

Radio and the Rise of the Nazis in Prewar Germany

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How far can the media protect or undermine democratic institutions in unconsolidated democracies, and how persuasive can they be in ensuring public support for dictator's policies? We study this question in the context of Germany between 1929 and 1939. Radio slowed down the growth of political support for the Nazis, when Weimar government introduced pro-government political news in 1929, denying access to the radio for the Nazis up till January 1933. This effect was reversed in 5 weeks after the transfer of control over the radio to the Nazis following Hitler's appointment as chancellor. After full consolidation of power, radio propaganda helped the Nazis to enroll new party members and encouraged denunciations of Jews and other open expressions of anti-Semitism. The effect of Nazi radio propaganda varied depending on the listeners' predispositions toward the message. Nazi radio was most effective in places where anti-Semitism was historically high and had a *negative* effect on the support for Nazi messages in places with historically low anti-Semitism.

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1. Introduction

Dictators often come to power through a democratic process.¹ When this happens, which essential institutional elements of a consolidated democracy are missing? How do future dictators persuade voters to support them, and how do they maintain popularity during and after consolidation of power? What are the safeguards against the rise of popularity of potential dictators? We show that whether future dictators or pro-democratic forces have control over mass media in democracies and whether dictators maintain such control in dictatorships plays an important role in answering these questions. We demonstrate that propaganda is most effective when people are positively predisposed in favor of its message, but it can be harmful for the dictator when listeners *a priori* disagree with the content of the message.

The rise of the Third Reich in Germany in the 1930s resulting in one of the largest catastrophes in the history of mankind was the most prominent example of a collapse of democracy without a military coup. Did control over mass media help to establish and maintain Adolf Hitler's dictatorial rule? The Nazis themselves strongly believed in media power. The future Reich minister of propaganda, Joseph Goebbels, noted in his diary right after Hitler was appointed chancellor of Germany and one month before the last competitive election of the Weimar Republic: "*Now it will be easy to carry on the fight, for we can call on all the resources of the State. Radio and press are at our disposal. We shall stage a masterpiece of propaganda*" (quoted in Shirer 1960). Later on, during the radio exhibition in Berlin in August 1933, he claimed, "*It would not have been possible for us to take power or to use it in the ways we have without the radio...*"² Historians, however, have not reached consensus on this question. Some scholars provide case-study evidence in support of this view (e.g., Shirer 1960 and Somerville 2012). Others (e.g., Zimmermann 2006) suggest that propaganda was not nearly as effective as Goebbels had claimed.³ Prior to our paper, there

¹ Examples come from different parts of the world, e.g., Robert Mugabe of Zimbabwe, Alexander Lukashenko of Belarus, Hugo Chavez of Venezuela.

² The full text of the speech in English can be found at <http://www.calvin.edu/academic/cas/gpa/goeb56.htm>. In 1934, Goebbels wrote in his diary that radio played a significant role in winning "the war of propaganda" and allowed Nazis to win the March 1933 elections (Weiss 1932, p. 9).

³ For example, Zimmermann (2006) wrote, "However, Goebbels's insistent claims regarding the power of his own propaganda, together with the characteristic methods he used, have misled later generations of historians

was no systematic empirical analysis of the impact of radio on political support for Nazis during the collapse of the Weimar Republic and the rise of the Third Reich. More generally, there was no systematic empirical evidence of the role of media in anti-democratic transitions and consolidation of dictatorships. Our aim is to fill this gap by measuring the effect of mass media 1) on maintaining or undermining democratic institutions of an unconsolidated democracy, depending on which political forces have control over media, and 2) on assuring popular support for a dictator's policies after the full consolidation of a dictatorial regime.

To identify the effect of radio we use a combination of a geographic variation in radio signal availability and of an over-time change in the content of radio broadcasts. In particular, we exploit the fact that during the Weimar Republic and the Third Reich the content of the broadcast changed twice, from having only educational and cultural programs before 1929 to having some political news with a mild anti-Nazi slant between 1929 and 1932 to heavy pro-Nazi propaganda starting from 1933, which we document using historical sources and data on radio programming.

First, we examine how shifts in the content of radio broadcasts influenced political support for the Nazi Party, which was gaining popularity during this period. We rely on geographical variation in radio listenership as well as radio availability calculated using Irregular Terrain Model (Hufford 2002, Olken 2009) to predict the strength of radio signal at every point in time in every locality based on the information on the location and the power of transmitters. The government of the Weimar Republic was unstable and, as a result, five parliamentary elections took place between 1928 and 1933 in addition to presidential elections of 1932.⁴ This sequence of elections allows frequent measurement of political preferences of the electorate.

In response to the initiative of the German nationalists, including the Nazi Party (NSDAP)⁵, to organize a referendum on renouncing the Treaty of Versailles in 1929, the Weimar government altered previously-apolitical mix of radio programming to include political news. These news broadcasts were slanted against the Nazis, as the Nazis (and the

into believing, likewise, that the propaganda was effective, and into placing primary emphasis on the media as a system of persuasion—a misconception which persists today.”

⁴ These elections were held on May 1928, September 1930, July 1932, November 1932, and March 1933.

⁵ NSDAP stands for *Nationalsozialistische Deutsche Arbeiterpartei*, the National Socialist German Workers' Party. It was founded in 1920 and dissolved in 1945.

Communists) were denied airtime unlike other political parties, whereas analytical programs always took centrist, anti-extremist, and essentially, pro-government perspective. We show that in the first parliamentary elections after the radio became political, namely in September 1930, an increase in Nazi vote share was substantially lower in places with higher radio availability.

The content of radio broadcast took another sharp turn — from having a mild anti-Nazi slant to a pro-Nazi propaganda — after Hitler was named chancellor of Germany and gained control over radio, among other executive powers, in January 1933. Only 5 weeks later, in the last competitive parliamentary elections of the Weimar Republic in March 1933, the effect of radio was reversed, so that an increase in Nazi vote share was greater in places with higher radio availability. The results are robust to using contemporaneous radio signal strength or fixing it at any point in time between 1928 and 1933; this highlights the fact that the main driver of the reversal of the effect of the radio is, indeed, the change in radio content.

We also identify the effect of the radio solely from the changes in the signal strength. The 1920s and 1930s was the time of rapid expansion of radio in Germany, and the number of radio subscriptions increased from essentially zero in 1924 to 2 million in 1928, to 3 million in 1930, and to more than 4.5 million in 1933. Thus, we can estimate the effect of radio diffusion, conditional on all time-invariant characteristics of localities, as well as time-specific shocks for all observable control variables. During the three elections between 1930 and 1932, when the Nazis were not given access to the radio, we find a significant negative effect of radio expansion on votes for the Nazi Party. In a specification allowing for differential effects of the radio over time, we confirm that radio had a significant negative effect on vote share of the Nazis in 1930, and a significant positive effect — in 1933. These results show that unobserved heterogeneity between localities is unlikely to drive our results.

In addition, we find that during both rounds of presidential elections in 1932, when radio had a pro-incumbent, anti-Nazi slant, radio signal a positive effect on the share of votes cast for the incumbent, Paul von Hindenburg. We also show that radio had a significant negative effect on the vote in the referendum against the Treaty of Versailles in 1929, which was supported by the Nazis.

Two counterfactual exercises highlight the role of the radio in the rise of the Third Reich. First, in the absence of the radio during the campaign for the September 1930 election,

Nazis could have gained almost as many seats as their main competitor, the Social Democratic Party (SPD). Therefore, they could have had larger bargaining power over choosing the candidate for chancellor two-and-a-half years before they actually gained executive power. Second, if the radio were switched off in January 1933, the subsequent elections would have produced a 2.7 percentage point lower vote share for the Nazi Party (which constitutes about 25 percent of what NSDAP actually gained between the November 1932 and March 1933 elections).⁶ The magnitude of these effects appears substantial in size, given that the Nazi propaganda was in effect for only five weeks and was less dramatic compared to the other methods of achieving electoral win by the Nazis, which included the ban on the newspapers supporting the Centre Party, violent attacks on meetings of Social Democrats, the passage of Reichstag Fire Decree, which removed some basic civil right and allowed the arrest of all the leaders of the Communist party, etc. In addition, historical evidence suggests that in 1933 propaganda primarily targeted uneducated poor workers (Paul 1990 [1933]), who rarely had access to radio sets, as shown by our data. To better understand the magnitudes, we also calculate persuasion rates for both pro- and anti-Nazi messages, similar to DellaVigna and Kaplan (2007), DellaVigna et al. (forthcoming), DellaVigna and Gentzkow (2011), and Enikolopov et al. (2011). We find that in the last few months that Germany remained a democracy, the persuasion power of pro-Nazi propaganda was smaller than that of the radio slanted against the Nazis in the 1930.

Our results confirm that radio propaganda was indeed an important tool in the struggle for power in the late Weimar Republic and was used both by the Nazis (after 1933) and by their opponents (before 1933).

The second question that we pursue in our analysis is whether radio helped the Nazis to maintain political support after they fully consolidated their power. We rely on such manifestations of political support for the regime as Nazi Party membership, deportations of Jews, and other expressions of anti-Semitism.⁷ We find that radio propaganda was important

⁶ In the absence of the radio in 1930, Nazis would have gained 3.9 percentage points more votes (22.1% instead of 18.2% of the total vote), or just 2.4 below their main competitor, the Social Democratic Party (SPD). In the absence of the radio in 1933, the Nazis would have gained 41.2% of the total vote in March 1933 elections.

⁷ Even though there were three parliamentary elections in the Nazi Germany—in November 1933, March 1936, and April 1938—voting results from these elections are useless in measuring political support for Nazis during this time. As is typically the case in dictatorial regimes, the Nazis banned all opposition parties, and in all of these

in persuading Germans to support the Nazi policies. First, radio availability increased the number of new members joining the Nazi Party after January 1933, when Nazis had full control over the content of radio broadcasts, but not in 1932, when they had no control over the content. The results imply that without radio propaganda, the number of new members of the Nazi Party would have been 46 percent lower in 1933. Radio exposure was also associated with higher levels of anti-Semitism as measured by the number of anti-Jewish letters to *Der Stürmer*, one of leading Nazi newspapers, written by ordinary Germans between 1935-1938, and the number of Jews deported to concentration camps.

The effects of propaganda on the public expressions of anti-Semitism crucially depend on the listeners' predisposition to the broadcasted message: Nazi radio propaganda had a larger positive effect on expressions of Anti-Semitism in places that were more positively predisposed to the Nazi propaganda. In particular, propaganda was most effective in places, which were historically more anti-Semitic, as proxied by the occurrence of anti-Jewish pogroms during the Black Death in 1348-1350 (Voigtländer and Voth 2012), and in places with larger popular discontent rooted in wealth inequality, proxied by the inequality in landholdings as of 1895 (Ziblatt 2009). In contrast, in places where population was negatively predisposed to the anti-Semitic messages, namely, in towns where pogroms did not occur despite the presence of a Jewish community in 1349, i.e., where the local German population historically was not anti-Semitic, the effect of Nazi radio propaganda on public expression of anti-Semitism was negative. This result highlights potential pitfalls of propaganda, which can backfire: if listeners are unlikely to believe the message, they may update negatively their prior about the nature of the regime, making the propaganda counterproductive. This evidence also sheds light on the mechanism of the effect of the Nazi propaganda on the public expressions of anti-Semitism. Potentially, it could serve as both persuasion and coordination devices, namely, making people change their views as a result of propaganda or just signaling that certain actions will not be punished. Since coordination mechanism is inconsistent with a negative effect of propaganda even if people are negatively predisposed to the message, one can conclude that at least a part of the effect is likely to come from direct persuasion

elections voters were presented with a single list containing only Nazi candidates. As a result, in 1933 the voter turnout and the vote for NSDAP were above 90%, while in subsequent elections they were above 98%.

(dissuasion), with the direction of the effect depending on the prior attitude of listeners toward the broadcasted message.

We conduct a series of tests in the spirit of Altonji-Elder-Taber (2005) to verify that our estimates of the effect of radio signal in cross-section specifications relying on the variation in signal strength are unlikely to be biased due to the effect of unobservable confounds. We show that, after controlling for urbanization (as measured by flexible polynomial of population and the city dummy) and province fixed effects, the part of the radio signal strength that can be predicted by the observables is not significantly associated with the outcomes of interest. Relying on the variation in the signal strength, however, is not crucial for our identification, as much of our analysis relies solely on the change in the content of radio broadcast holding the radio signal constant. We also verified robustness of our estimates to using matching estimator. In addition, a series of placebo tests provides evidence in favor of our identifying assumptions. We show that radio had no effect on outcomes that theoretically could not be affected by radio, namely, those measured before radio started to broadcast political news. In particular, future radio availability was not significantly associated with voting in Parliamentary elections in 1920, 1924 or 1928, with voting in Presidential elections in 1925, or with violence in 1920s.

Overall, the results suggest that, first, mass media can be both an important safeguard against the fall of unconsolidated democracy and an important facilitating factor in such a fall depending on who exercises control over content and whether the extremist speech is banned from the media; second, mass media can help dictators gain popular support and persuade people in virtue of their most horrible policies; and third, propaganda may be counterproductive if listeners have negative predisposition about its message.

Our paper relates to several growing literatures. First, the results contribute to our understanding of institutions in unconsolidated democracies and dictatorships (see Acemoglu and Robinson 2006 or Acemoglu and Robinson 2012 for an overview of the relevant literature). Our paper is the first to empirically assess the role of mass media in the process of institutional change, in particular, in the fall of a democracy and the rise of a dictatorship.⁸ It

⁸ Notable theoretical contributions to the theory of media in autocratic states are, for instance, Besley and Prat (2006), Egorov, Guriev, and Sonin (2009), and Gehlbach and Sonin (2012).

also contributes to the literature on the role of media in political persuasion (see, e.g., Strömberg (2004), DellaVigna and Kaplan (2007), Gentzkow (2006), Gerber, Karlan, Bergan (2009), Knight and Chiang (2009), Gentzkow et al. (2011), and Durante and Knight (2012) on developed democracies; and Enikolopov, Petrova, Zhuravskaya (2011) and DellaVigna et al. (forthcoming) on immature democracies). Our paper is the first to study the role of media under different political institutions in the same country: during the process of anti-democratic transition and in a dictatorship. We contribute to the literature by showing heterogeneous effects of propaganda and particularly the negative effect of propaganda if the audience disagrees with its message. Our work is also related to the literature on the effects of media on ethnic hatred and public expression of nationalistic feelings, i.e., DellaVigna et al. (forthcoming) and Yanagizawa (2012). In contrast to these contributions, our paper demonstrates the role of media for a much broader set of outcomes.

Finally, we contribute to the historical literature studying the determinants of electoral success of the Nazi party (Falter 1980, Ferguson and Voth 2008, King et al. 2006, Satyanath, Voigtländer and Voth 2013), the effects of propaganda in the Weimar Republic and Nazi Germany (e.g., Sington, Weidenfeld 1943; Ross 2006; and Zimmermann 2006), and the support of anti-Semitism when the Nazi were in power (Voigtländer and Voth 2012). Our paper, however, is the first to provide systematic, empirical evidence on the causal effect of radio propaganda on support for the Nazis.

The rest of the paper is organized as follows. Section 2 provides background information. Section 3 presents hypotheses. Section 4 describes data. Section 5 discusses empirical strategy and identification issues. Section 6 presents the empirical results. Section 7 concludes.

2. Background

2.1. Political landscape

The Weimar Republic was a parliamentary democracy established in Germany in 1919. Until 1932, its government was controlled by a coalition of centrist parties led by the democratically oriented Social Democratic Party of Germany (*Sozialdemokratische Partei Deutschlands*, SPD). Despite numerous economic problems, including hyperinflation in the first half of the 1920s, the coalition had a stable majority until 1930. However, the beginning of Great

Depression, U.S. stock market crash of 1929, and associated recall of American short-term loans to Germany, together with the continuous heavy burden of reparations, weakened the electoral support of parties in government. Early elections, held September 14, 1930, did not strengthen the coalition, but had the opposite result: the centrist parties lost a big share of the vote to opposition parties, and in 1930-1932 the centrist government could function only with the aid of presidential decrees. NSDAP certainly benefited from the economic crisis: it received 18.3% of the vote in 1930, compared with just 2.6% in 1928. Ongoing economic depression led to further radicalization of the population. In the presidential election of March 1932, Adolf Hitler captured 30.1% of votes in the first round, second only to the incumbent president, Paul von Hindenburg (49.6%). In April 1932, Von Hindenburg won the second round over Hitler, 53% to 36.7% (there were three candidates in the race). In the early parliamentary elections held July 31, 1932, the Nazi Party received an astounding 37.3% of votes. The Nazis got electoral support from the growing ranks of the unemployed and financial support from rich industrialists who feared substantial tax increase to pay government debt. Despite strong electoral support of Hitler's party, von Hindenburg refused to appoint him chancellor. In the November 1932 parliamentary election, Nazis got a lower vote share compared to previous elections, namely 33.1% of the vote. However, as a result of misguided political strategizing during negotiations between von Hindenburg and ex-chancellor Franz von Papen (ironically, aimed at setting constraints on the Nazis), Hitler was appointed chancellor on January 30, 1933.

Shortly thereafter, the Nazis quickly set about consolidating all political power, including police and radio stations. Goebbels unleashed a widespread campaign of radio propaganda. After the allegedly staged Reichstag fire in February 1933, the Reichstag Fire Decree suspended most civil liberties and restricted the freedom of press. The Communist leaders were arrested. Terror began to spread over the country. A week later, in the last competitive pre-WWII elections in Germany, the NSDAP gained 43.9% of votes, which allowed the Nazis in coalition with the Centre Party to pass the Enabling Act in 1933, which effectively allowed Hitler's government to enact decrees without consulting the Parliament. By the summer of 1933, all political parties except the NSDAP were outlawed, all independent newspapers were closed, Nazi officials were put in charge of all local governments, and trade unions were abolished and their leadership imprisoned. Germany had become a dictatorship.

2.2. Radio content

Early 1920s were marked by the beginning of the radio in Germany. In 1923 and 1924, the state postal company (*Reichspost*) together with private investors created nine regional broadcasting companies. Initially, these companies controlled their own content. Their programming included music (concerts, stage plays, and operas), literary programs (*belles lettres* and poetry), weather, sports, scientific and popular lectures, and advertising. Local news was mostly limited to nonpolitical information about local affairs, such as retail prices and police calls for witnesses.

In their first year of operation, few regional companies experimented with broadcasting political news. However, within several months of operation, the news agency Dradag had centralized the production of all political news programs. During the parliamentary election campaigns in May 1924, when the number of radio subscribers reached 16,000, Dradag allocated 15 minutes of air time to each of the following five parties: Zentrum, the DNVP, the SPD, the DVP, and the DDP.⁹ In 1924, the Minister of Home Affairs, Karl Jarres, argued for the regulation of radio, recognizing the risk of abusive uncontrolled political influence on the masses (Dussel 2010). As a result, a majority stake in Dradag was nationalized and the editors were obliged to report in line with official government positions. During the campaigns leading up to the parliamentary election of December 1924, when the number of registered listeners grew to more than 460,000, candidates were not given any airtime. By contrast, in the presidential election campaign of 1925, two candidates, von Hindenburg and Wilhelm Marx, were allocated radio time, whereas the Communist candidate, Ernst Thälmann, was not allowed to speak on the air. During this time, the role of politics in radio broadcasts was a subject of ongoing political debate. In 1926, a regulation forbidding any political, especially partisan, content was enacted. Between 1926 and 1928, radio was deliberately apolitical; broadcasts consisted of cultural and entertainment programs and the only few appearances of government officials were related to the celebrations of the constitution or the memorial day

⁹ DNVP stands for *Deutschnationale Volkspartei*, the German National People's Party; SPD stands for *Sozialdemokratische Partei Deutschlands*, the Social Democratic Party of Germany; DVP – *Deutsche Volkspartei*, the German People's Party; DDP – *Deutsche Demokratische Partei*, the German Democratic Party.

for the 9th November 1918. During the parliamentary elections of 1928, no content related to electoral campaigns was aired.

In 1929, however, the policy regarding radio content changed. The Nazi Party, in coalition with other right-wing parties, organized a referendum against respecting reparations required under the Treaty of Versailles (i.e., the so-called Young Plan). In response, the government launched an intensive campaign to encourage voting “no” in the referendum (Bausch 1956, p. 124).¹⁰ After 1929, radio became increasingly politicized, offering more and more pro-government and pro-democratic content, which included economic and political news, lectures, and speeches.

In order to illustrate the change in the radio content in the first decade of radio in Germany, we have collected information on radio programming. In particular, we have comprised a list of radio appearances of prominent political figures on the radio (i.e., government officials at the national or local level, party representatives from any political party, or members of parliament) between 1923 and the March 1933 election. Data Appendix describes the source of these data. Chart 1.A. of Figure 1 shows the number of appearances of political figures on the radio between the 1st of January 1923 and the 4th of March 1933, the last day of the campaign for the last competitive election in Germany before WWII. The figure confirms the claims of media historians (e.g., Pohle 1955, p. 93, Bausch 1956, p.170-171) that before 1929 radio was not used for the purposes of political persuasion: the figure shows a discontinuous jump in 1929 and an increasing trend since 1929 in the political broadcast.

Chart 1.B. of Figure 1 zooms into the election campaigns at the time when radio became politicized and plots the number of appearances of the political figures affiliated with the Nazis, the Weimar government coalitions, or other parties by election campaign, it also gives percentage of vote received by the Nazis in each parliamentary election. Figure A1 in the appendix gives more detailed information, namely, the number of appearances of political figures on the radio separately for each political party each year during the first decade of

¹⁰ The referendum failed due to insufficient turnout. The following quote is a typical example of messages broadcasted on the radio in the face of the referendum. Reich Minister of Home Affairs Carl Severing spoke on the radio on October 9, 1929, saying: “*The primitive consideration shows that the referendum against the enslavement of the German people would reach exactly the opposite of what it combats. The referendum relies on completely false premises, conceals crucial facts and works with methods which undermine the moral foundations of in democracy shaped, self-conscious people.*” (*Vossische Zeitung*, 10/10/1929, p.1).

German radio. It is evident from these figures that the Nazis were denied access to radio before Hitler's appointment as the Chancellor and had preferential access to radio after the appointment.

The graphs demonstrates that during the parliamentary election campaigns in 1930 airtime was given to all major parties with the exception of the Nazis (NSDAP) and the Communists (KPD). During the presidential election campaigns in the spring of 1932, airtime was given exclusively to the incumbent president, von Hindenburg, who campaigned against Hitler.¹¹

During the campaign for the parliamentary election of July 1932 chancellor von Papen have tried to establish closer ties with the Nazi Party and NSDAP was given some airtime together with other opposition parties with the exception of the communists, KDP (namely, Nazi representatives appeared on the radio three times).¹² The government, however, reserved a disproportionate amount of broadcasting time for itself (e.g., Pohle 1955, p. 106; Paul 1990, p. 93). After the elections of July 1932, the regional broadcasting companies were reformed, becoming more centralized and nationalized. Under Chancellor von Papen, radio was brought under firm state control over the latter half of 1932. "*As part of this restructuring, Interior Minister von Gayl ordered a daily 'Government Hour' for all radio broadcasters, during which ministers could hold supposedly 'unpolitical' speeches in support of government policies*" (Ross 2006, p. 206). By November 1932, the centralization and nationalization of all radio broadcasts was completed. By that time chancellor von Papen abandoned his attempts to establish closer ties with the Nazi Party, so NSDAP representatives were again denied airtime and the chancellor himself campaigned against Hitler.¹⁴

Thus, before Hitler was appointed chancellor, on January 30, 1933, the Nazis had virtually no influence on the content of radio broadcasts and radio content had been slanted in favor of

¹¹ Here is an example of von Hindenburg's radio speech: "*The election of a party man [Hitler], who is an advocate for a one-sided and extreme political ideology and who would turn the majority of the German people against him, would lead our homeland into a deep and extraordinary crisis. It is my duty to prevent this.*" (Schulthess 1932, p.55).

¹² Georg Strasser spoke twice on the radio on 6/14/1932 and on 6/29/1932 and Joseph Goebbels spoke once on 6/18/1932.

¹⁴ For example: "*When, today, I campaign against Hitler, for the rule of law, for the national community and for order in governance, I am thus following the goal---and he is not---that millions of his followers have for years longed for burning hearts in the struggle against party rule, against arbitrariness, and injustice.*" (Schallaufnahmen, p. 28, Roller, p. 129-130, Schulthess, p. 144-149).

government coalitions and, thus, against the Nazi Party. But under Hitler, radio programming changed sharply, and swiftly. Between February 1 and the parliamentary elections of March 5, the Nazis launched an intensive daily radio advertising campaign. Between February 1 and March 4 1933, Adolf Hitler, who had never been given access to radio before, spoke 16 times on the radio. The total number of appearances of the Nazis on the radio during the March 1933 election campaign was 28 compared to total of 4 appearances during the entire period from 1923 to January 29, 1933). The Nazis also minimized airtime for its coalition partner, the DNVP (which appeared on the radio 12 times during that campaign), and blocked access of all other parties (Diller 1980, p. 61). After Hitler's appointment, radio content became dominated by propaganda aimed primarily at uneducated workers (Paul 1990 [1933], p. 39). The broadcasts from demonstrations, marches, and rallies were to transmit the illusion that the Nazi movement was massively popular, which in turn would garner more votes during the upcoming elections.

The Nazis continued to use radio as one of their main propaganda tools up until their defeat. The content of radio broadcasting became even more centralized and all other ideologies were prevented from influencing the broadcasting. All employees considered 'unreliable', mostly Jews, were fired. Listening to and disseminating information delivered by foreign radio was heavily prosecuted (Dussel 1999, p. 105).

Anti-Semitic content was broadcast from 1933 on with varying degrees of intensity. As early as 1 April 1933, the Nazis called for a boycott of Jewish businesses on the radio.¹⁵ There was less anti-Semitic propaganda at the end of 1933 and in 1934 (Sommerville 2012, p. 118), but a new wave of anti-Semitism on radio was launched in September 1935, when Hitler announced new Anti-Jewish Law for the Protection of German Blood and German Honor. In the subsequent two years, open anti-Semitic propaganda was kept again rather low, with only few exceptions (Sommerville 2012, p. 123, 125). The period directly preceding the Night of Broken Glass—October and the first week of November 1938—was rather devoid of any Jewish-related content and it was only after the shooting of a German diplomat, Ernst von Rath, by a Jew on November 7, that the German News Agency was instructed to disseminate a

¹⁵ However, according to Sommerville (2012, p.99 and 115) this propaganda “*did not lead to a hugely successful response. Party and radio propaganda clearly had its limits in prompting action and manipulating the population.*”

story of a Jewish conspiracy (Steinweis 2009, p. 18-20). At the beginning of 1939 the stories of a global Jewish conspiracy against Germany was constantly broadcasted over the radio and used as a pretext for war preparations and for eliminatory anti-Semitic propaganda. After the outbreak of the Second World War, the anti-Jewish propaganda was intensified even more.

Online Appendix entitled “Anecdotal Evidence” presents quotes from various political speeches broadcasted on the radio at different points in time; quotes from historians analyzing the content of the broadcast, and quotes from Goebbels’s diaries, in which he speaks about the organization of the March 1933 election campaign and the Nazis preparation for the takeover of the radio before they actually took control over it. All these pieces of evidence point to the presence of three distinct periods in the history of radio in Germany before the WWII: 1) prior to 1929, radio was apolitical; 2) between 1929 and January 29 1933, radio broadcast was increasingly politicized in favor of the Weimar governments with virtually no access of the Nazis to the broadcast; and 3) from January 30 on, the radio broadcast became heavily biased in favor of the Nazis. Figure 2 portrays the timeline of the key political events analyzed in this paper with respect to these three periods in radio broadcasting.

2.3. Availability of radio

In the first decade of its existence, the German radio network rapidly expanded. The number of transmitters, and their power grew rapidly and almost monotonically. At the end of 1924, there were only 12 transmitters scattered around the country with cumulative power of 3.45kW. By the parliamentary elections of 1928, there were already 27 transmitters in operation with cumulative power of 67.75kW. By September 1930 elections, the number and the location of transmitters did not change from the previous election, but many of the existing transmitters had a substantial power upgrade, so that the cumulative power of transmitters increased to 81.5 kW. By the next election in July 1932, four powerful 60kW transmitters were in operation (both the new ones and upgrade old ones) and the cumulative power of transmitters increased to 262.25kW. By the next election, which took place just a few months later, namely, in November 1932, the cumulative power of transmitters increased to 315kW and by the March 1933 election campaign, the cumulative power of transmitters increased to 514.75kW with the total of 25 transmitters in operation, among which six having power of 60kW and one - 120kW. The Nazis continued upgrading the power of transmitters and added

several new transmitters after consolidating political power. As a result of further expansion, the cumulative power of transmitters increased to 960kW by 1938.

How was the location of transmitters decided? Initially, the country was divided into nine broadcasting districts, each with a diameter of about 200–300 km. To make the signal available to as many people as possible, transmitters were initially built in the center of the major city of each broadcasting district. Each transmitter was operated by the corresponding regional broadcasting company. The range and quality of the signal was insufficient to provide uniform radio signal coverage over the country. The demands for more localized content from areas with the signal and for radio availability from areas with no signal led to the construction of additional transmitters. The Geneva Frequency Plan, which came into effect in November 1926, reduced the number of available radio frequencies and led to the creation of single-frequency networks in each of the nine broadcasting districts. This resulted in uniform programs within each of the broadcasting districts. The technical upgrades of the more powerful transmitters required moving them from the city center to the outskirts (Schütte 1971) and a study of population densities was conducted to determine the optimal location of the most powerful transmitters to reach the maximum potential listeners.¹⁷ An additional important rationale for upgrading the power of existing transmitters and building new ones was to reduce signal disturbances from foreign transmitters near the border.¹⁸

The listenership of radio was also rapidly growing together with the expansion of the signal strength. Vaessen (1938) gives aggregate information about the number of radio subscribers during the first decade of German radio. Figure 3 presents these data. Radio subscription rates were expanding fast from essentially zero in 1924 to almost 5 million by the end of 1933 (with 65.36 million population). Each year thereafter saw about 1 million additional radio subscribers.¹⁹ According to Lerg (1980), by 1927 the transmitters' signal

¹⁷ Neuordnung des Rundfunks in Deutschland. Der Deutsche Rundfunk, Nr. 49, 6.12.1929, p. 1545f.

¹⁸ For example, the transmitter in Flensburg was constructed in December 1928 as a response to a nearby Danish transmitter. The transmitter in Gleiwitz was built in 1925 because of a Polish transmitter in nearby Kattowitz, and its power was increased to 12 kW in 1927 after the power of the Kattowitz transmitter was increased to 10kW. This upgrade made the “supplementary” transmitter in Gleiwitz the third most powerful in Germany at that time (Schütte 1971).

¹⁹ The subscription figures give a lower bound on the number of radio listeners, because 1) usually there were several listeners per subscription and 2) some listeners have evaded the subscription fee (e.g., Fuge 2009). However, the number of evaders was probably not very large after the initial period of radio introduction as evading the subscription fee was severely punished.

reached areas populated by 31.3% of the German population, and by 1934 it reached 70% of the population. Far from all of them, however, had radios. Fuge (2009, p. 21) reports that 33.3% of German households had a radio set in 1934 and 65% in 1938.

Radio listenership was significantly higher in the big cities with transmitters and suburban areas around them, as the signal was sufficiently strong for reception with relatively cheap crystal radio receivers. Listenership was lower in rural areas because fewer citizens had the more powerful radio sets needed to capture broadcasts. Radio listenership was further hindered in rural areas by the widespread lack of electricity, since at the time, 96.5% of receivers required power supply. The monthly radio subscription fee of 2 marks, which was routinely collected up to 1933, was roughly equivalent to the price of a monthly newspaper subscription, two hours of skilled labor, or four hours of unskilled labor. Technical progress led to improvement of radio receivers over time, but their quality and price varied substantially. The cheapest crystal radio receiver was available for 25 to 30 marks, while more sophisticated vacuum detectors ranged from 110 to 380 marks. Anecdotal evidence shows that some German houses in the 1920s and 1930s were equipped with homemade radios.²⁰ Overall, radio listenership was higher in places with higher population density, better economic conditions, and more favorable terrain (Cebulla 2004, p. 34). We confirm these findings using our own data in section 5.2 below.

From 1933 onward, the Nazis strove to increase the number of radio listeners. Mass production of an affordable radio receiver, was organized by Goebbels orders. The *Volksempfänger* (people's receiver) was launched on August 18, 1933, during the international radio exhibition in Berlin. During the radio exhibition in 1938 a new, even cheaper version of people's receiver was presented and by May 1939 0.9 million receivers had been sold with another 1.9 million followed by 1943 (Dussel 1999, p. 101). In an attempt to maximize listenership after consolidating power, the Nazis substantially broadened the categories of the

²⁰ During the First World War, 4,000 radio operators were trained to assemble their own receivers, and members of many local radio clubs also made their own receivers. According to Lerg (1980, p. 105), after 1932, when the prices for radios declined, the scale of home-making of new radios declined; however, the home upgrades of radios leading to a better reception increased.

population exempt from the radio subscription fees (Fuge 2009). Radio was also made available those who could not afford a private radio receiver through collective listenership.²¹

3. Hypotheses

First, to test whether the radio played a role in dismantling the democratic institutions of the late Weimar Republic, we consider how radio availability affected voting for the Nazi Party during three periods: (1) before 1929, when radio was neutral and apolitical; (2) between 1929 and 1932, when radio had a relatively mild pro-government, pro-democracy and anti-Nazi slant; and (3) after January 1933, when the Nazis started using radio as a full-fledged propaganda machine. We expect that exposure to radio decreased the vote share of the Nazi Party at the time when radio had an anti-Nazi slant and increased the vote share of the Nazi Party after it got control over the radio. An important falsification test is to verify that radio signal was uncorrelated with the Nazi vote share conditional on observables before radio got political content.

Second, we investigate the effect of radio on the support for Nazi policies after Hitler established dictatorial rule in 1933. We expect radio propaganda to increase the number of new members in the Nazi Party and promote open expressions of anti-Semitic sentiment among ordinary Germans.

Third, we test the hypothesis about the difference in persuasion power of the propaganda messages between audiences more and less positively susceptible to propaganda. Listener's prior about the content of the message should matter for the effectiveness of propaganda (DellaVigna and Gentzkow, 2010). In particular, we expect that in places with higher initial levels of anti-Semitism, Nazi radio propaganda had a larger effect on the expressions of anti-Semitic sentiments compared to places with lower initial levels of anti-Semitism. Furthermore, as recent research in social psychology suggests that higher levels of income and wealth inequality are associated with higher levels of anxiety (e.g., Pickett and Wilkinson 2011) and that people with high level of anxiety are more responsive to persuasion

²¹ “The party through its ‘wireless wardens’ and ‘block wardens’ in every village and town, help[s] to install communal receiving sets, organizes group listening, lays down rules about the erection of aerials, and reports on illegal listening-in to foreign stations” (Sington and Weidenfeld 1943).

messages (Marcus et al. 2006, Brader, Valentino, and Suhay, 2008), we expect propaganda to be more effective on average in more unequal localities.

Fourth, radio was far from being the only means of political persuasion. Even before taking control over radio, Nazis organized fierce political campaigns using posters, street rallies, and door-to-door campaigning. We test whether radio propaganda was a substitute or complement to one of the other tools of Nazi political persuasion: Hitler's electoral speeches.

4. Data sources

Radio availability. We use two main sources of data for radio availability across different regions: radio signal strength, available for the entire period, and radio subscription rate, available only for three points in time: April 1931, April 1932 and April 1933. We calculate radio signal strength using information on the radio transmitters. Our primary source of data for transmitter location, frequency, and power is *Mitteilungen der Reichs-Rundfunk-Gesellschaft* (various years). In addition, we use data from *Rundfunk Jahrbuch 1929* for the year 1928. All these sources refer to *Union Internationale de Télécommunications* as the primary source of their data. Based on this information, we calculate predicted radio signal strength in all localities using the Irregular Terrain Model (Hufford 2002, employed also by Olken 2008, Enikolopov et al. 2011, and DellaVigna et al. forthcoming). For each district (*Kreis*) and each town, we compute signal strength at their geographical centers. The district boundaries come from the map of administrative borders in 1925. Figure 4 presents the map of the radio signal strength by district during the five parliamentary elections in 1928-1933. In addition, Figures A2 and A3 in the online appendix present the maps of the radio subscription rate and the changes in the signal strength over this time period. The source of the data on the radio subscription rate is described in the data appendix.

Electoral measures. The data on elections come from Falter and Hänisch (1990) and ICPSR (1999). We use voting results for the five parliamentary (Reichstag) elections between 1928 and 1933, two rounds of presidential elections in March and April 1932, and the referendum on the "Law Against the Enslavement of German People" in December 1929 by district. For the parliamentary elections, we focus mainly on the Nazi vote share, but we also consider the vote shares of other major parties and voter turnout. For the presidential elections, the outcomes are the shares of votes received by the incumbent von Hindenburg and by Hitler. As

for the referendum, the outcome is the number of votes in favor of the proposal during the referendum as a share of registered voters.²²

Anti-Semitism measures. The measures of anti-Semitism primarily come from Voigtländer and Voth (2012) and are at city-level. In particular, we use the information on the number of anti-Semitic letters to *Der Stürmer* from 1935 to 1938, a dummy variable for whether synagogues or Jewish prayer rooms were damaged or destroyed during the *Reichskristallnacht* in 1938, and the information on the number of Jews deported from 1933 to 1942. After 1942, deportations of Jews grew into a systematic and massive policy and, therefore, stopped being a proxy for local anti-Semitism. Before 1942, however, deportations reflected hostility of local officials and non-Jewish neighbors. For example, Gellately (2001) provides evidence that the vast majority of the Gestapo cases against the Jews were based on denunciations by local non-Jewish population. This variable comes from the database of Jewish deportees during the Nazi period, which was compiled by the German Federal Archives (Bundesarchiv 2007). To measure historical predisposition to anti-Semitism at city level, we use measures of the incidence of pogroms and information on the existence of Jewish settlement in the 14th century from Voigtländer and Voth (2012).

NSDAP membership. The information on NSDAP membership comes from the data set of party membership cards (Brustein and Falter, 1995). Based on these data, we compute the number of people who joined NSDAP in 1932 and between February and May of 1933, by city. The Nazis stopped accepting new members in May 1933 because of too many applications (this ban was lifted in 1937). We restrict the sample to those cities for which there is at least one observation in both 1932 and 1933. The reason for this is that missing data for a particular city-year does not mean that there were no new members from this city joining NSDAP, as the data are a random sample of party membership cards stratified at the city and year level.

Control variables. For sociodemographic variables, our primary source was data from *Zentralarchiv* and German census data from Falter and Hänisch (1990). In particular, we use

²² For a proposed law that did not require changes in the constitution to pass referendum, a majority of eligible voters had to turn up to the polls and a majority of those who turned up had to vote in favor of the proposal. Voter turnout at the referendum was extremely low (about 12 percent), so not voting was equivalent to casting the vote against the law. This is why we use the share of those who voted in favor of the law in the total number of eligible (registered) voters rather than as a share of valid votes.

the following sociodemographic variables from the census: population, the share of Jewish and Catholic population, and the share of workers in white- and blue-collar occupations in 1925. We also control for the shares of unemployed and partially employed people in 1933 as unemployment was an important determinant of pro-Nazi voting (Childers 1983 and King et al. 2008). We use data on property tax payments and the number of participants of World War I, welfare recipients, and pensioners receiving social assistance from the statistical yearbooks (*Statistik des Deutschen Reichs* for various years; see appendix for details).

As alternative measures of predisposition to propaganda, we also use the historical landholding inequality as of 1895 from Ziblatt (2009) and the vote for the extreme-right political party NSFP in December 1924. In some specifications, we also use the number of speeches that Hitler gave in 1932 in each city based on the information from Domarus (1962) and Dusik (1992).

We also collected geographical information for each locality in the dataset, namely, the altitude and the distance to the closest large city, defined as having more than 50 thousand people. These control variables are measured at the district level using the administrative borders in 1925. The electoral districts and sociodemographic data were manually merged to administrative district units in 1925.²³ The number of districts in the dataset is between 918 and 959, depending on the year.

All data sources are described in more detail in the appendix, and the summary statistics for all variables is presented in Table A1 in the appendix.

5. Empirical framework

In this section, we present our main specifications and motivate them with a series of reality checks and evidence in favor of the identifying assumptions.

5.1. Specifications

First, we examine the effect of radio exposure on the rise of electoral support for the Nazis using the following specification, which we estimate separately for each of the elections at the

²³ In cases when the level of election and socioeconomic data did not coincide with 1925 administrative districts (*Kreis*), we merged units in Census and elections data from Falter and Hänisch (1990) dataset with 1925 units using maps. Note that, due to gerrymandering, the number of electoral districts is different in different years.

time when radio had not neutral political content, i.e., for September 1930, July 1932, November 1932, and March 1933:

$$\Delta y_{it} = \beta_{0t} + \beta_{1t} \text{Exposure}_{it} + \mathbf{X}_{it}' \boldsymbol{\beta}_{2t} + \phi_{pt} + \epsilon_{it}, \quad (1)$$

where i indexes districts and t indexes elections. Δy_{it} is *the change* in vote share for the Nazi Party in district i between elections in period t and the previous elections in period $t-1$; Exposure_{it} is our main explanatory variable -- a measure of exposure to radio. We use three different measures, namely, the radio signal strength, a transformation of radio signal strength using generalized logistic function that generates the best fit in the bivariate relationship between subscription rates and the signal strength, and the subscription rate itself. We describe these measures in detail below.

ϕ_{pt} is a province fixed effect that takes into account the variation between provinces, and therefore, we focus on within-province variation.²⁴ ϵ_{it} describes unobserved heterogeneity. \mathbf{X}_{it} denotes the following set of controls. First, we control for the determinants of transmitter location that also can be related to the support for the Nazis independently of their effect on radio availability. As both radio signal strength and voting for the Nazis were strongly correlated with urbanization, it is important to control flexibly for population. In particular, we control for the fifth-degree polynomial of population and a dummy for city status of the district. As radio transmitters were located in or right next to big cities and the big cities were also the centers of diffusion of information via other means, we control for the distance to big cities and check that our results are robust to controlling for newspapers circulation and the number of cinemas. Second, we control for the socio-economic characteristics described in Section 4. Finally, as a measure of preexisting political preferences, we control for the vote shares of the two nationalistic parties (DNVP and NSFB), the two main non-nationalistic parties (SPD and Zentrum) and voter turnout in December 1924 parliamentary election, the year when radio was not yet available to the general public.

Second, we run a set of panel specifications with district and time fixed effects to account for time-invariant unobserved characteristics of the districts. In the main panel

²⁴ Previous literature on voting for the Nazi Party focused mostly on differences between provinces, we are using much finer data, controlling for all unobserved variation across provinces.

specification, we estimate the regression for the three consecutive elections in 1930 to 1932 when the radio was anti-Nazi:

$$y_{it} = \beta_0 + \beta_1 Exposure_{it} + \mathbf{Z}_{it}'\boldsymbol{\beta}_2 + \varphi_i + \tau_t + \epsilon_{it}, \quad (2)$$

where y_{it} stands for *the level* of the vote share for the Nazi Party in district i and election t . φ_i stands for the district fixed effects and τ_t is fixed effect for each period, i.e., each election t . In all panel specifications, we interact all time-invariant controls with time effects, and \mathbf{Z}_{it} stands for the set of these interactions. Note that unlike radio signal strength that is available for every election, the radio subscription rate is available only for three points in time between 1930 and 1932 that do not coincide with the timing of election campaigns; therefore, we can use this variable to measure radio exposure in a panel specification only for two periods. We estimate specifications (1) and (2) using OLS with all available measures of radio exposure and using 2SLS, in which the radio subscription rate is instrumented by the logistic function of signal strength.

The next panel specification uses data on all parliamentary elections between 1928 and 1933 and takes into account changes in the radio content directly by estimating the following equation:

$$y_{it} = \beta_0 + \beta_1 Slant_t * Exposure_{it} + \mathbf{Z}_{it}'\boldsymbol{\beta}_2 + \varphi_i + \tau_t + \epsilon_{it}, \quad (3)$$

where $Slant_t$ is measures of the direction of the slant in the political broadcast at time t . Based on the content analysis presented in Figure 1, we set the slant equal to 0 in 1928, -1 in 1930–1932, and 1 in 1933, since the available data on the content are too crude to assess the relative magnitude of anti- and pro- Nazis slant more finely.

We also estimate the effect of radio exposure using several cross-sectional outcomes using the following specification:

$$k_i = \beta_0 + \beta_1 Exposure_i + \mathbf{X}_i'\boldsymbol{\beta}_2 + \phi_p + \epsilon_i, \quad (4)$$

where k_{it} is a cross sectional outcome. We run this regression at district level for the results of the referendum in 1929 and of the presidential election in 1932 as outcome variables. We also estimate equation (4) for the new membership of the Nazi Party in 1933 in a subsample of cities, for which this variable is available. Finally, we estimate equation (4) on the population of German towns to establish the effect of the radio exposure on the expressions of the anti-Semitism after the Nazis consolidated power. We use a more parsimonious list of controls in

city-level regressions (to be described below), because cities constitute a more homogenous sample compared to districts as the latter include both rural and urban areas.

Finally, we study the differential effects of radio propaganda. We interact radio exposure with several alternative measures of susceptibility to propaganda in a series of cross-sectional specifications:

$$k_i = \beta_0 + \beta_1 Exposure_i + \beta_2 (Exposure_i - \overline{Exposure}) \times S_i + \beta_3 S_i + \mathbf{X}_{ipt}' \boldsymbol{\beta}_3 + \phi_p + \epsilon_i, \quad (5)$$

where S_i denotes different measures of predisposition to Nazi propaganda messages and general discontent of the population. We subtract the mean of radio exposure before taking the interaction term, so that the coefficient β_3 reflects the direct effect of these variables at the mean level of radio exposure.

5.2. Radio listenership and radio signal strength

First, we examine how radio signal strength is related to the radio subscription rate, which is the best available proxy for the actual radio listenership.²⁵ Figure 5 presents the bivariate scatterplot of the radio signal strength across districts in September 1930 and the subscription rate in April 1931. It shows that an increase in the signal strength translated into additional subscriptions only after a certain threshold level of signal strength. Below this threshold, the quality of the signal was insufficient to listen to the radio.²⁶ At the same time, only few observations lie above the threshold of signal strength, above which a further increase in signal strength did not translate into an increase in listenership because signal was already sufficiently strong for high-quality reception. Figure 5 also plots the generalized logistic function that we use to parametrically fit this relationship.

Table 1 presents the relationship between the radio subscription rate (for the three points in time when these data are available) and the signal strength at each parliamentary election date between 1930 and 1933 conditional on the standard set of controls. Panel A shows the results using the plain signal strength, and the result in Panel B instead of the plain

²⁵ The number of subscribers should be proportional to actual listenership but is substantially smaller, as it does not take into account that, on average, several people listen to one radio set with a subscription and that some people listened to radio without paying the subscription fee.

²⁶ Similar S-shape relationships have been documented in other contexts, e.g., Olken (2009). The threshold levels of the signal strength, above and below which the change in the signal does not affect the actual radio availability, change with technological progress. Thus, the level of the thresholds cannot be compared across different contexts.

signal strength uses the generalized logistic transformation of the signal strength using the function presented in Figure 5. In all cases, the coefficients on the signal strength or its non-linear transformation are positive and highly significant (the F-statistics for the significance of signal strength variables are presented in the last column of the paper). A one-standard-deviation increase in the signal strength was associated with a 2.9-percentage-point increase in the share of population with a radio subscription in 1930 (with the mean of 18.8 percent of subscribers in total district population as of 1931). In 1933, a one-standard-deviation increase in the signal strength was associated with 1.7 additional percentage points in the share of subscribers (with the mean value of 26 percent). Thus, we find a strong positive relationship between the quality of radio signal and radio listenership.

5.3. Determinants of the radio availability

What are the main determinants of radio availability? Radio signal strength in each location depends on the distance to transmitters, their power, and topography in the line of sight between transmitters and the location. Transmitters were placed strategically to reach as many listeners as possible. Because transmitters are not randomly located, radio signal strength is expected to be correlated with socioeconomic characteristics. Table 2 summarises the results of the cross-sectional regressions, in which, at every election date, the signal strength and its non-linear transformation are regressed on four groups of variables that jointly form our baseline set of controls: province fixed effects, the determinants of transmitter location, socioeconomic characteristics, and voting outcomes in 1924. The most important determinants of district signal strength are the province fixed effects and the variables that predict transmitter location, i.e., distance to the nearest big city, altitude, dummy for the urban districts, and population size (flexibly controlled for with the fifth-order polynomial). These variables alone explain over 97% of that part of the variation in the signal strength that is explained by the full set of controls.²⁸ However, some socioeconomic characteristics and voting outcomes in 1924 (in particular, the share of white-collar workers, welfare recipients per 1000 population, the voter turnout and the vote for NSFB party in 1924), are significant

²⁸ The variation in signal strength coming from topography conditional on free-space signal is insufficient for much of the German territory, and therefore, we rely on the variation in signal strength coming both from topography and distance to transmitters. However, the distance to the closest big city (with or without the transmitter) controls for the potential confounds, such as proximity to other sources of information, which, otherwise, would have been correlated with the free-space signal as transmitters locate close to big cities.

correlates of radio signal strength across districts between 1928 and 1933 even conditional on province fixed effects and the main determinants of transmitter location. The F-statistics for the joint significance of variables in each of these four groups is given in the Table 2.

The fact that signal strength is significantly correlated with voting outcomes before the appearance of radio is a potential concern, since this may indicate that some unobservable characteristics of districts determining the outcomes of interest are correlated with signal strength, which would bias the results that rely on the variation in the radio signal. The presence of correlation between unobservables and our main explanatory variable is untestable. However, we perform a series of tests in the spirit of Altonji, Elder, and Taber (2005) to show that such a correlation is not likely to bias the results. We describe these tests and report their results below together with the baseline results of each specification that relies on the variation in the signal strength. In addition, below we present results that rely only on the variation in radio content holding the signal constant. As these results do not rely on the variation in radio signal, they require a much weaker identification assumption.

6. Results

6.1. The effect of radio on the support for the Nazis while Germany was still a democracy

Panels A and B of Table 3 present results of cross-sectional regressions in which the change in the Nazi vote share from the previous election is related to various measures of radio exposure for each parliamentary election between September 1930 and March 1933. Specifically, Panel A presents estimation results of equation (1) with the signal strength and its logistic transformation as a proxy for radio exposure. The list of baseline covariates is described in Section 5.

The results show that radio availability had a different effect on political support for the Nazi Party at different points in time depending on its content. We find that the radio exposure had a significant effect on the change in the political support for the Nazis when and only when the content of the political broadcast changed. As radio content shifted from neutral to having an anti-Nazi slant, i.e., between elections of 1928 and 1930, the radio signal was associated with a significantly slower accumulation of votes by the Nazis. The magnitude of the effect implies that a one standard deviation increase in the signal strength led to a 0.8 percentage point smaller increase in the share of votes for NSDAP between 1928 and 1930. There is no

significant effect of radio signal on the gain of votes by the Nazis for the two consecutive elections in 1932, when radio content was not changing dramatically, with Nazi representatives not having access to the broadcast.²⁹ In contrast, when radio content shifted from being anti-Nazi to pro-Nazi, i.e., between elections in November 1932 and March 1933, we find a positive and significant effect of the signal strength on the change in the Nazi vote share. A one standard deviation increase in the signal strength led to a 0.5 percentage point larger increase in the Nazi vote share between November 1932 and March 1933. The scatterplots for these regressions indicate that none of the results are driven by outliers (see Figure A4 in the appendix) and reflects a shift in the distribution of votes (see Figure A5 in the appendix).

Table A2 in the appendix illustrates how the point estimates of the coefficients are affected by changes in the list of covariates. For both September 1930 and March 1933 elections, the magnitude of the estimated effects do not change much with additional covariates after we control for province fixed effects, population, and city dummy. Most notably, controlling for the distance to big cities, which may proxy for the exposure to alternative sources of political information, such as newspapers, cinemas, or political rallies, does not affect the magnitude of the estimated coefficients too much: the inclusion of this control does lead to a negative shift in the point estimates of the coefficient on radio exposure. Namely, the inclusion of this control increases the magnitude of the negative effect in 1930 and decreases the magnitude of the positive effect in 1933; neither of these shifts is large. Appendix Table A3 verifies that the results are robust to using matching estimator instead of OLS.³⁰

To get a better sense of the magnitude of the effect, we consider our proxy for listenership—the share of the district population with subscription to the radio—as an alternative measure of radio exposure. We report both OLS and IV results, in which the radio subscription rate is instrumented by the non-linear transformation of the radio signal strength. IV regressions are better identified both because listenership is an endogenous choice variable

²⁹ The sign of the coefficient is positive for July 1932 and negative for November 1932, consistent with the fact that representatives were allowed to appear several times on the radio before July 1932 elections and were fully excluded before the November 1932 elections.

³⁰ To do the matching, we use alternative thresholds for signal strength, to create mapping between a continuous signal strength measure and binary signal variable for matching estimator, based on the relationship between listenership and signal strength. We use nearest neighbor matching for all the controls that we include in our regressions, with exact matching by province, city status, and the extent of historical anti-Semitism.

and because the subscription rate measures listenership with an error. Panel B of Table 3 presents the results. According to the IV estimation, a one standard deviation increase in subscription rate in a district led to a decrease in Nazi vote share by 2.9 percentage points in 1930 and an increase in Nazi vote share by 1.7 percentage points in 1933, in comparison to their results in previous elections. OLS estimates are substantially smaller in magnitude (such that the effect for March 1933 is insignificant), plausibly, because of a measurement error.

The main identification assumption behind the results presented in Panels A and B of Table 3 is that, conditional on observable differences between districts (i.e., socioeconomic characteristics, pre-existing political preferences, and geographical characteristics, including proximity to large cities), the variation in the radio signal strength was not correlated with the unobserved characteristics affecting the change in the political support for the Nazis. We follow Altonji, Elder, and Taber (2005) to show that it is unlikely that such a correlation biases our results, under a reasonable assumption that unobservables are correlated with observables. In particular, we first predict signal strength in each district with observables by taking the fitted value from the regressions of the signal strength and its non-linear transformation on the full set of baseline controls, with the exception of the most fundamental structural determinant of the support for the Nazis, namely, the fifth-order polynomial of population and dummy for urban district (for which we control directly). Then, we regress the Nazi vote shares on this fitted value controlling for the fifth-order polynomial of population and the city dummy. None of these regressions show a significant correlation between the index of observables, which best predicts the signal strength and its logistic transformation, and the Nazi vote share. This test suggests that the results of the Table 3 are unlikely to be driven by unobserved heterogeneity among districts, provided that unobservables are correlated with our baseline controls.

Since we cannot directly test the identifying assumptions behind the results in Table 3, we proceed to estimating specifications that require less stringent identification assumptions. First, we fix the measures of radio exposure at a certain point in time, and consecutively estimate equation (1) for all elections between September 1930 and March 1933 holding the radio exposure constant³¹ In this specification, the effect of radio is identified solely from the

³¹ For this exercise, we use a more parsimonious set of controls that includes Control variables include province

change in the content of the radio and the identifying assumption is that the correlation between the political support for the Nazis and the unobservables does not change over time, but this correlation does not need to be zero.. Figure 6 summarizes the results by plotting the coefficient estimates. Consistent with our previous findings, the effect of radio exposure on the change in the Nazi vote share moves from negative in 1930 to zero in 1932 and to positive in 1933 irrespective of the time at which we measure radio signal.

During the 1930s, radio was expanding and, therefore, we can also explore the over-time changes in the signal strength to estimate the persuasion power of the radio, controlling for time-invariant unobserved heterogeneity between districts with district fixed effects. At first, we confine our analysis to the three consecutive elections in which radio had an anti-Nazi slant, in 1930 and 1932. Columns 1 and 2 of Table 4 present the results of the estimation of equation (2). We find that the 1930–1932 expansion of radio led to a smaller Nazi vote share in districts that gained access to the radio during this time, conditional on all observables as well as unobserved heterogeneity between districts. The magnitude of the point estimate is similar to what we found in cross-section in 1930 for the specification where we use a non-linear transformation of signal strength as a proxy for radio exposure and somewhat smaller for the specification with liner signal strength. In both specifications, the effect is statistically significant.

In columns 3 and 4 of the table, we report estimation of equation (3) using data from five elections in 1928-1933 with radio availability interacted with the measure of radio slant. This specification combines the effects of the change in the radio content with the change in the radio availability due to radio expansion. We find that radio availability interacted with the measure of the pro-Nazi slant has a positive and significant effect on the Nazi vote.

Columns 5 and 6 present results of regressions estimating equation (3) with radio subscription rate as a measure of radio exposure. The timing of the measurement of the subscription rate, however, allows matching only two time periods in a panel (and only imperfectly). Thus, we run this equation as a cross-section of the first differences in which the change in the Nazi vote share between September 1930 and November 1932 is regressed on

fixed effects, fifth polynomial of population, urban district dummy, shares of Jews and Catholics, shares of blue-collar and white-collar workers.

the change in the subscription rate between April 1931 and April 1932.³² Column 5 reports the OLS estimate and column 6 the IV estimate, with the change in the subscription rate instrumented by the change in the logistic transformation of the radio signal between September 1930 and November 1932. Both specifications give the predicted negative coefficient, but only IV is significant. The magnitude of the effect implies that a one standard deviation increase in the signal strength in the period between 1930 and 1932 led to a decrease in the share of votes for NSDAP of between 0.4 percentage point (OLS specification) and 2.8 percentage point (IV specification). A one standard deviation increase in the signal strength in the period between 1930 and 1933 led to a 0.5 percentage point change in the share of votes for NSDAP.

Overall, the panel-data specifications of Table 4 confirm that the time-invariant unobserved heterogeneity is not what drives the results in cross-sectional specifications as the results remain strong and significant when we include location fixed effects.

We also study the effects of radio on the voting “yes” during the 1929 -Nazi-supported referendum for the “Law against the Enslavement of German People,” and on the results of presidential election in 1932. In particular, we estimate a cross-sectional specification (4) for these outcomes controlling for our baseline set of controls and the NSDAP vote share in 1928 (to control for pre-existing political preferences). Panel A of Table 5 presents these results. The support of the referendum is significantly negatively related to radio exposure, measured both by radio signal strength and its non-linear transformation. A one standard deviation increase in the signal strength led to a 0.8 percentage point (i.e. 5 percent) decrease in the support of the referendum. The estimated effect of radio on the results of the presidential elections is less precise, but has the predicted sign: positive for the vote share of incumbent von Hindenburg, and negative for the vote share of Hitler. Only one out of four estimated coefficients are statistically significant, however. Panel B of Table 5 presents the results of the test à la Altonji, Elder, and Taber (2005), which confirms that the index of observables that best predicts radio availability is not significantly correlated with the outcomes of interest,

³² The results are similar if we look at the change in the Nazi vote share between September 1930 and July 1932.

controlling for pre-existing political preferences, fifth-order polynomial of population and the city dummy.³³

We also examine how radio availability affected voter turnout. Table A5 presents the results of the regressions estimating equation (1), with turnout as the dependent variable. We find a marginally significant positive effect of radio signal strength in March 1933 and no significant effect in other elections or if we use non-linear transformation of the signal strength. Overall, there is no evidence of the effect of radio availability on turnout at parliamentary elections.

Overall, our results are consistent with the hypothesis that, while Germany was still a democracy, radio played an important role in slowing down the Nazis' rise to power before they took control over content and that this effect was undone in the March 1933 election, after just one month of heavy pro-Nazi radio propaganda.

6.2. Did radio help the Nazis maintain political support after they consolidated power?

Next, we examine whether and how radio helped the Nazis maintain public support for their policies after they came to power in 1933, focusing on non-electoral outcomes.

First, we consider whether the radio propaganda helped the Nazi recruit new party members. Results are reported in Table 6. The sample consists of 633 (out of 958) districts with information on party membership.³⁵ We find that in 1932, when radio still had an anti-Nazi slant, the number of party members was not significantly related to radio availability (columns 1 and 2). It is not surprising, that the Weimar republic's radio did not have an effect on the Nazi party membership, as, presumably, those who joined the party at that time were mostly the core Nazi supporters, whose preferences for the party were relatively strong and could not be affected by radio messages. In contrast, in February-May of 1933, after the Nazis took over the radio, party membership became significantly positively associated with radio

³³ We also looked at the cross-sectional regressions in which the level of Nazi vote share (rather than the difference in vote share from previous election) is related to the signal strength of German radio for each parliamentary election between March 1928 and March 1933. The results are presented in Table A4. We find that, in 1928, when radio was neutral and apolitical, radio availability did not affect Nazi vote share. During elections of September 1930 radio signal strength became a negative significant predictor of Nazi vote share. In July 1932, and November 1932 the magnitude of the coefficient becomes smaller and it loses statistical significance, and in March 1933 the negative effect of radio signal strength became much less pronounced and insignificant.

³⁵ Results are robust to using the full sample, treating missing observations as zeros.

signal strength (columns 3 and 4). Columns 5 and 6 show that party membership in February-May of 1933 increased faster in places where the 1932 growth rate was higher, however, controlling for new party membership in 1932 does not alter the coefficients on the radio exposure or their standard errors: they remain positive and statistically significant. The magnitude of the effect implies that approximately 46 percent of new NSDAP members were persuaded by radio propaganda during the first two months of the Nazi control over the broadcast.³⁶ The Panel B of Table 6 presents the results of the Altonji, Elder, and Taber (2005) tests. Consistent with our identification assumptions, they yield no statistically significant association between the indices of observables and the new Nazi party membership.

Second, we examine whether Nazi radio propaganda had an effect on expressions of anti-Semitism proxied by deportations of Jews between 1933 and 1942, anti-Semitic letters to the Nazi newspaper, *Der Stürmer*, and attacks on synagogues during the Night of Broken Glass (*Reichskristallnacht*). These variables are measured at the city level for 1,428 locations. We estimate equation (4) with these measures of anti-Semitism as dependent variables and radio signal strength in 1937 as the main explanatory variable.³⁷ In city-level analysis, the set of controls differs from the district-level analysis in three ways. First, we control for log of city population instead of the fifth-order polynomial because the variation in city population is much smaller than between cities and rural areas. Second, to account for city's geography, we control for altitude and whether the city is located on a navigable river following Voigtländer and Voth (2012). Third, we control for the historical presence of Jews with the dummy indicating a sizable Jewish community in 1349.³⁸ Since the variable measuring the number of letters to *Der Stürmer* is right-skewed, we use Poisson maximum likelihood estimation. Regressions with attacks on synagogues as the dependent variable are run on a subsample of cities with a synagogue.

³⁶ Estimates of the effect of radio are obtained by comparing observed outcomes with a counterfactual scenario in which the logistic transformation of signal strength, which can be interpreted as the predicted share of radio subscriptions, is set to zero.

³⁷ As there is no data for listenership or subscription rates after April 1933, we can only use signal strength as a measure of radio exposure in 1937. Due to the absence of these data, we cannot estimate the S-shape relationship between the signal strength and listenership. The 1933 data for subscription rate are not useful for this exercise as listenership almost doubled between 1933 and 1937 (Vaessen 1938). The results are robust to using signal strength for later periods.

³⁸ This variable also comes from Voigtländer and Voth (2012) and is not available for the population of districts, so we cannot use it in the analysis of voting behavior.

The results presented in Table 7 indicate that, on average, the exposure to Nazi radio significantly increased both the number of deportations of Jews and the number of letters to *Der Stürmer*. The magnitudes of these effects are as follows: a one standard deviation increase in the radio signal strength in 1937 led to a 15 percent increase in the number of deportations and a 18 percent increase in the number of letters to *Der Stürmer*. With an average of 1.8 letters per city this implies an increase of 0.3 letters per city. The effect of radio on the attacks on synagogues is insignificant (while the point estimate has the predicted positive sign).³⁹

The average effect of radio exposure on the expressions of anti-Semitism masks an important heterogeneity of the effect of radio propaganda depending on listeners' priors with regard to the broadcasted message and general susceptibility to propaganda. To address this question, we estimate equation (5) where we add measures of predispositions to the Nazi propaganda or general susceptibility to propaganda and their interaction with radio signal strength as additional covariates. We proxy the predisposition to anti-Semitism with two alternative variables: pogroms in 1349 during the Black Death in the subsample of cities with historical Jewish settlement and the vote in December 1924 for the National Socialist Freedom Party (NSFP), a right-wing party with a very anti-Semitic rhetoric which was formed as a coalition of the right-wing German National People's Party (DVFP) and the then-banned NSDAP. In addition, we proxy for the general discontent of the population during the economic hardships of the early 1930s with land inequality measured in 1895 (Ziblatt 2008, Ziblatt 2009), hypothesizing that in places with higher wealth inequality the general public had higher anxiety during the severe economic crisis, and thus, was easier persuaded by the Nazi messages. Table 8 reports the results. Panel A reports results for pogroms in 1349 and the sample in this panel is confined to the cities with Jewish settlements in 1349 (as the measure of historical anti-Semitism is meaningful only in this subsample, Voigtländer and Voth 2012). Panel B reports results for the vote for NSFP in 1924 and panel C – for the historical land inequality.

³⁹ A possible reason for why we do not find a significant effect on the attacks on synagogues is that it was organized and largely executed by the Nazis. Historians suggest that the Nazis staged this event as a popular act despite low participation of the ordinary Germans. E.g. according to Sommerville (2012) the violence was “organized by party officials, not a spontaneous outbreak of anti-Jewish violence by ordinary Germans or even violence encouraged by propaganda” (p. 124).

We find that the coefficients on the interaction terms between our measures of predispositions to anti-Semitism, namely, pogroms in 1349 and the vote for NSFP in 1924, on the one hand, and the radio availability in 1937, on the other hand, are positive and statistically significant for the deportations and the letters to *Der Stürmer*. The coefficients on these interaction terms in regressions with the attacks on synagogues as the outcome are also positive, but imprecisely estimated. These results indicate that Nazi radio propaganda had a larger effect on the expressions of anti-Semitism in cities with *ex-ante* more anti-Semitic population. Propaganda of anti-Semitic actions was much more effective for cities which witnessed historical pogroms compared to the average city: the point estimates of the effect of the radio propaganda on the expressions of anti-Semitism are 3 to 4 times larger in cities with pogroms in 1349 (as seen from the comparison of the first rows of Tables 7 and Panel A of Table 8). Propaganda was also more persuasive on average in cities with higher vote for NSFP in 1924. Effect of radio propaganda on deportations (letters to *Der Stürmer*) in places in with the vote for NSFP in 1924 one standard deviation above the mean was 1.8 times (1.5 times) larger compared to the level in places with the mean level of vote for NSFP.

As reported in Panel C of Table 8, there is also a positive and statistically significant effect of the interaction term between the historical land inequality and radio signal strength for deportations and attacks on synagogues. This evidence is consistent with the prediction that propaganda is more effective on people with higher levels of anxiety, to which population in unequal societies are particularly prone during economic recessions. The effects are sizable: effect of radio propaganda on deportations in places in historical land inequality was one standard deviation above the mean was 2.1 times larger than in places with the mean level of land inequality. The difference is even stronger for the effect on attacks on synagogues, as there was almost no effect of propaganda at the mean level on land inequality. Overall, the coefficients on the interaction between signal strength with various measures of susceptibility to propaganda confirm that propaganda has a stronger effect when falls on a fertile ground.

Importantly, the results presented in the Panel A of Table 8 also show that propaganda can backfire and lead to a higher levels of resistance to the dictator, if propaganda messages contradict the prior of the listeners. In particular, in cities where pogroms did not occur during the Black Death despite having historical Jewish settlement, the effect of radio signal strength was negative as reflected in the negative and significant coefficients on the radio signal

strength (second row of Panel A of Table 8) for both the deportations and the letters to *Der Stürmer*. Again, the result for the attacks on synagogues has the sign consistent with the other results, but statistically insignificant. We find that in cities that had historical Jewish settlement, but did not experience Black Death pogroms, a one standard deviation increase in radio availability led to a 40 percent decrease in deportations and 70 percent decrease in the number of letters to *Der Stürmer*. Intuitively, when listeners hear propaganda messages that, they know, are false, they use this information to negatively update their prior assessment of the quality of the regime. In the case of the Nazi propaganda, such an update must have triggered higher resistance to the Nazis and willingness to hide Jews among Nazi opponents.⁴⁰

In sum, the results of Tables 7 and 8 confirm that the exposure to Nazi radio propaganda increased the frequency of expressions of anti-Semitism by ordinary Germans on average and that the effect of the propaganda varied with the listeners' predisposition to the message and general susceptibility to propaganda. Listeners in places with historically high anti-Semitism (and, therefore, positive predisposition to the Nazi messages) and high land inequality (and, therefore, higher anxiety in times of economic crises) reacted more positively to the Nazi radio propaganda. In contrast, when the listeners were negatively predisposed to anti-Semitic messages, propaganda was actually dissuasive, rather than persuasive.

6.3. Persuasion rates

In order to assess the relative effectiveness of radio during the times when it had a pro-Nazi and an anti-Nazi slant, we compute persuasion rates, i.e., the fraction of the audience who were convinced to change their behavior as a result of being exposed to German radio. We use the formula for a continuous measure of radio exposure introduced by Enikolopov et al. (2011).⁴¹ It yields the effect of an infinitesimally small change in media exposure taking into

⁴⁰ Note that, in contrast to the historical pogroms variable, we not expect a negative direct effect of the radio propaganda in localities with zero vote for NSFP in 1924, as it does not indicate the absence anti-Semitism in these cities. To explore further a possibility that propaganda may backfire, we calculate the effect of the signal strength at the lowest land Gini in our sample and report it in third row from the bottom of the table. The effect of radio propaganda at the minimum level of land Gini (45 in our sample) is negative and statistically significant for the anti-Semitic letters and the attacks on synagogues, but not for the deportations. The effect of radio propaganda is negative and significant for the level of land Gini present only in 1% of the sample for the letters and in 15% of the sample for the synagogues. For all three outcomes, the effect the radio propaganda is positive and significant for the level of land inequality present in over 50% of the sample.

⁴¹ This formula differs from the first formula for persuasion rates derived by DellaVigna and Kaplan (2007) in the

account the effect of turnout and controlling for the fraction of people who could potentially be persuaded (i.e., who would not have voted in favor of the message without being exposed).

For the March 1933 election, we compute the persuasion rate for the message of the Nazi propaganda—“*vote for the Nazi Party*”—using the following formula:

$$f = \frac{1}{1-v_0t_0} \left(t \frac{dv}{de} + v \frac{dt}{de} \right) = \frac{1}{1-v_0t_0} \cdot \frac{1}{de/ds} \left(t \cdot dv/ds + v \cdot dt/ds \right), \quad (6)$$

where v is vote share of NSDAP, t is turnout, v_0 and t_0 are Nazi vote share and turnout in the absence of radio. dv/ds is the effect of the change in radio signal strength on Nazi vote share (columns 7 and 8 of Table 3). As de/ds we take the effect of the change in radio signal strength on the listenership share in 1933 (column 4 of Table 1). dt/ds is the corresponding effect for turnout. As there is no robust evidence of the effect of radio signal strength on turnout in any of the years (see Table A5) we take $dt/ds = 0$ and set $t = t_0$, so that t_0 does not enter the calculation.

In contrast, voters who potentially could respond to the message of the Weimar government—“*do not vote for the Nazis, vote for other (government) parties*”—are only those who in the absence of radio would have voted for the Nazis. Thus, the formula for the negative message takes the following form:

$$f = \frac{1}{-v_0t_0} \left(t \frac{dv}{de} + v \frac{dt}{de} \right) = \frac{1}{-v_0t_0} \cdot \frac{1}{de/ds} \left(t \cdot dv/ds + v \cdot dt/ds \right), \quad (7)$$

As in the case of the message of the Nazi propaganda, we estimate persuasion rate at $t = t_0$ and $\mu = \mu_0$. As dv/ds we take the coefficient on the effect of radio signal strength on change in Nazi vote share from columns 1 and 2 in Table 3, as de/ds we take the effect of the change in radio signal strength on the listenership share in 1931 (column 1 of Table 1). Again, we take $dt/ds = 0$.

following three respects: (1) it focuses on the case of continuous exposure by analyzing the effect of an infinitesimal change in radio exposure; (2) it allows turnout to increase or decrease for voters exposed to radio broadcasts, as some people who would have voted in the absence of the message may decide to abstain from turning up for the election, which is the case in our data; (3) it allows us to compute separately persuasion rates for a positive message (i.e., encouragement to vote for a specific party) or for a negative message (i.e., discouragement to vote for a specific party). Note that the difference between the effects of positive and negative messages is particularly important in a multiparty system such as Germany's.

Note that our out best proxy for listenership is the radio subscription rate. Thus, in order to calculate persuasion rates, we need to multiply the subscription rate by the estimate of an average number of adult radio listeners (i.e., eligible voters) per subscription. Ross (2008 p. 137) suggests that there were four adult individuals using one subscription on average in the urban areas and five – in rural areas. Under the assumption of four eligible voters listening to the radio with one subscription, the persuasion rates of the messages “*vote for the Nazis*” in March 1933 and “*do not vote for the Nazis*” in September 1930 were 10.9% and 31.5%, respectively.⁴² However, these estimates are very sensitive to the assumption of the number of voters exposed to the radio per subscription, as reported in Figure A4, which plots the estimates of the persuasion rates as a function of assumed number of listeners-voters per subscription. For the March 1933 campaign, the estimates of persuasion rate range from 6.2% for 7 listeners per subscription to 21.8% for 2 listeners; whereas for the message of the 1930 campaign, the corresponding range is between 18 and 63%.

For all the cases, we find that radio election campaign in the Weimar republic in 1930 was more persuasive than the first Nazi radio election campaign in 1933. This can be explained by a combination of the following factors. First, the campaign of September 1930 elections was longer than that of the March 1933 election, which may have contributed to its effectiveness. Second, the “negative” political messages, i.e., not to vote for a certain party, are generally more persuasive in a multiparty setting than the “positive” messages, i.e., to vote for a particular party (see, for instance, a discussion of this issue in Enikolopov et al. 2011). Finally, since extremist messages can lead to a dissuasion effect among a part of the population that *a priori* disagrees with the message, as shown in the previous section, media with a mild slant may be more persuasive than outright propaganda. Moreover, in the beginning of 1933, radio sets were (yet) largely unavailable to the poorest part of the population that was the primary target of the Nazi messages and among whom the Nazi messages were supposed to be most persuasive.

⁴² For signal strength $f_{1933} = [1/(1-0.474*0.886)] * [1/(0.0015*4)] * (0.043*0.886) = 10.9\%$ and $f_{1930} = -[1/0.222] * [1/(0.00218*4)] * (-0.061) = 31.5\%$. Results for non-linear transformation of signal strength are similar: $f_{1933} = [1/(1-0.488*0.886)] * [1/(0.0054*4)] * (0.118*0.886) = 8.5\%$ and $f_{1930} = -[1/0.239] * [1/(0.00658*4)] * (-0.212) = 33.7\%$.

Assuming the mean number of listeners per subscription was between two and seven, the persuasion rates of German political radio broadcasts during the campaigns of 1930 and 1933 are comparable in size to the power of media in political persuasion in more mature democratic settings: 12% persuasion rate for the Fox News Channel (DellaVigna and Kaplan 2007), 20% – for the Washington Post (Gerber, Karlan, and Bergan 2009), and 65% – for the “negative” message, “do not vote for the government party,” broadcasted by an independent Russian TV channel in 1999 (Enikolopov et al. 2011).

6.4. Placebo tests

To provide additional evidence in favor of our identification assumptions we show that German radio availability is not associated with outcomes that it was not supposed to affect. Specifically, we test whether radio signal strength at every election between 1928 and 1933 affected the change in the share of votes received by extremist right-wing parties between 1924 and 1928. Namely, we examine the correlation between radio availability and the difference between the Nazi vote share in 1928 and the vote shares received by DNVP and NSFB in December 1924. We find no significant relationship, as one would expect given that radio was apolitical in 1928 (as reported in Panel A of Table 9). We also test whether signal strength at any point in time between 1928 and 1933 was associated with any voting outcomes in 1920 and December 1924 parliamentary elections or 1925 presidential elections. In 70 placebo tests, we find one significant coefficient at 5% level coefficient for the vote for DNVP and signal strength in 1933 (which is the opposite sign to the baseline results) and three significant coefficients at 10% level for DNVP in 1920 (with the same sign as the baseline results) (see Panels B, C, and D of Table 9), the rest of the estimated coefficients are not statistically significant, which is within the margin of statistical error.

Analogous to our estimations for the effect of radio on the expression of anti-Semitism, we also test for the effect of signal strength in 1930, 1932, 1933, 1935, and 1937 on the crime rates from 1900 to 1920 and on the anti-Jewish pogroms in 1920s in the sample of cities. In addition, we estimate the interaction effects between pogroms in 1349 and signal strength. and find no significant effect in any of these placebo regressions. Again, the results are well within the margin of statistical error, we find 3 estimated coefficients to be significant at 10% level and one at 5% level out of 80 placebo tests (see Table 10).

7. Conclusions

In the context of the Weimar Republic and the early Third Reich, we examine the role mass media during the dismantling of the democratic institutions and after the full consolidation of the dictatorship. We find that relatively mild anti-Nazi slant in radio news programs between 1929 and 1932 was effective in substantially reducing the Nazi Party vote in three consecutive parliamentary elections. In 1933, Nazis took control over radio and began airing pro-Nazi propaganda; in just one month, this fully undid the effect of anti-Nazi radio of the previous four years.

After the Nazis fully consolidated power, radio propaganda was instrumental in ensuring public support for the regime. It helped the Nazis enroll new party members and encouraged denunciations of Jews, leading to their deportation to concentration camps and causing open expressions of anti-Semitism, such as writing anti-Semitic letters to the national newspaper. The effects of the Nazi propaganda on expressions of anti-Semitism were particularly pronounced when the message was aligned with listeners' predispositions, e.g., a more anti-Semitic audience, as measured by the historical anti-Semitism in the location, was more easily convinced by Nazi radio propaganda. In contrast, propaganda was counter-productive when the message was contradicting listeners' priors: the least anti-Semitic audience, measured by historical anti-Semitism, reacted negatively to the Nazi radio showing more resistance to the regime.

Our findings suggest that mass media plays an important role in the process of institutional change. In particular, restrictions of extremist speech are an important element helping mass media to serve as a safeguard of democracy. Without such restrictions, mass media can become an important catalyst of the establishment of a dictatorial rule, if future dictators get control over the content. We also show that propaganda in an established dictatorial regime contributes to its stability and dictator's popularity on average, but it is effective only among audiences that are positively predisposed to the propaganda's message.

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Figure 1. Timing and political orientation of radio broadcast.
 Chart 1.A. The presence of the political broadcast

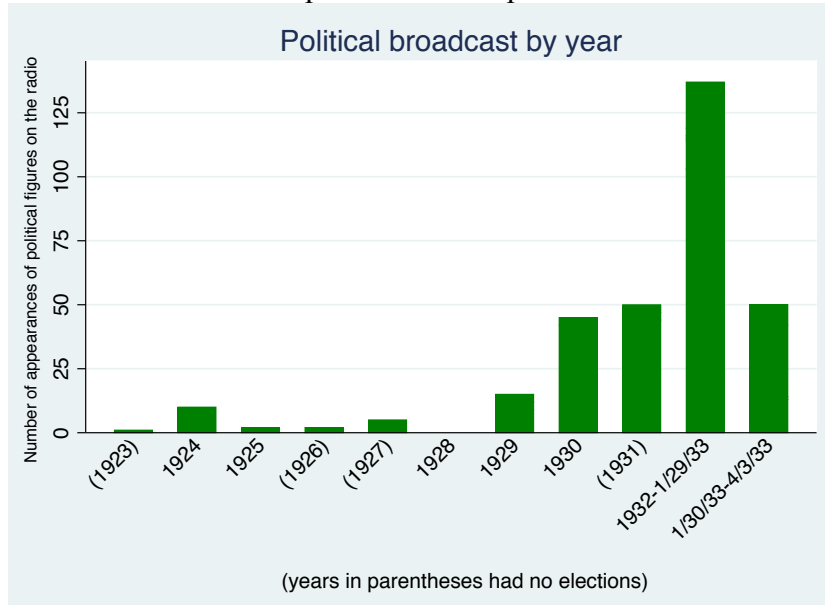
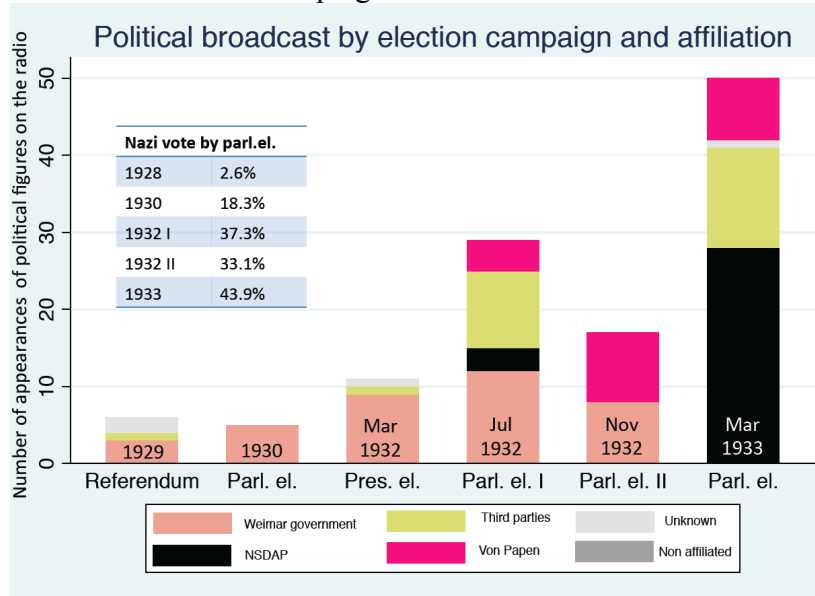


Chart 1.B. Access of political figures to radio by election campaign and affiliation



Note: Chart 1.B. zooms into the election campaigns at the time when radio became political and aggregates political affiliation of speakers into three main groups. “Weimar government” indicates all parties in the Weimar coalition government at the time of the campaign. Figure A1 in the appendix presents information on the timing for the entire political broadcast separately for all political parties. Von Papen’s speeches are presented as separate category and not as non-affiliated since he was an important person on the political scene. Appendix “Anecdotal Evidence” gives quotes from Von Papen’s radio appearances during 1932 and 1933 election campaigns, which show that in 1932 he campaigned against the Nazis and in 1933 he was mildly pro incumbent Nazi government.

Figure 2. Timeline of key political events.

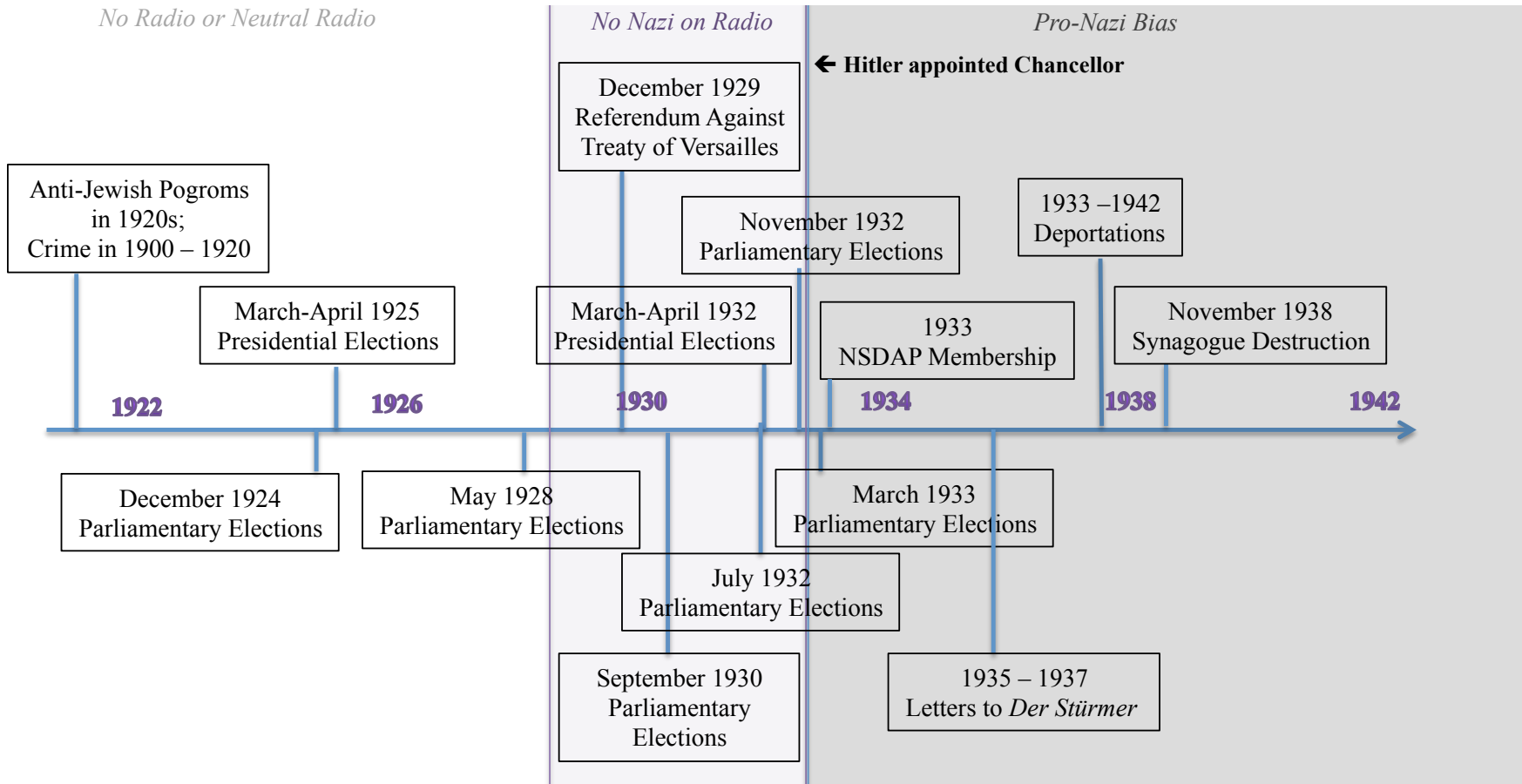
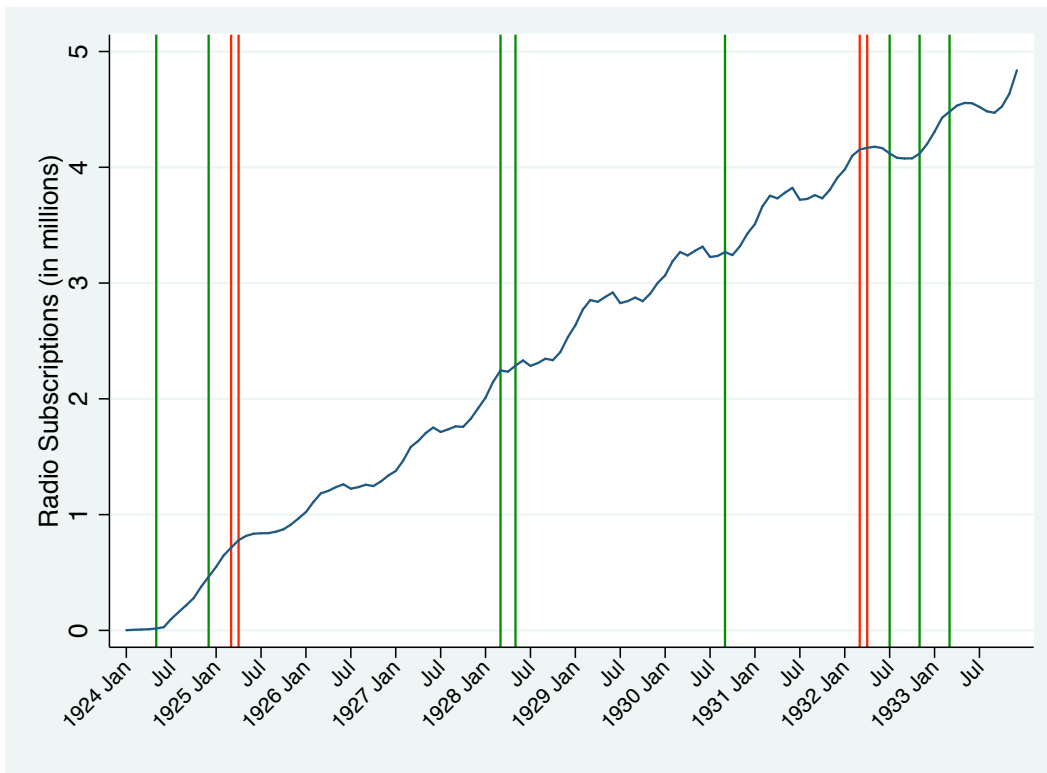
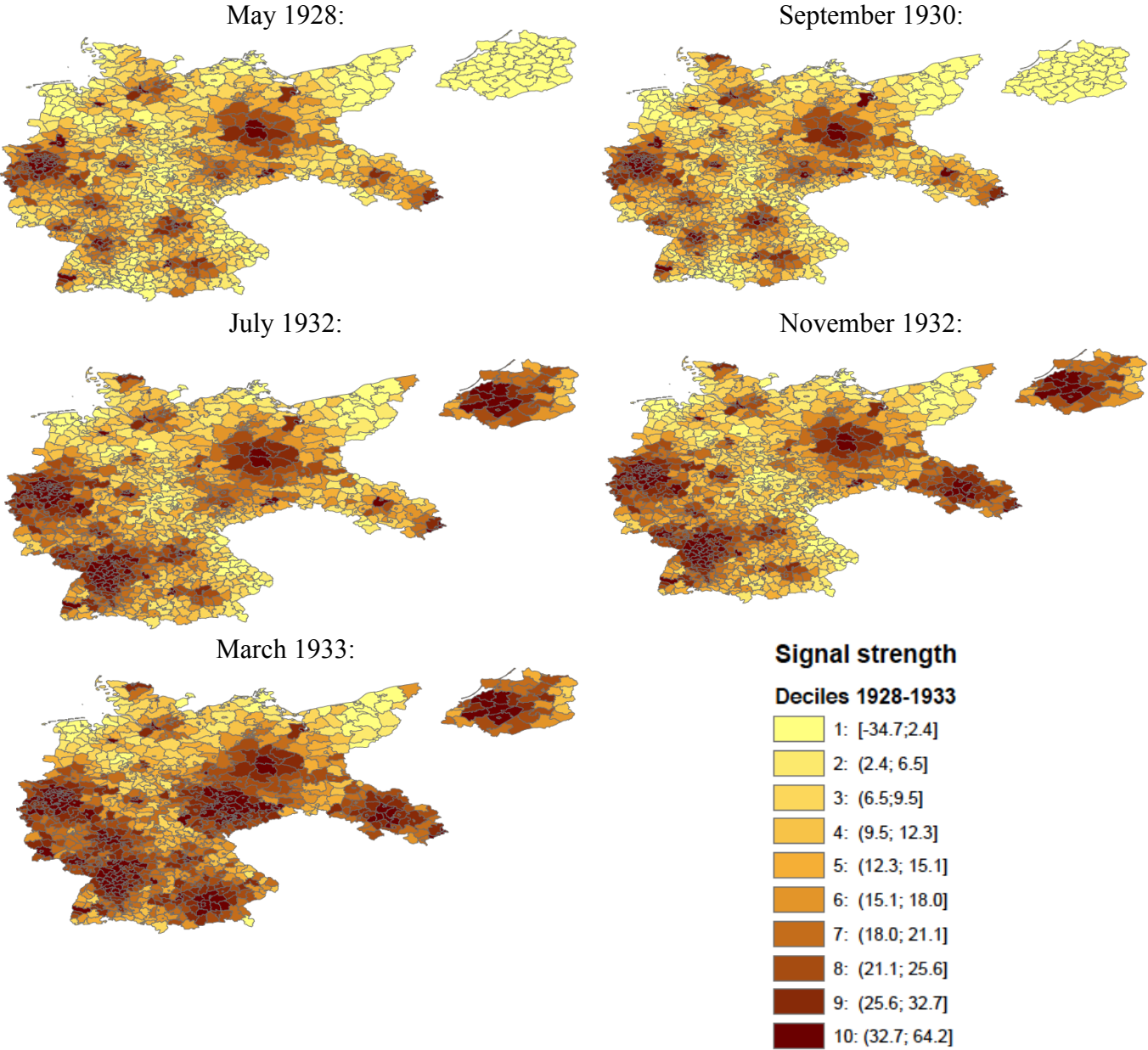


Figure 3. Number of Radio Subscriptions in Germany, 1924 – 1933.



Notes: Green lines – dates of parliamentary elections. Red lines – dates of presidential elections.

Figure 4. Signal strength over time, deciles defined over the pooled sample of May 1928-March 1933.



Note: The legend provides threshold levels of signal strength for each decile.

Figure 5. Radio Subscriptions and Signal Strength, 1931 (no controls)
t-statistic for the linear bivariate relationship: 14.12

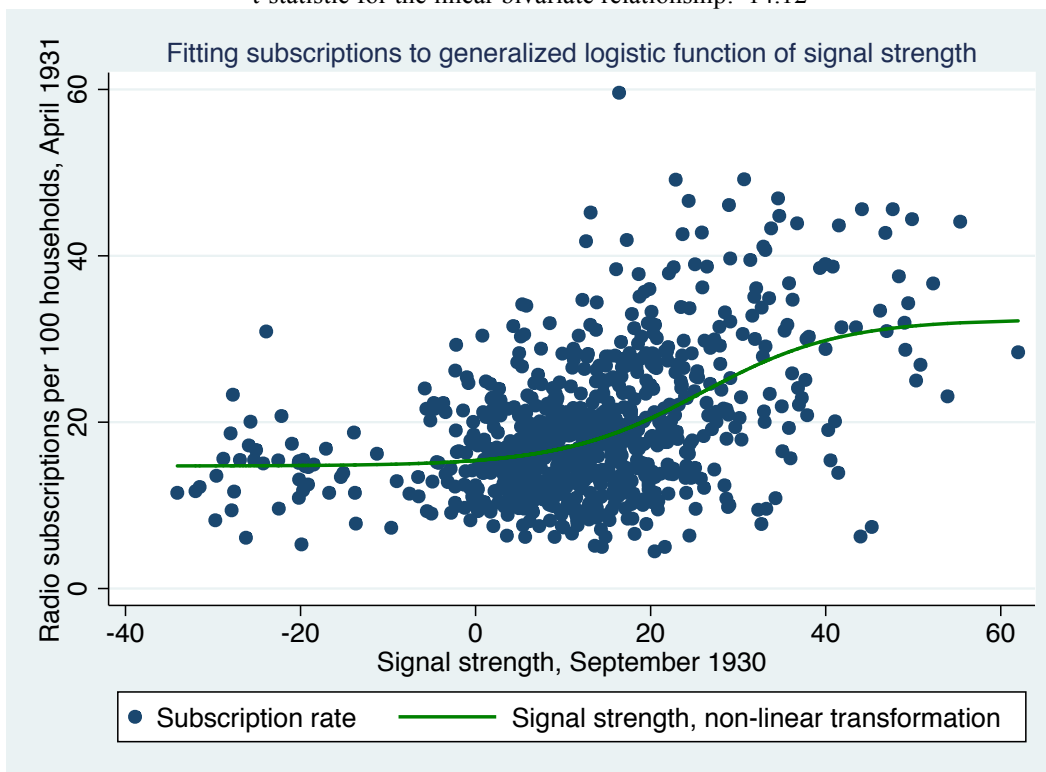
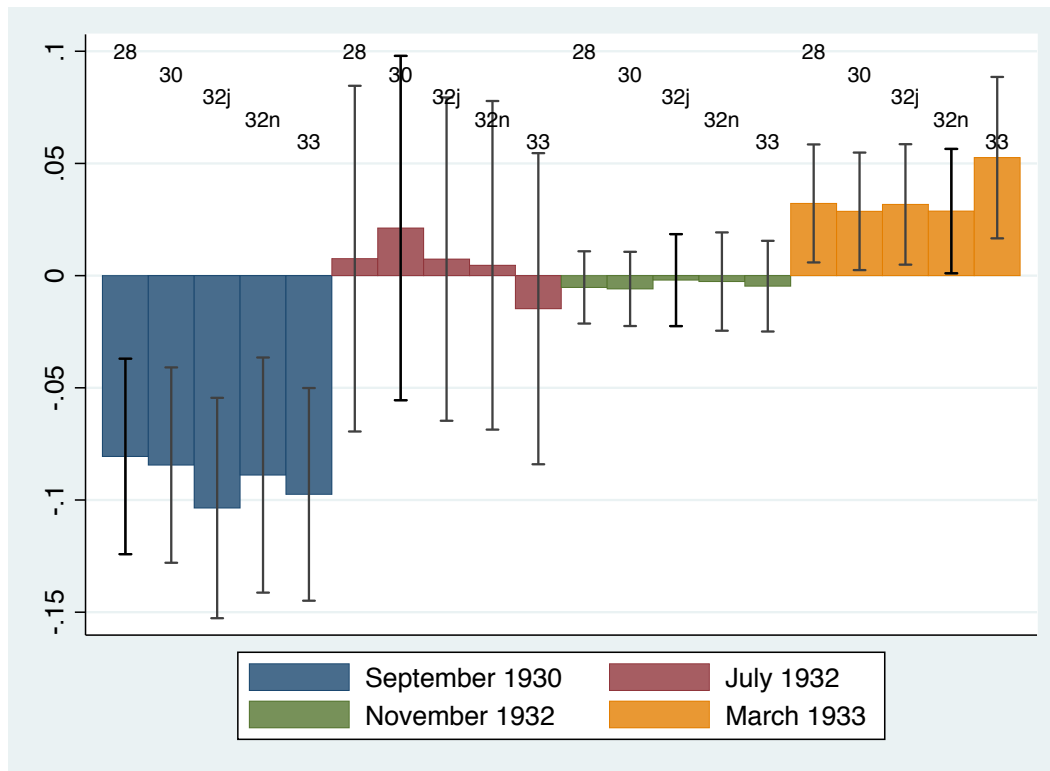


Figure 6. Radio effect estimates for signal strength and its leads and lags.



Note: Dependent variable: change in vote share for Nazi party since previous elections. Different colors correspond to different elections; different bars of the same color represent coefficient estimates on the signal strength fixed at May 1928, July 1932, November 1932, or March 1933 (the date at which the signal is measured in denoted by 28, 30, 32a, 32b, and 33 respectively). Control variables include province fixed effects, fifth polynomial of population, urban district dummy, shares of Jews and Catholics, shares of blue-collar and white-collar workers. 90% confidence intervals are shown.

Table 1. Radio Subscriptions and Radio Availability

	Share of households with radio subscription at a given date			
Panel A.	(1)	(2)	(3)	(4)
<i>The date for the subscription rate variable:</i>	<i>Apr 1931</i>	<i>Apr 1932</i>	<i>Apr 1932</i>	<i>Apr 1933</i>
<i>The date for the signal strength variable:</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Radio signal strength	0.218*** [0.030]	0.178*** [0.027]	0.167*** [0.030]	0.153*** [0.037]
Distance to the nearest big city, city dummy, altitude	Yes	Yes	Yes	Yes
Socioeconomic controls	Yes	Yes	Yes	Yes
Population, fifth-order polynomial	Yes	Yes	Yes	Yes
Voting controls, 1924	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes
Observations	810	835	835	836
R2	0.591	0.544	0.539	0.506
F-stat for the signal strength variable	50.83	40.52	29.85	17.14
Panel B.				
<i>The date for the subscription rate variable:</i>	<i>Apr 1931</i>	<i>Apr 1932</i>	<i>Apr 1932</i>	<i>Apr 1933</i>
<i>The date for the signal strength variable:</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Radio Signal Strength, non-linear transformation	0.658*** [0.096]	0.669*** [0.096]	0.646*** [0.114]	0.543*** [0.130]
Distance to the nearest big city, city dummy, altitude	Yes	Yes	Yes	Yes
Socioeconomic controls	Yes	Yes	Yes	Yes
Population, fifth-order polynomial	Yes	Yes	Yes	Yes
Voting controls, 1924	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes
Observations	810	835	835	836
R2	0.595	0.545	0.538	0.505
F-stat for the signal strength variable	44.86	45.66	29.53	16.57

Note: Standard errors clustered by province (*Wahlkreis*) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable is the number of subscriptions per 100 households. Voting controls include turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924. Historical controls include dummy for pogroms in 1349 and a dummy for a Jewish settlement in 1349. Historical controls are not significant in all specifications. Number of observations varies because of missing data on listenership and because of redistricting.

Table 2. Determinants of Radio Availability

<i>Election date:</i>	Radio Signal Strength					Radio Signal Strength, non-linear transformation				
	<i>March 1928</i> (1)	<i>September 1930</i> (2)	<i>July 1932</i> (3)	<i>November 1932</i> (4)	<i>March 1933</i> (5)	<i>March 1928</i> (6)	<i>September 1930</i> (7)	<i>July 1932</i> (8)	<i>November 1932</i> (9)	<i>March 1933</i> (10)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<u>Determinants of transmitter location</u> (population, distance to the nearest big city, city dummy, altitude):										
Distance to the nearest city, log	-3.201*** [0.650]	-3.543*** [0.654]	-2.755*** [0.598]	-2.588*** [0.567]	-2.676*** [0.481]	-1.072*** [0.229]	-1.218*** [0.242]	-0.666*** [0.172]	-0.556*** [0.145]	-0.631*** [0.145]
Altitude	-0.007* [0.004]	-0.006 [0.004]	-0.009** [0.004]	-0.008* [0.004]	-0.008* [0.004]	-0.002 [0.001]	-0.002 [0.001]	-0.002* [0.001]	-0.002 [0.001]	-0.002** [0.001]
City (Stadtkreis) dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population, fifth-order polynomial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-stat for determinants of transmitter location	9.218	9.334	10.73	8.348	14.27	9.304	10.46	13.15	11.06	14.32
<u>Socioeconomic controls</u> (shares of Jews and Catholics, shares of blue-collar and white-collar workers, share of war participants, share of welfare recipients, property tax, unemployment):										
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-stat for socioeconomic variables	7.05	7.823	5.54	5.031	3.866	5.645	6.373	6.349	3.784	3.334
<u>Voting results in 1924</u> (shares of vote received by parties and turnout):										
Voting results in 1924	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-stat for voting in 1924	2.866	3.254	6.089	6.959	5.801	1.231	1.889	3.38	1.99	3.891
R-squared	0.669	0.68	0.598	0.609	0.57	0.545	0.556	0.576	0.53	0.487
Observations	959	959	959	959	959	959	959	959	959	959
<u>The share of the total explained variation, explained only by:</u>										
Determinants of transmitter location	38.57%	41.18%	43.81%	37.11%	51.93%	58.35%	62.95%	46.70%	47.55%	57.29%
Determinants of transmitter location and province fixed effects	97.61%	97.50%	97.16%	98.36%	97.02%	98.90%	98.02%	98.26%	99.43%	97.33%
Socioeconomic controls and voting results in 1924	29.45%	28.82%	29.26%	28.74%	34.21%	36.15%	35.25%	30.38%	33.02%	40.04%

Table 3. Radio and an Increase in Nazi Vote Share

<u>Panel A. Reduced form estimation</u>								
Change in Vote Share of the Nazi Party Since Previous Elections								
	Election dates: Sep 1930		Jul 1932		Nov 1932		Mar 1933	
	(Change from May 1928)		(Change from Sep 1930)		(Change from Jul 1932)		(Change from Nov 1932)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio signal strength	-0.061***		0.038		-0.004		0.044**	
	[0.022]		[0.031]		[0.013]		[0.020]	
Radio Signal Strength, non-linear transformation		-0.210***		0.138		0.037		0.122*
		[0.069]		[0.105]		[0.050]		[0.068]
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	958	958	958	958	919	919	918	918
<u>Panel B. OLS and IV results</u>								
Change in Vote Share of the Nazi Party Since Previous Elections								
	Election dates: Sep 1930		Jul 1932		Nov 1932		Mar 1933	
	(Change from May 1928)		(Change from Sep 1930)		(Change from Jul 1932)		(Change from Nov 1932)	
	Specification: OLS IV		OLS IV		OLS IV		OLS IV	
	Date for the subscription rate variable: Apr 1931		Apr 1932		Apr 1932		Apr 1933	
Radio subscription rate, %	-0.096**	-0.362***	0.039	0.172	-0.020	0.067	0.022	0.195*
	[0.043]	[0.101]	[0.027]	[0.145]	[0.016]	[0.082]	[0.018]	[0.109]
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	809	807	834	832	811	809	811	809
F-statistic for the exclusion of the instrument		44.86		45.66		29.53		16.57
<u>Panel C. Altonji-Elder-Taber Tests</u>								
Change in Vote Share of the Nazi Party Since Previous Elections								
	Election dates: Sep 1930		Jul 1932		Nov 1932		Mar 1933	
	(Change from May 1928)		(Change from Sep 1930)		(Change from Jul 1932)		(Change from Nov 1932)	
Index of observables (predicted signal strength)	-0.037		-0.138		-0.018		-0.043	
	[0.070]		[0.112]		[0.042]		[0.049]	
Index of observables (predicted non-linear signal strength)		0.016		-0.327		-0.190		-0.334*
		[0.203]		[0.451]		[0.198]		[0.194]
Population, fifth-order polynomial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	958	958	958	958	919	919	918	918
R-squared	0.432	0.432	0.392	0.390	0.377	0.380	0.573	0.576

Note: Standard errors clustered by province (Wahlkreis) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Other controls include share of Jewish and Catholic population, shares of blue- and white-collar workers in 1925, city dummy, number of war participants per 1,000, number of welfare recipients per 1,000, number of renters of social housing per 1,000, log of average property tax, altitude, distance to the nearest big city (city with population over 50k), turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924, dummy for pogroms in 1349 and a dummy for a Jewish settlement in 1349. Number of observations changes between elections because of redistricting.

Table 4. Radio Availability and Voting for the Nazis: District Fixed Effects

	Nazi Vote Share				Change in the Nazi Vote Share	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time span of the sample:</i>	<i>September 1930, July 1932, and November 1932</i>		<i>All parliamentary elections 1928 – 1933, combined</i>		<i>Between September 1930 and November 1932</i>	
<i>Specification:</i>	<i>Panel: OLS</i>	<i>Panel: OLS</i>	<i>Panel: OLS</i>	<i>Panel: OLS</i>	<i>First differences: OLS</i>	<i>First differences: IV</i>
Radio Signal Strength	-0.036* [0.018]					
Radio Signal Strength, non-linear transformation		-0.219*** [0.076]				
Radio signal strength x pro-Nazi slant (0 for 1928, -1 for 1930 – 1932, +1 for 1933)			0.026*** [0.007]			
Non-linear transformation of signal strength x pro-Nazi slant (0 for 1928, -1 for 1930 – 1932, +1 for 1933)				0.125*** [0.029]		
Change in subscription rate between April 1931 and April 1932					-0.027 [0.123]	-1.253** [0.591]
Baseline controls, interacted with time fixed effects	Yes	Yes	Yes	Yes		
Baseline controls					Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	No	No
Observations	2,836	2,836	4,713	4,713	786	786
R-squared	0.922	0.923	0.959	0.959	0.658	0.479
F-statistics for instrumental variable						29.13

Note: Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Controls comprise fifth-order polynomial of population, share of Jewish and Catholic population, shares of blue- and white-collar workers in 1925, city dummy, number of war participants per 1,000, number of welfare recipients per 1,000, number of renters of social housing per 1,000, log of average property tax, altitude, distance to the nearest big city (city with population over 50k), turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924, dummy for pogroms in 1349 and a dummy for a Jewish settlement in 1349. Number of observations changes between elections because of redistricting.

Table 5. Radio Availability and Voting in Anti-Versailles-Treaty Referendum and April 1932 Presidential Elections.

Panel A. Radio availability and other voting outcomes.

	Referendum on the "Law against the Enslavement of the German People"		1932 Presidential Elections, 1st round			
	Voted "Yes" in the Referendum (share of eligible voters)		Von Hindenburg Vote Share		Hitler Vote Share	
	(1)	(2)	(5)	(6)	(7)	(8)
Radio signal strength	-0.063*		0.054**		-0.048	
	[0.032]		[0.026]		[0.036]	
Radio Signal Strength, non-linear transformation		-0.645**		0.179		-0.219
		[0.239]		[0.112]		[0.146]
Nazi party vote share in 1928	0.644***	0.634***	-0.459***	-0.458***	0.580***	0.580***
	[0.089]	[0.089]	[0.070]	[0.070]	[0.065]	[0.065]
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	949	949	952	952	952	952
R-squared	0.73	0.73	0.79	0.79	0.80	0.80

Panel B. Altonji-Elder-Taber tests

	Voted "Yes" in the Referendum (share of eligible voters)		Von Hindenburg Vote Share		Hitler Vote Share	
Index of observables (predicted signal strength)	-0.143		-0.100		-0.165	
	[0.134]		[0.174]		[0.159]	
Index of observables (predicted non-linear transformation of signal strength)		-1.154		-1.071		-0.216
		[0.978]		[0.678]		[0.616]
Nazi party vote share in 1928	1.2770***	1.2826***	-1.5642***	-1.5822***	1.3245***	1.3540***
	[0.090]	[0.089]	[0.137]	[0.129]	[0.113]	[0.109]
Population, fifth-order polynomial	Yes	Yes	Yes	Yes	Yes	Yes
Observations	949	949	952	952	952	952
R-squared	0.561	0.561	0.553	0.557	0.527	0.526

Note: Standard errors clustered by province (Wahlkreis) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Controls comprise fifth-order polynomial of population, share of Jewish and Catholic population, shares of blue- and white-collar workers in 1925, city dummy, number of war participants per 1,000, number of welfare recipients per 1,000, number of renters of social housing per 1,000, log of average property tax, altitude, distance to the nearest big city (city with population over 50k), turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924, dummy for pogroms in 1349 and a dummy for a Jewish settlement in 1349. Number of observations changes between elections because of redistricting.

Table 6. Radio Availability and Nazi Party Membership: Cross-Sectional Estimates

Panel A. Baseline Results						
	Log of the Number of New Party Members of NSDAP					
	<i>Time period: Jan 1932 - Jan 1933</i>		<i>Feb - May 1933</i>			
	(1)	(2)	(3)	(4)	(5)	(6)
Radio Signal Strength	0.0031 [0.0020]		0.0053** [0.0019]		0.0052** [0.0020]	
Radio Signal Strength, non-linear transformation		0.0002 [0.0095]		0.0198** [0.0076]		0.0199** [0.0077]
Log of new party membership in 01/1932-01/1933					0.0545* [0.0291]	0.0579* [0.0288]
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	613	613	613	613	613	613
R-squared	0.543	0.542	0.151	0.152	0.156	0.157
Panel B. Altonji-Elder-Taber tests						
	Log of the Number of New Party Members of NSDAP					
	<i>Time period: Jan 1932 - Jan 1933</i>		<i>Feb - May 1933</i>			
	(1)	(2)	(3)	(4)	(5)	(6)
Index of observables (predicted signal strength)	0.0002 [0.006]		0.0006 [0.004]		0.0009 [0.004]	
Index of observables (predicted non-linear signal strength)		0.0058 [0.031]		0.0023 [0.015]		0.003 [0.016]
Log of new party membership in 01/1932-01/1933					0.0269 [0.027]	0.0269 [0.027]
Population, fifth-order polynomial	Yes	Yes	Yes	Yes	Yes	Yes
Observations	613	613	613	613	613	613
R-squared	0.444	0.444	0.100	0.100	0.101	0.101

Note: Standard errors clustered by province (Wahlkreis) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Controls comprise fifth-order polynomial of population, share of Jewish and Catholic population, shares of blue- and white-collar workers in 1925, city dummy, number of war participants per 1,000, number of welfare recipients per 1,000, number of renters of social housing per 1,000, log of average property tax, altitude, distance to the nearest big city (city with population over 50k), turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924, dummy for pogroms in 1349 and a dummy for a Jewish settlement in 1349. Number of observations changes between elections because of redistricting.

Table 7. Radio Availability and Anti-Semitism

Panel A. Full sample results.			
	Log(deportations before 1942)	Letters to <i>Der Stürmer</i>	Attacks on synagogues
<i>Model:</i>	OLS	ML	OLS
<i>Sample:</i>	<i>All cities</i>	<i>All cities</i>	<i>All cities with synagogues in 1933</i>
	(1)	(2)	(3)
Radio signal strength in 1937	0.016** [0.006]	0.019** [0.009]	0.001 [0.001]
Log (population)	0.277*** [0.069]	0.636*** [0.107]	-0.005 [0.013]
Altitude	-0.001 [0.001]	-0.001** [0.001]	0.000 [0.000]
City located at navigable river	0.363*** [0.067]	0.561*** [0.119]	0.043** [0.019]
Jewish settlement in 1349	0.661*** [0.103]	0.716*** [0.149]	0.046* [0.026]
Socioeconomic controls	Yes	Yes	Yes
Voting controls, 1924	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Observations	1,295	1,361	1,115
R-squared	0.407		0.105

Note: Results of ordinary least squares estimation in columns (1) and (3) ; Results of Poisson maximum likelihood estimation in column (2). Standard errors are clustered by province (*Wahlkreis*). * p<0.1, ** p<0.05, *** p<0.01. Unit of observation is city in Voigtländer and Voth (2012) sample. Voting controls include voter turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924.

B. Altonji-Elder-Taber style test.

VARIABLES	Log(deportations before 1942)	Letters to <i>Der Stürmer</i>	Attacks on synagogues
<i>Model:</i>	OLS	ML	OLS
<i>Sample:</i>	<i>All cities</i>	<i>All cities</i>	<i>All cities with synagogues in 1933</i>
Index of observables (Prediction of signal strength)	0.034 [0.022]	0.025 [0.021]	0.005 [0.004]
Population	Yes	Yes	Yes
Geographic variables	Yes	Yes	Yes
Jewish settlement in 1349	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Observations	1,295	1,361	1,114
R-squared	0.150		0.015

Note: Results of ordinary least squares estimation in columns (1) and (3) ; Results of Poisson maximum likelihood estimation in column (2). Standard errors clustered by province (*Wahlkreis*) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 8. Radio Availability and Anti-Semitism, the Role of Historic Predispositions

	Letters to <i>Der Stürmer</i>	Log(deportations before 1942)	Attacks on synagogues
<i>Model:</i>	OLS	ML	OLS
	(1)	(2)	(3)
Panel A. Interactions with pogroms			
	Sub-sample of cities with historical Jewish settlement		
Pogroms in 1349 * Radio signal strength, demeaned	0.049***	0.081***	0.004
	[0.016]	[0.023]	[0.007]
Radio signal strength, 1937	-0.035*	-0.063***	-0.005
	[0.018]	[0.022]	[0.007]
Pogroms in 1349	0.830***	0.423**	0.174**
	[0.192]	[0.215]	[0.069]
All baseline controls	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Observations	292	315	271
R-squared	0.625		0.242
B. Interaction with NSFP vote in 1924			
	Full sample of cities		Sample of cities with synagogues
Vote for NSFP in 1924*Radio signal strength, demeaned	0.156**	0.109***	0.016
	[0.076]	[0.041]	[0.017]
Radio signal strength, 1937	0.005	0.010	-0.001
	[0.007]	[0.009]	[0.002]
Vote for NSFP in 1924	6.839**	8.830***	0.925*
	[2.860]	[3.084]	[0.487]
All baseline controls	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Observations	1,295	1,361	1,115
R-squared	0.419		0.108
Panel C. Interactions with historical inequality			
	Full sample of cities		Sample of cities with synagogues
Land inequality in 1895 *Radio signal strength, demeaned	0.125***	0.058	0.032***
	[0.039]	[0.048]	[0.010]
Radio signal strength, 1937	-0.070**	-0.025	-0.022***
	[0.028]	[0.032]	[0.007]
Land inequality in 1895	1.698*	1.156	-0.464**
	[0.938]	[1.056]	[0.226]
All baseline controls	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Full radio effect for minimal level of inequality (Gini index 45)	-0.013	0.001	-0.007***
Observations	1277	1343	1098
R-squared	0.401		0.115

Note: Results of ordinary least squares estimation in columns (1) and (3); Results of Poisson maximum likelihood estimation in column (2). Standard errors are clustered by province (*Wahlkreis*). * p<0.1, ** p<0.05, *** p<0.01. Unit of observation is city in Voigtländer and Voth (2012) sample. For panel A, sample includes only cities with Jewish settlements in 1349. Baseline controls include log(population), share of Jewish population in 1925, share of Catholic population in 1925, share of blue-collar workers in 1925, share of white-collar workers in 1925, dummy for Jewish settlement in 1349, number of WWI participants per 1,000, number of welfare recipients per 1,000, number of pensioners with social assistance per 1,000, and voting controls for 1924. Voting controls for 1924 include voter turnout and vote shares of DNVP, NSFB, SPD, and Zentrum in 1924.

Table 9. Placebo Tests. District-Level Results

Panel A: Radio Availability and Change in Vote Share of the Nazi Party Since Previous Elections					
<i>Radio signal strength from:</i>	<i>May 1928</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Change between Votes for Nazi Party in May 1928 and vote for DNVP in December 1924	-0.058 [0.091]	-0.054 [0.092]	-0.026 [0.087]	-0.042 [0.086]	0.036 [0.077]
Change between Votes for Nazi Party in May 1928 and vote for NSBF in December 1924	-0.001 [0.018]	-0.002 [0.018]	0.014 [0.023]	0.011 [0.023]	0.005 [0.022]
Panel B: Radio Availability and Voting in 1924					
<i>Radio signal strength from:</i>	<i>May 1928</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Vote share of DNVP in 1924	-0.00057 [0.00043]	-0.00059 [0.00043]	-0.00063 [0.00052]	-0.00061 [0.00051]	-0.00106** [0.00046]
Vote share of KPD in 1924	-0.00002 [0.00020]	-0.00012 [0.00019]	-0.00003 [0.00018]	0.00003 [0.00016]	-0.00009 [0.00025]
Vote share of SPD in 1924	-0.00001 [0.00029]	-0.00005 [0.00030]	-0.00000 [0.00029]	-0.00013 [0.00028]	0.00043 [0.00030]
Vote share of Zentrum in 1924	-0.00015 [0.00021]	-0.00014 [0.00020]	-0.00029 [0.00029]	-0.00027 [0.00029]	-0.00044 [0.00027]
Voter turnout in 1924	0.00030 [0.00019]	0.00033 [0.00020]	0.00024 [0.00020]	0.00021 [0.00021]	0.00023 [0.00020]
Panel C: Radio Availability and Voting in 1920					
<i>Radio signal strength from:</i>	<i>May 1928</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Vote share of DNVP in 1920	0.00080* [0.00042]	0.00073* [0.00041]	0.00062 [0.00045]	0.00069 [0.00043]	0.00087* [0.00044]
Vote share of KPD in 1920	0.00011 [0.00019]	0.00003 [0.00019]	0.00002 [0.00016]	-0.00003 [0.00015]	0.00006 [0.00016]
Vote share of SPD in 1920	0.00048 [0.00049]	0.00038 [0.00048]	0.00026 [0.00044]	0.00045 [0.00046]	-0.00054 [0.00034]
Vote share of Zentrum in 1920	0.00015 [0.00019]	0.00016 [0.00019]	0.00031 [0.00029]	0.00030 [0.00029]	0.00046 [0.00028]
Voter turnout in 1920	0.00004 [0.00020]	0.00000 [0.00021]	0.00010 [0.00022]	0.00013 [0.00023]	0.00020 [0.00020]
Panel D: Radio Availability and Voting in 1925 Presidential Elections					
<i>Radio signal strength from:</i>	<i>May 1928</i>	<i>Sep 1930</i>	<i>Jul 1932</i>	<i>Nov 1932</i>	<i>Mar 1933</i>
Vote share of von Hindenburg in 1925	0.003 [0.030]	0.010 [0.030]	0.013 [0.028]	0.010 [0.029]	0.031 [0.039]
Vote share of Marx in 1925	-0.006 [0.025]	-0.002 [0.024]	-0.010 [0.026]	-0.003 [0.027]	-0.025 [0.033]
Vote share of Thälmann in 1925	0.003 [0.017]	-0.008 [0.015]	-0.003 [0.014]	-0.007 [0.013]	-0.006 [0.017]
Voter turnout in 1925	-0.012 [0.021]	-0.004 [0.022]	0.007 [0.022]	0.001 [0.021]	-0.034* [0.020]

Note: Each cell reports results of a separate regression. Specifications are exactly the same as in corresponding regressions with real rather than placebo outcomes, except for Panel A, where the list of baseline controls does not include the vote for DNVP and NSBF in 1924. In Panel B voting controls are for turnout and vote for DNVP, SPD, KPD, and Zentrum in 1920 (NSFB did not participate in 1920 elections).

Table 10. Placebo Tests. City-Level Results

Panel A. Crime rate 1900-1920, all cities										
<i>Radio signal strength from:</i>	<i>Mar 1937</i>		<i>Sep 1930</i>		<i>Nov 1932</i>		<i>Mar 1933</i>		<i>Jan 1935</i>	
Coefficient for signal strength	-0.0001	-0.0001	-0.0001	0.0000	0.0000	0.0000	-0.0001	0.0000	-0.0001	-0.0001
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Coefficient for interaction of signal strength and pogrom in 1349		-0.0001		-0.0004		-0.0002		-0.0003		-0.0003
		[0.0002]		[0.0002]		[0.0002]		[0.0002]		[0.0002]
Coefficient for pogrom in 1349		0.0064		0.0089*		0.0070		0.0094		0.0102
		[0.0051]		[0.0050]		[0.0045]		[0.0058]		[0.0061]
Panel B. Pogroms in 1920s, all cities										
<i>Radio signal strength from:</i>	<i>Mar 1937</i>		<i>Sep 1930</i>		<i>Nov 1932</i>		<i>Mar 1933</i>		<i>Jan 1935</i>	
Coefficient for signal strength	0.0001	-0.0002	0.0010	-0.0003	0.0007	-0.0001	0.0009	-0.0003	0.0009	-0.0003
	[0.0006]	[0.0005]	[0.0010]	[0.0006]	[0.0011]	[0.0006]	[0.0010]	[0.0006]	[0.0011]	[0.0005]
Coefficient for interaction of signal strength and pogrom in 1349		0.0002		0.0040*		0.0028		0.0033		0.0032
		[0.0016]		[0.0021]		[0.0020]		[0.0024]		[0.0024]
Coefficient for pogrom in 1349		0.0511		-0.0084		-0.0082		-0.0259		-0.0337
		[0.0521]		[0.0373]		[0.0507]		[0.0637]		[0.0729]
Panel C. Crime rate 1900-1920, subsample of cities existing in 1349										
<i>Radio signal strength from:</i>	<i>Mar 1937</i>		<i>Sep 1930</i>		<i>Nov 1932</i>		<i>Mar 1933</i>		<i>Jan 1935</i>	
Coefficient for signal strength	-0.0001	-0.0001	-0.0003	0.0000	-0.0001	0.0000	-0.0002	-0.0001	-0.0003	-0.0001
	[0.0002]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0003]	[0.0002]	[0.0003]
Coefficient for interaction of signal strength and pogrom in 1349		-0.0001		-0.0004		-0.0002		-0.0002		-0.0002
		[0.0003]		[0.0003]		[0.0003]		[0.0004]		[0.0004]
Coefficient for pogrom in 1349		0.0048		0.0094		0.0066		0.0081		0.0088
		[0.0099]		[0.0071]		[0.0084]		[0.0103]		[0.0113]
Panel D. Pogroms in 1920s, subsample of cities existing in 1349										
<i>Radio signal strength from:</i>	<i>Mar 1937</i>		<i>Sep 1930</i>		<i>Nov 1932</i>		<i>Mar 1933</i>		<i>Jan 1935</i>	
Coefficient for signal strength	0.0007	0.0011	0.0025	0.0025	0.0018	0.0019	0.0025	0.0022	0.0027	0.0022
	[0.0016]	[0.0021]	[0.0019]	[0.0019]	[0.0021]	[0.0019]	[0.0020]	[0.0020]	[0.0021]	[0.0019]
Coefficient for interaction of signal strength and pogrom in 1349		-0.0009		0.0007		0.0006		0.0003		0.0004
		[0.0016]		[0.0023]		[0.0025]		[0.0022]		[0.0020]
Coefficient for pogrom in 1349		0.0688*		0.0303		0.0266		0.0334		0.0294
		[0.0403]		[0.0340]		[0.0537]		[0.0512]		[0.0548]

Note: Each column in every panel reports results of a separate regression, with dependent variable mentioned in the name of each panel. Specifications are exactly the same as in corresponding regressions with real rather than placebo outcomes. Odd columns report specifications analogous to those reported in Table 7. Even columns report specifications analogous to those reported in Panel A of Table 8.