby villages—disrupting inter-community networks and, in turn, potentially creating intra-community ties. Consistent with the model's predictions, we find that municipalities exposed to the bombing exhibit persistently higher voter turnout forty years later, when democratic elections were reestablished in Spain. Our findings suggest that the bombing may have reinforced within-community cohesion, generating social bonds that endured and were passed on across generations.

We focus on the case of *La Desbandá*, a mass flight of civilians that took place in southern Spain during the Civil War. In early February 1937, as Nationalist troops advanced toward the Republican-controlled city of Málaga—supported by Italian fascist and Nazi German air forces—tens of thousands of civilians attempted to escape eastward along the coastal road to

Almería. As they fled, the column of civilians was bombed from the air and shelled from the sea, turning the road into a scene of devastation. Contemporary accounts estimate that around 150,000 people were caught in the attack,[1] and roughly 5,000 were killed, making it *"one of the most devastating episodes of the [Spanish Civil] war"* (González de la Aleja, 2012, p. 48)—surpassing even the infamous bombing of Guernica.[2]

We estimate the effect of exposure to the road bombing on voter turnout in democratic elections held decades later. To address potential endogeneity, we estimate a two-stage least squares model (2SLS) in which exposure to bombing is instrumented with three geographic variables: distance to deep waters, terrain ruggedness, and elevation. These instruments are negatively correlated with the likelihood and intensity of bombing. For instance, the greater the distance to deep waters, the harder it was for warships to approach the shore and shell the area; likewise, areas located at lower elevations were easier targets for aircraft. The choice of instruments is motivated by historical testimonies reporting that ships could approach the coast so closely that witnesses could see the attackers' faces, and that planes flew extremely low during the attacks, with their wings touching the asphalt. In addition, we include a set of geographic and demographic controls to account for observable differences between towns, as well as province-fixed effects.

Our estimates indicate that municipalities more exposed to bombing exhibited significantly higher voter turnout during the first seven democratic elections (1977–1996). After this period, the effect disappears, suggesting that although the wartime trauma persisted during the forty years of dictatorship that followed, the affected communities ultimately proved resilient as democracy consolidated. Our results are robust to alternative specifications and validation exercises, including the exclusion of large towns, adjustments to the instruments, spatial correlation corrections, and a falsification test on a comparable, non-bombarded road in northern Spain, among others.

Finally, we conduct a set of additional estimations that reinforce our proposed network mechanism and rule out competing explanations—particularly the possibility that our results are driven by higher economic development. This concern is plausible given that the road was located along the Spanish coast, an area that experienced a major tourism boom in the 1960s. Using a difference-in-differences strategy, we show that our findings are not explained by differences in public goods provision (proxied by illiteracy rates) or by post-war economic development (proxied by population growth). Consistent with our interpretation, we further find

[1] Some testimonies collected in Brenes Sánchez, 2022 raise the figure to 200,000 or even 300,000.

[2] Indeed, many historians argue that Picasso's Guernica, commissioned by the Republican government in 1937, alluded to the tragedy of Málaga (Majada Neila et al., 2006, pp. 83–84; Gómez Rodríguez, 2023; Javier López, 2017).

stronger effects in areas that experienced a greater loss of neighboring connections—measured by the share of adjacent municipalities through which the bombed road segment passed, relative to the total number of neighboring municipalities.

Our paper contributes to several strands of literature. First, it relates to research on the effects of capital destruction. A large body of work has examined how bombings and other violent episodes during wars affect economic growth and related indicators, often yielding mixed results. For example, Davis et al., 2002, study the Allied bombing of Japanese cities during World War II and show that most cities recovered their relative size within a relatively short period. Similarly, Miguel et al., 2011, analyze the long-term impact of U.S. bombing in Vietnam on population density, poverty rates, consumption levels, and literacy, finding no persistent negative effects. In contrast, Yamada et al., 2021, document long-term adverse effects of U.S. bombing on economic development in northern Laos, but not in the south. Likewise, Feigenbaum et al., 2022, show that Sherman's March during the American Civil War had lasting negative effects on economic activity decades later.

Second, by analyzing a specific episode of the Spanish Civil War and its impact on voter turnout, we contribute to the literature on how exposure to civil conflict shapes social capital. The relationship between violence and social cohesion is, in principle, ambiguous: violence can erode trust and civic ties, but it can also encourage cooperation to cope with adversity. Empirical evidence reflects this tension. Some studies find positive effects of conflict on social capital: for example, individuals exposed to more intense violence in Sierra Leone show higher participation in community meetings, local groups, and voting (Bellows et al., 2009), and other works report increases in voting or cooperative behavior (Blattman, 2009; Gilligan et al., 2014). Similarly, Yamamura, 2020 document that survivors of Hiroshima and Nagasaki exhibit higher levels of interpersonal trust. However, other studies find no significant effect (De Luca et al., 2014; Fontana et al., 2023; Rodon, 2024) or even negative impacts (Rohner et al., 2013; Arjona et al., 2025; Cassar, Paluine Grosjean, et al., 2013).

Finally, we contribute to the networks literature by providing an empirical field application of the Galeotti et al., 2010 network model. While recent laboratory experiments directly test its comparative statics (Gallo et al., 2023); Charness et al., 2014), to our knowledge there is no prior field evidence applying this framework to historical contexts. More generally, a vast empirical literature has relied on network theory to study diffusion processes (Banerjee et al. 2013; Centola 2010), labor markets (Topa, 2001; Calvó-Armengol et al., 2007), political mobilization (Acemoglu et al., 2018; Enikolopov et al., 2020), and trust after conflict (Cassar, Pauline Grosjean, et al., 2013; Bellows et al., 2009; Voors et al., 2012). Our paper is therefore the first attempt to examine a historical capital shock and its long-run effect through the lens of a network model.

This paper is structured as follows. Section 2 presents the theoretical model. Section 3 revises the historical background of the Spanish Civil War. Section 4 shows the data sources that form our dataset. Section 5 provides the identification strategy while Section 6 presents the main results, along with a series of robustness checks that reinforce our findings and an analysis of several transmission channels. Finally, Section 7 concludes.

2 Theoretical framework

We apply the network model of Galeotti et al., 2010. Consider a set of voters, $N = \{1, 2, ..., n\}$, connected by an undirected network. We assume that a link between any two voters is formed independently with probability $p \in (0, 1)$, *i.e.*, à la Erdős et al., 1959. For a given network, let N_i denote the set of neighbors of voter i, and let k_i denote her degree, *i.e.*, her number of neighbors.

We model the decision whether or not to vote in an election, independently of the party chosen. Formally, each voter i takes an action, $x_i \in \{0, 1\}$, where $x_i = 1$ means to cast a ballot, and $x_i = 0$ means to abstain.

We model voting as a strategically complementary behavior. That is, a voter's payoff when voting increases with the number of neighbors that also vote. Let $x_{N_i} = \sum_{j \in N_i} x_j$ denote the sum of neighbors' choices. We assume that the payoff function of voter i, denoted by $\pi_i(x_i, x_{N_i})$, takes the following form:

$$\pi_i(x_i, x_{N_i}) = \begin{cases} a x_{N_i} - c & \text{if } x_i = 1 \\ 0 & \text{if } x_i = 0, \end{cases}$$

where $c > 0$ reflects the voting cost and $a > 0$ the coordination benefits. We assume $c > a$, i.e. the cost of voting is larger than the incremental benefit of one more neighbor voting.

Voters have incomplete information about the network: they know their own degree, but not the degrees of their neighbors.

2.1 Equilibrium

We consider the Bayesian Nash Equilibrium in pure strategies, where a voter's type is her corresponding degree. Given payoff symmetry and degree independence, we focus on symmetric equilibria. We identify the strategy of a voter with a mapping $\sigma : \{0, 1, ..., n-1\} \longrightarrow \{0, 1\}$

where $\sigma(k) \in \{0, 1\}$ specifies the action chosen by any voter of degree k.

Because degrees are independent, the probability that a random neighbor votes, *i.e.*, a player's belief about others, does not depend on the player's own degree. Consequently, the expected number of voting neighbors increases linearly with the player's degree.[3] Moreover, the payoff structure implies that if it is optimal for a player with degree k to vote, then all players with a higher degree also find it optimal to vote. Together, these features create a natural setting where a threshold equilibrium can emerge. The next proposition states that when p is sufficiently high, such a degree-threshold equilibrium exists.

Proposition. *There exists a* $\overline{p} \in (0, 1)$ *such that, if* $p > \overline{p}$*, then there exists an integer* $t(p) < n - 1$ *such that:*

$$\sigma^*(k) = \begin{cases} 1 & \text{if } k \geq t(p) \\ 0 & \text{if } k < t(p) \end{cases}$$

is an equilibrium. Moreover, $t(p)$ *is non-increasing with* p*.*

Based on their beliefs, only players with degree at or above the threshold choose to vote[4] At the same time, beliefs are consistent with the actual behavior in the network.

The non-increasing threshold reflects that denser networks lead to more voting in equilibrium, as voting incentives rise with the number of neighbors. More formally, as the link probability increases, the distribution of neighbor degrees (which follows a binomial distribution) first-order stochastically dominates the previous one, making higher-degree neighbors more likely. This increases the expected number of voting neighbors, lowering the threshold, *i.e.*, players with lower degrees, who previously did not vote, now find it optimal to do so.

Overall, the framework derived from Galeotti et al., 2010 allows us to model voting as coordination game with networks. The model predicts that when a shock increases the link probability, more people will vote in equilibrium. In the following sections, we revisit the historical background of the most violent event during the Spanish Civil War, together with its impact on social capital.

3 Historical background

The unsuccessful coup d'état in July 1936—hindered by the resistance of the Republican forces, divisions within the army, and massive popular mobilization—led to the outbreak of the Spanish

[3] Under degree independence, the probability that any neighbor votes is fixed—it depends only on the distribution of neighbors' types (degrees), not on the player's own type. As a result, the expected number of voting neighbors is simply this probability multiplied by the number of neighbors.

[4] It can be that players with $k = t(p)$ are indifferent between voting or not, in which case $\sigma(t(p)) = \{0, 1\}$.

Civil War. The Nationalist forces advanced accross Spanish territory, encountering varying levels of resistance. In conservative places such as Burgos and Salamanca, with barely any resistance, the military coup succeeded almost immediately. Despite the limited opposition in those areas, individuals who opposed the uprising were arrested or executed. A very different scenario unfolded in southern Spain, particularly in Extremadura and Andalusia, where an agrarian war emerged. After the fall of Cádiz, other Andalusian provinces—Córdoba, Huelva, Sevilla, and the city of Granada—also came under Nationalist control.[5]

After the occupation of the cities near the Malagan capital—Ronda and Antequera—and the takeover of the main roads and railways, the only escape left for the civilian population opposed to the uprising was to flee along the sole route that connected to the rest of the territory controlled by Republican forces (Majada Neila et al., 2006, p. 13). The situation was very chaotic, and the civilians' reaction was instinctive and unplanned, driven only by the desperate need to reach Republican-held areas in the direction of Almería. The principal authority behind the Francoist military offensive in the south, the general Queipo de Llano, ordered the persecution of civilians that were trying to escape by the road from Málaga to Almería for seven days (from 7 to 14 February):

> *People of Málaga! I address first the misled militiamen. Your fate is sealed and you have lost. An iron circle will suffocate you within a few hours; for while on land and in the air we are the strongest, the Fleet—loyal to the dignity of the Fatherland—will take away any hope of escape, as the road to Motril is cut off (p. 202, Barranquero, 1994)*

There is plenty of historical evidence about the destruction of the Málaga–Almería road, which suggests that the bombardment led to the isolation of nearby towns. First, there are extensive testimonies of the cruelty and severity of the attacks (Majada Neila et al., 2006, p. 55-67, 149, 151):

> *From Motril to Almería we had a hard time, because the hills were surrounded by fascist forces; shots whizzed over our heads and they were throwing hand grenades toward the road.*
> *— Testimony of Carmen Jiménez Madrigal from Majada Neila et al. (2006, p. 147)*

> *Bombs kept falling without cease on the already shattered asphalt of the road.*
> *— Testimony of Cristobal Criado Moreno from Majada Neila et al. (2006, p. 161)*

> *The road was shelled the whole time by two ships and by planes.*
> *— Testimony of Isabel Anaya Serrano from Majada Neila et al. (2006, p. 197)*

These attacks, both by air and sea (Stewart et al., 2009, pp. 72–73), were carried out not

[5] Information contained in this paragraph comes from Preston (p. 116-119, 2023)

only with light weapon fire (machine guns) but also heavy ordnance such as shells and bombs, and artillery fire from ships and tanks (Martínez López, 2022, p. 9). For instance, T.C. Worsley narrates how people *"[w]ere bombed from the sea and from the air, and then strafed"* (Worsley, 2012, p. 257).

Likewise, numerous communications from the rebel air force report the dropping of bombs along the road:

> *Bombing of the road east of Malaga, with another 24 x 10kg bombs on vehicles and fleeing pedestrians. [...] Bombing of groups of people at the western exit of Motril with 24 x 10 kg, successful.*
> *— Cited in Brenes Sánchez, 2022, p. 75*

> *Vélez-Motril road, fugitives in Motril, bombing of a column of trucks with 24 x 10 kg (very good) receiving an impact.*
> *— Cited in Brenes Sánchez, 2022, p. 80.*

In fact, the type of bombing employed by the rebel forces and their allies was specifically intended to devastate the area entirely, rather than to target specific objectives:

> *Meanwhile, the road was being ravaged by rebel aircraft with carpet bombing, also known as saturation bombing [a type of bombing that aims for the complete destruction of the area by detonating bombs in every part of it, as opposed to precision bombing].*
> *— (Brenes Sánchez, 2022, p. 78).*

Bridges were also destroyed (Majada Neila et al., 2006, p. 95, 179). For example, the bridge between Almuñécar and Motril was destroyed on February 8th (Brenes Sánchez, 2022, p. 79), and the one over the Guadalfeo river—destroyed during the war—was not rebuilt until 1944.[6]

Contemporary testimonies also shed light on the nature of the attacks and help explain the relevance of our instruments. They describe how the pattern and intensity of the bombardments were shaped by geographic and topographic features—such as elevation, ruggedness, and proximity to deep waters conditioned both aerial and naval operations. Indeed, several testimonies recount how the Nazi and Fascist aircraft attacked at low altitude:

> *The Fascist aircraft appeared. [...] They were flying so low that you could see the pilots' faces.*
> *— Testimony of Amparo Gallardo Ruiz from Majada Neila et al. (2006, p. 103)*

> *The entire road was being bombed, as planes came down so low their wings touched the asphalt, and then they opened fire with machine guns.*
> *— Testimony of Carmen Jiménez Madrigal from Majada Neila et al. (2006, p. 144)*

[6]See, for instance: `https://esp.sika.com/dms/getdocument.get/c37871c2-30ef-4f23-92d5-65235796d4fa/guadalfeo_salobrena.pdf`

Moreover, several testimonies mention boats—such as the cruisers *Canarias*, *Baleares* and *Almirante Cervera*, among others—attacking from very short range, close to the road:

> *They were bombing us mercilessly. We could see their faces; they knew we were defenseless civilians and could see us perfectly. They were so close that when they hit [...] we could see them jumping on their decks, celebrating.*
> *— Testimony of José Antonio Baena Torres from Majada Neila et al. (2006, p. 202)*

Consequently, distance to deep water, elevation, and terrain ruggedness become historically grounded measures of exposure, as they capture the physical constraints that shaped the reach and intensity of the bombardments. These pieces of evidence demonstrate the severity of the destruction of the Málaga-Almería road following the attacks by Franco's army. Moreover, reconstruction of infrastructure in Spain after the war was slow. In particular, despite the efforts, *"it will take several years to complete the reconstruction of the road network, due to the civil war"* (Uriol Salcedo, 1992, p. 262). The new General Plan for Public Works (*Plan Peña*) encountered major difficulties and a shortage of materials, even in 1948, and it was not until the 1950s that *"unequivocal signs of overcoming the calamities of the civil war appear"* (Uriol Salcedo, 1992, p. 271).

In the remainder of the paper, we shall demonstrate that this devastation increased social ties within the affected towns due to the isolation that followed.

4 Data

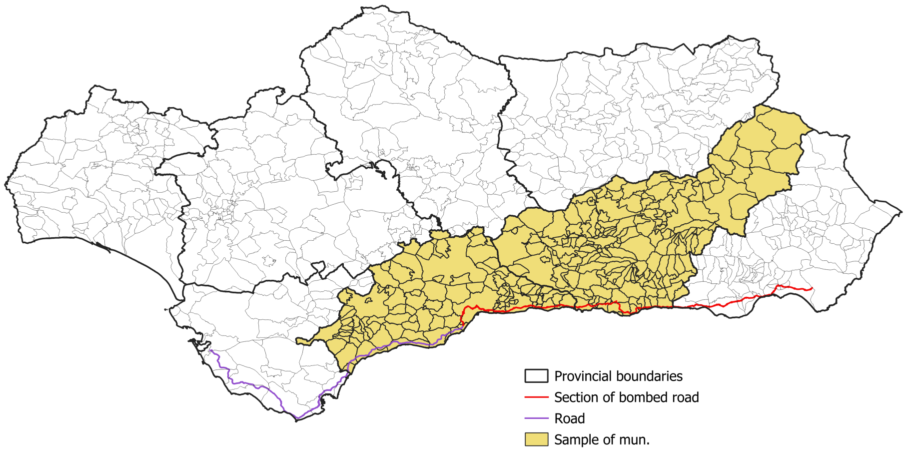
To identify the segment of the road affected by the bombardment, we employ geolocalized roadmaps from the National Center of Geographic Information (CNIG, in its Spanish acronym) and retain the portion between Málaga and Almería, which has been consistently identified in contemporary testimonies (Majada Neila et al., 2006).[7] Figure 1 displays the map of the Andalusia region, including the provincial boundaries and the part of the road that was affected by strikes in red (the remaining part of the road in blue). The road crosses four provinces in Andalusia, while three of them were impacted during *la Desbandá* (Málaga, Granada, and Almería). Due to data constraints on several variables—particularly on the main dependent variable, turnout—, we only analyze the municipalities in the provinces of Málaga and Granada, excluding those in Almería from this study. The independent variable is defined as the negative of the distance from each town to the bombed road. In the baseline specification, this distance is measured from the centroid of each municipality to the bombed road.[8] Figure A1 displays

[7] Also available at `https://www.elindependientedegranada.es/blog/fosas-desbanda-0`

[8] As a robustness check, we also consider the minimum geodesic distance in Section 6.2.

the distribution of municipalities by distance to the bombed road.

Figure 1: Road and sample of municipalities



Note: Map of Andalusia illustrating the main road and the section affected by bombing. Municipalities that are part of our sample are shown in yellow.

We also employ a series of geographical time-invariant variables. Some of them, such as river length (in kilometers), municipality area (in square kilometers), and average elevation (in meters) are calculated from the Digital Elevation Model GTOPO30 produced by the US Geological Survey. Besides, terrain ruggedness (in hundreds of meters, measured by the Terrain Ruggedness Index) is obtained from Nunn et al., 2012. Finally, data on the distance to deep waters is calculated from the General Bathymetric Chart of the Oceans (GEBCO). These last three variables (elevation, ruggedness, and distance to deep waters) will be used as instruments in our econometric model.

As mentioned in section 1, the dependent variable—social capital—is proxied by electoral turnout. In this case, we use data for the general elections, which are considered "first order elections" (Reif et al., 1980). We collect data from the election celebrated right before the Civil War (February-March, 1936) in the province of Granada from the Electoral Board of the Electoral Census of this province, while the data for Málaga is obtained from Velasco Gómez, 1983, based on the results published in the Official Gazette of the Province.[9] Data from Granada is obtained at electoral section—the lowest level of aggregation in each municipality—level, whereas data from Málaga is available at municipal level. In both cases, the number of electors, the number of voters and the number of votes for each candidate is available.[10] Data from

[9] The electoral law for the 1936 General Election established that provinces were generally the electoral constituencies; however, some cities (including Málaga) were a separate constituency. See the 1933 Electoral Law in: `https://www.boe.es/gazeta/dias/1933/07/28/pdfs/GMD-1933-209.pdf`

[10] The voting system was a limited voting one, where electors had fewer votes than the number of seats in the constituency. In particular, in those constituencies that awarded 13 seats, electors may vote for 10 candidates; in those provinces that awarded 8 seats, they may vote for 6 candidates. See the 1931 Electoral Decree in: `https://www.congreso.es/docu/PHist/docs/07repu/A00639-00641.pdf`.

the different electoral sections is aggregated at the municipality level. Then, we calculate the turnout as the proportion of electors that voted. The rest of the elections—those celebrated after the dictatorship, from 1977 to 2023—are collected at the municipality level from the Ministry of Interior. As additional covariates, we calculate the left- and right-wing vote shares, as the proportion of the mean of votes to the candidates of the corresponding ideological bloc with respect to the total number of voters in each municipality.[11]

Map A2 displays the geographical distribution of political participation across Andalusia between 1977 and 1996, corresponding to the period of the first five elections held immediately after the end of the dictatorship. Darker areas indicate municipalities with higher voter turnout, particularly concentrated along the southern corridor and major urban centers.

Additionally, we collect the number of inhabitants in each municipality who are able to read and write from the population censuses. For years 1920, 1930 and 1940, this data comes from the historical censuses, which are available at the Documentary collection (*Fondo documental*) of the Spanish National Statistic Institute (INE). Furthermore, the illiteracy rates in each municipality for years 1991 and 2001 are available in the Multiterritorial Information System of Andalusia of the Institute of Statistics and Cartography of Andalusia.[12] In order to guarantee the homogeneity and comparability of the variables across time, we calculate the illiteracy rate in a given municipality as the proportion of the total population that neither can read nor write, or the proportion of people that are not literate, depending on the case. Using population data from 1930, we construct an indicator variable that takes value one if the municipality had more than 2,000 inhabitants that year, and zero otherwise to control for urban and rural areas.

Finally, we collect additional information on the presence of religious institutions. Religious reform was among the most significant reforms carried out during the Second Republic. It was highly controversial and became one of the main political cleavages of the period, between the left (secular) and the right (Catholic). In order to control for religiosity, we digitize data on the presence of a bishopric, an archpriest, or any religion institution in a given municipality from historical maps the Library of the Spanish Geographical Institute.

Table A1 presents summary statistics for the main outcome and explanatory variables, along with the relevant geographical controls. Table A2 provides reports balancing tests examining whether the instrumental variables are correlated with pre-treatment covariates. As shown in

[11]Given the limited voting system, electoral alliances (usually ideological blocs) typically nominated as many candidates as the number of votes each elector could cast. As a result, one bloc would win approximately that number of seats ("majority seats") with the remaining ones allocated to the opposing bloc ("minority seats").

[12]The historical censuses of 1950, 1960, and 1970 do not include the educational level of the population in each municipality, and the illiteracy rates at the municipal level are not available in the most recent censuses. This last source also provides the total number of inhabitants (*de facto* population) in each municipality for years 1900 to 2001.

Panel B, there is no correlation with the historical demographic variables, such as population growth (except for the rate between 1920 and 1930) or the number of single men or women. There is also no correlation with the presence of religious institutions for ruggedness and elevation (Panel C), or with the political outcomes (neither left- nor right-wing vote share, Panel D). On the contrary, as expected, the instruments are correlated with the geographical variables (Panel A). For instance, municipalities situated in less elevated zones are more likely to be urban, to have a smaller area, and to have a longer river. Furthermore, the relation between ruggedness or elevation with the average gradient is (geographically) straightforward. In any case, these results are not likely to represent a threat to our identification. As mentioned before, the road was the only available alternative to evacuate Málaga (Stewart et al., 2009, p. 67; González de la Aleja, 2012, p. 60).

5 Identification Strategy

Our empirical strategy builds on the network model presented in Section 2. The model predicts that denser local networks may foster coordination and civic engagement, which may later materialize in higher electoral turnout. We interpret the 1937 bombardment of the Málaga–Almería road as a natural experiment that reshaped the structure of social interactions within nearby municipalities. To identify the impact of the road's destruction, we exploit variation in exposure to the bombardments. We do not directly observe the intensity of bombing at the town level. Instead, we use distance to the bombed road as a proxy for exposure. Specifically, we compare municipalities located close to the targeted road—more exposed to the bombardments and the destruction of the road—with more distant towns that were less exposed. For ease of interpretation, we define our independent variable (*Exposure*) as the negative of distance, so that higher values indicate greater exposure to the bombardments.

To address potential endogeneity concerns, we adopt a two-stage least squares (2SLS) strategy. Our main concern is that the location of the road or its destruction may be correlated with unobserved factors affecting both the exposure to the bombardments and subsequent voting participation. We therefore instrument proximity to the bombed road with geographic features that shaped the feasibility and targeting of the bombing but are otherwise unrelated to post-war political engagement. Specifically, we use distance to deep waters ($Dist.\ Deep.\ Waters$), elevation, and terrain ruggedness (TRI) as instruments.

We expect our instruments to be negatively correlated with exposure to the bombardments. The sections of the road located closer to deep waters suffered heavier naval attacks, as these were the stretches where warships could sail nearer to the coastline and fire at land targets.

Historical accounts describe how *"the cannons of the warships, which fired at ground level—or rather, at sea level—from about 200 meters away"*, illustrating that bombardments were most intense where deep waters approached the shore.[13] Likewise, both elevation and terrain ruggedness are expected to reduce exposure. This is consistent with the behavior of both civilians and military forces during the bombardment. Many civilians —among them women, children, and the elderly— fled through lower and flatter areas, which became the main targets of the attacks. As reported by witnesses, aircrafts flew at very low altitudes, *"so low that the pilots' faces were visible and the wings nearly touched the ground"*, suggesting that bombing operations were concentrated in open, flat terrain.

The analysis relies on repeated cross-sections of municipalities observed over several election years (1936, and from 1977 to 2023). We use both a collapsed dataset, summarizing average effects across years, and separate cross-sectional estimations by election year, since *Exposure* is time-invariant. In the first stage, we estimate the relationship between the geographic instruments and the distance to the attacked road:

$$Exposure_i = \gamma_1 TRI_i + \gamma_2 Elevation_i + \gamma_3 Dist.\ Deep.\ Waters_i + \mathbf{X}_i + \delta_p + u_i. \tag{1}$$

where $Exposure_i$ is the negative of the distance from municipality i to the bombed road, TRI_i, $Elevation_i$, and $Dist.\ Deep.\ Waters_i$ are ruggedness, average elevation, and distance to deep waters, respectively. The vector $\mathbf{X}_i$ includes municipality-level control variables, while δ_p denotes province fixed effects—-to control for unobserved factors common to municipalities within the same province.

In the second stage, we estimate the causal effect of proximity to the bombed road on political participation, measured by voter turnout:

$$Turnout_i = \beta Exposure_i + \mathbf{X}_i + \delta_p + \varepsilon_i, \tag{2}$$

where $Turnout_i$ is political turnout—our social capital proxy—in municipality i, and $Exposure_i$ is the negative of the distance from municipality i to the bombed road. The vector $\mathbf{X}_i$ includes municipality-level control variables and δ_p denotes province fixed effects. The identification strategy relies on variation in road proximity across municipalities within provinces.[14]

The validity of our instruments relies on two conditions: relevance and the exclusion restriction. The following section reports the first-stage estimates, confirming that the instruments

[13] See Table B3 in Section B for a comprehensive list of testimonials that reinforce the usage of our instruments for distance to the bombed road.

[14] Given the cross-sectional nature of the data, standard errors are not clustered at municipality level.

are correlated with the endogenous regressor in the expected direction and exhibit overall relevance. The exclusion restriction requires that the instruments affect political participation only through their impact on exposure to the bombardments. We consider this assumption plausible within our empirical framework. There is no theoretical or empirical reason to expect distance to deep waters and terrain ruggedness—two exogenous and time-invariant geographic features—to directly influence contemporary voting participation. Elevation could, in principle, affect town size or accessibility and thereby civic engagement. Nonetheless, we include a wide range of geographic controls, along with province fixed effects, to account for any residual correlation.

6 Results

In this section, we present the main findings of the paper. We begin by examining the baseline estimates of the effect of proximity to the bombed road on turnout. Then, we present a series of robustness checks to assess the consistency of the results, as well as the examination of several channels of transmission.

6.1 Main results

Table 1 presents the baseline results. Column (1) reports the first-stage estimates corresponding to Equation (1). The coefficients on the three instruments are negative, indicating that higher elevation, greater terrain ruggedness, and larger distance to deep water are associated with lower values of exposure, *i.e.,* greater actual distance from the bombed road and reduced likelihood of being affected by the bombardments. This is consistent with our expectations. The Kleibergen–Paap F-statistic, which exceeds 60, provides strong evidence that the excluded instruments are jointly relevant and not weak.

Columns (2) and (3) present the OLS and reduced-form estimates, respectively. Column (4) reports the second-stage 2SLS coefficient, which accounts for potential endogeneity in distance to the bombed road. The coefficient is statistically significant and implies that moving one kilometer closer to the bombed road increases turnout by 0.170 percentage points on average between the 1977 and 1996 elections, equivalent to about 0.24 percent of the mean of the dependent variable.

To analyze the dynamics of the effects, Figure 2 plots the estimated effects of exposure by election year. It shows a clear increase in voter turnout over time since the first democratic elections. The effect is strongest during the first four elections, after which it gradually weakens and eventually stabilizes. This pattern suggests that the impact of the bombings lasted

Table 1: Baseline results.

	First-Stage	Baseline Results		
	(1)	(2)	(3)	(4)
	OLS	OLS	R. Form	2SLS
TRI	-0.654		-0.746**	
	(0.424)		(0.302)	
Elevation	-0.313		-1.414	
	(2.037)		(1.799)	
Dist. deep water	-0.002***		-0.000***	
	(0.000)		(0.000)	
Exposure		0.140***		0.170***
		(0.025)		(0.036)
Province FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	270	270	270	270
Mean of Dep. Variable	-40.47	72.83	72.83	72.83
F stat	61.3			61.3
Controls	Yes	Yes	Yes	Yes

NOTES: *Dependent variable*: *Exposure* in col. (1), political turnout (%) in general elections celebrated in 1936, and 1977-1996 in columns (2)-(4). Column (1) reports the first-stage OLS estimates, where the dependent variable is an indicator equal to 1 if a municipality is located within 10 kilometers of the bombarded road and 0 otherwise. Column (2) shows the OLS results on the effect of the town being close to the bombarded road on political participation. Column (3) reports the reduced-form estimates, while Column (4) shows the 2SLS results, which follows the specification in Equation 2. All specifications include province fixed effects. Statistical significance is denoted by * p<0.10, ** p<0.05, and *** p<0.01.

throughout the dictatorship and became visible once democracy was restored. However, as democratic institutions consolidated, the effect gradually faded, suggesting a process of social resilience and the dilution of the wartime legacy once democracy proved stable.

6.2 Robustness Checks

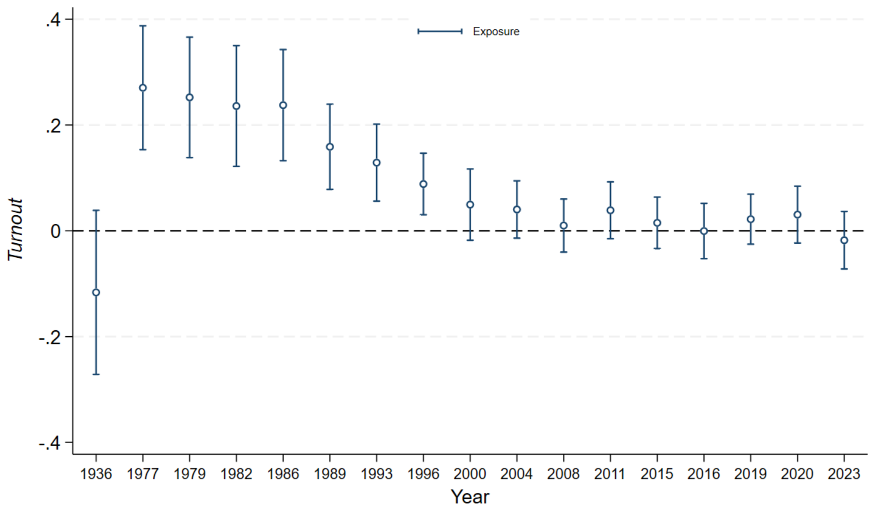
To assess the robustness of our findings, we conduct a series of additional analyses. Their results are reported in Table C4 of the Appendix.

Alternative definition of the instrument. In the baseline specification, the distance to deep water instrument is defined using a 15-meter threshold. In Column (1), we adopt a 10-meter threshold instead. The results remain virtually unchanged, suggesting that our findings are robust to the choice of bandwidth used to construct the instrument.

Reducing the sample of municipalities. Column (2) restricts the sample to municipalities located within 50 kilometers of the bombed road. Although the number of observations declines substantially, the results remain consistent with the baseline findings. This approach reduces potential bias arising from differences between nearby and more distant towns, providing a more localized comparison.

Alternative measure of distance. In the baseline estimation, we measure distance from the centroid of the town to the nearest point of the bombed segment. In Column (3), we consider

Figure 2: Effect of the road massacre on turnout



Note: The plotted coefficients are obtained from separate cross-sectional regressions for each year, following Equation 2. Vertical bars indicate 95% confidence intervals. All specifications include province fixed effects.

minimum geodesic distance from any point within the municipal boundary to the bombed road, showing that the sign and significance of our estimates remain unchanged and therefore are not sensitive to the specific definition of distance.

Removing most populated towns. One concern is that larger urban centers, which may have more established political organizations or higher baseline mobilization levels, could influence our result. Therefore, we remove the largest cities from the sample, *i.e.,* those whose population numbers in 1930 exceed the 90^{th} percentile. The estimates presented in Column (4) show that the results remain robust.

Placebo road in Basque Country and Navarre. We perform a placebo analysis using a different road—unaffected by bombing—located in the Basque Country and Navarre, two northern regions of Spain that also suffered heavy bombing during the Civil War. Due to data availability constraints, within the Basque Country we restrict the analysis to the province of Álava. Map C3 shows the municipalities included in this sample together with the placebo road. The estimates from this falsification test, reported in Column (5), indicate that the main relationship is unique to the Andalusian setting and does not simply reflect general features of other regions affected by the conflict.[15]

[15] In this falsification exercise, we analyze an inland road, as data for the coastal provinces of the Basque Country are unavailable. Therefore, we only include ruggedness and elevation as instruments in this case. The F-statistic is 7.5

6.3 Mechanisms

We have shown a temporary increase in electoral participation among the municipality most exposed to the bombings of the Málaga–Almería road. We attribute this effect to stronger intra-community ties formed through the Civil War and reinforced by the isolation caused by the road destruction. An important concern, however, is that the bombed road ran entirely along the coast and, during the 1960s, Spain experienced a major tourism boom. Thus, it could be that our estimated effect merely reflects the economic growth of coastal villages resulting from this boom. In this section, we present additional evidence that reinforces our interpretation and rules out competing mechanisms, particularly the hypothesis that the observed relationship is driven by postwar economic development.

Economic development. To assess whether the observed turnout effect is driven by postwar economic development rather than wartime exposure, we examine two potential channels—human capital and population growth. A key concern is that towns located near the bombed road, which ran along the coast, may have benefited disproportionately from Spain's tourism boom in the 1960s through greater investment, public goods provision, and demographic expansion, which could in turn have increased electoral participation.

To address this, we estimate the following difference-in-differences specification:[16]

$$y_{it} = \beta Exposure_i \times Post_t + \mathbf{X}_{it} + \tau_i + \gamma_t + \varepsilon_{it}, \tag{3}$$

where y_{it} denotes either illiteracy rates—a proxy for human capital and public good provision—or population size—which captures local economic growth. $Exposure_i$ is defined as the negative of the distance between municipality i and the bombed road. $Post_t$ denotes an indicator variable equal to 1 for years after 1937. A significant coefficient β would indicate that towns closer to the bombed road experienced differential changes in literacy or population levels relative to those farther away, suggesting that the political participation results may be driven by postwar socioeconomic dynamics rather than direct wartime exposure.

The estimated coefficients, presented in Figure D4 in the Appendix, are statistically insignificant across all years analyzed, indicating that both population and illiteracy rates remained similar in municipalities closer to and further from the bombed road. These results rule out the possibility that our turnout effect is mainly driven by postwar economic development or by the long-term benefits of the coastal tourism boom.

Networks. To reinforce our interpretation that the observed increase in turnout stems

[16] These outcomes are better suited to this approach, as we have a longer pre-treatment panel compared to turnout, for which only a single pre-treatment year is available.

from the disruption of inter-town connections—and the resulting intensification of within-town ties—we estimate the following equation:

$$Turnout_i = \beta_1 Exposure_i + \beta_2 Lost_i + \beta_3 (Exposure_i \times Lost_i) +_i +\delta_p + \varepsilon_i, \tag{4}$$

where $Lost_i$ is the fraction of i's pre-war municipal neighbors that became unreachable after the road was destroyed. Table 2 reports the results from Equation (4). As expected, the coefficient on $Lost_i$ is positive and statistically significant, indicating that municipalities that became more isolated after the road was destroyed display higher levels of turnout. This is consistent with isolation fostering stronger within-community ties. The coefficient on the interaction term $Exposure_i \times Lost_i$ is also positive and significant, suggesting that the effect of exposure on turnout is stronger among towns that lost a greater share of their pre-war municipal connections. These results support our interpretation that the bombing increased civic engagement by disrupting inter-town networks and reinforcing local cohesion.

Table 2: Channels: Networks

	Baseline	Channel
	(1)	(2)
Exposure	0.149***	0.132***
	(0.033)	(0.033)
Lost		0.129***
		(0.033)
Exposure × Lost		0.018***
		(0.006)
Observations	267	267
Mean of Dep. Variable	72.93	72.93
F stat	96.6	22.6
Controls	Yes	Yes

NOTES: 2SLS results. Column (1) presents the baseline results for comparison. Column (2) includes the interaction between exposure to the bombing and the loss of neighboring towns. All specifications include province fixed effects. Standard errors are reported in parentheses. Statistical significance is represented by * p<0.10, ** p<0.05, *** p<0.01.

7 Conclusion

In this paper, we demonstrate that capital destruction caused during a civil conflict impacts social ties within affected communities. Based on the Galeotti et al., 2010 network model, we show a clear increase in voter turnout over time since the first democratic elections, which is stronger during the first democratic elections—after which it gradually weakens and eventually stabilizes. This pattern suggests that the impact of war and conflict on social capital lasted throughout the dictatorship and became visible once democracy was restored. However, memory dies out: as democratic institutions consolidated, the effect gradually faded, suggesting the dilution of the wartime legacy once democracy proved stable. We have determined, by using a theoretical model with testable implications that provide a plausible mechanism, that the observed positive impact of a highly localized episode of capital destruction was an adaptive response to the disruption of social ties, rather than a beneficial consequence of the conflict itself.

The literature studying the relationship between conflict and social capital is far from being conclusive. In this work, we present a paradox, namely that despite the destruction of infrastructure and the loss of thousands of lives, social cohesion may strengthen under certain circumstances. From our findings, we can draw two policy lessons. First, in the aftermath of conflict and its subsequent isolation, people may develop resilience and cooperation as a way of adaptation, which translates into greater participation in politics and community life. Second, memory policies are essential to preserve historical awareness and reinforce the relationship between collective suffering and civic responsibility, preventing historical amnesia that might undermine democratic culture.

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Appendix

A Data

Table A1: Summary Statistics

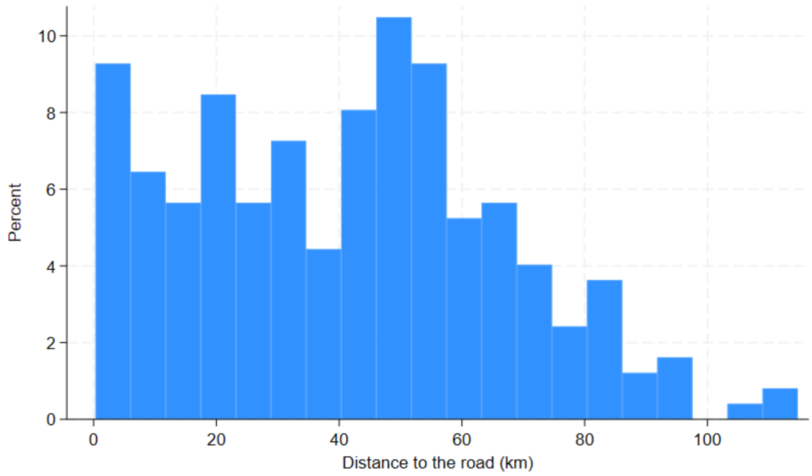
	Mean	Std. Dev.	Min	Max	N
Panel A: Main variables					
Turnout	73.421	6.668	52.00	92.31	270
Exposure	-40.471	25.611	-114.70	0.00	270
Lost	7.140	17.218	0.00	83.33	270
Panel B: Geographical variables					
Urban	0.585	0.494	0.00	1.00	270
Area	72.970	96.146	1.65	748.26	270
River length	5.400	8.295	0.00	59.27	270
Dist. deep water	39923.728	25155.636	1610.82	110235.71	270
Avg elevation	0.836	0.404	0.06	2.39	270
TRI	4.349	2.265	0.27	9.64	270

Table A2: Balancing Tests

Panel A: Geographical variables										
	Urban (dummy)		Municipality area (km^2)		Avg. gradient		River (dummy)		River length (km)	
Ruggedness (TRI)	-0.023	(0.020)	-2.494	(2.440)	3.013***	(0.091)	0.016	(0.018)	0.464***	(0.174)
Avg. elevation	-0.328***	(0.112)	80.352***	(15.224)	3.080***	(0.672)	-0.103	(0.112)	-7.226***	(0.993)
Dist. deep waters	-0.000	(0.000)	-0.001	(0.001)	-0.000***	(0.000)	0.000**	(0.000)	0.000*	(0.000)
Panel B: Historical demographics										
	Pop. growth (1900–1930)		Pop. growth (1910–1930)		Pop. growth (1920–1930)		Single men (per 10,000 inh., 1910)		Single women (per 10,000 inh., 1910)	
Ruggedness (TRI)	-2.406	(1.541)	-1.405	(1.118)	-0.425	(0.457)	5.973	(19.079)	47.725	(55.094)
Avg. elevation	-6.936	(6.181)	-4.615	(4.260)	-5.354**	(2.518)	-171.434	(106.595)	215.126	(261.690)
Dist. deep waters	0.001	(0.001)	0.001	(0.000)	0.000*	(0.000)	0.006	(0.004)	0.001	(0.004)
Panel C: Religious institutions										
	Bishop (1891–1910)		Archpriest (any, 1891–1910)		Any religious institution (1891–1910)					
Ruggedness (TRI)	0.016	(0.020)	-0.010	(0.010)	0.008	(0.020)				
Avg. elevation	-0.019	(0.121)	-0.089	(0.066)	-0.117	(0.116)				
Dist. deep waters	0.000***	(0.000)	-0.000	(0.000)	0.000***	(0.000)				
Panel D: Political outcomes										
	Left-wing vote share (1936)		Right-wing vote share (1936)							
Ruggedness (TRI)	-0.008	(0.012)	0.005	(0.012)						
Avg. elevation	-0.035	(0.062)	0.058	(0.061)						
Dist. deep waters	0.000	(0.000)	-0.000	(0.000)						

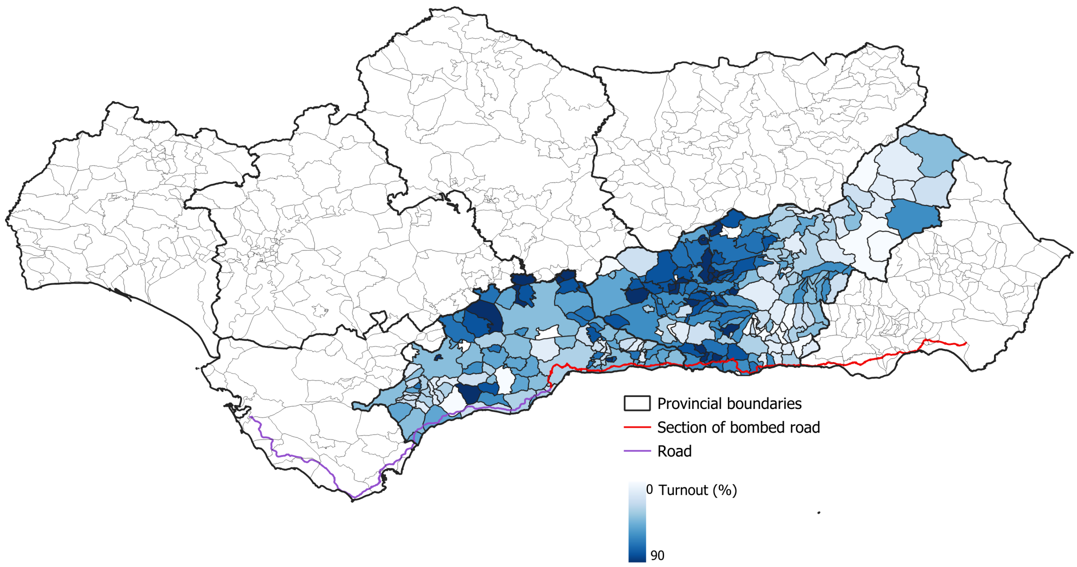
Note: This table reports balancing tests examining whether the instrumental variables are correlated with pre-treatment covariates. Each column presents a cross-sectional regression following the specification of the first-stage regression in Column (1) of Table 1, with a pre-treatment characteristic as the dependent variable. All specifications include province fixed effects. Standard errors are adjusted for heteroskedasticity.

Figure A1: Distribution of Municipalities by Distance to the Bombed Road



Note: Histogram showing the distribution of municipalities by their distance to the road affected by bombing. The x-axis represents the distance in kilometers, while the y-axis indicates the percentage of municipalities falling within each distance interval.

Figure A2: Political participation (1977-1996)



Note: Average political participation across Málaga and Granada in the period 1977–1996. Darker shades indicate higher electoral turnout rates at the municipal level. The blue line represents the main road, while the red line marks the bombed road.

B Historical background

This section provides additional historical anecdotes that reinforce the employment of ruggedness, elevation and distance to deep water as instrumental variables.

Table B3: Selected testimonies from *Majada Neila et al.* (2006)

Quote	Witness	Page
"But the shells kept falling, and the planes strafed at low altitude."	—	56
"They dropped incendiary bombs from the planes, and Franco's enormous ships never stopped firing their cannons at us. We could see the sailors perfectly — how they moved across the deck, how the cannons turned and aimed at us before firing. [...] If the ships had come any closer, they would have crashed against the rocks. For them, it was a macabre fairground game: they killed us as if we were insects."	Acracia León Cuenca	95
"[...] the cannons of the warships, which fired at ground level — or rather, at sea level — from about 200 meters away."	Adolfo Sánchez Vázquez	99
"Beyond the Caleta bridge, a squadron of six planes flew low over the area, spreading death."	Arthur Koestler	138
"The road to Almería ran along the coast, so ships, in broad daylight, fired from very close range."	Concepción Lara Díaz	154
"The ships also bombarded us. They came close to the coast and dazzled us with huge searchlights."	Consuelo Torres Fernández	155
"One of the Fascist battleships approached the coast and began the bombardment. [...] Everyone tried to reach a bend where the road moved away from the sea."	Elizabeta Parshina	173

Continued on next page

Table B3 — continued from previous page

Quote	**Witness**	**Page**
"The road was shelled the whole time by two ships and by planes; the Italians were chasing us from behind."	Isabel Anaya Serrano	197
"[...] The shelling from the warships was constant, especially during the day. For this reason, we walked mostly at night. During the day, we moved through the fields to avoid the road. The ships — the Canarias and the Cervera — even at night illuminated the road with huge searchlights and then unleashed bursts of machine-gun fire."	Juan José Carmona Doblado	224
"After covering the first few kilometers of road, as we rounded a curve that looked out over the sea, we realized that in our flight we were being followed by ghostly warships, patrolling near the coast, usually with their lights on, like the lords and masters of these waters. It was said that they were German and Italian ships, sailing under the Spanish flag — though not that of the Republic."	Juan Valderrama Lara	231
"When it got lighter, we saw that there were ships out at sea, and they soon began to approach. [...] Then the warships came so close that we could see the sailors on deck, and we also saw the name of the largest ship — it was the Canarias — and they started turning the cannons and aiming, and boom! the cannon shots started whizzing by. [...] Some Nationalist aircraft came flying very low, circling around and dropping bombs."	Manuel Cortés Quero	243
"The planes, which did not hide their nationality, and the warships, which came as close to the coast as they could, chose the spots most suitable for obtaining the best possible target."	Manuel Sánchez Fuertes	253

Continued on next page

Table B3 — continued from previous page

Quote	**Witness**	**Page**
"At that moment, someone raised the alarm, and a plane appeared, following the line of the road, strafing and bombing at low altitude."	Miguel Escalona Quesada	257

C Robustness Checks

Table C4: Robustness Checks.

	Dist. deep water (10m)	Sample ≤ 50 km	Min. geodesic dist.	Remove most pop.	Placebo: north	Conley SE
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	0.163***	0.270***		0.180***	-0.411	0.170***
	(0.031)	(0.084)		(0.041)	(0.323)	(0.050)
Exposure			0.176***			
			(0.038)			
Observations	270	173	270	243	304	270
Mean of Dep. Variable	72.83	72.93	72.83	72.90	70.49	72.83
F stat	110.7	48.4	51.0	67.2	7.5	
Controls	Yes	Yes	Yes	Yes	Yes	Yes

NOTES: *Dependent variable:* political turnout (%) in general elections celebrated in 1936, and 1977-1996. Column (1) employs an alternative definition of the instrument—distance to deep water—using a 10-meter threshold instead of 15 meters in the baseline. Column (2) restricts the sample of municipalities to include towns located within 50 kilometers of the road. Column (3) computes the minimum geodesic distance to the bombed road. Column (4) excludes the most populated cities from the sample, while Column (5) presents a placebo analysis using a road that was not bombed in the Álava (Basque Country) and Navarre. Column (6) corrects for spatial correlation (Conley, 1999). All specifications include province fixed effects. Standard errors are reported in parentheses. Statistical significance is represented by * p<0.10, ** p<0.05, *** p<0.01.

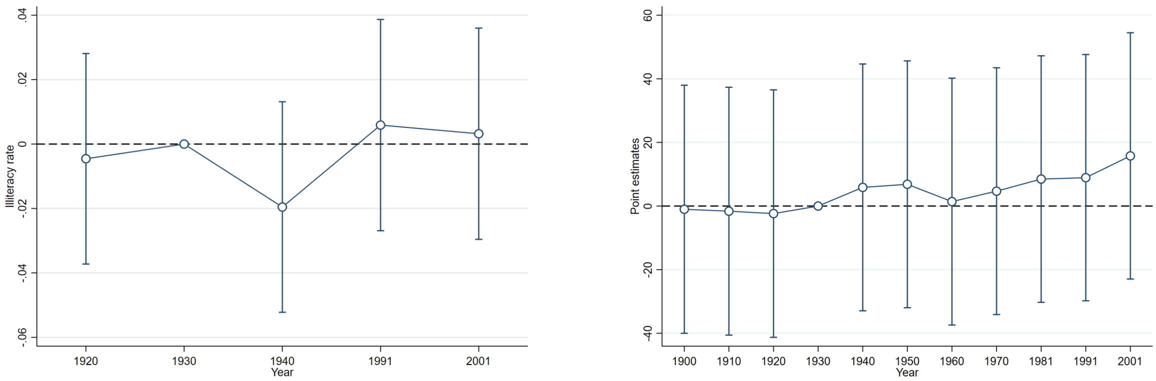
Figure C3: Placebo: Road and sample of municipalities

Note: Map of Álava (Basque Country) and Navarre used in the placebo analysis, together with the route of the placebo road. The highlighted areas indicate the municipalities included in the sample.

D Mechanisms

D.1 Education and population

Figure D4: Event study graphs



A) Illiteracy B) Population

Note: The graphs show the coefficients of a leads-and-lags model, obtained following Equation (4). Vertical bars indicate 95% confidence intervals. All specifications include municipality and year fixed effects.