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Abstract: A growing literature attributes the rapid diffusion of anti-regime collective action in authoritarian regimes to mass media broadcasts. We examine this relationship in the context of the June 17, 1953 uprising in East Germany, the first national rebellion against communist rule in Eastern Europe. The uprising was characterized by an extraordinarily swift and wide-ranging spread of anti-regime collective action. Observers on both sides of the Iron Curtain attributed the uprising to Western media broadcasts, particularly news broadcasts by the Radio in the American Sector (RIAS) of Berlin. Although historians have strongly endorsed this view it has never been empirically tested. We exploit plausibly exogenous variation in RIAS signal strength across East Germany and an unusually rich set of covariates to investigate the relationship between municipality-level protest events and RIAS broadcasts. We find no evidence to support the hypothesis that RIAS caused the diffusion of protest during the uprising. Instead, our results suggest that social ties played an important role in the swift diffusion of anti-regime collective action.

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In recent decades, rebellions have repeatedly challenged—and sometimes swept away—authoritarian regimes that appeared to be firmly entrenched and largely unchallenged. The astounding aspect of many recent rebellions in the former Soviet Union, the Balkans, and the Middle East has been their spontaneity, with protest expanding without extensive mobilization by political parties, interest groups, or social movement organizations.

How can we explain the rapid diffusion of such anti-regime collective action, particularly in light of the fact that it often occurs in the absence of an organized opposition? Many studies have claimed that mass uprisings in authoritarian regimes are the result of informational cascades. As pointed out by Kuran (1991), Lohmann (1994, 2000), and Hale (2013), among others, the influx of politically relevant information might trigger a rebellion of the oppressed masses by helping them overcome barriers to collective action such as preference falsification and pluralistic ignorance.

Some evidence for this view comes from the collapse of communism in Eastern Europe, the Color Revolutions, and the Arab Spring. In many of these cases, scattered and uncoordinated opposition spread rapidly, quickly mushrooming into massive popular uprisings that were seemingly aided by the spread of information through mass media and the internet (Beissinger 2007; Hale 2013; Opp, Voss, and Gern 1995; Pfaff 2006; Kuran 1991; Lohmann 1994; Kotkin 2009; Radnitz 2010; Weidmann 2015a; Weyland 2012). Recently, much attention has been drawn to the possible role played by digital communication technologies, in particular social media, with some scholars going so far as to hail them as "liberation technologies" (Diamond and Plattner 2012; see also Howard 2010; Kalathil and Boas 2003; Shirky 2011; Enikolopov, Makarin, and Petrova 2016; for a critical review see Weidmann 2015a).

However, spontaneous rebellions are not confined to the new era of social media, nor are explanations limited to these technologies. Scholarship has long posited a link between mass media and the diffusion of collective action. Sociologists have observed "positive feedback" in protest events: the occurrence of a protest in one location appears to make protest in a nearby location more likely (Biggs and Andrews 2010: 188). Print media have been an especially important vehicle of positive feedback. For example, in Andrews and Biggs' (2006) study of the spread of the sit-in movement in the U.S. South, newspaper coverage of previous sit-ins substantially increased the hazards of one occurring elsewhere. Other scholars have explored how the Reformation, a rebellion against ecclesiastical and imperial authorities, was propelled by the nascent print industry (Cantoni 2015; Dittmar and Seabold 2014; Edwards 1994; Rubin 2014). The printing press has also been credited with facilitating the diffusion of protest in the revolutions of 1848 and of nationalist and socialist mass movements more generally (Anderson 1991; Gellner 1983; Hedström, Sandell, and Stern 2000; Sperber 2005).

Social scientists have also explored the role of radio and television broadcasts in research on protest movements (see, e.g., Krabill 2010; Myers 2000; Roscigno and Danaher 2001). For example, in a study of the diffusion of race riots, Myers notes the "extraordinary importance of the mass media in driving waves of collective behavior" (Myers 2000: 201). Adena et al. (2015) credit radio propaganda with the rise of the Nazis and anti-Jewish pogroms in Weimar Germany. Yanagizawa-Drott (2014) presents evidence that hate radio propelled the Rwandan genocide.

The impact of *foreign* radio and television broadcasts may be especially explosive in authoritarian regimes that rely on censorship to maintain information control (Egorov, Guriev, and Sonin 2009). Because foreign broadcasters are able to circumvent censorship barriers and often possess a credibility that domestic media lack, they may be particularly effective in overcoming informational deficits, altering political beliefs, and facilitating collective action. The availability of foreign radio and television broadcasts, either through the unintended spillover of broadcasts from neighboring countries or through deliberate efforts by foreign broadcasters, thus has the potential to challenge authoritarian control (Kern and Hainmueller 2009; Huang 2015). This intuition strongly influenced Western information policy during the Cold War, leading to the creation of radio stations such as *Voice of America*, *Radio Liberty/Radio Free Europe,* and the BBC's *World Service,* all of which broadcast into the Soviet bloc as part of a concerted propaganda effort designed to undermine communist rule (Johnson and Parta 2010).

Nevertheless, the existing empirical evidence for the impact of foreign mass media on public opinion and collective action in authoritarian regimes is limited and inconclusive (Kern and Hainmueller 2009; Lu, Aldrich, and Shi 2014; Huang 2015; Crabtree, Darmofal, and Kern 2015). Explanations of anti-regime collective action that focus on media-driven protest diffusion have intuitive appeal. They are difficult to test, however, especially in the context of authoritarian regimes in which reliable data on protest events and media exposure are either hard to assemble or simply unavailable (Hale 2013: 335).

Moreover, an alternative theoretical perspective suggests that while mass media can make politically relevant information more widely available, better information does not usually suffice to turn passive bystanders into active participants, particularly when collective action is dangerous and its benefits are uncertain. In highly repressive settings, even if new information changes expectations and beliefs and provides examples of protest to emulate, it may be insufficient to generate collective action. Instead, the growth of collective action under repressive conditions may require social recruitment by activists who persuade or pressure others to adopt a rebellious stance (Watts and Dodds 1997; Kim and Pfaff 2012; Opp and Gern 1993; McAdam 1986). The social diffusion literature considers mobilization for collective action most likely to occur when social influence is exerted (Rogers 1995; Valente 1995; Watts and Dodd 2009). Participation in high-risk political behavior, in particular, seems to rely heavily on personal appeals and micro-mobilization among actors linked by social ties (Gould 1995; Kitts 2000; McAdam 1986; Opp and Gern 1993; Pfaff 1996).

In this paper, we study the June 17, 1953 uprising in the German Democratic Republic (GDR) to test whether large-scale diffusion of anti-regime collective action in an authoritarian setting can be explained by informational diffusion through foreign radio broadcasts. The East German uprising is a historically important case both because it was the first large-scale uprising against communist rule in Eastern Europe and because it influenced subsequent popular uprisings in Hungary, Czechoslovakia, and Poland (Ekiert 1996; Kopstein 1996). Whereas contemporary observers of the uprising and later historians were united in their belief that broadcasts of an American radio station, *Radio in the American Sector* (of Berlin) (RIAS), were responsible for turning limited labor unrest in East Berlin into a nation-wide uprising, this claim has never been tested empirically.[1]

Although numerous studies have examined the preconditions, conduct, and implications of the East German uprising, our paper is the first to empirically analyze RIAS' impact on the uprising. We do so by exploiting a natural experiment. RIAS signal strength varied considerably across East Germany because of the location and technical characteristics of RIAS broadcast transmitters and natural topography. As a result, many but not all East Germans had access to RIAS broadcasts. We use electromagnetic signal propagation models to calculate RIAS signal strength across East Germany. We then combine the resulting signal strength measures with municipality-level data on protest events during the uprising and an unusually extensive set of covariates, mostly drawn from the unpublished 1950 East German census. Across a wide range of model specifications and robustness tests, we find no evidence that RIAS broadcasts contributed to the diffusion of protest. We then look at patterns of social relations in East Germany to explain protest diffusion. We find empirical support for social influence as a plausible explanation for the large-scale, rapid spatial diffusion of protest during the uprising.

I. The June 17, 1953 uprising

In October 1949, the GDR was established under the auspices of Moscow in the Soviet Zone of Occupation. In July 1952, the ruling East German Socialist Unity Party (SED) held its second party conference, in which it outlined plans to "construct socialism" along Stalinist lines. These plans included the rapid development of a heavy industrial base, central planning, agricultural collectivization, and military rearmament. The social implications

[1] RIAS was a German-language radio station founded by U.S. military authorities in 1946 in the American sector of Berlin. It operated specifically for listeners in the Soviet occupation zone of Germany. Under the motto "A free voice from the free world," RIAS functioned as an instrument of U.S. Cold War information policy (Ostermann 2001: 172; Riller 2004). Despite its mission to promote American interests, RIAS' reporting and commentary generally tried to present a "realistic evaluation of the situation in the GDR" (Fricke 2005: 63) rather than simply convey anti-communist propaganda.

were profound as the plan de-emphasized domestic consumption, intensified the exploitation of labor, and endorsed expropriation of private assets.

The SED pledged to spend two billion marks in 1952–1953—about 10% of an already strained state budget—in order to build up the East German armed forces. This choice of "guns over butter" was extremely unpopular given post-war privation and East Germans' strong anti-war sentiments (Weber 1999; Allison 2000; Dale 2004; Port 2007; Diedrich 2003). The regime's policies undercut production of consumer goods and worsened food shortages in the cities (Dale 2004; Piskol 1995; Port 2007; Witkowski 2006). By the end of 1952, living standards in the GDR had fallen to the dismal post-war levels recorded in 1947 (Koop 2003: 41; Baring 1957: 15–21).

At the same time, the regime went on the offensive against sections of the population it regarded as politically unreliable. It declared a "struggle against the churches" (*Kirchenkampf*) that included the persecution of religion and the suppression of religious organizations (Knabe 2003; Maser 1992; Nowak 1996). Hundreds of thousands of SED members whose devotion to the party was considered suspect, many of them former Social Democrats, were purged (Knabe 2003). Workplace councils, often dominated by Weimar-era trade unionists, were dismantled and replaced by the state-controlled *Freier Deutscher Gewerkschaftsbund* (Free German Trade Union Federation, FDGB) (Pritchard 2000).

From the outset, these economic and social policies were greeted with dismay. Shop-floor resistance intensified and sporadic protests and wildcat strikes were reported in some industrial centers. The number of citizens in prison or awaiting trial doubled to 60,000 within a few months (Kopstein 1996; Port 2007; Weber 1999). Some 187,000 East Germans fled westward in 1952 and more than 297,000 joined them in 1953 (Statistisches Bundesamt 1993: 149). Yet, despite sharply rising political disaffection, there was no domestic force capable of voicing, much less organizing, concerted opposition to the ruling communist party.

However, in March 1953, the death of Soviet dictator Joseph Stalin called the campaign to construct socialism into question (Applebaum 2012; Ekiert 1996; Kopstein 1996).

As the Soviet leadership split into contending factions, the East German regime became unsure of how changes in Moscow would influence policy toward the two Germanies (Ostermann 2001). The SED's general secretary, Walter Ulbricht, insisted on forging ahead. In April 1953, the regime declared the Protestant youth movement an illegal organization, expelling student members and firing religious personnel from universities and schools (Knabe 2003). The remaining private industrial sector was also targeted for elimination, with a new directive denying food ration cards to employees of private firms with more than five employees, a policy that affected about 10% of the population (Knabe 2003). These measures were especially threatening to the remaining middle classes, which were nominally represented by the Christian Democratic (CDU) and Liberal Democratic (LDP) parties in a Communist-led parliamentary bloc.

In May, the campaign intensified with a new measure that increased work norms by 10%. This uncompensated increase in work norms, together with growing costs of living, slashed workers' real incomes by about a third (Kopstein 1996: 412; Ross 2000). With this step, the regime had created a widely generalized grievance that offended the very working-class constituencies socialism claimed to represent.

Just weeks later, the East German regime abruptly reversed many of these policies. We now know that the SED leadership had come under withering criticism from Stalin's successors who condemned it for political incompetence and economic mismanagement (Ostermann 2001). Under pressure from Moscow to recalibrate its policies and increase its popular support, the regime decided in early June to discontinue most of its campaign to build socialism. On June 11th, *Neues Deutschland*, the party's official daily, printed a notice from the Politburo admitting that mistakes had been made and announcing a new course that would halt expropriations, release some political prisoners, improve living standards, encourage the return of East Germans who had fled to West Berlin or West Germany, and relax some policies concerning culture and religion.[2]

This abrupt change seemed to rebuke party loyalists and state functionaries who had

[2] *Neues Deutschland,* "Kommuniqué des Politbüros des Zentralkomitees der SED vom 9. Juni 1953," June 11, 1953, p. 1.

been charged with ruthlessly carrying out the now discredited policies. As Ulbricht was widely perceived to be hostile to "liberalism" and restraint, SED party members speculated that he was losing power or was out of favor with Moscow (Brant 1957; Baring 1957: 24). Dale (2004: 153) comments that the reversal "generated confusion and divisions at all levels of the SED and state, while below decks it was widely interpreted by many as sign that the SED's time was up." For their part, many workers—particularly in the construction sector—objected to an apparent oversight: The 10% increase in work norms had not been rescinded together with the other discredited policies.

Partly in reaction to this, sporadic work stoppages occurred at several East Berlin construction sites. On June 14, *Neues Deutschland* editorialized that the interests of construction workers could no longer be ignored.[3] Yet on June 16, *Tribüne*, the official FDGB newspaper, published a front page article by Otto Lehmann, vice-chairman of the FDGB, stating that the government's decision to raise work norms was "entirely correct" and irrevocable.[4] Regarding this pronouncement as a direct provocation and perhaps also as a sign of splits within the party leadership, workers at several construction sites not only went on strike but marched in protest to the seat of government located in the center of East Berlin (Brant 1957; Knabe 2003; Koop 2003; Kowalczuk 2003; Mählert 2003). As they marched through the city their numbers were swelled by thousands of other workers and passersby. Protesters began to broaden their demands to include free elections, the release of political prisoners, and even the government's resignation. On reaching the House of Ministries, high-ranking regime representatives met with the protesters but failed to pacify them. The construction workers then marched back to their work sites proclaiming a strike for the following day, June 17. In the evening, the SED called an emergency meeting of party and trade union functionaries in East Berlin in which the decision was taken to overturn the norm increase. However, news of this decision did not reach work sites by the next morning. The SED also failed to contemplate the possibility that strikes and protests might spread

[3] *Neues Deutschland,* Siegfried Grün and Käthe Stern, "Es wird Zeit, den Holzhammer beiseite zu legen," June 14, 1953, p. 6.

[4] *Tribüne,* Otto Lehmann, "Zu einigen schädlichen Erscheinungen bei der Erhöhung der Arbeitsnormen," June 16, 1953, p. 1–2.

to other parts of the country (Diedrich and Hertle 2003: 21–22).

The next day, June 17, hundreds of thousands took to the streets in East Berlin. Concurrently, the uprising spread across the entire country, involving hundreds of villages, towns, and cities (Diedrich 1991: 230–39; Koop 2003: 349–50; Kowalczuk 2003: 284–93).[5] Although local events varied, the general pattern was that strikes occurred in state enterprises, after which hastily composed strike committees drafted lists of demands and then marched to the town center to confront state and party officials.[6] Frequently, demonstrators clashed with police. In a few instances, protesters laid siege to local government offices and SED party headquarters and attempted, sometimes successfully, to storm prisons and liberate prisoners. A Soviet intelligence report summarized these episodes with particular alarm, noting that government buildings were being targeted and agents of authority openly confronted: "vandalism of the mob, buildings stormed and set alight, members of the police and people who tried to stop things disarmed and beaten" (Christoforow 2003: 847–8).

The speed with which the uprising spread across the country completely stunned the East German regime. All over the country, security forces withered in the face of mass protests. When the Commander-in-Chief of the Group of Soviet Forces in Germany realized that the East German regime was about to fall, he deployed troops to buttress the East German government's authority. Soviet military commanders at the district level declared martial law beginning in the afternoon of June 17, with the exact timing depending on local circumstances. From this point onward, Soviet tanks and troops occupied the larger towns and cities of the GDR. For the most part, the uprising was over by nightfall. As was noted about an industrial town located more than 250 kilometers southwest of Berlin, "[t]he storm had left Saalfeld as suddenly as it had come" (Port 2007: 75).

Although a small number of protests and strikes occurred over the following days, especially in more remote parts of East Germany, the deployment of Soviet forces effectively shut down the uprising. Soviet troops killed dozens of protesters in suppressing the uprising

[5]We provide quantitative information on protest activities after introducing our data sources.

[6]For summaries of these events see Sperber (2004) and Wettig (2003).

and arrested thousands more. People taken into custody often received lengthy prison sentences and Soviet military authorities summarily executed more than a dozen (Mitter and Wolle 1993; Ostermann 2001; Christoforow 2003).

In the wake of the uprising, contemporary observers on both sides of the Iron Curtain were shocked at what had happened. Despite a complete lack of organized opposition to the regime and ambiguous opportunity signals, a wildcat strike in East Berlin had blossomed into hundreds of strikes and demonstrations across all of East Germany. How could the uprising have spread so widely and so swiftly?

II. Broadcast media and the diffusion of collective action

Political opportunity theory regards protest movements as being driven by the relative openness of an institutionalized political system, the stability of the elite alignments that support the regime, the presence of elite allies, and the regime's capacity for and willingness to employ repression (McAdam, McCarthy, and Zald 1996: 10; Tarrow 1994). Many historians see the political opportunity signals sent by the death of Stalin in March 1953 and the confusion surrounding the policy reversals in June as the cause of the East German uprising (e.g., Sperber 2004; Wettig 2003). One problem with this perspective is that the opportunity signals generated by these events were ambiguous, poorly understood by the population, and too general to be persuasive explanations for the widespread adoption of protest (Kopstein 1996). More importantly, even if political opportunity theory explains the *timing* of the uprising, it cannot account for its *spatial variation.* While the same opportunity signals were observed across East Germany, protests were not distributed uniformly in space (Bruce 2003; Diedrich 2003; Knabe 2003; Koop 2003; Ostermann 2001; Port 2007; Sperber 2004; Wittig 2003). We return to this point later.

Theories of collective action that focus on resource mobilization also seem to be of limited use in the East German case (Jenkins 1980; McCarthy and Zald 1977). The historical consensus is that the East German uprising cannot be explained by independent political parties, interest groups, or social movement organizations, all of which had either been eliminated or co-opted by the regime (Knabe 2003). In stark contrast to 1989, the protestant church also played no role in the 1953 uprising (Neubert 1998).

Media-driven diffusion processes offer a potentially convincing account of the spread of protest (Oliver and Myers 2003). Mass media can explain a shift in the scale and scope of protest, especially when information about discrete episodes of collective action is broadcast to wider arenas, thus "spawning new actors or sites of contention" (Givan, Roberts, and Soule 2010: 3). Mass media catalyze large-scale protest by providing new information, which leads people to change their expectations and political preferences and enables them to learn of and emulate novel forms of protest.[7] Mass media seem to be especially good at communicating a collective action "repertoire" of protest tactics and rhetoric that can be more or less spontaneously adopted across localities (Tarrow 1994; Traugott 1995). This "modular emulation" of a protest can not only facilitate rapid movement expansion but also spatial protest diffusion (Beissinger 2007). Mass media also facilitate collective action by enabling information to jump across lines of social and spatial segregation that ordinarily block collective action (Andrews and Biggs 2006; Givans, Roberts, and Soule 2010; Koopmans 2004; Myers 2000; Strang and Soule 1998). This function might be especially relevant in authoritarian regimes in which draconian state repression forces citizens to withdraw into small groups of trusted friends and family members, such as the "niche" societies of communist Eastern Europe (Völker and Flap 2001).

If the prevailing perspectives on the effect of mass media on protest diffusion are correct, mass protest during the East German uprising is likely to have been propelled by informational diffusion through RIAS broadcasts. Tarrow (2010: 209) describes informational diffusion as the "emulation of new forms of contention on the part of actors who learn, through impersonal means such as the media, of the actions of those who initiated those forms." The clear empirical implication of the media-driven diffusion argument is that those areas of East Germany most effectively penetrated by RIAS and thus best informed about events in East Berlin should have been the most likely to experience protest during the uprising:

[7] For reviews of the literature on protest cascades see Hale 2013; Lohmann 1994; Kuran 1991; Weidmann 2015a.

Media-driven diffusion hypothesis: *Ceteris paribus, the greater the availability of RIAS in a given municipality, the greater the odds that protest occurred in that municipality.*

III. The role of RIAS

Primarily because the diffusion of anti-regime collective action was so swift and wide-ranging, contemporary observers on both sides of the Iron Curtain and later historians have attributed the uprising to the broadcasts of RIAS (Bentzen 2003; Diedrich 2003, 1991; Diedrich and Hertle 2003; Flemming 2003; Fricke and Engelmann 2003; Koop 2003; Ostermann 2001; Weber 1999; Mitter and Wolle 1993). The East German regime saw the uprising as a failed fascist putsch instigated by Western *agents provocateurs* who had been directed by RIAS broadcasts (Applebaum 2012; Ostermann 2001; Christoforow 2003: 848–9; Fricke 2005; Baring 1957: 59–63).[8] Internal security reports claimed that many of the arrested protesters admitted listening to RIAS (Ostermann 2001: 172) and that RIAS broadcasts had "mobilized the provinces" (Holzweissig 2003: 3). Reflecting on the extent of the uprising, an East German official ruefully concluded that "June the seventeenth proves how many people listen to RIAS" (Applebaum 2012: 442). Soviet security officials also decried RIAS broadcasts for spreading the uprising (Ostermann 2001: 190, 200–201). According to one Soviet scholar, the uprising was the result of an American effort to "broadcast detailed instructions to all parts of East Germany" in order to orchestrate a "counter-revolutionary putsch" against the East German communist regime (Panfilov 1981: 128–129).

It would be easy to dismiss communist analyses blaming RIAS for the uprising as simply self-serving, but American and West German officials also believed that RIAS had facilitated the diffusion of protest. Egon Bahr, RIAS' chief political editor, "felt a peculiar thrill of responsibility when he heard that some of the demonstrators outside the capital had voiced demands that were the same, word for word, as those he had played on the radio the day before" (Applebaum 2012: 442). Indeed, Bahr went so far as to describe

[8]For example, *Neues Deutschland,* "Was ist in Berlin geschehen?", 18. Juni 1953, p. 1; *Neues Deutschland,* "Zusammenbruch des Abenteuers ausländischer Agenten in Berlin," 18. Juni 1953, p. 1.

RIAS as the principal catalyst of the uprising (Brink 2006). In July 1953, a U.S. State Department memo reported that "the rise of the workers against the Communists [...] was due in large measure to the broadcast[s] by RIAS" (Ostermann 2001: 172). Declassified documents clearly show that American military and intelligence officials were afraid that RIAS broadcasts were too provocative and might cause a military confrontation with the Soviet Union. Indeed, during the uprising itself, on June 17, Bahr's American supervisors ordered RIAS to refrain from broadcasting an appeal for a general strike that had been delivered to RIAS by a deputation of East German workers (Holzweissig 2003). After the uprising, Western officials resolved to pursue a more cautious information policy in the future (Ostermann 2001: 172–6).

What makes claims for RIAS's role as the catalyst of the uprising so plausible is that, throughout the uprising, RIAS provided its listeners with extensive coverage of the situation in East Germany. Starting with a 7:30 pm news broadcast on June 15, RIAS began reporting on work stoppages among workers at three East Berlin construction sites.[9] This broadcast was repeated four times later that night and the next morning. On June 16 at 1:30 pm, RIAS broadcast news of widespread strikes in the East Berlin construction sector and, for the first time, indicated that unrest was spreading beyond worksites: "Today in the Soviet sector [of Berlin] workers of the VEB Industrie-Bau protested against the norm increase of ten percent. As the protesters marched through Stalin-Allee they were joined by numerous Berliners. Yesterday, protest strikes had already occurred at several construction sites of this company. The extent of today's protests is not known at this hour" (RIAS 1953: 3). At 4:30 pm, RIAS reported extensively on the "large-scale mass protests" in East Berlin (RIAS 1953: 3).

At 7:30 pm, RIAS broadcast a list of workers' demands, which had been delivered to RIAS by a deputation of East German workers. The demands included a retraction of the work norm increase, lower costs of living, the government's resignation, and free and fair elections. RIAS also broadcast the construction workers' threat that strikes would continue

[9]See Table A1 in the online appendix for a complete list of RIAS broadcasts from June 15–17 related to the uprising.

until their demands had been met. The next RIAS broadcast, at 7:45 pm, provided an extensive summary of the day's events. It stressed that the protests had spread to all sections of society and that protesters were fighting to defend the interests of all East Germans. It also reported that East German police had done nothing to disperse the crowds and in some cases had even joined the protests. Finally, the broadcast compared the day's events to the 1918 November revolution that had lead to the establishment of the Weimar Republic (RIAS 1953: 3–4). During the next 24 hours, RIAS transmitted dozens of broadcasts that kept East Germans apprised of the events transpiring in East Berlin and East Germany.

These radio broadcasts had the potential to be highly influential since most East German households possessed a radio (Holzweissig 2003: 2).[10] While RIAS could not be received in all parts of the country, at the beginning of the 1950s it was by far the most popular Western radio station in East Germany, followed by *Nordwestdeutscher Rundfunk* (NWDR) (Merritt and Meritt 1980: 39, 126, 142–143).[11]

The *prima facie* case for media-driven protest diffusion during the June uprising seems strong. RIAS broadcast credible, up-to-date information about the escalating regime crisis that was not available from East German radio stations, which did not report on the uprising until after Soviet tanks had begun to crush it.[12] RIAS was also quite popular, at least in areas of East Germany with sufficient signal strength. Moreover, contemporary observers on both sides of the Iron Curtain agreed that RIAS had played a crucial role in spreading the uprising. Finally, and perhaps most importantly, it seems difficult to imagine

[10]In 1953, 67% of East German households held radio reception permits (Staatliche Zentralverwaltung für Statistik 1958: 29, 477). This number almost certainly understates the prevalence of radios since households had an incentive not to register as radio listeners so as to avoid paying the monthly radio reception fee of 2 Marks (Hermann, Kahle, and Kniestedt 1994: 205).

[11]In 1955, in a survey of radio listening habits of East Germans visiting the West Berlin trade fair, 37% of respondents reported that signal strength was too low for them to listen to RIAS broadcasts. See American Embassy, Office of Public Affairs. 1956. *A study of East Zone radio and tv habits. Report No. A–4, Series No. 3, October 29, 1956.* Television was in its infancy in 1953. The number of television sets in West Germany barely exceeded one thousand in the spring of 1953 (Nordwestdeutscher Rundfunk 1956).

[12]It was not until 2 pm on June 17 that the East German radio station *Rundfunk der DDR* broadcast a definitive revocation of the work norms and denounced the demonstrations as Western provocation and the work of "fascist agents" (Galle and Schuster 2000: 37; Holzweissig 2003).

that the uprising could have engulfed the whole country so quickly in the absence of RIAS.

All of these factors make the East German uprising a "most-likely" case (Gerring 2008) of media-driven diffusion of anti-regime protest. The next section of the paper introduces the data and research design that we will use to test the media-driven diffusion hypothesis.

IV. Research design and data

Our unit of analysis are East German municipalities (*Gemeinden*) observed over the period from June 16-21, 1953. Municipalities are the smallest administrative division of government in Germany. Our dataset contains all 2,584 municipalities with more than 1,000 residents (Krupkat 1958). We used Google Earth to determine the latitude and longitude of each of these municipalities, with coordinates measured at the approximate center of each municipality.

Our research design takes advantage of the fact that RIAS broadcasts could only be received in parts of East Germany.[13] We use two electromagnetic signal propagation models in conjunction with terrain data and information on the location and technical characteristics of RIAS broadcast transmitters to calculate RIAS signal strength across East Germany. The two models we use, the Terrain Integrated Rough Earth Model (TIREM) and the Irregular Terrain Model (ITM), have been used in research on media effects in economics to calculate the strength of radio and television signals (Olken 2009; Enikolopov, Petrova, and Zhuravskaya 2011; Adena et al. 2015).[14] The resulting model output provides us with RIAS signal strength for 1 km $\times$ 1 km cells covering East Germany. Figure 1 shows a map of RIAS signal strength based on ITM for the four RIAS transmitters (at two locations, West Berlin and Hof (Bavaria)) that existed in June 1953. We will use this RIAS signal strength measure to explore the relationship between RIAS broadcasts and anti-regime protests.[15]

[13]Eventually, with the use of more powerful transmitters and different frequencies, RIAS broadcasts would reach all of East Germany. In June 1953, however, this was not yet the case.

[14]See the online appendix for a detailed discussion of these models. Transmitter data and notes on data sources are provided in Table A2 in the online appendix.

[15]Figure A1 in the online appendix shows a histogram of RIAS signal strength based on the ITM model. In the robustness section we demonstrate that using TIREM instead of ITM does not affect our results; this is not surprising given that the two measures are correlated at $r \approx .92$ across the municipalities in our sample.

We use a municipality's coordinates to determine its RIAS signal strength. However, even knowing a municipality's signal strength does not allow us to distinguish between municipalities with and without access to RIAS broadcasts. The reason is that signal strength depends not only on transmitter characteristics and the path between transmitter and radio receiver but also to some extent on other factors such as the exact position and height of the receiver antenna and the technical characteristics of the radio receiver. These characteristics varied across radio receivers used in the early 1950s (Vogel 1999). It is therefore impossible to define a cutoff value that cleanly separates municipalities with access to RIAS from municipalities without access to RIAS. We do know, however, that the lower end of RIAS signal strength corresponded to the absence of usable signal while the upper end corresponded to excellent signal (Galle and Schuster 2000: 34–36). If RIAS broadcasts indeed had an effect on the probability of protest, the probability of protest should increase (weakly) monotonically with RIAS signal strength, conditional on covariates. Since the functional form of this relationship is unknown it will be important to allow for enough flexibility when modeling the effect of RIAS signal strength on the probability of protest.

The protest data come from a comprehensive historical compilation of sites of protest during the uprising (Kowalczuk 2003). It lists—based on primary and secondary sources that became available after 1989 and without distinguishing between different kinds of events—all municipalities known to have experienced public protests, strikes, or attacks on regime personnel or facilities between June 16 and June 21. We refer to any such event as a "protest" or "protest event."[16]

While these data are the most extensive collection of protest event data that exists for the June 1953 uprising, they suffer from three limitations. First, Kowalczuk (2003) does not record the size of a protest event. Second, we do not know how many protest events occurred in a given municipality. If a municipality experienced a strike on the morning of June 17 and a protest in the afternoon, Kowalczuk (2003) only lists one event as having

[16]Our outcome data thus avoid common problems with the coding of protest events from news reports (Mueller 1997; Weidmann 2015b).

occurred in that municipality. The data thus do not allow us to code the intensity of protest, either in terms of protest size or protest frequency. We can only create a binary indicator for the presence or absence of protest. Since we are interested in the spatial diffusion of protest, both of these limitations, while regrettable, are of limited consequence.

The third limitation concerns the temporal resolution of the data. We have no information about the exact date on which protest events occurred within the observation period (June 16–21).[17] However, this limitation is not problematic because of the remarkable swiftness of the June uprising. As discussed above, protests spread throughout East Germany within 24 hours. By the evening of June 17, Soviet military district commanders had declared martial law and Soviet troops and tanks had suceeded in dispersing protesters and striking workers. While isolated protests erupted over the next few days, particularly in more remote areas, the massive Soviet military presence quickly stifled all anti-regime activities. Undoubtedly, the vast majority of municipalities listed as experiencing a protest in our data did so on June 17.

Keeping these caveats in mind, 527 out of the 2,584 municipalities in our dataset experienced a protest event. The map in Figure 2 shows these municipalities, distinguishing between municipalities that did and municipalities that did not experience a protest during the uprising. This map makes it very clear that the uprising was not limited to select parts of East Germany—all regions participated in anti-regime protests in June '53.

Our main identifying assumption is that RIAS signal strength is idiosyncratic conditional on covariates. In other words, we assume that signal strength in a municipality is independent of unobserved municipality characteristics related to the probability of protest, conditional on observed characteristics. To deal with confounders at the district level, we use district fixed effects in some specifications.[18] In addition, we control for the municipality- and county-level covariates listed in Table 1.

At the municipality level, we observe the municipality size class, a categorical vari-

[17]We contacted Ilko-Sascha Kowalczuk and confirmed that more detailed data do not exist in published or unpublished form.

[18]In 1953, East Germany was divided into 14 districts (*Bezirke*), which were further divided into 217 counties (*Kreise*).

able measuring population size. We also observe whether a municipality is the seat of a county administration (*Kreisstadt*), the Euclidean distance from each municipality to East Berlin, and whether a municipality hosts a barracks of the East German army (*Kasernierte Volkspolizei*, KVP).[19]

At the county level, we observe the following covariates. To address the possibility that areas with better access to RIAS historically differed in their support for communism (and therefore their propensity to participate in the uprising), we use election results from the November 1932 Weimar elections. These elections were the last free and fair elections held before the rise of the Third Reich. We have data on turnout, invalid ballots, and vote shares for all significant parties competing in the elections.[20]

We have socio-economic data on sector shares and the proportion of unemployed from the unpublished August 1950 population census conducted in East Germany. From this source, we also have data on county population size and population density and the proportion of the county population that is male. In addition, we observe the percent population change between 1939 and 1950 and the proportion of the county population residing in the same state as in 1939. Both of these variables tap into the disruptions and population movements stemming from WWII and its aftermath. Moreover, we have data on the education level and religious affiliation of the population. Finally, from the 1950 housing census we have information on the living space per capita, which captures scarcity of housing, one

[19]Figure A2 in the online appendix shows a barplot of the distribution of municipality size classes.

[20]We also have election results for the 1946 state (*Land*) elections, the first state elections held in East Germany after the collapse of the Third Reich. These elections were not free and fair, as the Soviet occupation forces suppressed the Social Democrats, supported the SED, and discriminated against the Christian Conservatives (CDU) and Liberals (LDP) (Braun 1993; Schmitt 1993; Hajna 2000). Moreover, the 1946 election results suffer from missing data. We therefore decided to use 1932 election data in our primary analysis; this seems justified given the continuity between Weimar elections and 1946 state elections noted by Schmitt (1993). We present results using the 1946 election data in the robustness section. Interestingly, confirming our decision to use the 1932 data for our main analysis, the 1932 election results are stronger predictors of protest in 1953 than the 1946 election results. This finding probably reflects distortions introduced by vote fraud and voter intimidation in 1946.

of the most pressing problems in East Germany after the war.[21,22]

V. Results

Table 2 displays results from four probit models. Coefficient estimates and standard errors clustered at the county level are shown. Fixed effects for municipality size classes and, when applicable, districts are included in the specifications but have been omitted from the table. We use a cubic polynomial in RIAS signal strength to model the effect of RIAS signal strength on the probability of protest in a reasonably flexible manner. The third to last row of Table 2 shows p-values from a Wald test of the joint significance of the polynomial terms.

Model (1) does not support the hypothesis that RIAS broadcasts made protests more likely: the RIAS signal strength cubic polynomial is statistically insignificant ($p = 0.428$). In order to visualize the effect of RIAS signal strength, the top-left graph in Figure 3

[21]We spatially weighted the election results and census data using GIS county border shape files to account for changes in county borders over time. We split counties into non-overlapping polygons and then recomputed covariates on the basis of 1953 county borders using area-weighted averages. We can confirm the appropriateness of this weighting scheme by comparing the spatially weighted county population data from the August 1950 census to the same data adjusted for county border changes between 1950 and 1958 by the East German statistical office. The statistical office used municipality-level population figures (these data do no longer exist according to the Statistisches Bundesamt) and information on changes in municipalities' assignments to counties to correct for county border changes between 1950 and 1958. Since county borders were almost entirely constant between 1953 and 1958, this allows us to compare the spatially weighted August 1950 county population data to the truth, as computed by the East German statistical office. We find a correlation of $r = 0.97$. See also Figure A3 in the online appendix for a scatterplot of spatially weighted August 1950 population data and recomputed August 1950 population data.

[22]Following Adena et al. (2015), we implemented the following placebo test to check whether our main identifying assumption is plausible. We regressed RIAS signal strength on all covariates listed in Table 1 including a third-degree polynomial in distance to East Berlin as well as district fixed effects but omitting the covariates pertaining to the 1946 state elections. We then took the residuals from this regression and regressed them on the five covariates for the 1946 state elections: % turnout, % invalid votes, % SED vote share, % LDP vote share, and % CDU vote share. Missing data for the 1946 elections were multiply imputed; standard errors and statistical tests have been adjusted to account for multiple imputation as described in Little and Rubin 2002: 85–89 and Schafer 1997: 115–116. If RIAS signal strength is idiosyncratic conditional on covariates, we would expect the absence of a systematic relationship between residualized signal strength and 1946 election results. This is indeed what we find. The 1946 state election results neither individually nor jointly (Wald test p-value ≈ 0.857) predict residualized signal strength, indicating the lack of a systematic relationship between 1946 state election results and RIAS signal strength conditional on the other covariates. All Wald tests presented in the paper use a covariance matrix clustered at the county level.

plots the estimated probability of protest as a function of RIAS signal strength.[23] As one can see, the estimated effect is small. Moreover, the shape of the relationship between RIAS signal strength and the estimated probability of protest conflicts with our expectation of a (weakly) monotonically increasing probability of protest as RIAS signal strength increases. What we find instead is an inverted-U-shaped relationship. Increases in RIAS signal strength at first seem to increase the probability of protest, but once RIAS signal strength passes about 70 dBuV/m, further increases in signal strength seem to decrease the probability of protest.

Model (2) adds district fixed effects to the specification in model (1) to rule out the possibility of district-level confounding. We thus identify the effect of RIAS signal strength from variation in RIAS signal strength *within* districts. The results are largely unchanged. The p-value from the Wald test of joint significance of the RIAS signal strength polynomial terms is even larger ($p = 0.645$) and the top-right plot in Figure 3 shows that the estimated probability of protest now monotonically declines with increases in RIAS signal strength.

In the robustness section, we demonstrate that these results hold for a wide variety of additional tests and specifications. For now, we note that the results are inconsistent with the hypothesis of media-driven protest diffusion.

A. *Relational diffusion as an alternative explanation for the rapid spread of protest in June 1953*

If RIAS broadcasts cannot explain the spread of protest during the uprising, is there an alternative explanation that is supported by the available evidence?

Previous studies have illustrated how collective action can diffuse through interpersonal communication and social linkages between actors (Diani and McAdam 2003; Hedström 1994; Hedström, Sandell, and Stern 2000; Givan, Roberts, and Soule 2010; Kim and Pfaff 2012; Pierskalla and Hollenbach 2013; Enikolopov, Makarin, and Petrova 2016). In authoritarian regimes, political repression is often ubiquitous and parties, interest groups, and social movement organizations are usually banned or co-opted by the state. Filling the

[23] We use the observed values approach throughout (Hanmer and Kalkan 2013).

organizational void are loosely-structured groups which form around family and friendship circles and everyday social relations in neighborhoods, schools, and workplaces (Denouex 1993; Gould 1995; Mische 2008; Osa 2003; Pfaff 1996; McAdam 1986). Ordinarily, these groups are not politically motivated, but during periods of unrest they can form enclaves of individuals who commit to cooperation and without whom the critical mass of first movers cannot take shape (Centola 2013; Siegel 2009).

The advantage of these tight-knit structures lies in their capacity for interpersonal mobilization. If enclaves can be activated, participation levels will be high since all members are subject to intense social influence as well as monitoring by their fellow members. However, these structures may be less advantageous for diffusion. In an authoritarian context, the conditions for extensive collective action are typically poor and the resources and relations that favor extra-local diffusion are dominated by the regime and its supporters (Watts and Dodds 1997). Social relations are organized as tightly clustered networks in which all actors know each other but possess few ties to outsiders. Diffusion relies on such weak ties and may be highly constrained without the activities of bridging actors that link dispersed enclaves. Hence, the enclave social structure produces a spatial pattern in which there is significant participation in some localities but no participation in others (Siegel 2009: 134–6).

Case studies of both rural areas and industrial towns show that mobilization during the East German uprising occurred through local social relations. In factories and industrial towns, mobilization was initiated by outspoken workers and neighbors known for their oppositional stance or history of labor activism (Diedrich 1991). For the old industrial heartlands of Saxony and Thuringia, historians have documented protest born of local solidarity forged in working-class neighborhoods, in work brigades, and on factory floors (Herz 2003; Roth 1999).

Based on relational diffusion, we would expect that in order for protest to diffuse widely, social ties must link local enclaves at the periphery of an expanding protest movement to the initiators of the protest. As East Germany was a small and densely populated country—

18.2 million people shared a land area slightly smaller than the U.S. state of Tennessee ($\approx 108,000$ km^2)—the diffusion of protest across East Germany on June 17 could have been driven by extra-local ties to those with direct experience of what had happened in East Berlin on June 16. The historical record provides evidence that supports such an interpretation in the frequent reports of workers observing strikes in East Berlin on June 16 and returning to their hometowns to organize strikes the following day. For example, a report by the police superintendent for the southern Dresden district filed after the uprising states that on the morning of June 17, 2,000 workers organized a strike in the industrial district of Niedersedlitz. The striking workers had learned about the protests in East Berlin because some of them had visited the capital the day before (Diedrich and Hertle 2003: 132). The report likewise detailed how in the southeastern industrial town of Niesky, a worker who had returned from East Berlin incited fellow workers to strike when he told them that protests were taking place in the capital and urged them to join the uprising (Diedrich and Hertle 2003: 135).[24]

It is instructive to consider where protest did *not* occur. Discontented citizens in some rural areas could not overcome their relative isolation caused by patterns of dispersed settlement and few ties to outsiders (Wittkowski 2006: 252). In areas characterized by large farms and estates, Wittkowski (2006: 264) notes that "the topography worked against mass organization. With villages strewn throughout Mecklenburg, for instance, it was difficult to organize a public demonstration." In these thinly-settled areas would-be protesters had difficulty overcoming the relative social isolation and homogeneity that obstructs relational diffusion. By contrast, those rural communities that were the most prone to join the uprising were those in closer proximity to urban areas which facilitated linkages between

[24]There is also some evidence that relational diffusion occurred through modern communications technologies. Baring (1957: 51) reports that the proprietary telephone network maintained by the *Deutsche Reichsbahn*, which connected all East German train stations, and telex machines installed throughout the East German bureaucracy were used by employees to alert coworkers of the events in East Berlin. We can only surmise that private telephone connections must have been used for the same purpose, to alert family members, friends, and colleagues to the events of June 16. In 1953, there existed about 408,000 telephone connections in East Germany. How many of these were installed in private homes is unknown, but the vast majority of the about 6.7 million households in East Germany clearly did not have telephones. In addition, there were about 17,000 public phone booths (Statistisches Jahrbuch 1958: 29, 478.) Unfortunately, according to the Statistisches Bundesamt disaggregated data on telephone density do not exist.

peasants and mobilized workers, a pattern observed in the more densely populated regions of the south and southwest (Herz 2003; Roth 1999).

Since the density of social ties generally increases with geographic proximity (see Rivera, Soderstrom, and Uzzi 2010 for a review of the literature), the pattern of relational diffusion may be spatially constrained, with adjoining communities more likely to be reached than more distant communities. This was particularly true in East Germany, where social ties tended to be highly concentrated spatially because the structure of social relations was that of a niche society (*Nischengesellschaft*)—a series of local networks characterized by an abundance of strong ties and few longer-distance bridging ties (Völker and Flap 2001). This means that, despite high population density, protest diffusion in the GDR tended to be inefficient and characterized by many unbridged structural holes (Burt 2005). Lacking the ties which link a local critical mass of opponents to distant actors, protest would have been less likely to spread from initiators to individuals in spatially distant locales. As protest radiated outward from East Berlin, the sparseness of longer-distance ties would have slowed down the diffusion of the uprising, which implies that protests should have been more likely in municipalities closer to East Berlin. For more distant municipalities, the pace of relational diffusion may have been too slow given the short window of opportunity before the declaration of martial law. We thus propose that if social relations were responsible for the spread of protest, geographic distance from East Berlin—the inception point of the uprising—can be taken as a proxy for the likelihood of relational diffusion of collective action.

Relational diffusion hypothesis: *Ceteris paribus, the greater the geographic distance of a municipality from East Berlin, the lower the odds that protest occurred in that municipality.*

If relational diffusion played a role in the uprising, municipalities closest to East Berlin should have had a higher probability of experiencing protest than municipalities far away from East Berlin. For the municipalities in our dataset, Euclidean distance to East Berlin ranges from less than 10 km (Ahrensfelde in the Frankfurt district) to more than 320 km

(Frankenheim in the Suhl district), with the average distance close to 170 km. It seems plausible that the residents of Ahrensfelde had a much better chance of learning about the protests in East Berlin on June 16 from family members, friends, acquaintances, or coworkers than the residents of Frankenheim, even conditional on the covariates we have included so far.[25]

We test this possibility by adding a cubic polynomial of distance to East Berlin to our specifications. Model (3) in Table 2 reports results from a probit model with the full set of covariates but without district fixed effects while model (4) additionally contains district fixed effects. We find that even when controlling for Euclidean distance to East Berlin, there is no support for the hypothesis that RIAS broadcasts increased the probability of protest. In both models, the RIAS signal strength cubic polynomials are far from statistically significant ($p = 0.367$ without district fixed effects; $p = 0.297$ with district fixed effects). Plots showing the relationship between RIAS signal strength and the estimated probability of protest based on models (3) and (4) are included in the online appendix as Figure A4. As in the top-right plot of Figure 3, increases in RIAS signal strength lead to a monotonic decrease in the estimated probability of protest.

While we fail to find a statistically or substantively significant impact of RIAS signal strength on the probability of protest, models (3) and (4) in Table 2 provide evidence consistent with relational diffusion. Conditional on covariates and RIAS signal strength, municipalities close to East Berlin were much more likely to experience a protest event than municipalities farther away. Without district fixed effects (model (3)), the Wald test of the significance of the distance to East Berlin cubic polynomial decisively rejects the null hypothesis that distance to East Berlin does not improve model fit ($p = 0.000$). Model (4) in Table 2 additionally includes district fixed effects, so that the impact of Euclidean distance to East Berlin is estimated using within-district variation only. We continue to find strong evidence of a relationship between Euclidean distance to East Berlin and the

[25]Distance to East Berlin is negatively correlated with RIAS signal strength ($r \approx -0.41$). The correlation is relatively small in absolute value because of the presence of a RIAS transmitter in Hof (Bavaria) and because signal strength is also affected by topography. Multicollinearity is therefore not a concern.

probability of protest ($p = 0.004$). The two plots at the bottom of Figure 3 show how the estimated probability of protest varies with Euclidean distance to East Berlin. In both plots, it is clear that municipalities closer to East Berlin are much more likely to experience protest even after controlling for covariates, RIAS signal strength, and district fixed effects.

It is conceivable that the effect of RIAS depends on the presence or absence of social ties. Perhaps protest requires both access to the information conveyed through RIAS and effective social recruitment afforded by close proximity to East Berlin. Alternatively, RIAS broadcasts might only be needed to mobilize protest in the absence of social recruitment, i.e., in municipalities distant from East Berlin. We therefore also tested whether RIAS signal strength and distance to East Berlin interact. We found no evidence of such an interaction effect (Wald test p-value ≈ 0.724).

Our results clearly show that RIAS, in stark contrast to what contemporary observers on both sides of the Iron Curtain as well as later historians believed, did not play an important role in the diffusion of the uprising. Whereas the evidence in favor of relational diffusion is not as definitive as that against media-driven protest diffusion, our empirical results together with the historical case studies of particular regions cited earlier suggest that the diffusion of protest during the uprising is better explained by social recruitment than by foreign media broadcasts.

B. Robustness checks and extensions

In this section we discuss the results of various robustness checks and extensions of our empirical analysis. We have relegated the relevant tables and graphs to the online appendix. Most of our robustness tests involve alternative ways of measuring our primary independent variable—the availability of Western radio broadcasts in a municipality—and specifying this variable's effect on the probability of protest.

Our main analysis relies on one electromagnetic signal propagation model, ITM, to calculate RIAS signal strength. Using a different model, TIREM, instead does not affect our findings. Table A3 in the online appendix shows results from three additional models. The first model displays estimates based on the specification of model (4) in Table 2 using

TIREM instead of ITM to calculate RIAS signal strength.[26] We find no evidence of a relationship between RIAS signal strength and the probability of protest.

RIAS used a mix of frequency bands to broadcast its program. In Germany, the very high frequency (VHF) band was not used for radio broadcasts until after the end of WWII (Hermann, Kahle, and Kniestedt 1994: 89–92). In West Germany, VHF adoption, which required updated radio receivers, was rapid. By the end of 1953, 50% of all *Nordwestdeutscher Runkfunk* (NWDR) listeners used VHF (Nordwestdeutscher Rundfunk n.d.).[27] However, since adoption of the VHF band for radio broadcasting proceeded more slowly in East Germany (Hermann, Kahle, and Kniestedt 1994: 184–186; Walther 1961: 108), the proportion of East Germans who owned radio receivers equipped to receive VHF broadcasts was probably smaller. As a robustness check, we thus calculate RIAS signal strength excluding the VHF RIAS transmitter.[28] Columns 2 and 3 in Table A3 show results for specifications that either use ITM or TIREM to calculate RIAS signal strength while omitting the VHF transmitter. We continue to find no evidence for a relationship between RIAS signal strength and the probability of protest.

One may argue that the RIAS signal strength measures produced by ITM or TIREM overestimate actual signal strength in some municipalities because the East German regime attempted to use jamming transmitters to prevent the reception of Western broadcasts. In 1950, it began to install jamming transmitters that transmitted East German radio programs or wobbling noise on or near RIAS frequencies, thus jamming short- and medium wave RIAS broadcasts in the close vicinity of the jamming transmitters (Kundler 1994; Behnke et al. 1997: 247–256). The available evidence indicates that jamming was still fairly limited in June 1953. The East German regime began to massively invest in jamming only *after* the uprising in the (mistaken) belief that RIAS had been a key factor in the uprising (Fricke 2005; Riller 2004: 120).

[26]Figure A5 in the online appendix shows a map of RIAS signal strength from the TIREM model.

[27]NWDR was the public radio station in the former British occupation zone in the Northern part of West Germany.

[28]Maps of RIAS signal strength from ITM and TIREM models excluding the VHF transmitter are shown as Figures A6 and A7 in the online appendix.

After German reunification, RIAS thoroughly searched East German archives and talked to eyewitnesses of and former regime personnel involved in jamming activities to estimate the extent of East German jamming.[29] Based on this evidence, we know the location of 18 of the more powerful jamming transmitters, although it is unclear how many of them were already operational in June 1953. Nonetheless, as a robustness check on our findings, we set RIAS signal strength to its sample minimum for all municipalities within 10, 12, or 15 km of any of these jamming transmitters and re-estimated model (4) in Table 2.[30] The results are shown in Table A4 in the online appendix. Accounting for jamming in this way does not change our results.

While much more popular than other Western radio stations, RIAS was not the only foreign station East Germans could listen to (Merritt and Meritt 1980). The second most popular radio station was NWDR, although it too was only available in parts of East Germany.[31] As a robustness check, we use ITM to model the combined RIAS and NWDR signal strength across East Germany, to measure East Germans' access to at least one of the two most popular foreign radio stations. Results from estimating specification (4) in Table 2 are shown in Table A5 in the online appendix.[32] There is no evidence that RIAS

[29]The surviving archival evidence is quite limited. When East Germany ceased the jamming of Western radio broadcasts in the wake of détente in 1978 most documents were destroyed. In 2014, we searched the archives of the Federal Commissioner for the Stasi Records but found only a single, uninformative document related to East German jamming. The unpublished summary report of the RIAS findings is held by Deutsches Rundfunkarchiv (German Broadcasting Archive), F504-00-00/0010 ("Störungen der RIAS-Aussendungen durch Störsender der DDR", no author, 5. 2. 1991).

[30]Jamming transmitters were very low powered, typically transmitting with an ERP of up to 2 KW, so that their effective range was quite limited (Lutz 2005: 28; Behnke et al. 1997: 247–256). Since we lack details on the antennas used, we cannot directly incorporate them into our signal propagation models. When assuming a 10 km range, RIAS signal strength for 114 municipalities is set to the sample minimum. The number of affected municipalities increases to 168 for a 12 km range and to 264 municipalities for a 15 km range.

[31]Other radio stations, NWDR included, did not cover the events of June 15–16 to the same extent as RIAS. RIAS and NWDR were the only Western radio stations that had studios in West Berlin, which provided them with much better access to timely and accurate information about the developments in East Berlin and East Germany. West German news agencies did not carry the first reports about strikes in East Berlin because the information was not deemed credible. Initially, many Western observers believed the strikes and demonstrations to be staged by the East German regime itself (RIAS 1953: 1–3; Baring 1957: 60–61).

[32]NWDR transmitters are listed in Table A2 in the online appendix. Maps of RIAS/NWDR signal strength are shown as Figures A8 and A9 in the online appendix.

and NWDR facilitated the diffusion of protest during the uprising.

For the reasons given earlier, we prefer to use a continuous measure of RIAS signal strength. However, Figure A10 in the online appendix shows results from specifications that use a binary indicator for RIAS availability, using thresholds for RIAS availability that cover the observed range of RIAS signal strength. No matter which threshold we choose to distinguish between municipalities with and without access to RIAS, RIAS impact estimates are always small, mostly negative, and almost always statistically insignificant.

It is possible that cubic polynomials might not be flexible enough to accurately capture the relationship between RIAS signal strength and the probability of protest. Thus, we relax the functional form assumption by considering estimates from a nonparametric estimator. Figure A11 in the online appendix shows the results from a Random Forest fit using the same predictor variables as model (4) in Table 2. Even allowing for a fully flexible relationship between RIAS signal strength and the probability of protest, we still find no evidence supportive of the hypothesis that RIAS broadcasts increased the probability of protest.

So far, we have used 1932 election returns to control for pre-existing political preferences. Table A6 in the online appendix demonstrates that controlling for 1946 election returns instead does not affect our findings.

Our results are also not driven by the smallest municipalities in our sample, in which protest might be particularly dependent on social ties to outsiders. Table A7 in the online appendix shows that results remain the same when we restrict the sample to municipalities of size class 5 and above (left column, 1500 or more residents) or size class 6 and above (right column, 2000 or more residents).

We also assess the sensitivity of our results to our choice to measure the social connectedness of a municipality to East Berlin using Euclidean distance. Euclidean distance has been criticized for being a poor measure of connectedness (Deutsch and Isard 1961; Beck, Gleditsch, and Beardsley 2006). In the context of our case, too, Euclidean distance captures the strength of social ties connecting East Berlin to other parts of East Germany only imperfectly. In order to better capture the extent to which municipalities were connected to East Berlin we use an alternate measure, train distance.[33] Since private car ownership was very unusual in 1953, long-distance travel was typically done by train. Table A8 in the online appendix shows the results from two models with and without district fixed effects, and Figure A12, also in the online appendix, plots the effect of train distance on the probability of protest. In both models train distance strongly predicts the probability of protest, with the estimated probability of protest declining with increasing train distance.

Finally, it is possible that social ties to municipalities other than East Berlin could also have propelled the diffusion of protest. Such "second-order" relational diffusion would have consisted of the events in East Berlin on June 16 inspiring protests in other localities the following day, which then in turn inspired protests in proximate localities. This type of relational diffusion would have lead to a spatially concentrated pattern of protest in that we should see clusters of localities in which protests occurred as well as clusters of localities in which protests did not occur. We test this hypothesis of second-order relational diffusion by estimating a series of Bayesian spatial autoregressive probit models similar to model 4 in Table 2. The spatial weights matrix codes as neighbors of a given municipality its 5, 10, or 20 nearest neighboring municipalities. Alternatively, all municipalities within less than 20 km of a given municipality are coded as neighbors. The latter approach allows municipalities in more densely settled regions to have more neighbors than municipalities in more sparsely settled regions. Results are shown in Table A9 in the online appendix. In none of the four models is the estimated spatial dependence parameter substantively large or significantly different from zero, indicating the absence of second-order relational diffusion.

[33]We constructed the train distance variable by taking the shortest track length between the Berlin Ostbahnhof train station and the other 170 hub train stations that existed in East Germany in 1953 (Deutsche Reichsbahn 1953). For each municipality in our dataset, we then computed the Euclidean distance to the closest hub train station, which we multiplied by a factor of two to account for slower modes of travel such as bus or tram. Finally, we added this Euclidean distance to the track length between the hub train station and the Berlin Ostbahnhof station. We fully admit that this train distance variable represents a somewhat crude measure of connectedness. However, we believe that it improves upon pure Euclidean distance since it is tied to the then dominant mode of long-distance travel. It would be even better to use data on train passenger flows, but, unfortunately, such data do not seem to be available.

A somewhat different approach to second-order relational diffusion is to control for Euclidean distance from each municipality to the nearest county capital to proxy for mobilization through social ties connecting urban centers to more isolated, rural municipalities (Herz 2003; Roth 1999). Table A10 in the online appendix shows the results. While county capitals are much more likely to experience protests, Euclidean distance to the nearest county capital has no effect.

VI. Conclusion and implications

We have argued that the June 17, 1953 uprising in East Germany is a most-likely case of media-driven diffusion of collective action in an authoritarian regime. In-depth analyses of crucial, most-likely cases such as this one are powerful tools for theory testing. Such analyses assume added importance if they can help overcome the potential biases of established interpretations and prevailing research programs, such as that associated with the expanding literature on media-driven collective action (Gerring 2007; George and Bennett 2005; Ioannidis 2005).

Besides its historical importance, the value of the case we study lies in the excellent conditions for testing hypotheses it provides. Fortuitously for us, RIAS signal strength was determined at the local level not by a municipality's social or political attributes but by the location and technical characteristics of RIAS broadcast transmitters and natural topography. Natural experiments such as this one promise to solve endogeneity problems by inducing haphazard variation in the causal factor of interest in a manner that is "as good as random," at least conditional on observables (Dunning 2012). The fact that RIAS signal strength varied haphazardly across East Germany allows us to identify the impact of RIAS on the likelihood of protest. The case we study has the additional benefit of providing us with extensive covariates and reliable protest data. Combined, these factors make the East German uprising uniquely suited for testing the theory of media-driven protest diffusion in authoritarian regimes.

Our paper adds to the existing literature in a number of ways. First, we contribute to the very limited empirical work on the relationship between mass media and collective action in authoritarian regimes. Second, we empirically test the media-driven diffusion hypothesis in a historically important case, overturning the conventional wisdom that RIAS broadcasts were responsible for the spread of the East German uprising. Third, we make an important methodological advance by calculating radio signal strength based on electromagnetic signal propagation models. Some studies have avoided examining the mobilizing effects of radio or television broadcasts because of the challenges involved in determining radio and television signal availability (e.g., Andrews and Biggs 2006: 763).

Our empirical results show that the diffusion of protest during the East German uprising cannot be explained by foreign radio broadcasts. RIAS, in stark contrast to what contemporary observers on both sides of the Iron Curtain as well as later historians believed, does not appear to have played a substantial role during the uprising. Our study thus complements other research that casts doubt on the ability of foreign broadcasts to trigger rebellion. Foreign radio broadcasts did not ignite mass opposition or desertion in Nazi-controlled Europe even as the Third Reich was collapsing (Kershaw 2011). Similarly, West German television broadcasts cannot explain the mass movement that drove the 1989 East German revolution (Crabtree, Darmofal, and Kern 2015). Western television reception may have done more to stabilize the East German regime than to unseat it (Kern and Hainmueller 2009). At the same time, our findings support the view that social ties are important for the diffusion of collective action. Our results are thus consistent with previous work showing that information alone is insufficient to generate collective action, in particular when risks are high and success is highly uncertain. Under such circumstances, recruitment tends to occur through social networks in which information is exchanged and social influence is exerted (Diani and McAdam 2003; Kim and Pfaff 2012; Watts and Dodds 2007). Finally, our findings are also consistent with recent work on the effects of cellphones and social media on collective action. Since these horizontal communication technologies facilitate interpersonal communication, they can be conducive to the relational diffusion of collective action (Pierskalla and Hollenbach 2013; Warren 2015; Enikolopov, Makarin, and Petrova 2016).

Our study also has implications for government information policy. The idea that foreign radio and television broadcasts can empower opposition to authoritarian rule influenced policy during the Cold War, leading to the creation of radio stations such as *Voice of America*, *Radio Liberty/Radio Free Europe,* and the BBC's *World Service,* all of which broadcast into the Soviet bloc as part of a concerted propaganda effort (Johnson and Parta 2010). In a similar vein, the United States and other Western governments continue to fund international media broadcasts with the goal of promoting pro-Western values and encouraging peaceful change in authoritarian regimes. Examples include *Radio Sawa* and *Alhurra TV,* American radio and television stations broadcasting Arabic-language programming to the Middle East and North Africa. Our findings call for skepticism toward such policies. The history of post-war Eastern Europe suggests that, in spite of decades of broadcasting into the Soviet bloc by Cold War information services, protest was uncommon and driven principally by domestic crises (Ekiert 1996). Future research should do more to better understand the dynamics of spontaneous, large-scale protest in authoritarian regimes and isolate the role of social networks in these processes.

VII. References

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VIII. Tables and Figures

Table 1: Covariates and data sources

covariate	mean	sd	min	max	source
size class 4 (1k–1.5k)	0.370				Krupkat 1958
size class 5 (1.5k–2k)	0.158				Krupkat 1958
size class 6 (2k–3k)	0.163				Krupkat 1958
size class 7 (3k–5k)	0.132				Krupkat 1958
size class 8 (5k–10k)	0.094				Krupkat 1958
size class 9 (10k–20k)	0.045				Krupkat 1958
size class 10 (20k–50k)	0.029				Krupkat 1958
size class 11 (50k–100k)	0.005				Krupkat 1958
size class 12 (100k+)	0.003				Krupkat 1958
county capital	0.077				Krupkat 1958
distance to East Berlin (km)	169.195	64.260	9.701	322.866	ArcGIS
KVP base	0.014				Diedrich and Wenzke 2003: 58
% turnout 1946 elections†	0.919	0.017	0.843	0.956	Braun 1993
% invalid votes 1946 elections†	0.060	0.018	0.016	0.156	Braun 1993
% SED 1946 elections†	0.476	0.060	0.280	0.647	Braun 1993
% LDP 1946 elections†	0.219	0.088	0.035	0.562	Braun 1993
% CDU 1946 elections†	0.264	0.079	0.117	0.631	Braun 1993
% turnout 1932 elections	0.819	0.037	0.729	0.909	Falter and Hänisch 1990
% invalid votes 1932 elections	0.008	0.002	0.004	0.016	Falter and Hänisch 1990
% NSDAP 1932 elections	0.318	0.054	0.110	0.451	Falter and Hänisch 1990
% SPD 1932 elections	0.205	0.060	0.055	0.384	Falter and Hänisch 1990
% KPD 1932 elections	0.140	0.049	0.037	0.324	Falter and Hänisch 1990
% Zentrum 1932 elections	0.016	0.045	0.002	0.505	Falter and Hänisch 1990
% DNVP 1932 elections	0.091	0.043	0.022	0.227	Falter and Hänisch 1990
% DVP 1932 elections	0.015	0.010	0.004	0.070	Falter and Hänisch 1990
% agriculture and forestry	0.256	0.149	0.005	0.618	August 1950 census
% mining	0.062	0.100	0.003	0.895	August 1950 census
% metalworking industry	0.063	0.047	0.003	0.327	August 1950 census
% chemical industry	0.012	0.030	0.000	0.295	August 1950 census
% woods and plastics	0.045	0.044	0.008	0.307	August 1950 census
% consumer goods	0.090	0.071	0.013	0.350	August 1950 census
% construction	0.045	0.012	0.013	0.094	August 1950 census
% transportation	0.050	0.020	0.013	0.138	August 1950 census
% commerce	0.047	0.018	0.011	0.123	August 1950 census
% services	0.099	0.032	0.011	0.304	August 1950 census
% unemployed	0.231	0.036	0.028	0.336	August 1950 census
population size	79345.257	61886.915	5891.673	617574.000	August 1950 census
% population male	0.448	0.021	0.416	0.585	August 1950 census
population density	294.854	502.497	41.285	3960.446	August 1950 census
% population change 1939–50	0.237	0.204	−0.281	0.876	August 1950 census
% population in same *Land* as in 1939	0.694	0.099	0.456	0.940	August 1950 census
% 8 years of education	0.031	0.016	0.008	0.084	August 1950 census
% 10 years of education	0.827	0.061	0.302	0.885	August 1950 census
% 12 years of education	0.047	0.016	0.020	0.128	August 1950 census
% more than 12 years of education	0.018	0.008	0.009	0.082	August 1950 census
% trade school degree	0.044	0.016	0.021	0.108	August 1950 census
% university degree	0.005	0.002	0.002	0.023	August 1950 census
% protestant	0.826	0.068	0.154	0.921	August 1950 census
% catholic	0.114	0.066	0.044	0.840	August 1950 census
% agnostic	0.051	0.036	0.006	0.239	August 1950 census
living space per capita (m^2)	9.783	1.064	7.100	13.600	June 1950 census

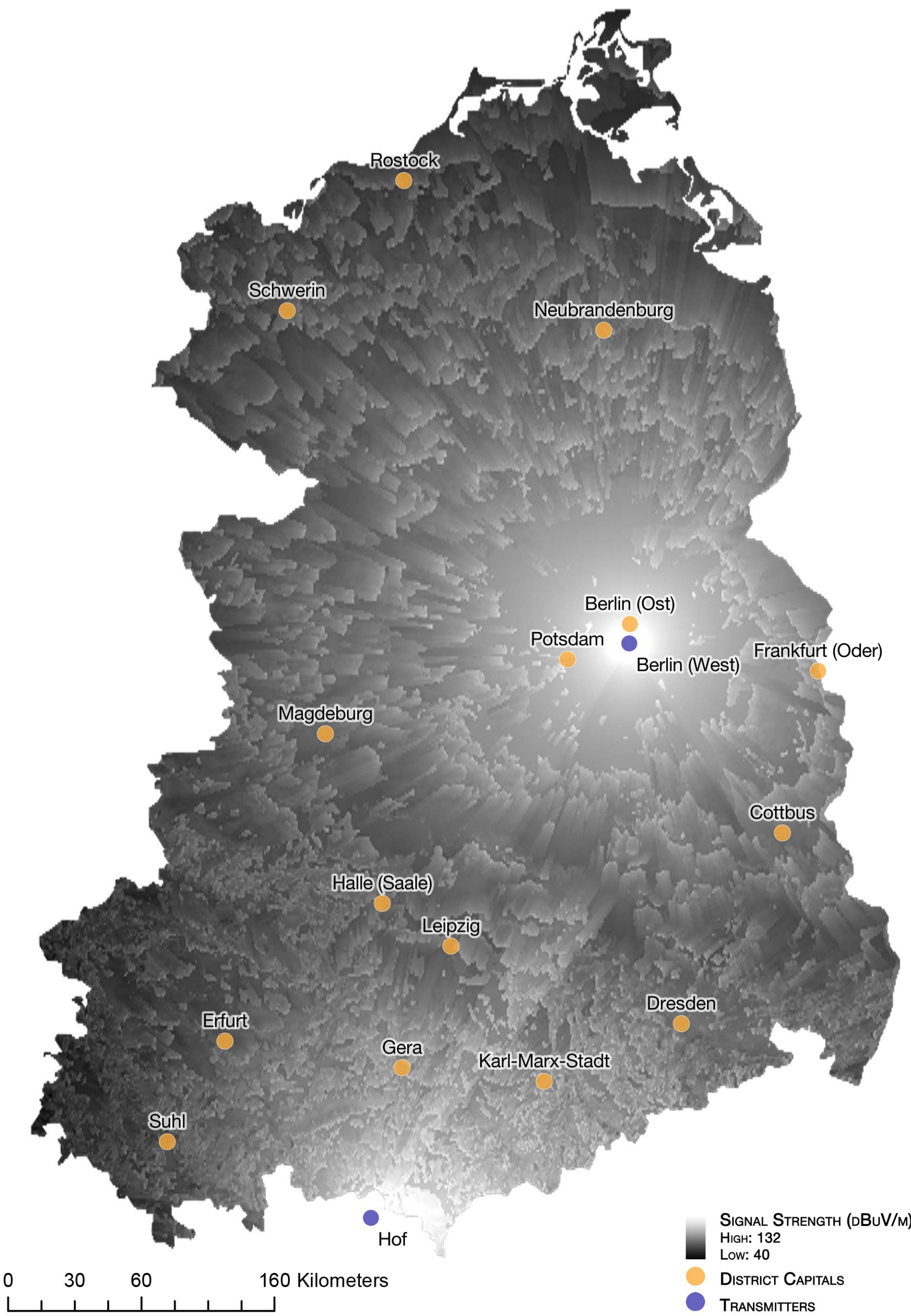
Note: The table displays covariate means, standard deviations, minima, and maxima. Standard deviations and ranges are omitted for binary covariates. August 1950 population census data are from Staatliche Zentralverwaltung für Statistik 1952, 1953. June 1950 housing census data are from Staatliches Zentralamt 1951. Election and census data are spatially weighted to account for county boundary changes over time. Covariates denoted with † have missing values; shown here are averages over five multiply imputed datasets.

Table 2: Main results

model	(1)		(2)		(3)		(4)	
	est.	se	est.	se	est.	se	est.	se
intercept	8.556	(22.944)	−2.049	(27.929)	9.109	(25.199)	6.245	(28.946)
county capital	0.798***	(0.158)	0.816***	(0.164)	0.800***	(0.160)	0.831***	(0.165)
KVP base	0.370	(0.414)	0.363	(0.431)	0.379	(0.413)	0.375	(0.424)
% agriculture and forestry	0.179	(2.025)	1.963	(1.945)	1.492	(1.875)	2.625	(1.886)
% mining	−1.833	(2.191)	0.364	(2.219)	−0.289	(2.134)	1.125	(2.163)
% metalworking industry	−1.500	(2.280)	1.258	(2.768)	1.109	(2.420)	1.880	(2.687)
% chemical industry	−0.020	(1.867)	2.090	(1.773)	1.662	(1.748)	2.587	(1.725)
% woods and plastics	−4.999*	(2.623)	−0.495	(2.854)	−2.576	(2.636)	−0.174	(2.796)
% consumer goods	−2.452	(2.290)	0.704	(2.419)	−0.764	(2.241)	1.212	(2.358)
% construction	−3.752	(5.898)	−4.288	(5.292)	−6.190	(6.052)	−6.234	(5.254)
% transportation	0.965	(4.169)	2.675	(4.776)	2.058	(4.014)	4.088	(4.591)
% commerce	−1.491	(9.848)	−3.975	(9.946)	−0.240	(8.139)	−3.065	(9.738)
% services	3.405	(4.877)	8.434	(5.502)	5.484	(4.731)	9.108*	(5.302)
log(population size)	−0.328**	(0.164)	−0.358**	(0.172)	−0.407**	(0.167)	−0.355**	(0.169)
% population male	3.279	(5.870)	4.844	(5.875)	5.282	(5.944)	5.745	(5.779)
population density	−0.001	(0.001)	0.000	(0.001)	−0.001	(0.001)	0.000	(0.001)
% population change 1939–50	−0.536	(0.811)	−0.856	(0.939)	−0.396	(0.782)	−0.878	(0.969)
% population in same *Land*	−1.676	(1.521)	−1.055	(1.900)	−0.111	(1.571)	−0.112	(1.849)
% 8 years of education	−10.926	(8.653)	−16.756**	(7.758)	−6.968	(7.490)	−12.242	(7.923)
% 10 years of education	−1.548**	(0.665)	−1.429**	(0.689)	−1.703***	(0.648)	−1.331*	(0.702)
% 12 years of education	−14.050	(15.557)	−0.644	(14.320)	−11.695	(14.910)	−3.150	(14.184)
% more than 12 years of education	−39.797	(65.175)	−83.174	(62.480)	10.928	(63.327)	−63.019	(62.218)
% trade school degree	4.140	(8.370)	1.082	(10.011)	−10.755	(9.080)	−1.936	(9.864)
% university degree	179.594	(179.271)	185.244	(163.493)	106.005	(172.498)	164.548	(160.448)
% protestant	−14.168	(20.068)	4.720	(24.035)	−4.505	(21.461)	0.939	(24.702)
% catholic	−14.087	(20.503)	1.915	(24.229)	−6.436	(21.824)	−3.153	(24.797)
% agnostic	−13.215	(19.709)	9.264	(24.414)	−4.714	(21.332)	4.395	(25.195)
living space per capita (m^2)	0.084	(0.112)	−0.081	(0.155)	0.055	(0.113)	−0.079	(0.149)
% turnout '32	6.438	(4.353)	9.414*	(5.500)	11.882***	(4.173)	11.490**	(5.486)
% invalid votes '32	31.190	(28.758)	46.210	(34.866)	57.003*	(32.010)	61.572*	(37.117)
% NSDAP '32	−7.397**	(3.242)	−9.618**	(4.043)	−10.404***	(2.971)	−10.447***	(3.990)
% SPD '32	−3.647	(3.202)	−9.328**	(4.570)	−9.612***	(3.092)	−11.555**	(4.679)
% KPD '32	−0.380	(3.246)	−4.543	(4.153)	−5.262*	(3.120)	−6.560	(4.305)
% Zentrum '32	−5.073	(3.513)	−4.286	(4.322)	−7.661**	(3.218)	−4.788	(4.360)
% DNVP '32	−8.367**	(3.399)	−12.200**	(5.210)	−15.217***	(3.617)	−15.290***	(5.416)
% DVP '32	−4.531	(12.917)	−4.795	(14.413)	−6.759	(13.932)	−4.460	(14.744)
RIAS signal strength	0.276	(0.396)	−0.029	(0.418)	−0.169	(0.421)	−0.248	(0.441)
RIAS signal strength^2	−0.003	(0.005)	0.000	(0.006)	0.002	(0.006)	0.003	(0.006)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)					−0.930	(0.974)	−1.703	(1.421)
distance to East Berlin^2 (100 km)					0.532	(0.681)	1.130	(0.888)
distance to East Berlin^3 (100 km)					−0.163	(0.143)	−0.282	(0.174)
Wald test RIAS *p*-value	0.428		0.645		0.367		0.297	
Wald test distance *p*-value					0.000		0.004	
district fixed effects	No		Yes		No		Yes	

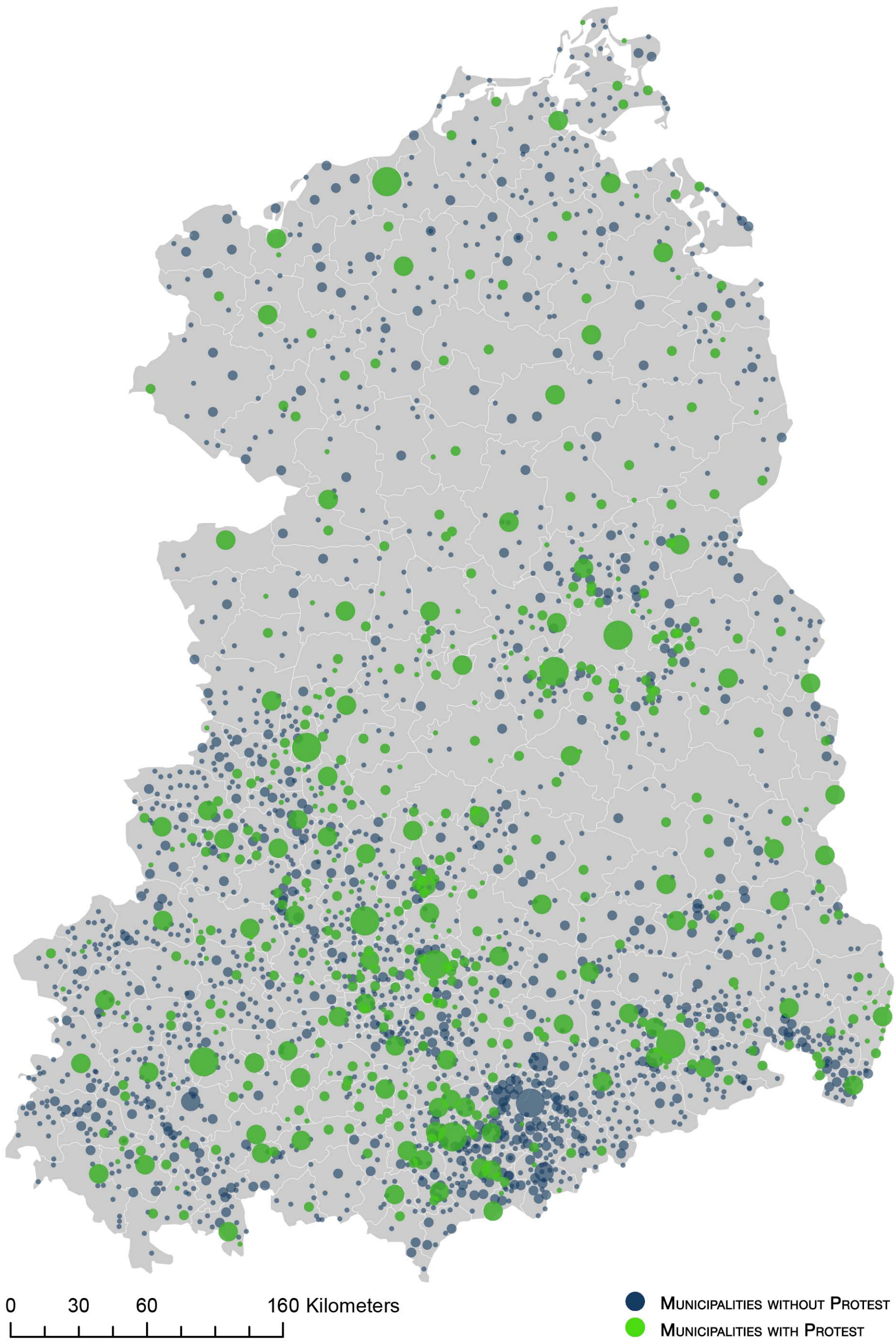
Note: $N = 2584$. The table displays probit coefficients and standard errors (clustered at the county level) from four probit models. Municipality size class and district fixed effects (when applicable) are not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms.
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Figure 1: RIAS signal strength



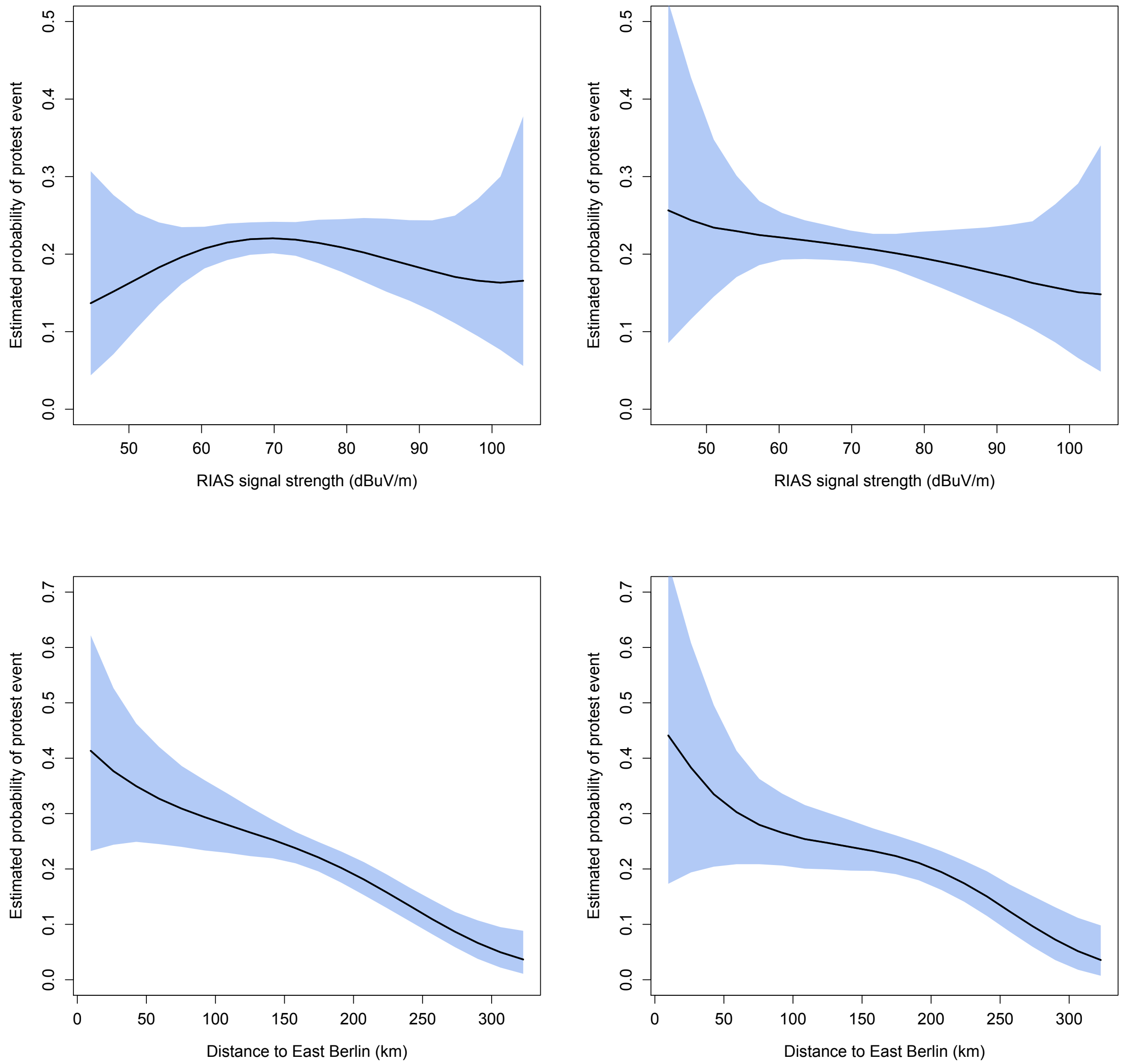
Note: The map shows variation in RIAS signal strength across East Germany based on the ITM electromagnetic signal propagation model with all four RIAS transmitters included. Blue symbols mark the RIAS transmitters in West Berlin and Hof (Bavaria). Orange dots mark East German district capitals.

Figure 2: Municipalities with and without protests during June 1953 uprising



Note: The map displays all East German municipalities with at least 1,000 residents. Municipalities that experienced protests are shown in green. The size of a municipality's plotted circle increases with population size. White borders denote counties.

Figure 3: Estimated probabilities based on models in Table 2



Note: The top two plots display the estimated probability of protest from models (1) and (2) in Table 2 as a function of RIAS signal strength. The bottom two plots display the estimated probability of protest from models (3) and (4) in Table 2 as a function of Euclidean distance to East Berlin. Pointwise 95% confidence intervals are shown in blue.

IX. Online Appendix

Not for publication

X. Radio signal propagation modeling

In what follows we describe both the software and the process used to create our signal strength measures based on the ITM and TIREM electromagnetic signal propagation models. Predictions from these models have been repeatedly validated with on-the-ground signal strength measures (Eppink and Kuebler 1994; Lazaridis et al. 2013; Longley and Rice 1968; Seybold 2005). Due to the high accuracy of these models, they are commonly employed to calculate radio signal strength for commercial and defense applications.

We used ArcGIS Desktop 9.3 in conjunction with the Communication System Planning Tool (CSPT) extension for ArcGIS, created by the Institute for Telecommunication Sciences at the U.S. Department of Commerce for the U.S. Department of Defense. CSPT provides a set of functions for calculating the spatial propagation of electromagnetic signals based on terrain data in conjunction with information about the characteristics of broadcast transmitters and radio receivers. Similar commercial software is used by mobile phone providers, for example, to create coverage maps of their services.

Broadcast transmitter data are shown in Table A2 of this online appendix, which lists the power and frequency of all RIAS broadcast transmitters in operation during June 1953. Data on transmitter latitude and longitude are from Google Earth, altitude and antenna height are from Wikipedia. We uniformly set the radio receiver height to 10 meters above ground, following common practice (DeBolt n.d.). In the robustness section, we also include *Nordwestdeutscher Rundfunk* (NWDR) transmitters. NWDR transmitter data are from Nordwestdeutscher Rundfunk (1956), which lists all transmitters operating in November 1955. To the extent that some of these transmitters were not yet operational in June 1953 we might thus slightly overstate NWDR signal strength.

Since RIAS and NWDR transmitters broadcast on different frequency bands (shortwave, medium wave, and VHF), we follow best practice and use two different radio propagation models to calculate signal strength. According to Nicholas DeMinco, an analyst with the National Telecommunications and Information Administration, this is the favored approach for modeling a mix of transmitters (personal communication, August 3, 2014). First, we use the Irregular Terrain Model (ITM), which is also known as the Longley-Rice model. Since its development in 1968, ITM has been regularly used to model the effect of topography on radio signal reception. It is still the model most commonly used by the FCC (DeBolt n.d.; Hufford, Longley, and Kissick 1982; Longley and Rice 1968; National Institute of Standards and Technology 2004: 36; National Telecommunications and Information Association n.d.; Seybold 2005: 143). In addition to accounting for transmitter characteristics and topography, ITM can also account for a number of site-specific factors such as climate zone type and ground conductivity (DeBolt n.d.; Longley and Rice 1968). We kept the majority of these variables at their default values (DeBolt n.d.) since they either do not affect coverage area predictions or do not apply to our specific model.

Second, we used the Terrain Integrated Rough Earth Model (TIREM). Developed in the 1960s, TIREM has become the standard model used by the Department of Defense to calculate radio signal loss (Powell 1983). Similar to ITM, TIREM calculates radio signal loss as a function of transmitter characteristics, distance, and topographic features (Eppink and Kuebler 1984; Powell 1983). Like ITM, TIREM can also account for a range of site-specific factors when calculating signal strength (Eppink and Kuebler 1984; Powell 1983). As above, we kept the majority of these variables at their default values, since they either do not affect coverage area predictions or do not apply to our specific model.

ITM and TIREM each have particular strengths in certain areas. ITM more accurately models ground wave transmissions (Hufford, Longley, and Kissick 1982) while TIREM more accurately models skywave transmissions (Powell 1983). Radio waves used in radio broadcasting can propagate in two ways. They can either propagate following the curvature of the Earth; this is called ground wave propagation. They can also reflect off charged particle layers in the ionosphere and return to Earth; this is called skywave propagation. Skywave propagation can occur over much greater distances than ground wave propagation. These differences are important because the RIAS and NWDR transmitters use various frequency bands. Depending on the frequency band chosen, transmitters use either ground wave propagation or skywave propagation or both. Two of the RIAS transmitters broadcast on medium wave, part of the medium frequency radio band most commonly used for AM radio broadcasting. The medium wave band ranges from about 500 kHz to 1600 kHz. Wavelengths in the medium wave band use both ground-wave and skywave propagation. A third RIAS transmitter broadcasts over shortwave, a band that ranges from about 3 MHz to 30 MHz. Wavelengths in this band primarily propagate through the sky. Finally, one of the RIAS transmitters uses the VHF band, which ranges from 30 MHz to 300 MHz. Wavelengths in this band propagate through ground wave only. In the paper, we present results based on ITM. In this online appendix, we also present results based on TIREM.

For all models and sets of transmitters, we used the "Single/Multiple Transmitter Coverages" function of CSPT to create coverage maps and signal strength measures. This function "run[s] propagation analyses on each transmitter individually and then combine[s] these individual coverages into a single composite coverage of all the transmitters in the scenario" (DeBolt n.d.: 60). This procedure generates a coverage map displaying available signal strength for 1 km $\times$ 1 km cells covering all of East Germany. The output of each model is measured in dBuV/m, or electric field strength relative to 1 microvolt per meter. This is the typical unit for measuring received signal strength from radio broadcasts (Seybold 2005).

Table A1: RIAS broadcasts during the East German uprising

date	time	broadcast contents
6/15	7:30 PM	strikes in East Berlin at three construction sites; protest resolution demanding the retraction of norm increase delivered to GDR government
6/15	10:00 PM	strikes in East Berlin at three construction sites; protest resolution demanding the retraction of norm increase delivered to GDR government (repeat)
6/16	12:00 AM	strikes in East Berlin at three construction sites; protest resolution demanding the retraction of norm increase delivered to GDR government (repeat)
6/16	6:30 AM	strikes in East Berlin at three construction sites; protest resolution demanding the retraction of norm increase delivered to GDR government (repeat)
6/16	7:30 AM	strikes in East Berlin at three construction sites; protest resolution demanding the retraction of norm increase delivered to GDR government (repeat)
6/16	1:30 PM	demonstration in East Berlin against norm increase; size currently unknown
6/16	4:30 PM	large-scale demonstrations in East Berlin, demands include retraction of norm increase, lower costs of living, the government's resignation, and free and fair elections
6/16	7:30 PM	broadcasts resolution by striking workers demanding retraction of norm increase, lower costs of living, free and fair elections, and that workers are not punished for participating in strikes if demands are not met by tomorrow East Berlin workers will go on strike
6/16	7:45 PM	detailed report on strikes and demonstrations in East Berlin, compares demonstrations to 1918 revolution; commentary by Eberhard Schuetz, RIAS program director
6/16	10:15 PM	detailed report on strikes and demonstrations in East Berlin, compares demonstrations to 1918 revolution; commentary by Eberhard Schuetz, RIAS program director (repeat)
6/16	10:40 PM	commentary by Jakob Kaiser, West German minister of all-German affairs; he cautions East Germans not to endanger themselves and to act in a prudent manner, stresses that fundamental change in East Germany can only occur through German unification
6/16	11:00 PM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers
6/17	12:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers (repeat)
6/17	12:10 AM	commentary by Eberhard Schuetz, RIAS program director (repeat)
6/17	1:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers (repeat)
6/17	1:10 AM	detailed report on strikes and demonstrations in East Berlin, compares demonstrations to 1918 revolution (repeat)
6/17	1:21 AM	eyewitness reports of previous day's demonstrations in East Berlin; stresses that police were powerless to stop the demonstrations
6/17	2:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers (repeat)
6/17	2:10 AM	commentary by Eberhard Schuetz, RIAS program director (repeat)
6/17	2:21 AM	eyewitness reports of previous day's demonstrations in East Berlin; stresses that police were powerless to stop the demonstrations (repeat)
6/17	3:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers (repeat)
6/17	4:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin; publishes statements of solidarity from West Germany, West Berlin, and East Berlin workers (repeat)
6/17	5:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin (repeat)
6/17	5:36 AM	commentary by Ernst Scharnowsky, West Berlin labor leader; calls on East Germans to support striking workers
6/17	6:00 AM	publishes calls for demonstration in East Berlin at 7 am; stresses that the protest movement is no longer confined to retraction of norm increase and to East Berlin (repeat)
6/17	6:40 AM	commentary by Ernst Scharnowsky, West Berlin labor leader; calls on East Germans to support striking workers (repeat)
6/17	7:20 AM	commentary by Ernst Scharnowsky, West Berlin labor leader; calls on East Germans to support striking workers (repeat)
6/17	9:48 AM	reports on demonstrations taking place in East Berlin
6/17	10:10 AM	eyewitness reports of demonstrations and clashes between protestors and police in East Berlin; Soviet armed vehicles disperse protestors
6/17	10:39 AM	reports on demonstrations taking place in East Berlin (repeat)
6/17	12:20 PM	eyewitness reports of demonstrations in East Berlin
6/17	12:30 PM	news report on events in East Germany
6/17	1:06 PM	warns listeners about taking action against Soviet forces
6/17	1:30 PM	warns listeners about taking action against Soviet forces; news report on events in East Germany
6/17	1:40 PM	eyewitness reports of demonstrations in East Berlin; announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces
6/17	1:45 PM	warns listeners about taking action against Soviet forces (repeat)
6/17	2:10 PM	announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces (repeat)
6/17	2:18 PM	appeal by West German parties and German trade union confederation to avoid provoking Soviet forces; stresses the need for free and fair elections and German reunification
6/17	2:30 PM	announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces (repeat)
6/17	2:31 PM	appeal by West German parties and German trade union confederation to avoid provoking Soviet forces; stresses the need for free and fair elections and German reunification (repeat)
6/17	2:41 PM	announces declaration of martial law in East Berlin; listeners about taking action against Soviet forces (repeat)
6/17	2:42 PM	appeal by West German parties and German trade union confederation to avoid provoking Soviet forces; stresses the need for free and fair elections and German reunification (repeat)
6/17	3:00 PM	news report on events in East Germany
6/17	3:08 PM	announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces (repeat)
6/17	3:09 PM	appeal by West German parties and German trade union confederation to avoid provoking Soviet forces; stresses the need for free and fair elections and German reunification (repeat)
6/17	4:02 PM	announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces (repeat)
6/17	4:03 PM	appeal by West German parties and German trade union confederation to avoid provoking Soviet forces; stresses the need for free and fair elections and German reunification (repeat)
6/17	4:30 PM	news report on events in East Germany
6/17	5:00 PM	announces declaration of martial law in East Berlin; warns listeners about taking action against Soviet forces (repeat)
6/17	6:00 PM	news report on events in East Germany
6/17	6:51 PM	summary of events within the previous 24 hours
6/17	7:30 PM	news report on events in East Germany
6/17	8:19 PM	live coverage of speech by Ernst Reuter, major of West Berlin
6/17	9:00 PM	news report on events in East Germany
6/17	9:30 PM	live coverage of rally of the German trade union confederation and the West Berlin Social Democratic Party
6/17	10:00 PM	news report on events in East Germany
6/17	10:36 PM	live coverage of debate in West Berlin House of Representatives
6/17	11:00 PM	news report on events in East Germany
6/17	11:15 PM	interviews with members of West German federal parliament

Source: RIAS (1953).

Table A2: Transmitter locations and characteristics

Station	Location	ERP (kW)	Frequency	Latitude	Longitude	Altitude (m)	Antenna height (m)	Band
RIAS	Berlin-Britz	20.0	6005 kHz	52.448200	13.431000	43	147.0	shortwave
RIAS	Berlin-Britz	300.0	989 kHz	52.448200	13.431000	43	147.0	medium wave
RIAS	Berlin-Britz	9.0	93.6 MHz	52.448200	13.431000	43	147.0	VHF
RIAS	Hof	40.0	737 kHz	50.319251	11.897351	532	100.0	medium wave
NWDR	Aachen-Stolberg	2.0	701 kHz	50.778808	6.243647	285	104.0	medium wave
NWDR	Bonn	5.0	1586 kHz	50.708033	7.096708	171	109.5	medium wave
NWDR	Braunschweig-Salzgitter	2.0	520 kHz	52.219650	10.465207	104	105.5	medium wave
NWDR	Flensburg	1.5	1570 kHz	54.791839	9.503394	59	103.0	medium wave
NWDR	Göttingen	5.0	971 kHz	51.570000	9.981944	353	100.0	medium wave
NWDR	Hamburg	100.0	971 kHz	53.519200	10.102808	1	198.5	medium wave
NWDR	Hannover	20.0	1586 kHz	52.327678	9.736758	54	106.5	medium wave
NWDR	Herford	2.0	701 kHz	52.145031	8.724678	224	105.0	medium wave
NWDR	Kiel	5.0	1586 kHz	54.332700	10.068000	26	106.5	medium wave
NWDR	Kleve	0.4	1586 kHz	51.786411	6.111144	99	54.0	medium wave
NWDR	Langenberg	100.0	971 kHz	51.356300	7.134100	242	180.0	medium wave
NWDR	Lingen	2.0	1570 kHz	52.535039	7.353167	29	104.0	medium wave
NWDR	Norden-Osterloog	2.0	701 kHz	53.604167	7.138611	0	120.0	medium wave
NWDR	Oldenburg-Etzhorn	40.0	1586 kHz	53.185155	8.243209	17	104.0	medium wave
NWDR	Osnabrück	5.0	1586 kHz	52.253991	8.053480	107	106.5	medium wave
NWDR	Siegen	2.0	755 kHz	50.884881	8.040294	354	58.0	medium wave
NWDR	Aachen-Stolberg	3.0	90.0 MHz	50.778808	6.243647	285	104.0	VHF
NWDR	Bonn	0.5	89.75 MHz	50.708033	7.096708	171	109.5	VHF
NWDR	Braunschweig-Salzgitter	2.5	90.9 MHz	52.219650	10.465207	104	105.5	VHF
NWDR	Flensburg	13.0	93.0 MHz	54.791839	9.503394	59	103.0	VHF
NWDR	Göttingen	1.5	88.8 MHz	51.570000	9.981944	353	100.0	VHF
NWDR	Hamburg	47.0	88.5 MHz	53.519200	10.102808	1	198.5	VHF
NWDR	Hamburg	4.5	95.1 MHz	53.519200	10.102808	1	198.5	VHF
NWDR	Hamburg	4.5	96.3 MHz	53.519200	10.102808	1	198.5	VHF
NWDR	Hannover	46.0	93.0 MHz	52.327678	9.736758	54	106.5	VHF
NWDR	Hannover	4.5	97.8 MHz	52.327678	9.736758	54	106.5	VHF
NWDR	Heide-Dithmarschen	15.0	93.6 MHz	54.195467	9.248333	66	93.0	VHF
NWDR	Heide-Dithmarschen	15.0	90.0 MHz	54.195467	9.248333	66	93.0	VHF
NWDR	Kiel	2.0	94.2 MHz	54.332700	10.068000	26	106.5	VHF
NWDR	Langenberg	95.0	95.7 MHz	51.356300	7.134100	242	210.0	VHF
NWDR	Lingen	11.0	88.8 MHz	52.535039	7.353167	29	104.0	VHF
NWDR	Münster	3.5	94.5 MHz	51.965014	7.359972	178	113.0	VHF
NWDR	Norden-Osterloog	12.0	93.3 MHz	53.604167	7.138611	0	120.0	VHF
NWDR	Nordhelle	16.0	93.9 MHz	51.148086	7.756700	669	18.0	VHF
NWDR	Oldenburg	34.0	95.4 MHz	53.185155	8.243209	17	104.0	VHF
NWDR	Osnabrück	2.0	93.6 MHz	52.253991	8.053480	107	106.5	VHF
NWDR	Siegen	0.5	91.8 MHz	50.884881	8.040294	354	58.0	VHF
NWDR	Teutoburger Wald	108.0	94.2 MHz	51.906044	8.821789	401	60.0	VHF

Note: The table shows technical characteristics of RIAS and NWDR transmitters in June 1953 (RIAS) and November 1955 (NWDR). Data for RIAS transmitters are from Deutsches Rundfunkarchiv D-0253-K ("10 Jahre RIAS: Technische Entwicklung—Frequenzen und Leistungen," Technische Direktion, v. Broecker, 8. 1. 1956). Data for NWDR transmitters are from Nordwestdeutscher Rundfunk (1956). Latitude and longitude are from Google Earth, altitude and antenna height are from Wikipedia.

Table A3: Robustness check: TIREM and omitting VHF transmitters

signal propagation model	TIREM (with VHF)		ITM (without VHF)		TIREM (without VHF)	
	est.	se	est.	se	est.	se
intercept	1.497	(27.384)	4.590	(26.203)	−2.252	(26.107)
county capital	0.837***	(0.166)	0.827***	(0.166)	0.834***	(0.166)
KVP base	0.394	(0.434)	0.378	(0.423)	0.373	(0.424)
% agriculture and forestry	2.940	(1.910)	2.688	(1.941)	3.065	(1.961)
% mining	1.545	(2.165)	1.200	(2.207)	1.519	(2.214)
% metalworking industry	2.075	(2.607)	2.069	(2.737)	2.307	(2.692)
% chemical industry	2.862	(1.762)	2.526	(1.817)	2.970	(1.816)
% woods and plastics	−0.393	(2.741)	−0.240	(2.806)	−0.018	(2.781)
% consumer goods	1.782	(2.336)	1.304	(2.376)	1.652	(2.368)
% construction	−5.534	(5.218)	−6.268	(5.175)	−5.665	(5.138)
% transportation	4.432	(4.613)	4.744	(4.637)	4.940	(4.616)
% commerce	0.263	(10.076)	−3.548	(9.993)	−1.925	(10.240)
% services	8.267	(5.244)	9.007*	(5.253)	9.644*	(5.198)
log(population size)	−0.353**	(0.168)	−0.329*	(0.171)	−0.354**	(0.168)
% population male	5.023	(5.768)	6.002	(5.741)	5.809	(5.918)
population density	0.000	(0.001)	0.000	(0.001)	0.000	(0.001)
% population change 1939–50	−0.877	(0.962)	−0.815	(0.972)	−1.046	(0.989)
% population in same *Land*	0.476	(1.882)	−0.040	(1.902)	−0.219	(1.924)
% 8 years of education	−11.942	(8.000)	−12.261	(8.060)	−12.323	(8.049)
% 10 years of education	−1.363*	(0.719)	−1.254*	(0.723)	−1.088	(0.775)
% 12 years of education	−3.814	(13.902)	−1.775	(14.007)	−3.395	(13.946)
% more than 12 years of education	−58.915	(64.828)	−59.359	(62.295)	−59.139	(63.609)
% trade school degree	−2.251	(10.060)	−2.513	(10.031)	−1.553	(10.176)
% university degree	180.602	(160.980)	168.236	(162.156)	168.381	(162.228)
% protestant	−9.951	(26.239)	5.750	(25.042)	3.811	(25.555)
% catholic	−13.387	(26.369)	1.887	(25.114)	0.105	(25.603)
% agnostic	−6.204	(26.706)	8.923	(25.599)	7.188	(26.191)
living space per capita (m^2)	−0.139	(0.146)	−0.080	(0.150)	−0.098	(0.151)
% turnout '32	12.457**	(5.455)	11.254**	(5.595)	11.865**	(5.548)
% invalid votes '32	63.016*	(37.949)	63.762*	(36.875)	68.145*	(37.607)
% NSDAP '32	−11.051***	(3.982)	−10.309**	(4.074)	−10.645***	(4.000)
% SPD '32	−12.418***	(4.671)	−11.582**	(4.758)	−11.872**	(4.740)
% KPD '32	−7.794*	(4.325)	−6.503	(4.395)	−6.824	(4.328)
% Zentrum '32	−5.981	(4.369)	−4.902	(4.468)	−5.408	(4.403)
% DNVP '32	−16.625***	(5.461)	−15.301***	(5.522)	−15.725***	(5.401)
% DVP '32	−10.230	(14.816)	−4.154	(14.478)	−6.047	(14.269)
RIAS signal strength	0.444	(0.406)	−0.451	(0.328)	−0.051	(0.131)
RIAS signal strength^2	−0.006	(0.005)	0.007	(0.005)	0.001	(0.002)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)	−3.933**	(1.888)	−1.287	(1.359)	−2.230	(1.449)
distance to East Berlin^2 (100 km)	2.145**	(1.075)	0.892	(0.855)	1.476	(0.950)
distance to East Berlin^3 (100 km)	−0.410**	(0.195)	−0.245	(0.170)	−0.343*	(0.189)
Wald test RIAS *p*-value	0.160		0.382		0.269	
Wald test distance *p*-value	0.005		0.004		0.014	
district fixed effects	Yes		Yes		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from three probit models. Municipality size class and district fixed effects are included but not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms.
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A4: Robustness check: East German jamming

jamming radius	10 km		12 km		15 km	
	est.	se	est.	se	est.	se
intercept	−0.640	(25.725)	−1.633	(25.698)	−2.556	(25.571)
county capital	0.821***	(0.166)	0.834***	(0.166)	0.838***	(0.166)
KVP base	0.391	(0.423)	0.382	(0.428)	0.382	(0.427)
% agriculture and forestry	2.706	(1.911)	2.680	(1.899)	2.629	(1.896)
% mining	1.302	(2.194)	1.232	(2.174)	1.189	(2.172)
% metalworking industry	1.984	(2.702)	1.923	(2.661)	1.918	(2.656)
% chemical industry	2.689	(1.769)	2.562	(1.766)	2.501	(1.768)
% woods and plastics	−0.007	(2.775)	−0.188	(2.763)	−0.266	(2.760)
% consumer goods	1.524	(2.350)	1.371	(2.349)	1.247	(2.355)
% construction	−6.614	(5.308)	−6.335	(5.264)	−6.155	(5.237)
% transportation	4.662	(4.589)	4.509	(4.549)	4.438	(4.556)
% commerce	−3.218	(9.496)	−3.144	(9.521)	−3.000	(9.496)
% services	8.990*	(5.206)	9.165*	(5.184)	9.050*	(5.166)
log(population size)	−0.337**	(0.171)	−0.333**	(0.170)	−0.332**	(0.169)
% population male	6.308	(5.754)	5.774	(5.763)	5.528	(5.772)
population density	0.000	(0.001)	0.000	(0.001)	0.000	(0.001)
% population change 1939–50	−0.979	(0.971)	−0.947	(0.973)	−0.946	(0.975)
% population in same *Land*	−0.228	(1.843)	−0.171	(1.837)	−0.198	(1.829)
% 8 years of education	−12.114	(7.757)	−12.357	(7.774)	−12.357	(7.796)
% 10 years of education	−1.422*	(0.727)	−1.343*	(0.727)	−1.337*	(0.723)
% 12 years of education	−3.089	(14.148)	−2.825	(14.040)	−2.398	(13.992)
% more than 12 years of education	−66.152	(62.867)	−69.641	(62.775)	−70.358	(62.517)
% trade school degree	−3.097	(10.212)	−2.141	(10.074)	−2.056	(10.089)
% university degree	185.275	(160.184)	188.479	(161.552)	189.807	(162.029)
% protestant	2.755	(24.936)	0.500	(24.907)	0.722	(24.923)
% catholic	−0.938	(25.040)	−3.093	(25.014)	−2.821	(25.028)
% agnostic	6.425	(25.464)	4.021	(25.424)	4.157	(25.443)
living space per capita (m^2)	−0.092	(0.147)	−0.092	(0.146)	−0.096	(0.146)
% turnout '32	11.315**	(5.512)	11.507**	(5.437)	11.758**	(5.472)
% invalid votes '32	61.923*	(36.998)	59.924	(36.732)	58.612	(36.644)
% NSDAP '32	−10.443***	(3.979)	−10.641***	(3.941)	−10.862***	(3.951)
% SPD '32	−11.548**	(4.716)	−11.578**	(4.651)	−11.768**	(4.672)
% KPD '32	−6.629	(4.296)	−6.773	(4.245)	−6.961	(4.254)
% Zentrum '32	−5.102	(4.378)	−5.211	(4.319)	−5.416	(4.319)
% DNVP '32	−15.250***	(5.412)	−15.278***	(5.332)	−15.478***	(5.338)
% DVP '32	−7.298	(14.339)	−6.715	(14.290)	−7.037	(14.319)
RIAS signal strength	−0.045	(0.229)	0.089	(0.222)	0.122	(0.200)
RIAS signal strength^2	0.001	(0.003)	−0.001	(0.003)	−0.002	(0.003)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)	−1.914	(1.408)	−2.021	(1.376)	−1.929	(1.390)
distance to East Berlin^2 (100 km)	1.229	(0.881)	1.291	(0.865)	1.245	(0.870)
distance to East Berlin^3 (100 km)	−0.289*	(0.174)	−0.299*	(0.172)	−0.291*	(0.172)
Wald test RIAS *p*-value	0.166		0.294		0.442	
Wald test distance *p*-value	0.026		0.027		0.032	
district fixed effects	Yes		Yes		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from three probit models. Municipality size class and district fixed effects are included but not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms.
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A5: Robustness check: Combined RIAS/NWDR signal strength

signal propagation model	ITM (with VHF)		ITM (without VHF)	
	est.	se	est.	se
intercept	9.221	(27.396)	0.780	(29.130)
county capital	0.822***	(0.166)	0.835***	(0.166)
KVP base	0.376	(0.424)	0.377	(0.424)
% agriculture and forestry	2.488	(1.877)	2.597	(1.872)
% mining	0.958	(2.166)	1.004	(2.152)
% metalworking industry	1.942	(2.695)	1.867	(2.675)
% chemical industry	2.261	(1.722)	2.402	(1.728)
% woods and plastics	−0.452	(2.811)	−0.394	(2.792)
% consumer goods	1.029	(2.361)	1.174	(2.342)
% construction	−5.963	(5.159)	−5.634	(5.231)
% transportation	4.239	(4.619)	4.387	(4.625)
% commerce	−3.976	(9.646)	−3.287	(9.653)
% services	8.455	(5.247)	8.375	(5.195)
log(population size)	−0.316*	(0.167)	−0.327**	(0.164)
% population male	5.839	(5.726)	5.371	(5.733)
population density	0.000	(0.001)	0.000	(0.001)
% population change 1939–50	−0.830	(0.973)	−0.889	(0.986)
% population in same *Land*	−0.325	(1.911)	−0.204	(1.898)
% 8 years of education	−12.461	(8.060)	−12.743	(8.028)
% 10 years of education	−1.396*	(0.721)	−1.317*	(0.720)
% 12 years of education	−3.622	(13.920)	−2.660	(13.794)
% more than 12 years of education	−60.850	(62.235)	−63.098	(62.505)
% trade school degree	−1.680	(10.094)	−2.276	(10.164)
% university degree	177.215	(161.966)	180.045	(165.024)
% protestant	3.601	(25.011)	2.496	(24.945)
% catholic	−0.349	(25.079)	−1.234	(25.062)
% agnostic	6.385	(25.547)	5.237	(25.442)
living space per capita (m^2)	−0.062	(0.152)	−0.076	(0.151)
% turnout '32	10.475*	(5.452)	11.171**	(5.469)
% invalid votes '32	61.742*	(36.064)	59.167*	(35.413)
% NSDAP '32	−9.955**	(3.989)	−10.312***	(4.002)
% SPD '32	−10.735**	(4.652)	−11.130**	(4.642)
% KPD '32	−6.003	(4.271)	−6.333	(4.272)
% Zentrum '32	−4.132	(4.371)	−4.729	(4.430)
% DNVP '32	−14.586***	(5.401)	−14.998***	(5.377)
% DVP '32	−5.198	(14.276)	−5.760	(14.466)
RIAS/NWDR signal strength	−0.489	(0.480)	−0.111	(0.544)
RIAS/NWDR signal strength^2	0.007	(0.006)	0.002	(0.007)
RIAS/NWDR signal strength^3	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)	−1.387	(1.334)	−1.995	(1.395)
distance to East Berlin^2 (100 km)	0.955	(0.845)	1.317	(0.890)
distance to East Berlin^3 (100 km)	−0.248	(0.168)	−0.310*	(0.178)
Wald test RIAS/NWDR p-value	0.462		0.379	
Wald test distance p-value	0.021		0.017	
district fixed effects	Yes		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from two probit models. Municipality size class and district fixed effects are included but not shown. The first Wald test tests the joint significance of the RIAS/NWDR signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms.
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A6: Robustness check: 1946 elections data

model	(1)		(2)	
	est.	se	est.	se
intercept	0.113	(5.360)	5.131	(8.415)
county capital	0.746*	(0.402)	0.807**	(0.407)
KVP base	0.286	(0.615)	0.283	(0.642)
% agriculture and forestry	0.144	(1.441)	1.025	(1.470)
% mining	−0.648	(1.534)	−0.308	(1.594)
% metalworking industry	1.583	(1.715)	1.525	(1.920)
% chemical industry	1.733	(1.396)	1.769	(1.396)
% woods and plastics	−0.687	(1.659)	0.444	(1.781)
% consumer goods	0.896	(1.537)	1.920	(1.590)
% construction	−0.009	(2.508)	−2.751	(2.431)
% transportation	3.452	(2.214)	6.338**	(2.536)
% commerce	−12.284***	(3.733)	−15.810***	(3.611)
% services	3.308	(2.277)	7.003***	(2.473)
log(population size)	−0.287	(0.412)	−0.220	(0.404)
% population male	7.319***	(2.449)	9.208***	(2.604)
population density	0.000	(0.021)	0.000	(0.021)
% population change 1939–50	−0.439	(0.846)	−0.951	(0.937)
% population in same *Land*	−0.145	(1.379)	0.720	(1.448)
% 8 years of education	−6.751**	(2.729)	−10.532**	(3.280)
% 10 years of education	−0.710	(0.804)	−0.725	(0.864)
% 12 years of education	−15.526***	(4.560)	−7.152	(4.426)
% more than 12 years of education	33.609**	(11.294)	−37.402**	(13.691)
% trade school degree	−12.966**	(3.974)	−4.179	(3.322)
% university degree	20.524	(16.807)	79.784**	(26.994)
% protestant	5.396	(5.508)	0.116	(5.577)
% catholic	6.027	(5.453)	0.361	(5.589)
% agnostic	13.716**	(5.363)	7.863	(5.394)
living space per capita (m^2)	−0.011	(0.331)	−0.123	(0.392)
% turnout '46	−1.700	(3.548)	−2.586	(6.313)
% invalid votes '46	1.336	(4.313)	0.950	(5.724)
% LDP '46	2.019*	(1.173)	1.450	(1.337)
% CDU '46	−0.723	(1.176)	0.731	(1.191)
RIAS signal strength	−0.190	(0.645)	−0.176	(0.646)
RIAS signal strength^2	0.003	(0.075)	0.002	(0.075)
RIAS signal strength^3	0.000	(0.005)	0.000	(0.005)
distance to East Berlin (100 km)	−0.642	(1.030)	−2.390*	(1.213)
distance to East Berlin^2 (100 km)	0.458	(0.846)	1.522	(0.975)
distance to East Berlin^3 (100 km)	−0.137	(0.381)	−0.323	(0.428)
Wald test RIAS *p*-value	0.894		0.573	
Wald test distance *p*-value	0.033		0.060	
district fixed effects	No		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from two probit models. Municipality size class and district fixed effects (when applicable) are not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms. Missing values in 1946 elections data have been multiply imputed. Standard errors and statistical tests have been adjusted to account for multiple imputation as described in Little and Rubin (2002: 85–89) and Schafer (1997: 115–116).
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A7: Robustness check: Omitting smallest municipalities

model	(1)		(2)	
sample restriction	size class ≥ 5		size class ≥ 6	
	est.	se	est.	se
intercept	−9.444	(34.898)	−16.886	(36.155)
county capital	0.876***	(0.166)	0.834***	(0.167)
KVP base	0.429	(0.472)	0.480	(0.535)
% agriculture and forestry	2.020	(2.202)	1.593	(2.596)
% mining	−0.385	(2.488)	−0.570	(2.890)
% metalworking industry	−0.151	(3.245)	−0.319	(3.647)
% chemical industry	2.164	(1.971)	3.099	(2.316)
% woods and plastics	−1.410	(3.132)	−0.310	(3.615)
% consumer goods	−0.287	(2.654)	0.801	(2.914)
% construction	−8.840	(6.256)	−5.869	(7.349)
% transportation	2.090	(5.283)	4.146	(5.861)
% commerce	2.648	(11.210)	−3.531	(13.055)
% services	7.114	(5.921)	7.376	(7.327)
log(population size)	−0.242	(0.192)	−0.376*	(0.220)
% population male	10.145	(6.813)	10.863	(7.922)
population density	0.000	(0.001)	0.000	(0.001)
% population change 1939–50	−1.296	(1.099)	−0.282	(1.225)
% population in same *Land*	−0.556	(2.168)	−0.552	(2.466)
% 8 years of education	−14.562	(9.658)	−12.584	(10.717)
% 10 years of education	−1.107	(0.757)	−1.271	(1.071)
% 12 years of education	12.519	(12.965)	11.321	(14.396)
% more than 12 years of education	−135.109**	(57.924)	−128.836*	(70.962)
% trade school degree	−0.269	(10.856)	−0.004	(11.568)
% university degree	239.832	(181.244)	255.157	(209.518)
% protestant	14.391	(28.810)	23.953	(29.995)
% catholic	9.950	(28.821)	15.586	(30.435)
% agnostic	18.654	(29.585)	29.489	(30.833)
living space per capita (m^2)	0.016	(0.161)	0.071	(0.172)
% turnout ’32	7.604	(6.336)	0.993	(7.043)
% invalid votes ’32	60.409	(43.166)	82.051*	(43.044)
% NSDAP ’32	−9.824**	(4.858)	−7.566	(4.767)
% SPD ’32	−8.681	(5.733)	−6.070	(5.652)
% KPD ’32	−4.797	(5.274)	−2.290	(5.095)
% Zentrum ’32	−2.419	(5.542)	4.139	(6.717)
% DNVP ’32	−9.561	(6.707)	−7.253	(6.554)
% DVP ’32	−9.434	(18.809)	−15.293	(18.820)
RIAS signal strength	−0.209	(0.513)	−0.094	(0.640)
RIAS signal strength^2	0.002	(0.007)	0.001	(0.009)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)	−1.361	(1.601)	−1.026	(1.830)
distance to East Berlin^2 (100 km)	1.553	(1.000)	1.431	(1.151)
distance to East Berlin^3 (100 km)	−0.436**	(0.198)	−0.417*	(0.229)
Wald test RIAS p-value	0.575		0.404	
Wald test distance p-value	0.008		0.035	
district fixed effects	Yes		Yes	
N	1,628		1,219	

Note: The table displays probit coefficients and standard errors clustered at the county level from two probit models. Municipality size class and district fixed effects are not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the distance to East Berlin polynomial terms.

* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A8: Robustness check: Train distance

model	(1)		(2)	
	est.	se	est.	se
intercept	11.255	(24.472)	2.738	(28.985)
county capital	0.813***	(0.162)	0.845***	(0.166)
KVP base	0.354	(0.418)	0.343	(0.423)
% agriculture and forestry	1.021	(1.913)	2.374	(1.863)
% mining	−0.859	(2.158)	0.712	(2.124)
% metalworking industry	−0.014	(2.400)	1.574	(2.728)
% chemical industry	0.886	(1.742)	2.193	(1.708)
% woods and plastics	−3.242	(2.633)	−0.034	(2.767)
% consumer goods	−1.109	(2.279)	1.120	(2.336)
% construction	−5.341	(6.072)	−4.734	(5.298)
% transportation	1.119	(4.100)	2.632	(4.660)
% commerce	−2.208	(8.605)	−5.481	(9.874)
% services	4.811	(4.808)	8.480	(5.407)
log(population size)	−0.362**	(0.163)	−0.332**	(0.169)
% population male	3.287	(5.982)	4.740	(5.820)
population density	−0.001	(0.001)	0.000	(0.001)
% population change 1939–50	−0.317	(0.796)	−1.015	(0.956)
% population in same *Land*	−0.655	(1.595)	−0.444	(1.929)
% 8 years of education	−9.505	(7.973)	−14.535*	(7.989)
% 10 years of education	−1.617**	(0.662)	−1.222*	(0.710)
% 12 years of education	−12.911	(15.354)	−1.571	(14.094)
% more than 12 years of education	−18.418	(66.209)	−81.149	(63.397)
% trade school degree	−3.301	(8.781)	0.225	(9.938)
% university degree	182.894	(178.436)	203.587	(163.460)
% protestant	−11.169	(20.843)	1.267	(24.509)
% catholic	−12.535	(21.194)	−2.008	(24.611)
% agnostic	−10.677	(20.577)	5.382	(24.924)
living space per capita (m^2)	0.013	(0.117)	−0.119	(0.160)
% turnout '32	9.401**	(4.191)	10.117*	(5.446)
% invalid votes '32	48.863	(31.255)	59.107	(36.618)
% NSDAP '32	−9.352***	(2.995)	−9.827**	(3.988)
% SPD '32	−6.954**	(3.102)	−10.070**	(4.647)
% KPD '32	−3.556	(3.152)	−5.665	(4.219)
% Zentrum '32	−6.566**	(3.239)	−4.630	(4.257)
% DNVP '32	−12.248***	(3.581)	−13.020**	(5.382)
% DVP '32	−6.572	(13.381)	−2.687	(14.800)
RIAS signal strength	0.086	(0.427)	−0.068	(0.441)
RIAS signal strength^2	−0.001	(0.006)	0.001	(0.006)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)
train distance to East Berlin (100 km)	−1.097	(0.780)	−1.926**	(0.948)
train distance to East Berlin^2 (100 km)	0.404	(0.395)	0.780*	(0.457)
train distance to East Berlin^3 (100 km)	−0.065	(0.062)	−0.105	(0.069)
Wald test RIAS p-value	0.371		0.186	
Wald test train distance p-value	0.006		0.081	
district fixed effects	No		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from two probit models. Municipality size class and district fixed effects (when applicable) are not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the train distance to East Berlin polynomial terms.
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Table A9: Results: SAR probit models

model	(1)		(2)		(3)		(4)	
Neighborhood definition	5 nearest neighbors		10 nearest neighbors		20 nearest neighbors		20 km circle	
	mean	sd	mean	sd	mean	sd	mean	sd
intercept	6.721	26.247	6.434	25.847	6.048	25.308	6.002	25.831
county capital	0.847	0.174	0.856	0.172	0.867	0.173	0.852	0.173
KVP base	0.419	0.361	0.427	0.360	0.427	0.361	0.424	0.359
% agriculture and forestry	2.720	2.256	2.725	2.259	2.635	2.212	2.777	2.264
% mining	1.168	2.442	1.209	2.445	1.154	2.392	1.253	2.447
% metalworking industry	1.934	2.828	1.976	2.809	1.886	2.752	2.026	2.811
% chemical industry	2.784	2.136	2.800	2.112	2.650	2.066	2.805	2.113
% woods and plastics	-0.278	2.821	-0.290	2.826	-0.261	2.763	-0.291	2.832
% consumer goods	1.370	2.464	1.409	2.476	1.351	2.421	1.359	2.482
% construction	-7.157	5.951	-7.016	5.954	-6.545	5.810	-6.955	5.931
% transportation	4.380	4.739	4.486	4.771	4.049	4.673	4.550	4.774
% commerce	-3.437	10.334	-3.387	10.267	-3.326	10.089	-3.080	10.265
% services	9.523	5.259	9.541	5.217	9.353	5.125	9.466	5.218
log(population size)	-0.383	0.176	-0.382	0.178	-0.359	0.175	-0.389	0.178
% population male	6.555	6.722	6.406	6.637	6.025	6.497	6.401	6.611
population density	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
% population change 1939–50	-0.937	0.886	-0.906	0.880	-0.867	0.862	-0.958	0.887
% population in same *Land*	-0.060	1.867	-0.059	1.872	-0.018	1.832	-0.157	1.890
% 8 years of education	-13.056	7.757	-13.121	7.793	-12.534	7.619	-13.386	7.866
% 10 years of education	-1.392	1.020	-1.404	1.015	-1.345	0.997	-1.428	1.023
% 12 years of education	-3.539	12.334	-3.432	12.491	-2.554	12.213	-4.294	12.583
% more than 12 years of education	-63.918	60.590	-65.475	60.533	-65.641	59.256	-64.175	60.613
% trade school degree	-2.591	8.902	-2.175	8.916	-2.481	8.721	-1.543	8.998
% university degree	172.684	165.013	176.513	165.196	174.196	161.487	174.603	165.600
% protestant	1.254	22.323	1.576	21.945	1.583	21.441	1.885	21.988
% catholic	-3.251	22.603	-2.846	22.215	-2.698	21.704	-2.509	22.250
% agnostic	5.017	23.053	5.329	22.702	5.273	22.186	5.672	22.753
living space per capita (m^2)	-0.086	0.137	-0.084	0.137	-0.082	0.134	-0.083	0.137
% turnout '32	12.550	5.238	12.560	5.182	12.024	5.099	12.683	5.176
% invalid votes '32	67.002	33.786	67.106	33.666	63.658	32.969	69.313	33.888
% NSDAP '32	-11.364	3.610	-11.279	3.600	-10.801	3.542	-11.420	3.590
% SPD '32	-12.566	4.312	-12.513	4.270	-12.035	4.203	-12.624	4.267
% KPD '32	-7.236	3.825	-7.146	3.793	-6.786	3.733	-7.270	3.792
% Zentrum '32	-5.323	4.348	-5.302	4.317	-4.980	4.228	-5.500	4.327
% DNVP '32	-16.548	4.370	-16.427	4.372	-15.811	4.312	-16.550	4.366
% DVP '32	-4.490	13.071	-4.369	13.142	-4.546	12.875	-3.897	13.205
RIAS signal strength	-28.165	43.944	-28.833	43.808	-27.671	43.378	-27.876	43.656
RIAS signal strength^2	36.965	60.472	38.157	60.361	36.779	59.766	36.720	60.158
RIAS signal strength^3	-16.889	27.394	-17.541	27.382	-17.010	27.109	-16.848	27.297
distance to East Berlin (100 km)	-1.930	1.313	-1.896	1.310	-1.830	1.285	-1.880	1.320
distance to East Berlin^2 (100 km)	1.267	0.834	1.245	0.831	1.218	0.815	1.215	0.840
distance to East Berlin^3 (100 km)	-0.314	0.173	-0.309	0.172	-0.303	0.168	-0.303	0.174
ρ	-0.056	0.067	-0.057	0.093	-0.007	0.120	-0.102	0.131
district fixed effects	Yes		Yes		Yes		Yes	

Note: $N = 2584$. The table displays posterior coefficient means and standard deviations from four Bayesian SAR probit models estimated using the `spatialprobit` `R` package. Municipality size class and district fixed effects are included but not shown. The spatial dependence parameter, ρ, is indistinguishable from zero in all four specifications.

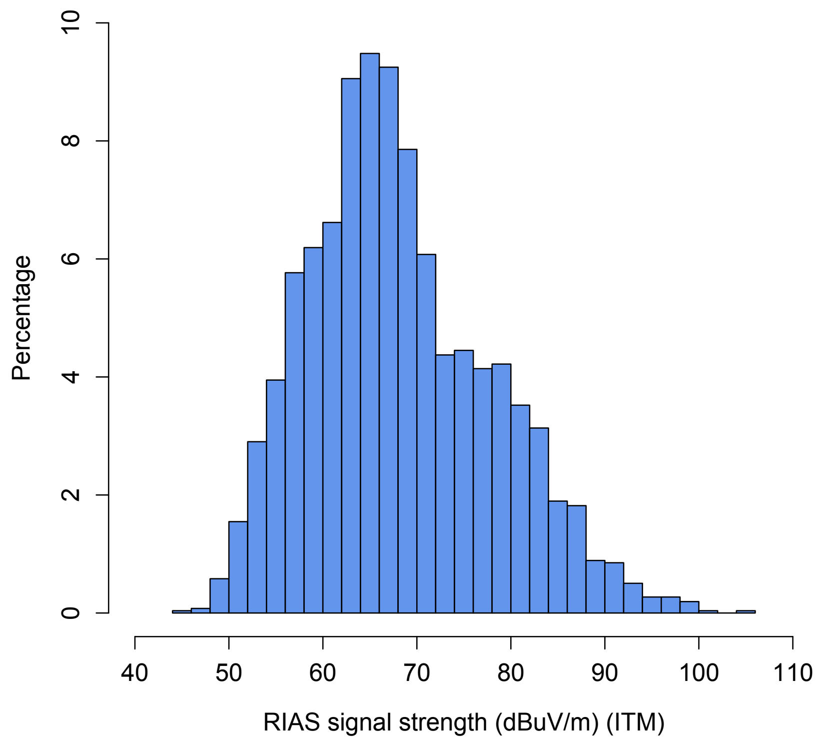
Table A10: Robustness check: Controlling for distance to nearest county capital

model	(1)		(2)	
	est.	se	est.	se
intercept	8.976	(25.166)	6.004	(28.704)
county capital	0.768***	(0.188)	0.818***	(0.192)
KVP base	0.377	(0.415)	0.374	(0.426)
% agriculture and forestry	1.523	(1.874)	2.638	(1.879)
% mining	−0.299	(2.139)	1.124	(2.169)
% metalworking industry	1.096	(2.422)	1.882	(2.688)
% chemical industry	1.646	(1.753)	2.582	(1.730)
% woods and plastics	−2.566	(2.634)	−0.167	(2.796)
% consumer goods	−0.763	(2.240)	1.209	(2.362)
% construction	−6.143	(6.048)	−6.202	(5.239)
% transportation	2.056	(4.026)	4.062	(4.655)
% commerce	−0.300	(8.164)	−3.062	(9.743)
% services	5.504	(4.731)	9.106*	(5.303)
log(population size)	−0.399**	(0.173)	−0.352**	(0.172)
% population male	5.275	(5.951)	5.747	(5.778)
population density	−0.001	(0.001)	0.000	(0.001)
% population change 1939–50	−0.398	(0.781)	−0.882	(0.968)
% population in same *Land*	−0.160	(1.570)	−0.132	(1.852)
% 8 years of education	−7.037	(7.500)	−12.290	(7.983)
% 10 years of education	−1.711***	(0.653)	−1.335*	(0.706)
% 12 years of education	−11.594	(14.888)	−3.096	(14.172)
% more than 12 years of education	10.670	(63.299)	−63.001	(62.295)
% trade school degree	−10.704	(9.058)	−1.953	(9.874)
% university degree	106.015	(172.445)	164.405	(160.847)
% protestant	−4.453	(21.424)	1.112	(24.505)
% catholic	−6.397	(21.794)	−2.975	(24.602)
% agnostic	−4.684	(21.304)	4.552	(25.001)
living space per capita (m^2)	0.057	(0.114)	−0.078	(0.149)
% turnout '32	11.796***	(4.165)	11.485**	(5.489)
% invalid votes '32	56.435*	(32.048)	61.364	(37.327)
% NSDAP '32	−10.351***	(2.986)	−10.439***	(3.998)
% SPD '32	−9.547***	(3.096)	−11.552**	(4.684)
% KPD '32	−5.198*	(3.127)	−6.548	(4.318)
% Zentrum '32	−7.599**	(3.245)	−4.788	(4.367)
% DNVP '32	−15.176***	(3.627)	−15.289***	(5.418)
% DVP '32	−6.814	(13.897)	−4.441	(14.812)
distance to nearest county capital (km)	−0.003	(0.009)	−0.001	(0.009)
RIAS signal strength	−0.167	(0.425)	−0.246	(0.442)
RIAS signal strength^2	0.002	(0.006)	0.003	(0.006)
RIAS signal strength^3	0.000	(0.000)	0.000	(0.000)
distance to East Berlin (100 km)	−0.901	(0.975)	−1.687	(1.431)
distance to East Berlin^2 (100 km)	0.516	(0.684)	1.120	(0.896)
distance to East Berlin^3 (100 km)	−0.160	(0.144)	−0.280	(0.176)
Wald test RIAS *p*-value	0.379		0.299	
Wald test distance *p*-value	0.000		0.005	
district fixed effects	No		Yes	

Note: $N = 2584$. The table displays probit coefficients and standard errors clustered at the county level from two probit models. Municipality size class and district fixed effects (when applicable) are not shown. The first Wald test tests the joint significance of the RIAS signal strength polynomial terms. The second Wald test tests the joint significance of the train distance to East Berlin polynomial terms.

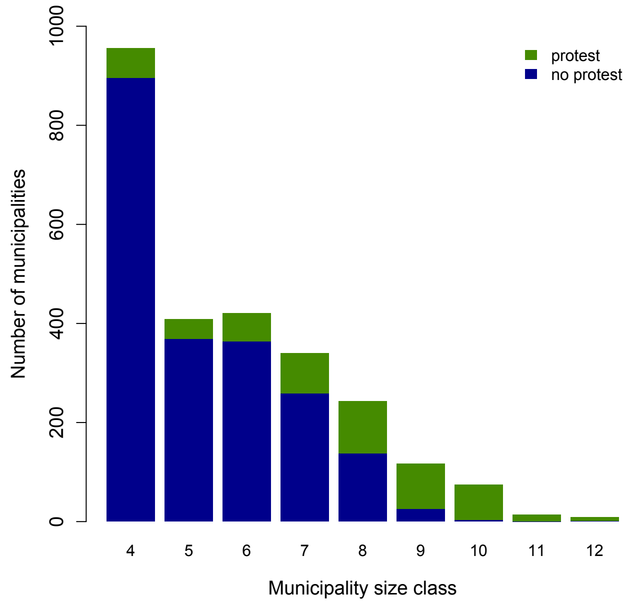
* denotes statistical significance at 0.10 level. ** denotes statistical significance at 0.05 level. *** denotes statistical significance at 0.01 level.

Figure A1: Histogram of RIAS signal strength (ITM)



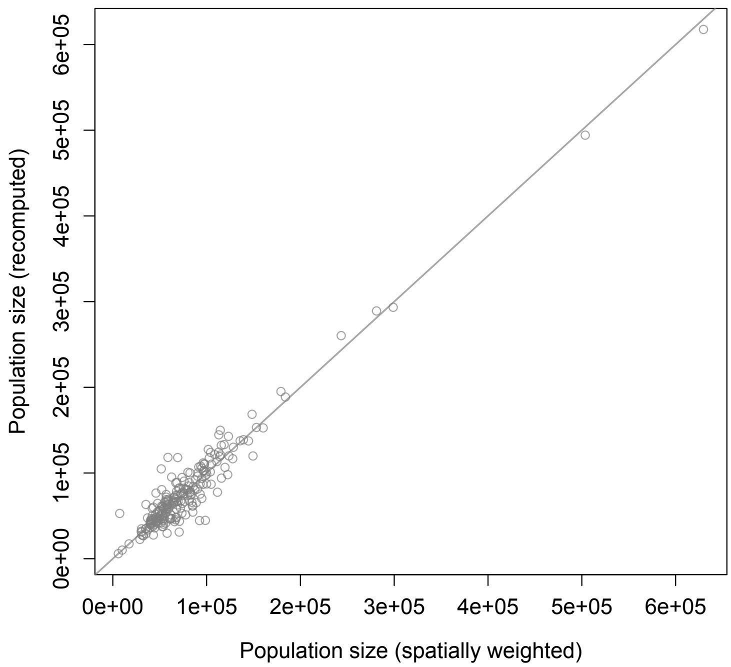
Note: The histogram displays the distribution of RIAS signal strength, calculated based on the Irregular Terrain Model, in our sample of municipalities.

Figure A2: Distribution of municipality size classes



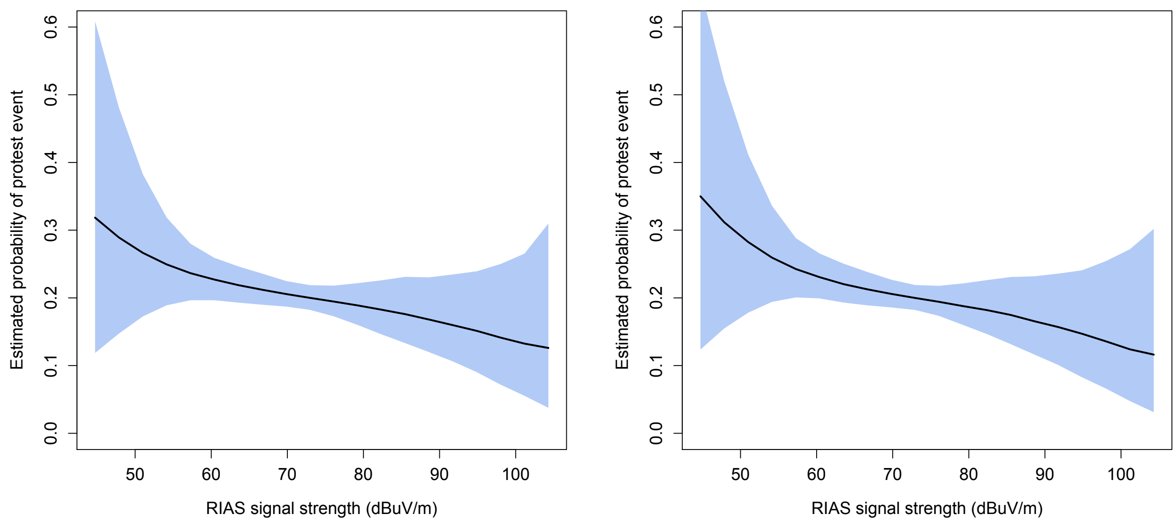
Note: The plot displays the distribution of municipality sizes classes, distinguishing between municipalities that experienced protests (shown in green) and municipalities that did not (shown in blue).

Figure A3: Scatterplot of recomputed and spatially weighted population sizes



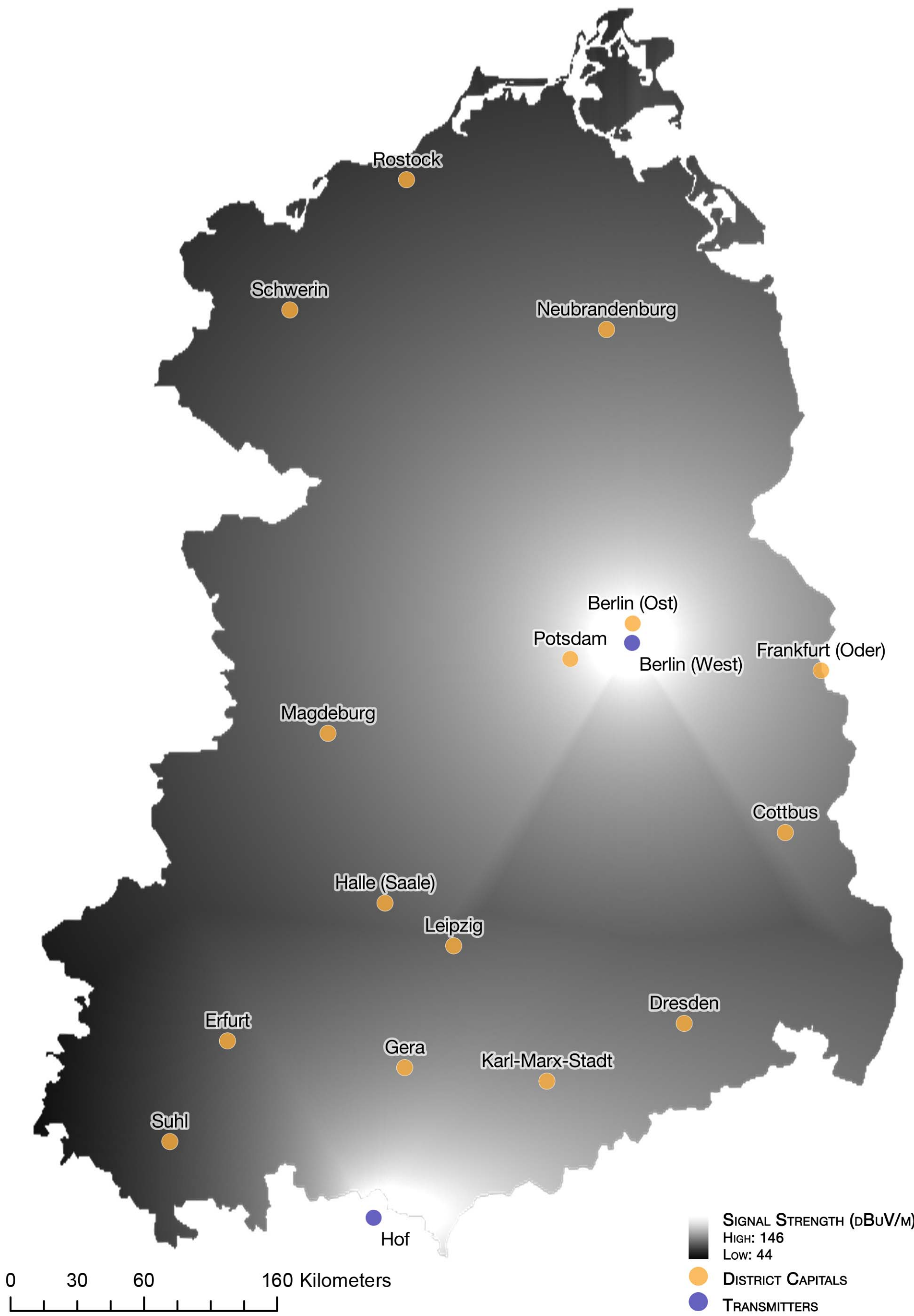
Note: The plot displays a scatterplot of August 1950 census county population data spatially weighted to 1953 counties on the x-axis and recomputed August 1950 census county population data from East Germany's statistical yearbook for 1958 counties (which are almost identical to 1953 counties) on the y-axis (Staatliche Zentralverwaltung für Statistik 1958). The correlation between the two variables is $r = 0.97$.

Figure A4: Estimated probabilities based on models (3) and (4) in Table 2



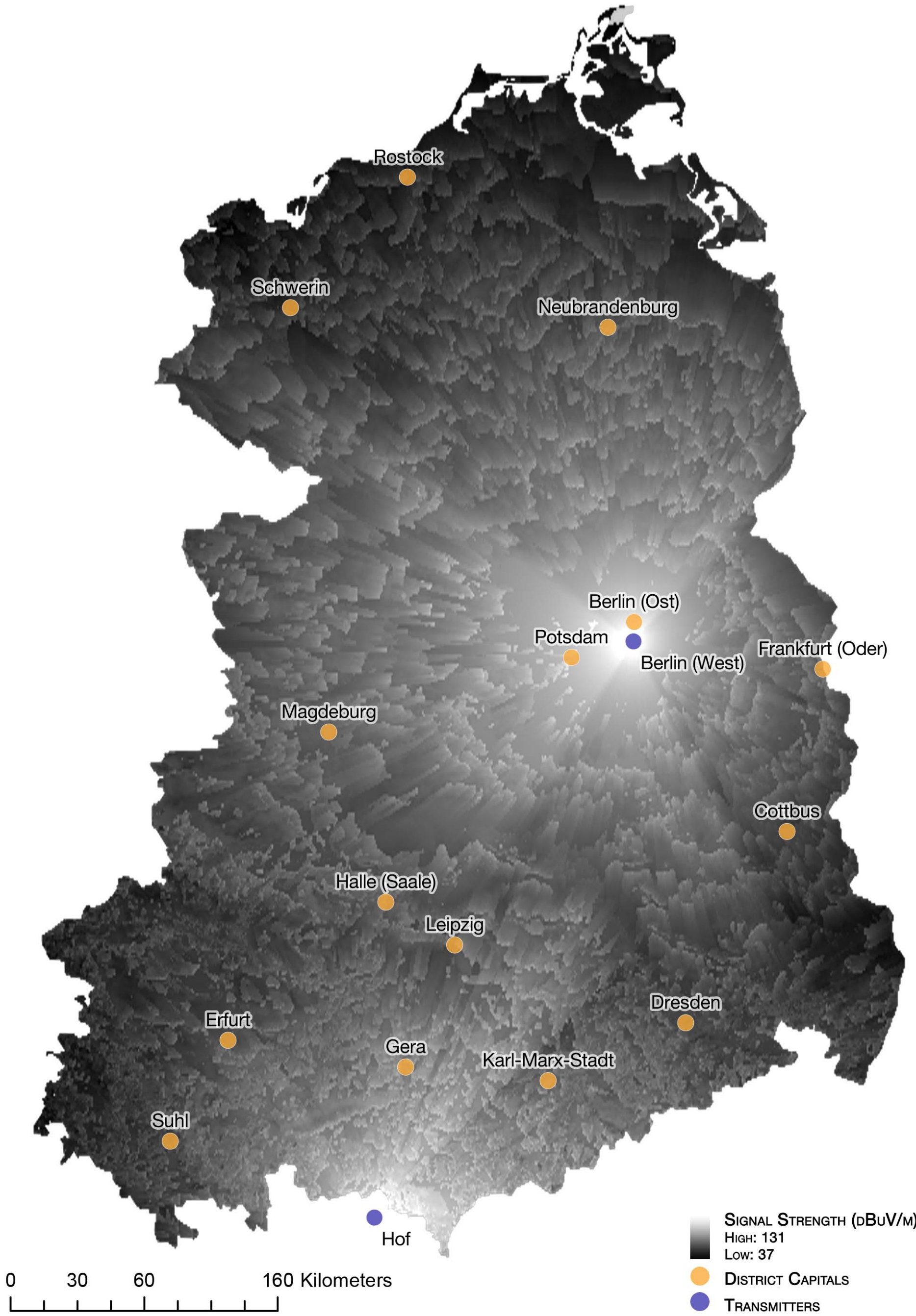
Note: The plots display the estimated probability of protest as a function of RIAS signal strength from models (3) and (4) in Table 2. Pointwise 95% confidence intervals are shown in blue.

Figure A5: RIAS signal strength (TIREM)



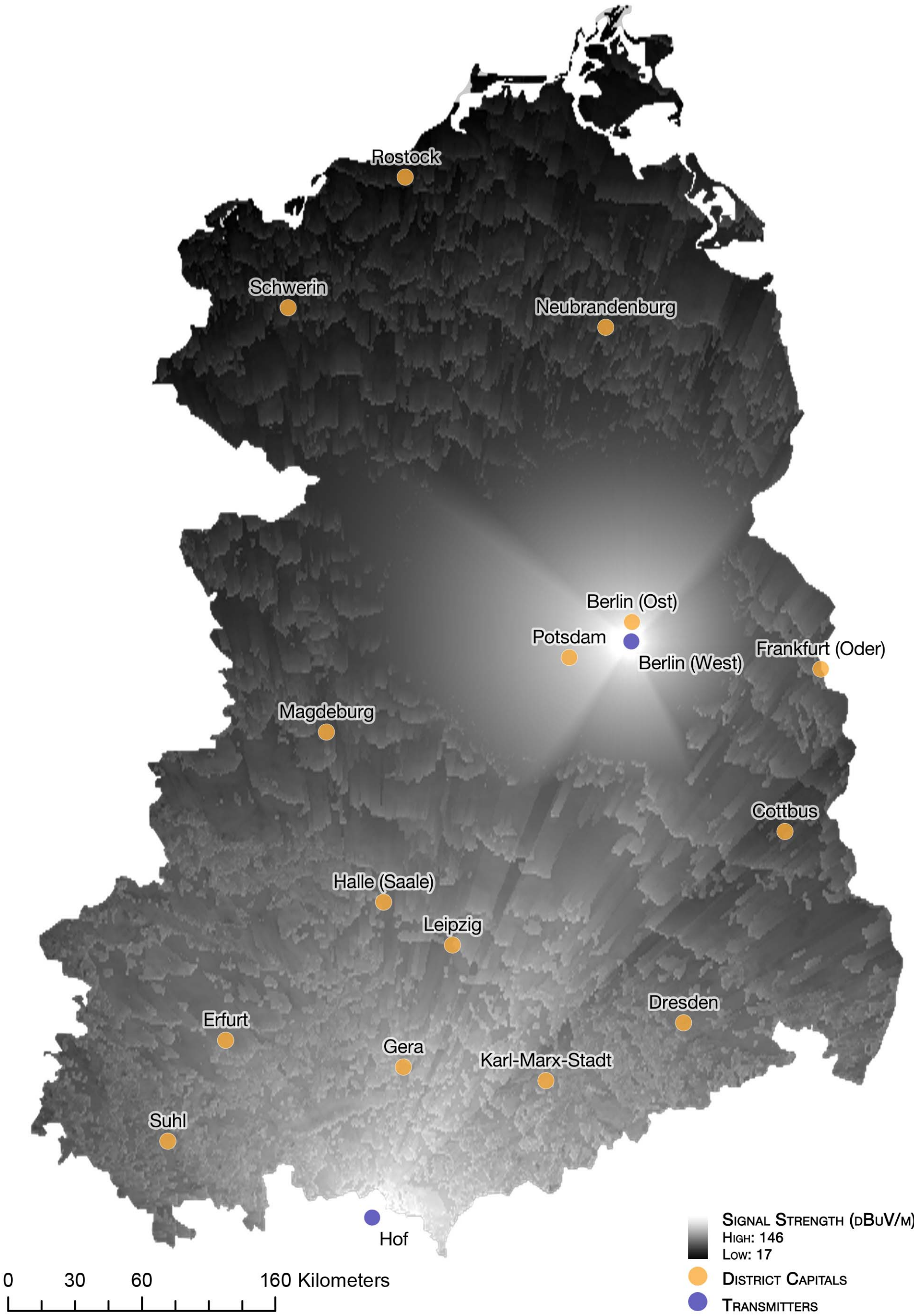
Note: The map shows variation in RIAS signal strength across East Germany based on the TIREM electromagnetic signal propagation model with four transmitters. Blue symbols mark the RIAS transmitters in West Berlin and Hof (Bavaria). Orange dots mark East German district capitals.

Figure A6: RIAS signal strength (ITM; no VHF)



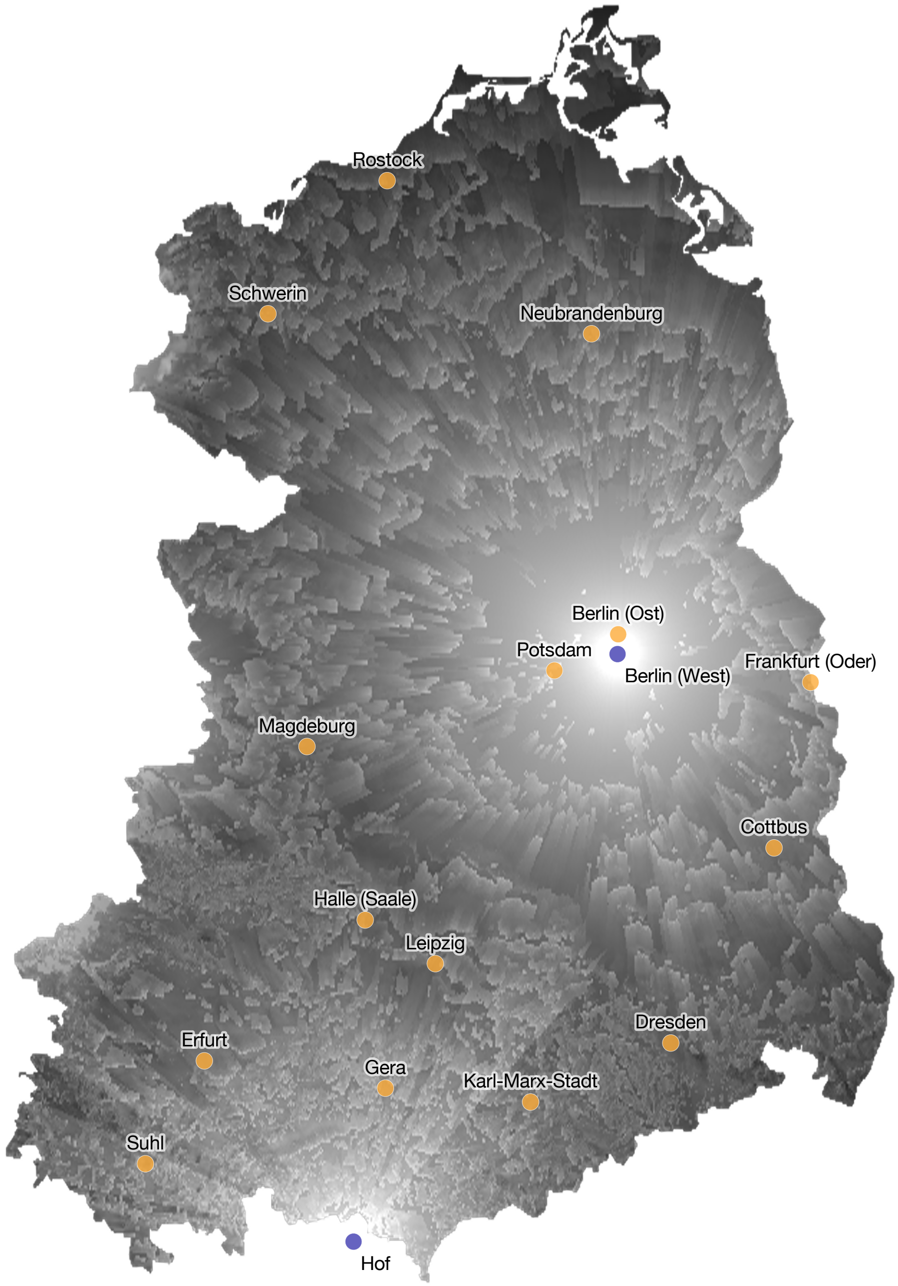
Note: The map shows variation in RIAS signal strength across East Germany based on the ITM electromagnetic signal propagation model with three transmitters. Blue symbols mark the RIAS transmitters in Hof and West Berlin. Orange dots mark East German district capitals.

Figure A7: RIAS signal strength (TIREM; no VHF)



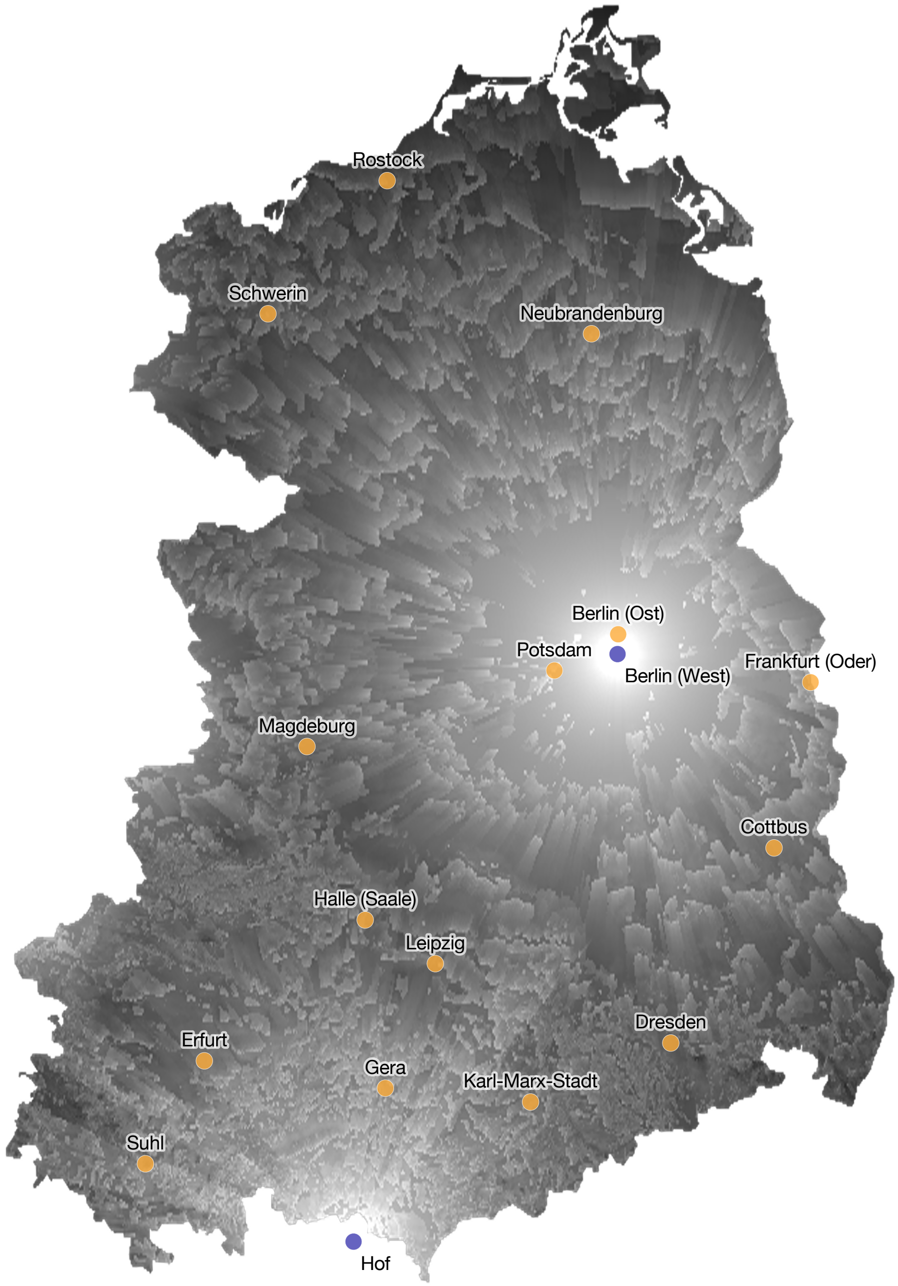
Note: The map shows variation in RIAS signal strength across East Germany based on the TIREM electromagnetic signal propagation model with three transmitters. Blue symbols mark the RIAS transmitters in West Berlin and Hof (Bavaria). Orange dots mark East German district capitals.

Figure A8: RIAS/NWDR signal strength (ITM)



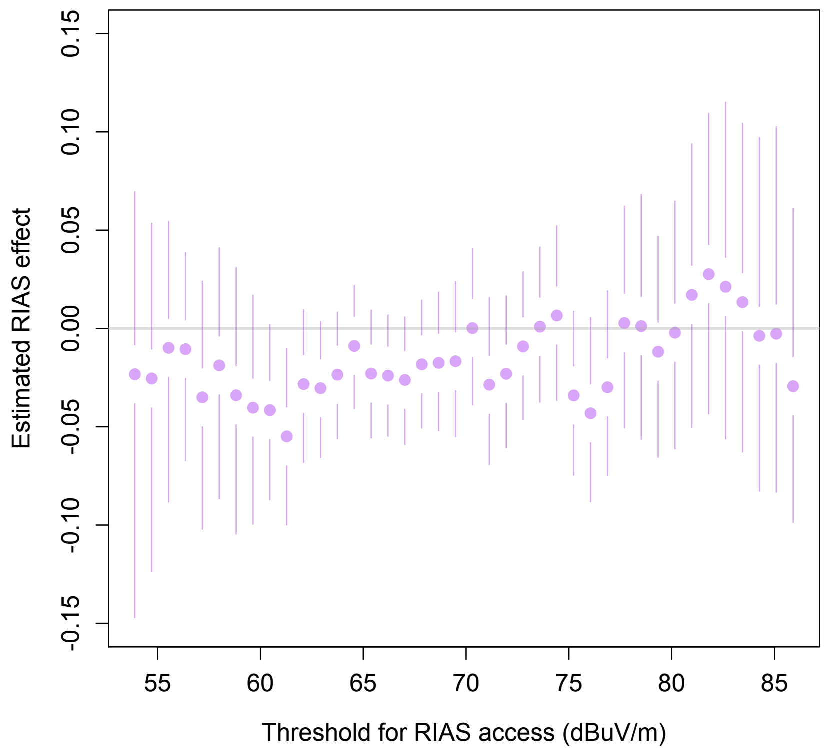
Note: The map shows variation in RIAS/NWDR signal strength across East Germany based on the ITM electromagnetic signal propagation model with all RIAS and NWDR transmitters included. Blue symbols mark the RIAS transmitters in West Berlin and Hof (Bavaria); the NWDR transmitters are not shown. Orange dots mark East German district capitals.

Figure A9: RIAS/NWDR signal strength (ITM; no VHF)



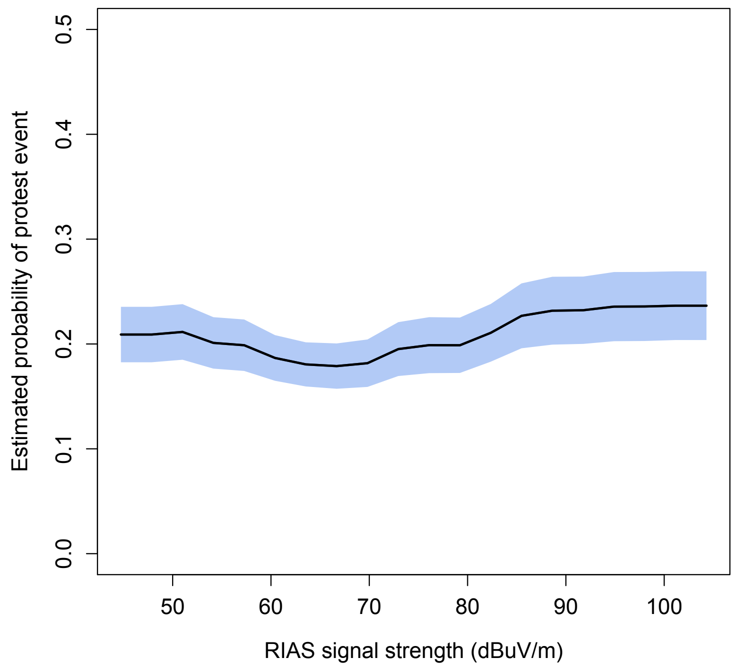
Note: The map shows variation in RIAS/NWDR signal strength across East Germany based on the ITM electromagnetic signal propagation model with all RIAS and NWDR transmitters included except VHF transmitters. Blue symbols mark the RIAS transmitters in West Berlin and Hof (Bavaria); the NWDR transmitters are not shown. Orange dots mark East German district capitals.

Figure A10: RIAS impact estimates based on binary measure of RIAS availability



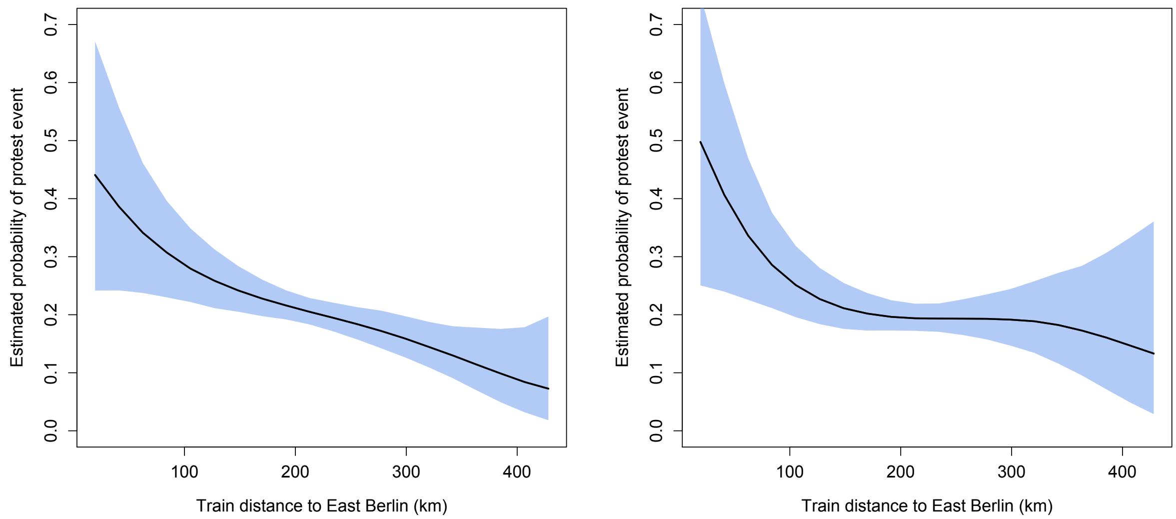
Note: The plot displays 40 RIAS impact estimates with 95% confidence intervals. Each estimate is based on a specification identical to the one used in model (4) in Table 2 except that a binary indicator of RIAS availability is used. Threshold values for RIAS availability are equally spaced between the .05 and .95 quantiles of the continuous RIAS signal strength measure.

Figure A11: Estimated probabilities based on Random Forest fit



Note: The plot displays the estimated probability of protest as a function of RIAS signal strength from a nonparametric Random Forest model containing the same set of predictors as probit model (4) in Table 2. Pointwise 95% normal-theory confidence intervals from a pairs bootstrap (clustered at the county level, 1,000 bootstrap samples) are shown in blue.

Figure A12: Estimated probabilities based on models (1) and (2) in Table A8



Note: The plots display the estimated probability of protest from models (1) and (2) in Table A8 as a function of train distance to East Berlin. Pointwise 95% confidence intervals are shown in blue.

XI. Additional references

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