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CESIFO WORKING PAPER NO. 5330  
CATEGORY 2: PUBLIC CHOICE  
APRIL 2015

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ISSN 2364-1428

# Radio and the Rise of the Nazis in Prewar Germany

## Abstract

How do the media affect public support for democratic institutions in a fragile democracy? What role do they play in a dictatorial regime? We study these questions in the context of Germany of the 1920s and 1930s. During the democratic period, when the Weimar government introduced pro-government political news, the growth of Nazi popularity slowed down in areas with access to radio. This effect was reversed during the campaign for the last competitive election as a result of the pro-Nazi radio broadcast following Hitler's appointment as German chancellor. During the consolidation of dictatorship, radio propaganda helped the Nazis to enroll new party members. After the Nazis established their rule, radio propaganda incited anti-Semitic acts and denunciations of Jews to authorities by ordinary Germans. The effect of anti-Semitic 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 in places with historically low anti-Semitism.

JEL-Code: D720, L820, N740.

Keywords: anti-semitism, dictatorship, media, Nazis, propaganda, unconsolidated democracy.

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April 16, 2015

The research support of UniCredit and Universities (for Maria Petrova) and the Ministry of Education and Science of the Russian Federation, grant No. 14.U04.31.0002 (for Ruben Enikolopov and Maria Petrova) is gratefully acknowledged. Ruben Enikolopov acknowledges support through Deutsche Bank membership during his stay at IAS. We are grateful to Jürgen W. Falter, Nico Voigtländer, Hans-Joachim Voth, and the Bundesarchive for sharing their data. We thank Ben Olken for providing the software for ITM calculation. We also thank Anton Babkin, Michela Bunn, Natalia Chernova, Ivan Korolev, Brian Libgober, Gleb Romanyuk, and Denis Shishkin for their excellent research assistance. We thank Alberto Alesina, Bob Bates, Carles Boix, Filipe Campante, Ernesto Dal Bo, Stefano DellaVigna, Quoc-Anh Do, Raquel Fernandez, Jeffrey Frieden, Matthew Gentzkow, Lisa George, Irena Grosfeld, Saumitra Jha, Alessandro Lizzeri, Marc Meredith, Jesse Shapiro, Andrei Shleifer, B.K. Song, Nico Voigtländer, and audiences at Harvard University, Princeton University, University of Chicago, Paris School of Economics, Hunter College at CUNY, Sciences Po, Essex University, Warwick University, NBER Political Economy Summer Institute, American Economic Association Meeting, Priorat Workshop on Bargaining and Politics, LSE/NYU Conference on Political Economy, CESifo Political Economy Workshop in Dresden, the 10th Workshop on Media Economics, and anonymous referees for useful comments.

## 1. Introduction

Dictators often come to power through democratic processes.<sup>1</sup> Which institutional elements of a consolidated democracy are missing when this happens? How do dictators persuade voters to support them before and after the consolidation of power? What are the safeguards against the rise of popularity of potential dictators? We show that the content of political messages determined by who has control over mass media and the prior beliefs of voters play a role in answering these questions.

The rise of the Third Reich in Germany in the 1930s 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. Referring to the time shortly after Hitler was appointed chancellor of Germany and one month before the last competitive election of the Weimar Republic, the Reich minister of propaganda, Joseph Goebbels, wrote in the edited version of his diary published in 1940: "*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). 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...*"<sup>2</sup> Historians, however, have not reached a consensus on the merits of these claims. Several scholars provide case-study evidence in support of the view that propaganda was as important as Goebbels had claimed (e.g., Shirer 1960 and Somerville 2012). Others (e.g., Zimmermann 2006) suggest that propaganda had little additional effect above and beyond the other factors that helped bring the Nazis to power.<sup>3</sup> Prior to our paper, there has not been a systematic empirical analysis of the impact of radio on political support for the Nazis during the collapse of the Weimar Republic and the rise of the Third Reich or,

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

<sup>2</sup> The full text of the speech in English can be found at <http://www.calvin.edu/academic/cas/gpa/goeb56.htm> (accessed August 5, 2014). In addition, in 1934, Goebbels was cited in a handbook of radio to state that radio played a significant role in winning "the war of propaganda" and allowed Nazis to win the March 1933 elections (Weiss 1934, p. 9).

<sup>3</sup> 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 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."

more generally, on the role of media in anti-democratic transitions and consolidation of dictatorships. This paper aims to fill this gap.

To identify the effect of radio we use a combination of an over-time change in the content of radio broadcast and geographic and over-time variation in radio exposure. The content of the broadcast changed twice in pre-WWII Germany. Before 1929, radio programs focused on educational and cultural programs. In response to the initiative of German nationalists to organize a referendum on renouncing the Treaty of Versailles in 1929, the Weimar government altered the previously apolitical mix of radio programming to include political news with a pro-government slant. The Nazis and the Communists were denied airtime unlike other political parties, whereas news analysis programs always took a pro-democratic and anti-extremist perspective. The content of radio broadcast took another sharp turn—from having no Nazi messages on the radio to airing pro-Nazi propaganda—after Hitler was named chancellor of Germany and gained control over radio among other executive powers in January 1933. We document these changes using data on radio programming and confirm with historical sources.

First, we examine how these shifts in radio content affected political support for the Nazi Party (NSDAP) before the establishment of the Nazi dictatorship.<sup>4</sup> The government of the Weimar Republic was unstable and, as a result, the five parliamentary elections between 1928 and 1933 with NSDAP participation provide us with a frequent measure of political preferences of the electorate. We show that in the parliamentary elections, following the introduction of the pro-government political news broadcast, the Nazis gained significantly lower vote share in areas with radio availability compared to areas with no radio signal. In contrast, in the last (semi) competitive parliamentary elections of March 1933, an increase in the Nazi vote share was greater in areas where radio was available. The five weeks of the Nazi radio access reversed the electoral effect of radio slanted in favor of the Weimar government.

We rely on the following two sources of variation in radio exposure: the variation in local radio subscription rates, available between 1931 and 1933, and in radio availability, i.e., the strength of radio signal, available at every point in time during 1928–1938 for every

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<sup>4</sup> NSDAP stands for *Nationalsozialistische Deutsche Arbeiterpartei*, the National Socialist German Workers' Party. It was founded in 1920 and dissolved in 1945.

locality, predicted using the information on the location and the power of transmitters by the Irregular Terrain Model (Hufford 2002, Olken 2009). During the three elections between 1930 and 1932, when the political broadcasts were pro-government and the Nazis were not given access to the radio, we find a significant negative effect of radio expansion on votes for the Nazi Party, conditional on all unobserved time-invariant characteristics of the localities. We also find that the changes in the radio content from apolitical to pro-Weimar in 1929 and from pro-Weimar to pro-Nazi in the end of January, 1933 had the opposite effects on the growth of Nazi popularity as a result of radio exposure: in places where radio was available, the NSDAP electoral gain since the previous parliamentary elections was lower in September 1930 elections and higher in March 1933 elections.

Two counterfactual exercises highlight the modest, but, nonetheless, important effect of radio on the electoral success of the Nazis. In the absence of radio during the campaign for the September 1930 election, the Nazis would have got additional 4.1 percentage points, i.e., 22.3% instead of 18.2% of the total vote. The difference in the vote shares is not big, but it would have reduced the gap between the Nazis and their main competitor, the Social Democratic Party (SPD), which got 24.5%. Such a small difference in election results between the Nazis and SPD could have affected the Nazis' bargaining power over policies and, in particular, over choosing the candidate for chancellor even in 1930. If the radio had been switched off in January 1933, the subsequent elections would have produced a 2.9 percentage point lower vote share for the Nazi Party (41.0 instead of 43.9, which constitutes about a quarter of what NSDAP actually gained in 4 months between November 1932 and March 1933 elections). This is a substantial effect, given that the Nazi propaganda was in effect for only five weeks and, at that time, it primarily targeted uneducated poor workers, who seldom owned a radio set (Paul 1990 [1933]).<sup>5</sup>

The radio had an effect on a range of other outcomes during this period as well, drawing a consistent picture: Pro-Weimar radio was effective in lowering political support for the 1929 referendum and in raising the incumbent's vote in the 1932 presidential election.

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<sup>5</sup> It is worth noting also that by the time of March 1933 election, the Nazi propaganda had not reached its full strength yet. At the same time, the Nazis used a number of different methods to win this election, including the communist and socialist newspapers, violent attacks on meetings of Social Democrats, the passage of Reichstag Fire Decree, which allowed arresting the leaders of the Communist party. They also used other means of political campaigning, such as public speeches at political rallies, posters, fliers, and press.

Nazi party membership was not affected by radio before the Nazis got radio access and was positively affected in 1933, after the radio became pro-Nazi. The extent of discrimination against Jews was negatively associated with the radio in 1928–1932, although these estimates are not very precise, and positively associated in 1933–1934. These results demonstrate that the control over radio content was used successfully in the struggle for power during the democratic period, both by the Nazi opponents before January 30, 1933 and by the Nazis after they gained control over radio in January 30, 1933.

Our second question is whether radio propaganda helped the Nazis maintain political support after the full consolidation of power. We focus on non-electoral manifestations of the popularity of the regime such as the number of Jews deported to concentration camps before 1942 mostly as a result of denunciations by Germans, the number of open anti-Semitic letters to a Nazi newspaper, *Der Stürmer*, between 1935 and 1938, and pogroms on the *Night of Broken Glass* in November 1938.<sup>6</sup> We find that radio was important in persuading Germans to support the regime. Exposure to Nazi radio propaganda in its full strength increased the number of Jews deported to concentration camps and the number of anti-Semitic open letters.

The effects of the Nazi anti-Semitic propaganda, however, crucially depended on the listeners' predisposition to the broadcasted message. It was most effective in areas with historically more anti-Semitic population, as proxied by the occurrence of anti-Jewish pogroms during the Black Death in 1348–1350 (Voigtländer and Voth 2012) or by the vote for the extreme nationalists (NSFP) in 1924, and in areas with larger popular discontent rooted in wealth inequality, as proxied by the inequality in landholdings as of 1895 (Ziblatt 2009). In contrast, in areas where the local German population historically was not anti-Semitic despite the presence of a sizable Jewish community, the effect of propaganda was negative on the deportations of Jews and open anti-Semitic letters to *Der Stürmer*. This result highlights potential pitfalls of propaganda: it can backfire, if listeners are unlikely to believe its message. Listeners may negatively update their prior about the nature of the regime, which, in turn, may lead to lower susceptibility to other means of persuasion by the regime (such as coercion) or even resistance (such as hiding Jews, in our context).

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<sup>6</sup> There were three parliamentary elections in the Nazi Germany—in November 1933, March 1936, and April 1938. Voting results from these elections, however, are uninformative of the political support for the Nazis during this time, as is typically the case in dictatorships.

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: making people change their views as a result of propaganda or just signaling that certain actions will not be punished. The coordination mechanism is inconsistent with a negative effect of propaganda even if people are negatively predisposed to the message. Thus, one can conclude that at least a part of the effect is likely to come from direct persuasion or dissuasion, with the direction of the effect depending on the prior attitude of listeners.

A number of tests provide evidence in favor of our identifying assumptions. First, the results are consistent between panel specifications with locality fixed effects and cross-section specifications. Second, a series of tests in the spirit of Altonji, Elder, and Taber (2005) show that our cross-section results are unlikely to be biased due to the effect of unobservable confounds. Third, we show that radio had no effect on placebo outcomes that were measured before radio started broadcasting political news.

Overall, the results suggest that, first, mass media can be both a safeguard against the fall of an unconsolidated democracy and a facilitating factor in its collapse depending on who exercises control over media content and whether the extremists are banned from the media; second, mass media does help dictators gain popular support and persuade people about the virtues of their most atrocious policies, but only if the majority does not disagree with the propaganda message *a priori*; and third, propaganda may even be counterproductive if listeners have a negative predisposition to its message.

Our paper contributes to the literature on institutions in unconsolidated democracies and dictatorships (see Acemoglu and Robinson 2006 and 2012 for an overview). It is the first to empirically assess the role of mass media in the process of institutional change and under different political institutions in the same country.<sup>7</sup> We contribute to the literature on the political persuasion of media by documenting the dissuasion effect of propaganda, previously not found by the literature (see, e.g., Strömberg 2004, DellaVigna and Kaplan 2007, Gentzkow 2006, Gerber, Karlan, and Bergan 2009, Knight and Chiang 2009, Gentzkow et al. 2011, Durante and Knight 2012, and Enikolopov, Petrova, Zhuravskaya 2011). Our results

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<sup>7</sup> Notable theoretical contributions to the theory of media in autocracies are, for instance, Besley and Prat (2006), Egorov, Guriev, and Sonin (2009), and Gehlbach and Sonin (2014).

also contribute to the literature on the effects of media on ethnic animosity, i.e., DellaVigna et al. (2014) and Yanagizawa-Drott (2014) and to the historical literatures on the determinants of electoral success of the Nazi party (Falter 1991, Ferguson and Voth 2008, King et al. 2006, Satyanath, Voigtländer and Voth 2013, Voigtländer and Voth 2014), on the effects of media in the Weimar Republic and Nazi Germany (e.g., Sington, Weidenfeld 1943, Ross 2006a, and Zimmermann 2006), and on anti-Semitism in Nazi Germany (e.g., Voigtländer and Voth 2012).

The rest of the paper is organized as follows. Section 2 lays out the historical and political background. Section 3 presents the hypotheses. Section 4 describes the data. Section 5 discusses empirical strategy and identification issues. Section 6 presents the 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. The beginning of the Great Depression with the U.S. stock market crash of 1929 leading to a recall of American short-term loans to Germany, and the continuous heavy burden of reparations weakened the electoral support of parties in government. In the early elections held on September 14, 1930, the centrist parties lost legislative majority and in 1930–1932 the government ruled with the aid of presidential decrees. The NSDAP received 18.3% of the vote in 1930 compared to just 2.6% in 1928. Ongoing economic depression led to further radicalization of voters. In the presidential election of March 1932, Adolf Hitler got 30.1% of votes in the first round, second only to the incumbent president, Paul von Hindenburg (49.6%). In April 1932, with three candidates running, von Hindenburg won the second round over Hitler, 53% to 36.7%. In the early parliamentary elections held on July 31, 1932, the Nazi Party received 37.3% of votes. The Nazis got political support from the working poor and financial support from rich industrialists, who feared substantial tax increases to pay for government debt. Despite strong



electoral support of Hitler's party, von Hindenburg refused to appoint him chancellor. In the November 1932 parliamentary election, the Nazis got only 33.1% of the vote. However, as a result of misguided political strategizing during negotiations between von Hindenburg and the 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 set about consolidating all executive powers, including police and radio stations. In particular, the Nazis used the radio in an unprecedented way in their political campaign during the March 1933 elections (see below). After the 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 March 1933 election, which was the last semi-competitive election in pre-WWII Germany, the NSDAP gained 43.9% of votes. This victory allowed the Nazis, in coalition with DNVP and the Centre Party, to pass the Enabling Act in March 1933, which effectively allowed Hitler's government to enact decrees without consulting the Parliament.<sup>8</sup> 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, trade unions were abolished, and their leadership was imprisoned. Germany had become a legal dictatorship. However, it took another year and a half to fully consolidate Hitler's power, particularly within the judiciary.

## 2.2. Radio content

The 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. 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

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<sup>8</sup> DNVP stands for *Deutschnationale Volkspartei*, the German National People's Party.

centralized the production of all political news programs (Sington et al 1943, p.140, von Saldern 2004, p. 316). In 1924–1925, the role of politics in radio broadcasts was a subject of ongoing political debate.<sup>9</sup> 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 for the 9<sup>th</sup> November 1918. During the parliamentary elections of 1928, no content related to electoral campaigns was aired (Bausch 1956, p. 175).

In 1929, however, the policy regarding radio content was changed. The Nazi Party, in coalition with other right-wing parties, organized a referendum to repudiate the reparations required under the Treaty of Versailles (i.e., the so-called Young Plan). In response, the government launched an intensive campaign against the proposal of the referendum (Bausch 1956, p. 169).<sup>10</sup> 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 compiled 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. The online appendix data section describes our sources. Panel A of Figure 1 shows the number of

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<sup>9</sup> 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 (*Sozialdemokratische Partei Deutschlands*, the Social Democratic Party of Germany), the DVP (*Deutsche Volkspartei*, the German People's Party), and the DDP (*Deutsche Demokratische Partei*, the German Democratic Party) (Bausch 1956, p. 175). 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 (Lerg 1980, p.185-187). As a result, a majority stake in Dradag was nationalized and the editors were obliged to report in line with official government positions (Dussel 2006, p. 81). 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. In 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.

<sup>10</sup> 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 democracy.*” (*Vossische Zeitung*, 10/10/1929, p.1).

appearances of political figures on the radio between the 1<sup>st</sup> of January 1923 and the 4<sup>th</sup> of March 1933, the last day of the election campaign. 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.

The slant of the political news changed sharply when Hitler was appointed chancellor. To illustrate this point, Panel 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 provides the vote share received by the Nazis in each parliamentary election. Figure A1 in the online appendix gives detailed information on the number of appearances of political figures on the radio for each political party by year. These figures corroborate that the Nazis were denied access to radio before Hitler's appointment as chancellor in January 1933 and had preferential access to radio after his appointment.

In particular, during the parliamentary election campaign of 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 (Lerg 1980, p. 447).<sup>11</sup> During the campaign for the July 1932 parliamentary election, the Nazis were given some airtime together with other opposition parties (with the exception of the communists); namely, Nazi representatives appeared on the radio three times during the campaign.<sup>12</sup> The government, however, reserved a disproportionate amount of broadcasting time for its own campaigning (Pohle 1955, p. 106; Paul 1990, p. 93): government representatives appeared 16 times on the radio, including 4 appearances of the newly appointed chancellor von Papen. During the campaign for the November 1932 parliamentary

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<sup>11</sup> 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).

<sup>12</sup> 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. These appearances of the Nazis on the radio during this campaign reflected the fact that chancellor von Papen tried to establish closer ties with the Nazi Party at that time; these attempts were abandoned before the start of the November 1932 election campaign.

election, the Nazis did not get a single appearance on the radio, while the chancellor von Papen, who actively campaigned against Hitler in this campaign, appeared on the radio 9 times and other government representatives made 8 radio appearances.<sup>13</sup> During the second half of 1932, radio was brought under a firm state control: the regional broadcasting companies were centralized and placed under the management of the Ministry of Interior. *“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 2006a, p. 206).

After Hitler’s appointment as chancellor, between February 1 and the parliamentary elections of March 5, the Nazis launched a daily radio political campaign. During this five-week campaign, Adolf Hitler, who had never been given access to radio before, spoke 16 times on the radio. The total number of appearances of the Nazi officials on the radio during the March 1933 election campaign was 28 compared to a total of 4 appearances during the entire period from 1923 to January 29, 1933. The Nazis also blocked access to radio of all other parties and minimized airtime of its coalition partner DNVP, which appeared on the radio 12 times during this campaign (Diller 1980, p. 61). However, it is important to note that the Nazi campaign for the 1933 elections was aimed primarily at uneducated workers, who at that time had limited access to the radio (Paul 1990 [1933], p. 39).

After the elections of March 1933, radio became an increasingly important propaganda tool for the Nazis and was used as such until their defeat (Welch 2002, p. 33).<sup>14</sup> All radio station employees considered “potentially unreliable” were replaced, while listening to foreign radio or disseminating its information was subject to prosecution (Dussel 1999, p. 105). But it was not until the fall of 1933 that complete control over this medium was installed (Führer and Ross 2006, p.83).

Anti-Semitic content was broadcasted starting from 1933 on with varying degrees of intensity. As early as April 1, 1933, the Nazis called on the radio for a boycott of Jewish businesses. There were, however, relatively few anti-Semitic messages on the radio in 1933

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<sup>13</sup> The online appendix presents quotes from the von Papen’s campaign speeches on the radio illustrating the tone of von Papen’s campaign.

<sup>14</sup> Soon after the elections Goebbels instructed radio producers: *“With this instrument [...] we shall win over the people.[...] Once we have won them, radio must hold the 100% of our supporters, must defend them, must indoctrinate them so thoroughly that no one can break away any more”* (quoted in Bramsted 1965, p. 63).

and 1934 (Somerville 2012, p. 118). In contrast, in September 1935, anti-Semitism became prominent on the radio following the announcement of the new Anti-Jewish Law for the Protection of German Blood and German Honor. In the subsequent two years, anti-Semitic messages lost their prominence on the radio with few exceptions (Somerville 2012, p. 123, 125). Then, after the shooting of a German diplomat, Ernst von Rath, by a Polish-German Jew Herschel Grynszpan on November 7, 1938, the German News Agency was instructed to disseminate a story of a Jewish conspiracy (Steinweis 2009, p. 18–20). From the beginning of 1939, the message of a global Jewish conspiracy against Germany was constantly broadcasted on the radio and the anti-Semitic propaganda became an integral part of the Nazi propaganda.

Both the data on the radio content and anecdotal evidence (presented in the online appendix) 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 1933 on, the radio broadcast became heavily biased in favor of the Nazis.<sup>15</sup>

### 2.3. Availability of radio

In the first decade of its existence, the German radio network expanded rapidly. Transmitters were frequently added and upgraded and the radio audience grew steadily. Figure 2 presents the aggregate number of radio subscriptions and the cumulative power of transmitters during the first decade of German radio.<sup>16</sup> The radio subscription rate increased from essentially zero in 1924 to almost 5 million by the end of 1933. (Germany's population was 65.36 million in 1933.) Each year thereafter saw about 1 million additional radio subscribers.<sup>17</sup> According to Lerg (1980), by 1927 the radio signal was sufficiently strong for high-quality reception in areas with 31.3% of the German population, and by 1934 it reached areas with 70% of the

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<sup>15</sup> Online appendix chapter “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 about the organization of the March 1933 election campaign.

<sup>16</sup> In the online appendix, we give precise information on the cumulative power and the number of transmitters at every election date.

<sup>17</sup> 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.

population. Far from all of them had radios, however. In 1934, 33.3% of German households had a radio set and radio-set ownership increased to 65% by 1938 (Fuge 2009, p. 21, Bramsted 1965, p74).

The transmitters were placed strategically to reach the maximum number of potential listeners. Listenership was substantially higher in the big cities with transmitters and suburban areas around them than in rural areas. Primarily, this was because of the differences in the signal strength, but also because of the differences in the access to electricity (96.5% of receivers required electric power supply in 1930s, according to Vollmann 1936) and due to income differences, more generally (Cebulla 2004, p. 34). The monthly radio subscription fee of 2 marks was routinely collected up to 1933; it was roughly equivalent to the price of a monthly newspaper subscription, two hours of skilled labor, or four hours of unskilled labor. The prices of radio receivers declined over time and the number of households that could afford them increased. The annual average household budget for radio related expenditures among lower-income households (below RM 3,000) increased from RM 4.11 in 1927–1928 to RM 15.75 in 1937 (Ross 2006b, p.185). Overall, radio listenership was higher in places with higher population density, better economic conditions, and more favorable terrain. However, even in rural areas far away from transmitters, listenership was above zero, as long radio waves (AM transmission) could travel great distances.<sup>18</sup>

From 1933 onward, the Nazis strove to increase the number of radio listeners. Mass production of an affordable radio receiver was organized on Goebbels orders. In addition, in an attempt to maximize listenership after consolidating power, the Nazis substantially broadened the categories of the population exempt from the radio subscription fees (Fuge 2009).<sup>19</sup>

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<sup>18</sup> For example, in 1931, the district with the lowest subscription share had 4.46 subscriptions per 100 households. In addition, in rural areas higher number of people listened to one radio set on average compared to urban areas (Ross 2008 p. 137) and listening to the radio in groups was popular already in the 1920s and early 1930s (Cebulla 2004, p. 82, Lacey 2006, p.71, von Saldern 1990, p.36). In the second half of 1930s, collective listening was organized by the Nazis at the local party branches (Bramsted 1965, p. 74). Sington and Weidenfeld (1943) note that “*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.*”

<sup>19</sup> More detailed historical information about radio subscriptions and radio listeners is provided in the online appendix.

### 3. Hypotheses

First, to test whether the radio played a role in dismantling democracy in the late Weimar Republic, we consider how radio 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 slant with no access of the Nazis to radio; and (3) after January 1933, when the Nazis started using radio as a propaganda machine. We expect that exposure to radio decreased the vote share of the Nazi Party at the time when the slant in the political news was in favor of the Weimar government and increased the vote share of the Nazi Party after it got control over the radio. A similar pattern is expected for other available outcomes measuring the popularity of extremist ideas and support for the Nazis. In particular, we expect radio to increase the number of new members in the Nazi Party and promote discrimination against Jews once the Nazis got control over the radio content in 1933.

Second, we investigate the effects of radio in the second half of the 1930s when Hitler fully consolidated power. Once the anti-Semitic propaganda took its full strength, we expect radio to trigger open and violent expressions of anti-Semitism among the ordinary Germans.

Third, we test whether the persuasion power of the propaganda messages depends on the audiences being more and less positively susceptible to propaganda. Theoretically, listener's prior beliefs 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 anti-Semitic radio propaganda had a larger effect on the open expressions of anti-Semitic sentiments compared to places with lower initial levels of anti-Semitism. Furthermore, as recent research in social psychology suggests, higher levels of wealth inequality are associated with higher levels of anxiety (e.g., Pickett and Wilkinson 2011) and people with high level of anxiety are more responsive to persuasive messages (Marcus et al. 2006, Brader, Valentino, and Suhay 2008); therefore, we expect propaganda to be on average more effective in more unequal localities.

### 4. Data sources

**Radio Exposure.** We use two main sources of data for radio availability: radio signal strength, available for districts and cities for the entire period, and radio subscription rate, available at

the district level for only three points in time: April 1931, April 1932 and April 1933. We calculate radio signal strength using information on transmitter location, frequency, and power from *Mitteilungen der Reichs-Rundfunk-Gesellschaft* (for various years) and 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). This methodology was also used by Olken (2009), Enikolopov et al. (2011), and DellaVigna et al. (2014). For the sake of comparability, we use exactly the same units of measurement as in the previous works, i.e., the decibels above the power required for top quality signal reception for TV. As some of our outcomes, such as electoral outcomes, are measured at the level of 958 districts (*Kreis*) and others, such as anti-Semitism, are measured at the level of 1391 cities, we compute signal strength at geographical centers for both districts and cities.<sup>20</sup> The district boundaries are obtained from the map of administrative borders in 1925. Figures A2–A4 in the online appendix present the district-level maps of the radio signal strength during each of the five parliamentary elections during 1928–1933, the radio subscription rate at each point in time, when it was measured, and the changes in the signal strength from one election to another. The sources of these data are described in the online appendix.

**Outcome variables.** We use results of each election during the period under study, the Nazi party membership, and different measures of anti-Semitism as outcome variables. Figure 3 presents the timing of measurement for all considered outcomes. Below we describe their sources.

*Electoral results.* The data on elections come from Falter and Hänisch (1990) and ICPSR (1999). We use voting outcomes at the district level for the five parliamentary (*Reichstag*) elections between 1928 and 1933, presidential elections in 1932, and the referendum on the “Law Against the Enslavement of German People” in December 1929. 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

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<sup>20</sup> As summary statistics Table A1 in the online appendix shows, an average district had 63,440 inhabitants and a median district had around 40,000 inhabitants.



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.<sup>21</sup> As placebo outcomes and controls, we also use data on the results of earlier elections.

*Anti-Semitism.* We use two sets of measures of anti-Semitism at the city level. For measures of discrimination against Jews in the period before the Nazis fully consolidated power and before they started systematic anti-Semitic propaganda, namely, between 1929 and 1934, we construct a city-level panel dataset based primarily on a comprehensive 3-volume compilation of Jewish history in the German-speaking world (Alicke 2008). Our dataset records any mention of verbal expressions of anti-Semitism (e.g., anti-Semitic demonstrations or speeches), physical violence (e.g., harassment, beatings, killings) and property damage (e.g., destruction of Jewish property) for each city. In rare cases, when the city was not surveyed in Alicke (2008), we supplement our dataset with information from the “Encyclopedia of Jewish Life Before and During the Holocaust” by Wigoder and Spector (2001). The resulting dataset is a city-level panel of occurrence of any incidence of discrimination or violence against Jews between 1929 and 1934. The measures of anti-Semitism for the period after the Nazis fully consolidated power come from Voigtländer and Voth (2012). 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 the local anti-Semitism. Before 1942, however, deportations reflected hostility of local officials and non-Jewish neighbors. In support of this, 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).

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<sup>21</sup> 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 proposed law. This is why we use the ratio of those who voted in favor of the law to the total number of eligible (registered) voters, rather than to the number of valid votes cast.

NSDAP membership. The information on NSDAP membership comes from a data set of party membership cards (Brustein and Falter 1995). Based on the information given in this source, we compute the number of people, who joined NSDAP in 1932 and between February and May of 1933, by city. Due to a massive increase in the number of applicants, the Nazis stopped accepting new members in May 1933 (this ban was lifted in 1937). We restrict the sample to those cities in 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.

**Predisposition to extremist propaganda.** To measure historical predisposition to anti-Semitism at the 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). As alternative measures of predisposition to propaganda, we also use the historical landholding inequality as of 1895 from Ziblatt (2009) and the vote in December 1924, i.e., at the time when NSDAP was banned, for the extreme-right political party NSFP, the National Socialist Freedom Party.

**Socioeconomic and geographic control variables.** For sociodemographic variables, our primary sources are *Zentralarchiv* and German census data from Falter and Hänisch (1990). In particular, we use the following sociodemographic controls 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 (Childers 1983 and King et al. 2008), and for the 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 the online appendix for details). Welfare recipients and property tax controls are included in the district sample only, as these data are not available at city level. In addition, we control for altitude for each district and city and for whether the city is located on a navigable river. For the districts sample, we also control for the distance to the closest big city (i.e., urban community with at least 50 thousand inhabitants). In some specifications, we include controls for the number of newspaper titles (from *Deutsches Institut für Zeitungskunde*) and cinemas (from *Reichs-Kino-Adreßbuch*) in 1932 at city level as well as the number of speeches that

Hitler gave in 1932 in each city, based on the information from Domarus (1962) and Dusik (1992).

The electoral districts and socio-demographic data were manually merged to administrative district units in 1925 borders.<sup>22</sup> The number of districts in the dataset varies between 918 and 959, depending on the year. All data sources are described in more detail in the online appendix, and the summary statistics for all variables are presented in Table A1 of the online appendix.

## 5. Empirical framework

In this section, we present our empirical approach and a series of reality checks to provide evidence in favor of our identifying assumptions.

### *5.1. The measures of radio exposure: subscriptions and 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.<sup>23</sup> Figure 4 illustrates the relationship between the signal strength across districts in September 1930 and the subscription rate in April 1931. The figure presents the scatterplot and the generalized logistic function that is the best-fit parametric relationship between the two variables. It shows that an increase in the signal strength translated into additional subscriptions only between two threshold levels of signal strength. Below the first threshold, the quality of the signal was insufficient to listen to the radio.<sup>24</sup> Above the second threshold a further increase in signal strength did not translate into an increase in listenership because signal was already sufficiently strong for high-quality reception; only few observations lie above the second threshold.<sup>25</sup>

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<sup>22</sup> 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 for different years.

<sup>23</sup> 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 (either legally or illegally). See section 5 of the online appendix for more details.

<sup>24</sup> As mentioned above, all districts had above zero subscription rates. The reason is the nature of AM transmission, which allows unstable radio reception with high-quality receivers even in places with a very weak signal.

<sup>25</sup> 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.

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. In Panel B we use the generalized logistic transformation of the signal strength using the function presented in Figure 4, which best fits the relationship between the signal strength and subscription rate. In all the cases, the coefficients on the signal strength or its non-linear transformation are positive and highly significant (the F-statistics for the significance of the signal strength variables are presented in the last column of the table). A one-standard-deviation increase in the signal strength was associated with a 2.8-percentage-point increase in the share of households with a radio subscription in 1930 (with the mean of 18.9% measured as of 1931). In 1933, a one-standard-deviation increase in the signal strength was associated with 1.8 additional percentage points in the share of subscribers (with the mean value of 26.5%). Thus, we use three alternative measures of radio exposure: namely, the untransformed radio signal strength, a non-linear transformation of the radio signal that is the best parametric predictor of subscription rates, which has a natural interpretation of the predicted subscription rate, and the subscription rate itself.

## 5.2. Specifications

Data for two of our outcomes, voting for the Nazis and discrimination against Jews, come as a panel. Our baseline panel specification is:

$$y_{it} = \beta_0 + \beta_1 \text{Slant}_t \times \text{Exposure}_{it} + \mathbf{Z}_{it}' \boldsymbol{\beta}_2 + \varphi_i + \tau_t + \epsilon_{it}, \quad (1)$$

where  $y_{it}$  denotes the respective outcome;  $i$  indexes the cross-sectional dimension of the panel, i.e., districts for election outcomes and cities for anti-Semitism outcomes; and  $t$  indexes time, i.e., election years for election outcomes and calendar years for anti-Semitism.  $\text{Exposure}_{it}$  is the main explanatory variable – one of the three alternative measures of the radio exposure. By  $\text{Slant}_t$  we denote the direction of the slant in the political radio broadcast at time  $t$ . Based on the content analysis, presented in Figure 1, we conclude that political news were slanted from 1929 onwards and that the slant was pro-Weimar government between 1929 and 1932 and pro-Nazi from 1933 until the end of our observation period. The available data on radio content are too crude to assess the relative magnitude of the slant; therefore, we just focus on its direction. As an approximation, we set  $\text{Slant}_t$  to be equal to 0 in 1928, -1 between 1929

and 1932, and 1 in 1933–1934.  $\varphi_i$  and  $\tau_t$  denote district (city) and year fixed effects.  $\mathbf{Z}_{it}$  denotes the interaction of all time-invariant control variables  $\mathbf{X}_i$  (to be described below) with time fixed effects.  $\epsilon$  denotes unobserved heterogeneity. We estimate equation (1) both restricting the sample to the sub-period 1929–1932 when  $Slant_t$  is constant (which includes elections of September 1930, July 1932 and November 1932) and for all available periods pooled together. We estimate equation (1) using OLS with signal strength and the predicted (based on signal strength) radio subscription rate as measures of radio exposure and using 2SLS with the actual radio subscription rate instrumented by the predicted subscription rate, whenever data availability for the actual subscription rates permits.<sup>26</sup> The main identifying assumption in these panel-data estimations is that the changes in the signal strength are uncorrelated with time-varying unobservable determinants of the support of the Nazis both before and after the changes in the radio slant.

As we have no data to measure the relative magnitude of the radio slant precisely, we also estimate the electoral effects of the radio persuasion separately during the time of the introduction of the pro-Weimar political news on the radio and at the time of the change in the direction of the slant to pro-Nazi. In order to do this, we estimate the following modifications of equation (1), taking first differences at these two episodes:

$$\Delta y_{it} = \theta_0 + \theta_{1(t)} Exposure_{it} + \mathbf{X}_i' \boldsymbol{\theta} + \epsilon_i, \quad (2)$$

where  $t = 1930$  or  $t = 1933$ ;  $\Delta y_{i,1930}$  is the change in the Nazi vote share between 1928 and 1930 elections and  $\Delta y_{i,1933}$  is the change in the Nazi vote share between November 1932 and March 1933 elections.<sup>27</sup> These estimations require additional identifying assumptions. At the 1930 election, equation (1) reduces to equation (2) if  $Slant_{1928} = 0$ . We present evidence in support of this identifying assumption in the following subsection: in particular, we show that radio had no effect on political preferences before the content turned political, namely in 1928. Consequently,  $\theta_{1(1930)} = \beta_1 Slant_{1930}$  and it is expected to be negative as the radio slant was in favor of Weimar government in 1930, i.e.,  $Slant_{1930} < 0$ . At the 1933 election, equation (1) is reduced to equation (2) under the assumption that radio exposure changed very little

<sup>26</sup> As mentioned in the data section, the district-level data on radio subscription rate is available only for three points in time between 1930 and 1933 that do not coincide with the timing of election campaigns.

<sup>27</sup> Precisely, the first difference of equation (1) takes the form:  $\Delta y_{it} = \theta_0 + \gamma_1 Exposure_{it} + \gamma_2 \Delta Exposure_{it} + \mathbf{X}_i' \boldsymbol{\theta} + \epsilon_i$ , where  $\gamma_1 = \beta_1 \Delta Slant_t$  and  $\gamma_2 = \beta_1 Slant_{t-1}$ .

between November 1932 and March 1933, i.e., that  $\Delta Exposure_{i,1933}$  is negligible, which is reasonable because the signal availability changed only slightly during this period, as illustrated by Figure 2, and the decisions about buying radios were sluggish to improvements in signal availability. Under this assumption,  $\theta_{1(1933)} = \beta_1 \Delta Slant_{1933}$ , which is expected to be positive as  $\Delta Slant_{1933}$  denotes the change in the radio content at the time of the Hitler's appointment from pro-Weimar government to pro-Nazi. Equation (2) is also estimated both with OLS and IV.<sup>28</sup>

The effect of radio on several cross-sectional outcomes is estimated using:

$$k_i = \alpha_0 + \alpha_1 Exposure_i + \mathbf{X}_i' \boldsymbol{\alpha}_2 + \epsilon_i, \quad (3)$$

where  $k_i$  is a cross sectional outcome, such as the Nazi party membership, expressions of anti-Semitism, or referendum and presidential election results. For all electoral outcomes, the unit of analysis is district-year. For the new membership of the Nazi Party, equation (3) is estimated in a subsample of districts, for which this variable is available. For the measures of anti-Semitism, this regression is estimated on the city sample.

Finally, to study the differential effects of radio propaganda, we interact radio exposure with several alternative measures of predisposition to propaganda denoted by  $P_i$  in a series of cross-sectional specifications:

$$k_i = \alpha_0 + \alpha_1 Exposure_i + \alpha_2 (Exposure_i - \overline{Exposure}) \times P_i + \alpha_3 P_i + \mathbf{X}_i' \boldsymbol{\alpha}_4 + \epsilon_i. \quad (4)$$

Specifications (3) and (4) require a more stringent identifying assumption that the cross-sectional variation in signal strength is uncorrelated with unobservable determinants of  $k_i$  conditional on  $\mathbf{X}_i$ .

### 5.3. The set of control variables and the determinants of radio availability

The set of controls includes three groups of variables. First, we control for socioeconomic and geographic characteristics, listed in Section 4; these are important determinants of voting for the Nazi. Second, we control for preexisting political preferences with the vote shares of the

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<sup>28</sup> Alternatively, one can represent the change in the outcome for consecutive elections as a function of the lagged radio exposure and the change in the radio exposure. In particular,  $\Delta y_{i,t} = \delta_0 + \delta_{1(t)} Exposure_{i,t-1} + \delta_{2(t)} \Delta Exposure_{i,t} + \mathbf{X}_i' \boldsymbol{\delta} + \epsilon_i$ , where  $\delta_{1(1930)} = \beta_1 \Delta Slant_{1930} = \beta_1 Slant_{1930} < 0$ ;  $\delta_{2(1930)} = \beta_1 Slant_{1930} < 0$ ;  $\delta_{1(1933)} = \beta_1 \Delta Slant_{1933} > 0$ ;  $\delta_{2(1933)} = -\beta_1 Slant_{1932} > 0$ . We check the robustness of our baseline results by estimating this equation for  $t = 1930$  and  $t = 1933$  in addition to estimating equation (2). Note that, unlike equation (2), it does not require additional assumptions.

two nationalistic parties DNVP and NSFP, 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.<sup>29</sup> And third, we control for the determinants of transmitter location as they also can be related to the support for the Nazis independently of their effect on radio availability. In particular, as both radio signal strength and voting for the Nazis were strongly correlated with urbanization and some districts are rural, in the districts sample, we control flexibly for population with the fifth-degree polynomial of population and for a dummy for city status of the district. In the sample of cities, it is sufficient to control for the log of city population, as the variation is much smaller. Radio transmitters were located in or right next to big cities, which were also the centers of diffusion of information via other means. To account for this, in the sample of districts, we control for the distance to cities of at least 50,000 inhabitants. We also verify that our results are robust to controlling for the number of available newspaper titles and cinemas. In all cross-sectional specifications  $X_i$  includes fixed effects for each of the 35 German electoral regions (*Wahlkreis*).<sup>30</sup>

Radio signal strength in each location depended 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 were not randomly located, radio signal strength could be correlated with socioeconomic characteristics. Table 2 summarizes the results of the cross-sectional regressions, in which, at every election date, the signal strength and its non-linear transformation by district are regressed on four groups of variables that jointly form our baseline set of cross-sectional controls: region fixed effects, determinants of transmitter location, socioeconomic characteristics, and voting outcomes in 1924. The most important determinants of district signal strength are the region fixed effects and the variables that predict transmitter location, i.e., distance to the nearest big city, altitude, dummy for the urban districts, and the fifth-order polynomial of population. These variables alone explain over 97% of that part of the variation

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<sup>29</sup> NSDAP was outlawed 1923–1925 and was not taking part in the parliamentary elections in 1924. Both DNVP and NSFP had nationalistic ideology and were close in spirit to the ideology of NSDAP. The correlation of NSDAP vote share in 1930 with DNVP vote share in 1924 was 0.55 and with NSFP vote share in 1924 it was 0.42.

<sup>30</sup> Previous literature on voting for the Nazi Party focused mostly on differences between regions, we are using much finer data, controlling for all unobserved variation across regions.

in the signal strength that is explained by the full set of controls.<sup>31</sup> However, some socioeconomic characteristics and voting outcomes in 1924 (in particular, the share of white-collar workers, average property tax, the voter turnout and the vote for NSFP party in 1924), are significant correlates of radio signal strength across districts even conditional on region 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.

Table A2 in the online appendix presents placebo tests, in which the results of 1920, 1924, 1925, and 1928 elections as well as the change in the vote share of extreme nationalists between 1924 and 1928 are regressed on the signal strength between 1928 and 1933, conditional on the determinants of transmitter location and socioeconomic variables. Most importantly, there is no significant effect of the radio on voting for NSDAP or any other political party in 1928, which provides evidence in support of the assumption that  $Slant_{1928} = 0$ . Out of 120 placebo regressions, the numbers of coefficients of interest significant at 1%, 5%, and 10% level are only 1, 4, and 10, respectively, which is well within the margin of statistical error. Among these few significant placebo results, we find that the signal strength in 1933 is negatively correlated with the vote shares of DNVP and NSFP in 1924 and is positively correlated with the vote share of DNVP in 1920. To account for this correlation, we control for pre-existing political preferences.

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. The results of these tests are reported at the bottom of the tables that show the baseline results for each specification that relies on the cross-sectional variation in signal strength. In addition, we present specifications that rely only on the variation in radio content holding the signal constant and a large set of additional placebo tests, the results of which provide evidence in favor of our identification assumptions.

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<sup>31</sup> The variation in signal strength coming solely from topography (as, e.g., in Olken, 2009) is insufficient because of a relatively flat surface of 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 city of at least 50,000 inhabitants (with or without the transmitter) does control for the potential confounds, such as proximity to other sources of information.



## 6. Results

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

**Electoral outcomes.** During the 1930s, radio was expanding and, therefore, we can explore the over-time variation in the signal strength to estimate the persuasion effect of the radio, controlling for time-invariant unobserved heterogeneity between districts. At first, we confine our analysis to the three consecutive elections in 1930 and 1932, when radio had a pro-government slant. Columns 1 and 2 of Table 3 present the results of the estimation of equation (1) for this period using the signal strength and the predicted radio subscription rate as proxies for radio exposure. We find that districts that gained access to radio at some point in time during 1930–1932, when radio had a pro-Weimar political content and the Nazis were not allowed on the air, saw a significant decline in the Nazi vote share, conditional on all observables as well as unobserved heterogeneity between districts. The effect is negative and significant for both proxies for radio exposure. The magnitude of the effect is as follows: an 8.2 percentage point increase in the predicted radio subscription rate—a change equal to a one standard deviation increase in the actual subscription rate in 1932—led to a decrease in the Nazi vote share in a district by 1.9 percentage points during the 1930–1932 period (according to the estimate presented in Column 2).

In columns 3 and 4 of Table 3, we report the results for the estimation of equation (1) pooling data from all five elections in 1928–1933 together. This specification combines the effect of the change in the radio availability due to radio expansion with that of the change in the radio content. Consistent with our hypothesis, we find that radio availability interacted with the measure of pro-Nazi slant has a positive and significant effect on the Nazi vote share. An 8.2 percentage point increase in the predicted radio subscription rate increases or decreases a Nazi vote share in a district by one percentage point on average, depending on the direction of the radio slant (according to the estimate presented in Column 4).

Columns 5 and 6 of Table 3 present the results with radio subscription rate as a measure of radio exposure. As mentioned above, the timing of the measurement of subscription rate at the district level allows matching only in two time periods in a panel (and only imperfectly). Thus, we use the first differences so that the change in the Nazi vote share between September 1930 and November 1932 is regressed on the change in the subscription rate between April

1931 and April 1932.<sup>32</sup> Column 5 reports OLS and column 6 – IV estimate, with the change in the subscription rate instrumented by the change in the predicted subscription rate between April 1931 and 1932. Both specifications give the predicted negative coefficient, but only IV is significant (at 5%). The magnitude of the effect implied by the IV estimates is much bigger than both the magnitudes implied by the OLS. The IV regression is better identified both because listenership is an endogenous variable and because the subscription rate measures listenership with an error.<sup>33</sup> One standard deviation in the change in actual subscription rate between 1931 and 1932 (equal to a 2.3 percentage point increase) led to a decrease in the share of votes for NSDAP of 4.9 percentage points according to the IV specification, which is larger but still consistent with magnitudes in the reduced form specifications.

Table 4 presents the estimates of the effects of the two changes in radio content that took place in 1929 and 1933 (as in equation 2). In particular, we regress the change in the Nazi vote share from the previous election on the measures of radio exposure for two parliamentary elections: September 1930 and March 1933. In Panel A, we use the signal strength and the predicted subscription rate as measures of exposure to radio and use OLS for the estimation; in Panel B, the actual subscription rate is used in OLS and IV framework.

The results confirm that radio availability had the opposite effect on political support for the Nazi Party depending on the direction of the political slant. As radio content shifted from neutral to having a pro-Weimar government slant with no airtime given to the Nazis, i.e., between elections of 1928 and 1930, the radio became associated with a significantly slower growth in the Nazi vote share. In contrast, when radio content shifted from being pro-Weimar coalition to pro-Nazi, i.e., between elections in November 1932 and March 1933, radio exposure led to a significant increase in the Nazi vote share. An 8.2 percentage point increase in the predicted radio subscription rate (equal to a one standard deviation increase in the actual subscription rate) in 1930 led to a 1.8 percentage point smaller increase in the share of votes for NSDAP between 1928 and 1930 and a similar-sized increase in the radio subscription rate in 1933 led to a one percentage point larger increase in the Nazi vote share between November

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

<sup>33</sup> Note that the bias from the endogeneity of listenership may go either way as at that time the decisions to listen to the radio depended primarily on the non-political content (such as sports, entertainment and culture), whereas political news constituted only a small part of the overall broadcast.

1932 and March 1933 elections.<sup>34</sup> (Figures A5 and A6 in the online appendix indicate that these results are not driven by outliers and reflect a shift in the distribution of votes.) As in the panel estimation, the cross-sectional IV estimates are substantially larger in magnitude compared to both the OLS and the reduced-form estimates: A one standard deviation increase in the subscription rate in a district led to a decrease in the Nazi vote share by 2.9 percentage points in 1930 and an increase in the Nazi vote share by 2.0 percentage points in 1933, in comparison to their results in previous elections.<sup>35</sup>

To assess the relative effectiveness of radio during the times when it had a pro-Weimar government slant and a pro-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 radio (see section 3 of the online appendix for detailed calculations). Under the assumption of four voters-listeners per subscription on average, we find that the persuasion rates of the messages “do not vote for the extremist parties (including the Nazis)” in September 1930 and “vote for the Nazis” in March 1933 were 36.8% and 9.8%, respectively. (We present the sensitivity of persuasion rates to the assumption about the number of listeners who are eligible voters per subscription in online appendix Figure A7.)<sup>36</sup> At first glance, the fact that the political campaign on the radio in the Weimar republic in 1930 appeared to be more persuasive than the first Nazi radio campaign of 1933 looks surprising. However, a combination of two important factors contributed to the relative ineffectiveness of the Nazi first radio campaign. First and most importantly, the effect of radio in 1933 was limited by the pattern of radio listenership. In

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<sup>34</sup> The comparisons with the counterfactual vote shares for the Nazis in the absence of radio, presented in the introduction, are obtained by comparing the observed outcome with a counterfactual scenario, in which the predicted share of radio subscriptions is set to zero. Namely, in September 1930, the Nazis actually got 18.25% of the total vote, whereas in the counterfactual scenario, they would have 4.1 percentage points more ( $=0.217$  [negative of the respective point estimate, Table 4, Panel A, Column 2] \* 18.76 [mean district value of the predicted signal strength in 1930, Table A1]). In March 1933, the Nazis got 43.9%, whereas in the counterfactual scenario, they would have 2.9 percentage points less ( $=-0.128$  [negative of the respective point estimate, Table 4, Panel A, Column 4] \* 22.83 mean district value of the predicted signal strength in 1933, Table A1]).

<sup>35</sup> We also examine how radio affected voter turnout. Tables A3 and A4 in the online appendix present the results using the same specifications as in Tables 3 and 4, respectively. We find only marginally significant effects of radio on turnout and only in few specifications. In particular, there is a small (and not very robust) positive effect of radio availability on turnout after the Nazis got control over radio.

<sup>36</sup> If the mean number of listeners per subscription was between three and six, the persuasion power of German political radio during the campaigns of 1930 and 1933 was comparable in size to the persuasion power of the modern media found in the literature in different 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).

particular, the Nazi 1933 election campaign was primarily targeted at uneducated working poor (Paul 1990[1933]). This was the social group, which had the largest share of voters, who switched to voting for NSDAP in 1933 (King et al. 2008), but inside which the ownership of radio sets was less common, albeit not negligible.<sup>37</sup> And second, the campaign of March 1933 election was shorter than that of the September 1930 elections, which may also have contributed to its relative ineffectiveness. However, a direct comparison of persuasion rates for 1930 and 1933 should be exercised with caution because, as shown by the previous literature on media persuasion, it is harder to persuade voters to vote for a particular party than not to vote for it, as the latter includes the option of not turning out to vote (see, e.g., Ansolabehere et al. 1999 and Enikolopov et al. 2011).

**Evidence in favor of the identifying assumptions and robustness checks.** In order to provide evidence that our cross-sectional results are unlikely to be driven by unobserved cross-district heterogeneity, we follow Altonji, Elder, and Taber (2005) to 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 determinants of the transmitter location, namely, the fifth-order polynomial of population (for which we control directly). Then, we regress the change in Nazi vote share as of 1930 and 1933 on this fitted value controlling for the fifth-order polynomial of population. The results are presented in Panel C of Table 4. All but one of these regressions show no significant correlation between the indices of observables, which best predict the signal strength or its logistic transformation, and the change in the Nazi vote share. The one exception is a negative and significant (at 10% level) correlation between the index of observables, predicting non-linear transformation of the signal strength, and the change in Nazi vote share in 1933. As the sign of this correlation is the opposite to the baseline results, under a reasonable assumption that unobservables are positively correlated with observables, this test suggests that our cross-sectional results are not driven by

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<sup>37</sup> We present historical data on radio listenership by social group in section 5 of the online appendix. We also investigate differential effects of radio during this campaign depending on the social structure of the population. Consistent with King et al. (2008), we find that the effect of the radio was stronger in communities with larger parts of the population comprised of groups that gave larger political support to the Nazis in 1933, i.e., districts with higher share of self-employed workers, helping family members, and agricultural workers (see Table A5 in the online appendix).

unobserved heterogeneity among districts, and in 1933 they may be biased downwards.<sup>38</sup> We also test whether the change in the sign of cross-sectional estimates between 1930 and 1933 is driven by the change in the radio availability rather than the change in the radio content. We fix radio signal strength at different points in time between 1928 and 1933 and re-estimate equation (2) for both 1930 and 1933 replacing contemporaneous signal with its lags and leads. This exercise allows us to compare the effect of the change in radio content holding the signal constant. Figure 5 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 changes sign from negative in 1930 to positive in 1933 irrespective of the time at which we measure radio signal.<sup>39</sup>

We also examine robustness of our results to using other electoral outcomes. Namely, we study the effects of radio on the voting “yes” during the 1929 Nazi-supported referendum for the “Law against the Enslavement of German People,” i.e., against the Treaty of Versailles, and on the results of presidential election in 1932. The radio programing was slanted against voting “yes” in the referendum and in favor of Hindenburg and against Hitler in the presidential elections. In particular, we estimate a cross-sectional specification (3) for

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<sup>38</sup> Table A6 in the online appendix illustrates how the point estimates of the coefficients of interest are affected by changes in the list of covariates. For both September 1930 and March 1933 elections, the magnitude of the estimated effects does not change much with additional covariates after we control for region fixed effects, population, and urban district dummy. Most notably, controlling for the distance to large cities, which may proxy for the exposure to alternative sources of political information, has a very limited effect on the magnitude of the estimated coefficients. Moreover, the results are robust to controlling directly for the alternative sources of political information such as the number of newspapers, the number of cinemas, as well as the number of public speeches made by Adolf Hitler (the results are presented in Table A7 in the online appendix). We also check that our results are not driven by specific parametric assumptions. In Panel A of Table A8 in the online appendix, we verify that the results are robust to using a binary measure of signal strength. Panel B of Table A8 reports the results of nearest neighbor matching performed on all controls with exact matching by region and urban/rural district status. We also checked that the results are robust to excluding regions with a very low and very high signal strength. Specifically, we drop regions for which the slope of the generalized logistic function of the signal presented in Figure 4 is smaller than 0.1 or 0.2. The results for these subsamples become even stronger (see Table A9). Table A10 in the online appendix presents the results of the specification, in which the changes in the vote share for the Nazis in 1930 and 1933 are related to the lagged signal strength and its change from the previous election (i.e., the specification described in footnote 28). As predicted, the estimates coefficients both at lagged signal strength and its change are negative in 1930 and positive in 1933. Three out of four coefficients are statistically significant. In Table A11 of the online appendix, we verify that the results of the panel regressions, presented in the columns 3 and 4 of Table 3, are robust to replacing the contemporaneous radio signal strength by the signal strength measured in 1928 in the interaction between radio signal and the pro-Nazi slant.

<sup>39</sup> Since the effect of political predispositions (measured by voting in 1924) and the geographical factors are not expected to vary over time, for this exercise, we use a more parsimonious set of controls, which includes region fixed effects, fifth polynomial of population, urban district dummy, shares of Jews and Catholics, and shares of blue-collar and white-collar workers.

these outcomes controlling for our baseline set of controls and the NSDAP vote share in 1928 (to account for the 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. An 8.2 increase in the predicted radio subscription rate (equal to a one standard deviation of the actual subscription rate) led to a 2 percentage point, i.e., 11.4 percent, decrease in the support of the referendum. The estimated effect of radio on the results of the presidential elections is less precise, but also 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 is statistically significant, however. Panel B of Table 5 presents the results of the test à la Altonji, Elder, and Taber (2005), which confirm that the index of observables that best predicts radio availability is not significantly correlated with the outcomes of interest, controlling for the fifth-order polynomial of population, urban district dummy, and pre-existing political preferences, with one exception of the marginally significant effect of the index of observables predicting non-linear transformation of signal strength on the vote for von Hindenburg, for which the sign of the effect is the opposite to the baseline, suggesting that the baseline coefficient may be biased downwards.

**Discrimination against Jews.** To examine the effect of radio on the spread of anti-Semitism before the full consolidation of power by the Nazis we look at the incidents of discrimination and violence against Jews across German cities during the period between 1929 and 1934. At that time, the most common manifestations of anti-Semitism took the form of harassment. We estimate equation (1) with city and year fixed effects, in which the unit of analysis is city-year, the dependent variable is a dummy for the occurrence of an anti-Semitic action, and the main independent variable is the plain signal strength. We cannot use non-linear transformation of signal strength because the data on subscription rate are not available at city level (and subscription rate was very different in cities than in rural areas).

The results are presented in Table 6. During the 1929–1932 period when the Nazis had no access to radio, radio had a negative, but statistically insignificant effect on discrimination against Jews (column 1). In 1933–1934, when the Nazis already had control over content, discrimination against Jews was positively and significantly associated with the radio availability (column 2). Note that the variation in the signal strength is insufficient to estimate

the effect of radio with city fixed effects for 1933–1934; and therefore, we estimate the effect on a pooled cross-section of cities. If we take into account both the radio expansion between 1929 and 1933 and the change in the radio content between 1932 and 1933 (column 3), we find that the coefficient on the radio availability interacted with the measure of pro-Nazi slant is positive and significant.<sup>40</sup> Overall, the results indicate that radio had a significant effect on anti-Semitism even before the Nazis were able to fully consolidate power and started to broadcast the message of global Jewish conspiracy on the radio, with the sign of the effect depending on the direction of the radio slant.

**Nazi party membership.** We also consider whether radio helped the Nazis to recruit new party members. The results are reported in Table 7. The sample consists of 613 (out of 958) districts with information on party membership.<sup>41</sup> We find that in 1932, when radio was pro-Weimar government, 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 much affected by political news on the radio. In contrast, in February-May of 1933, after the Nazis took over the radio, party membership became positively and significantly associated with radio 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 results: coefficients on the radio exposure remain positive and significant. The magnitude of the effect implies that 58 percent of new NSDAP members, who joined the party during the first two months of the Nazi control over the broadcast, were persuaded by radio propaganda.<sup>42</sup> Panel B of Table 7 presents the results of the Altonji, Elder, and Taber (2005) tests; they yield no statistically significant association between the indices of observables and the new Nazi party membership.

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<sup>40</sup> The results of cross-sectional analysis year by year are presented in Table A12 in the online appendix. Radio availability was associated with significantly lower discrimination against Jews in 1930 and significantly higher in 1933. The effects are not significant in all other years taken separately. Table A13 in the online appendix verifies that the results of the panel specification are robust to fixing the signal strength at 1928 level.

<sup>41</sup> Results are robust to using the full sample, treating missing observations as zeros.

<sup>42</sup> As in the other counterfactual scenarios, this estimate is obtained by comparing the observed outcome with a scenario, in which the logistic transformation of signal strength is set to zero.

Overall, our results are consistent with the hypothesis that, before Germany became fully consolidated dictatorship, radio played a role in slowing down (before 1933) and facilitating (after 1933) the rise of the Nazis to power.

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

In order to examine whether and how radio helped the Nazis to maintain public support for their policies during the dictatorship, we focus on the following measures of anti-Semitism: deportations of Jews between 1933 and 1942, anti-Semitic letters to the Nazi newspaper, *Der Stürmer* from 1935-1938, and attacks on synagogues during the Night of Broken Glass in 1938 (*Reichskristallnacht*). We estimate equation (3) with these outcomes as dependent variables and radio signal strength in 1937 as the main explanatory variable.<sup>43</sup> Since the variable measuring the number of letters to *Der Stürmer* is right-skewed, we use negative binomial distribution maximum likelihood estimation. Regressions with attacks on synagogues as the dependent variable are run on a subsample of cities with a synagogue.

The results presented in Panel A of Table 8 indicate that, on average, the exposure to Nazi radio propaganda in the second half of the 1930s 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 21 percent increase in the number of deportations from the mean level of 11.7 people deported from an average city. It also led to a 22 percent increase in the number of letters to *Der Stürmer* (or additional 0.38 letters per city) from the mean level of 1.76 letters. The effect of radio on the attacks on synagogues is insignificant (while the point estimate has the predicted positive sign).<sup>44</sup> The Altonji, Elder, and Taber (2005) tests presented in the Panel B of Table 8 show no statistical association between the indices of observables that best predict signal strength and deportations or anti-Semitic letter, suggesting that unobserved

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<sup>43</sup> As mentioned above, the data for subscription rates are not available after April 1933 at district level or at any point in time at city level. Therefore, we cannot estimate the S-shape relationship between the signal strength and listenership for the second half of the 1930s, as listenership almost doubled between 1933 and 1937 (Vaessen 1938). The results are robust to using signal strength for later periods.

<sup>44</sup> 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 Somerville (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).



heterogeneity is not driving these results. There is a statistically significant relationship between the index of observables that best predict signal strength and the attacks on synagogues, but for this outcome, baseline results are insignificant.

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 on the general susceptibility to propaganda. To unveil this heterogeneity, we estimate equation (4), which adds the measures of predispositions to the Nazi propaganda or general susceptibility to propaganda and their interaction with radio signal strength as additional covariates to specification (3). We proxy predisposition to anti-Semitism with two alternative variables: (i) pogroms in 1349 during the Black Death in the subsample of cities with historical Jewish settlement and (ii) the vote in May 1924 election for the National Socialist Freedom Party (NSFP), a right-wing party with an anti-Semitic rhetoric which was formed as a coalition of the German *Völkisch* Freedom Party (DVFP, a spinoff of DNVP) and the then-banned NSDAP. We measure the general susceptibility of the population to extremist messages, e.g., due to high levels of anxiety during the economic hardships of the early 1930s, with land inequality measured in 1895 (Ziblatt 2008, 2009), hypothesizing that in places with higher wealth inequality the general public was particularly dissatisfied during the severe economic crisis, and, thus, was more easily persuaded by the Nazi messages.

Table 9 presents the results. Panel A focuses on the effect of pogroms in 1349 with sample confined to the cities with Jewish settlements in 1349 (as this 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 for the population of districts. 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 for the attacks on synagogues 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 2.6 to 3.8 times larger in cities with pogroms in 1349 (as seen from the comparison of the first rows of Tables 8 and Panel A of Table 9). Propaganda was also more persuasive on average in cities with higher vote for NSFP in 1924. The effect of radio propaganda on deportations in places with the vote for NSFP in 1924 one standard deviation above the mean was 2.1 times larger compared to the level in places with the average political support for NSFP. In addition, a one standard deviation increase in the vote for NSFP in 1924, led to a 1.8 times larger the effect of radio propaganda on the letters to *Der Stürmer*.

Panel C of Table 9 focuses on the historical land inequality. We find a positive and statistically significant effect of the interaction term between the historical land inequality and radio signal strength for all three outcomes. 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 is particularly prone during economic recessions. The effects are sizable. The effect of radio propaganda on both deportations and anti-Semitic letters in places where historical land inequality was one standard deviation above the mean was two times larger than in places with the mean level of land inequality. Radio did not have an effect on the attacks on synagogues in places with the mean level of land inequality and it had a positive (although not large in magnitude) and significant at 10 percent level effect at the level on land inequality one standard deviation above the mean.

We also explore at what levels of vote for NSFP in 1924 and historical land inequality propaganda starts to matter using a more flexible specification, in which we estimate the effect of radio availability separately in each quartile of the distribution of these proxies for the predisposition to propaganda. Figure A8 in the online appendix presents the results. Typically, we find no effect of radio propaganda on the expressions of anti-Semitism for the first of the four quartiles of the distributions of these two measures; with the effect in the top quartile being the largest in most cases. Overall, the coefficients on the interaction between signal strength with various measures of susceptibility to propaganda confirm that propaganda has a much stronger effect when falls on a fertile ground.

Importantly, the results presented in Panel A of Table 9 also show that propaganda can backfire and lead to a higher level of resistance to the dictator, if propaganda messages contradict the prior of the listeners regarding the message. 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 9) for both the deportations and the letters to *Der Stürmer*. Again, the result for the attacks on synagogues has a sign consistent with the other results, but statistically insignificant. We find that in cities that had historical Jewish settlement, but did not experience pogroms during Black Death, a one standard deviation increase in radio availability led to a 28 percent decrease in deportations and 45 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 anti-Semitic propaganda of the later 1930s, such an update must have led to a better understanding of the dangers of the regime among non-anti-Semitic population and, thus, lower susceptibility to other means of persuasion by the Nazis and possibly even triggered higher resistance and willingness to hide Jews among Nazi opponents.<sup>45</sup>

In sum, the results presented in Tables 8 and 9 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 anti-Semitic messages) and high land inequality (and, therefore, higher anxiety in times of economic crises) were more receptive 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. Additional placebo tests

To provide additional evidence in favor of our identification assumptions, we test whether German radio was associated with outcomes that it was not supposed to affect. In section 5.3,

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<sup>45</sup> In contrast to the historical pogroms variable, we do 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 attacks on synagogues.

we already discussed the placebo tests, in which the results of all elections between 1920 and 1928 as well as the change in the vote share of extreme nationalists between 1924 and 1928 were related to the level of signal strength between 1928 and 1933 (see Table A2). We also verified that the past changes in electoral outcomes between December 1924 and May 1928 elections and between May and December 1924 elections are unrelated to future changes in the signal strength for all periods analyzed (see Table A14 in the online appendix). Overall, in these two sets of placebo tests combined we find significant effects at 1, 5, and 10% level in 0.6, 3.2, and 7.7% out of 156 regressions, respectively.

We also estimate a set of placebo regressions for the city sample. Analogous to our estimation of the effect of radio on the expressions of anti-Semitism, we 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 cross-section of cities (see Table A15 in the online appendix). In addition, we estimate the interaction effects between pogroms in 1349 and the signal strength for these outcomes. We find no significant coefficients in 20 regressions, estimating direct placebo effects of radio, and one marginally significant (and very small in magnitude) coefficient in 20 regressions on the interaction with historical pogroms, which is well within the margin of statistical error. Overall, the placebo tests suggest that there is no unobserved heterogeneity or pre-trends that could drive our results.

## 7. Conclusions

We examine the role mass media played before and during the fall of democracy in the Weimar Republic and after the full consolidation of dictatorship in the Third Reich. We find that the introduction of a pro-Weimar government slant in the radio news programs in 1929 was effective in reducing the growth of the Nazi Party vote share in the three consecutive parliamentary elections between 1930 and 1932. During the campaign for the March 1933 election, when the Nazis took control over the radio and began broadcasting pro-Nazi messages, the effect of the previous four years of the pro-Weimar radio was undone in just one month. During the establishment of the Nazi regime in early 1930s, Nazi radio convinced a large number of Germans to engage in discrimination and violence against Jews and to join the Nazi party.

After the consolidation of power in the second half of the 1930s, when radio propaganda took its full strength, radio encouraged denunciations of Jews, leading to their deportation to concentration camps, and open expressions of anti-Semitism, such as writing anti-Semitic letters to a national newspaper. The effects of the anti-Semitic propaganda on the expressions of anti-Semitism were particularly pronounced when the message was aligned with listeners' predispositions: a more anti-Semitic audience, as measured by the historical anti-Semitism, was more easily convinced by Nazi radio propaganda. In contrast, propaganda was counter-productive when the message contradicted the listeners' priors: the least anti-Semitic audience, measured by the absence of historical anti-Semitism, reacted negatively to the Nazi radio showing lower levels of support for the regime as a result of radio exposure.

Overall, the evidence suggests that mass media can play a role in the fall or preservation of an immature democracy. In particular, the 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 a catalyst for the establishment of a dictatorial rule. 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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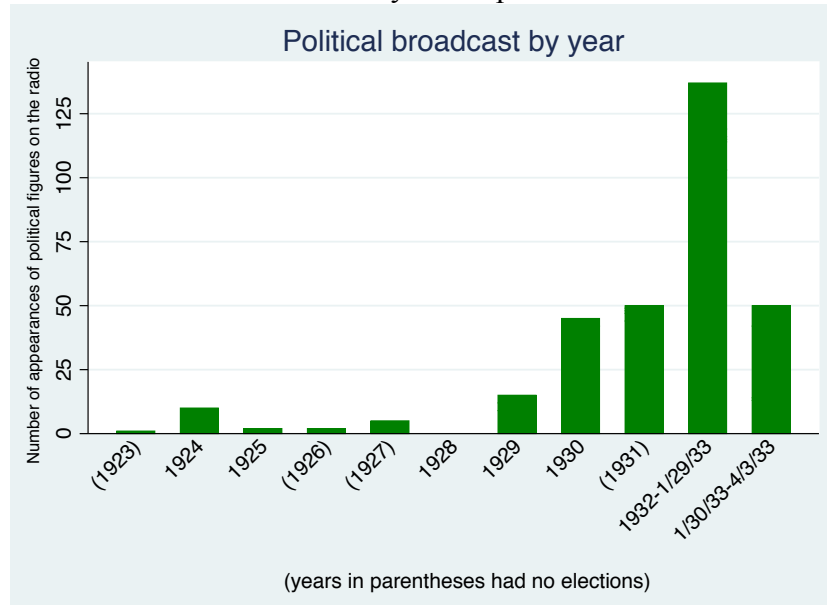
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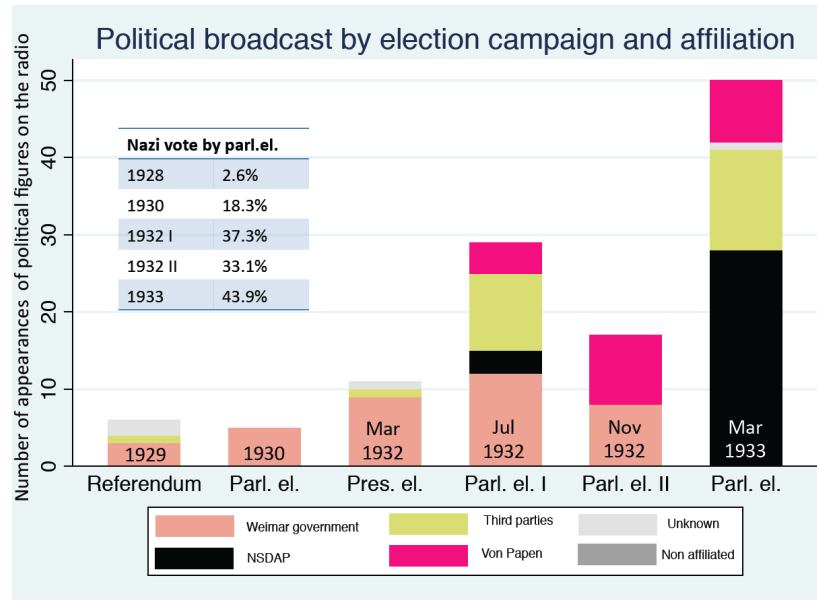
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Figure 1. Timing and political orientation of radio broadcast  
 Panel A. The intensity of the political broadcast

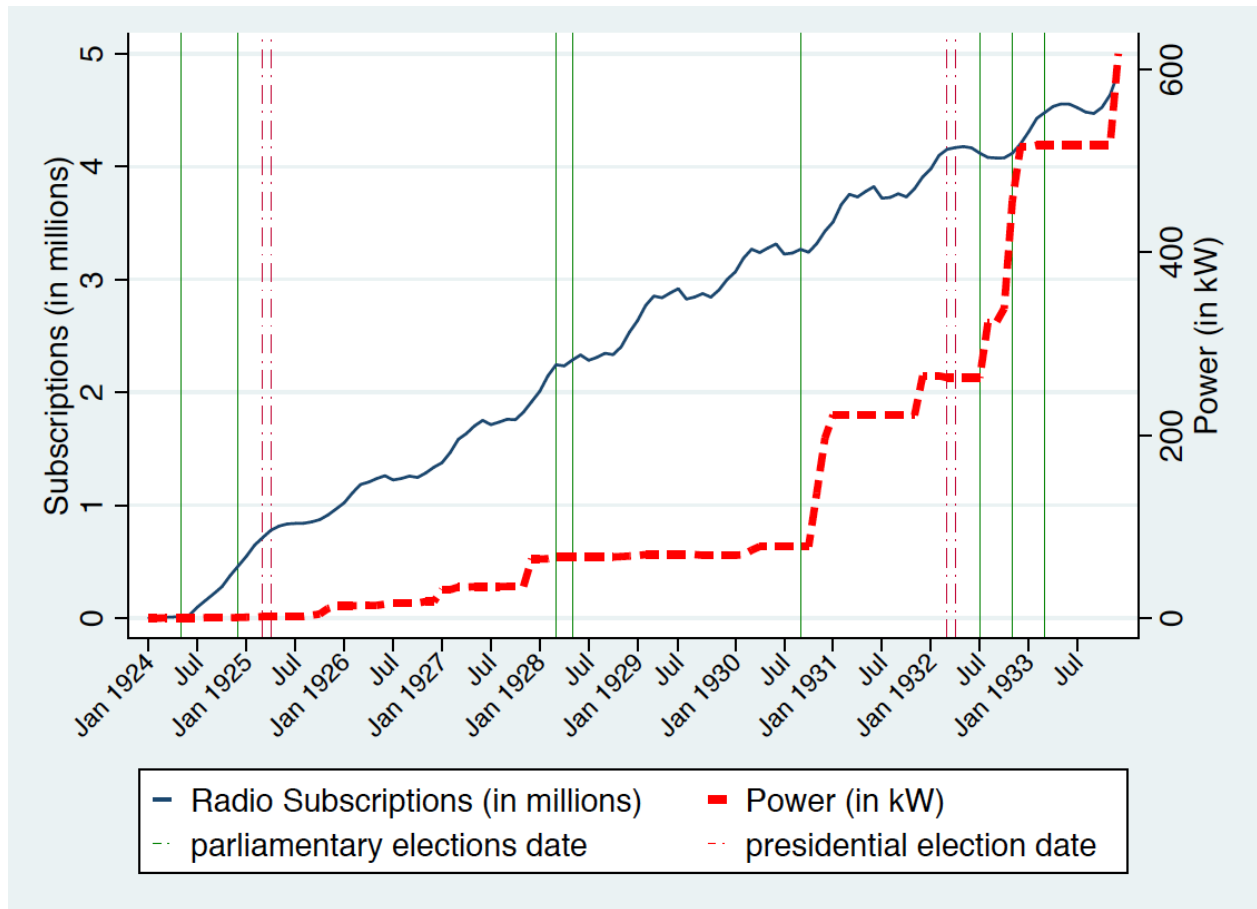


Panel B. Access of political figures to radio by election campaign and affiliation



Note: Figure 1b 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. Source: see Data Sources chapter of the online appendix: Data on the composition of the political broadcast.

Figure 2. Number of radio subscriptions and cumulated power of transmitters in Germany, 1924–1933



Source: Vaessen 1938 (subscriptions) and the authors' data on transmitters (see online appendix: data sources).

Figure 3. The timing of the measurement of outcome variables and of the change in radio content

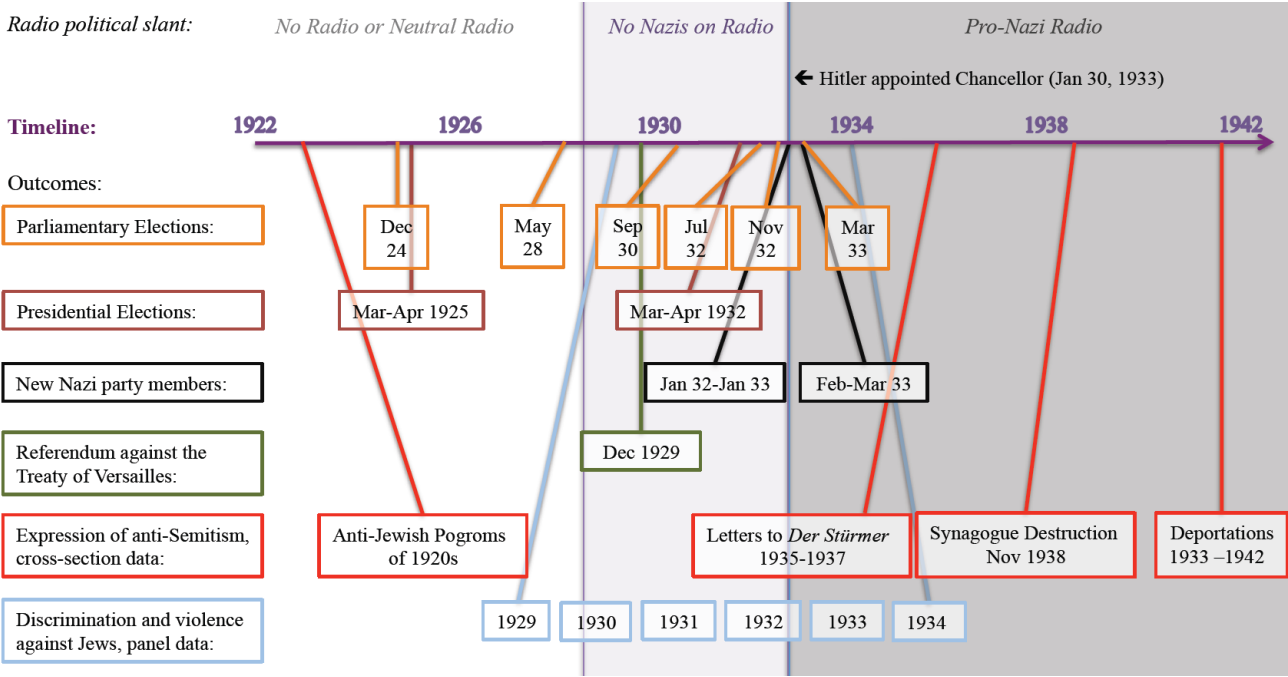
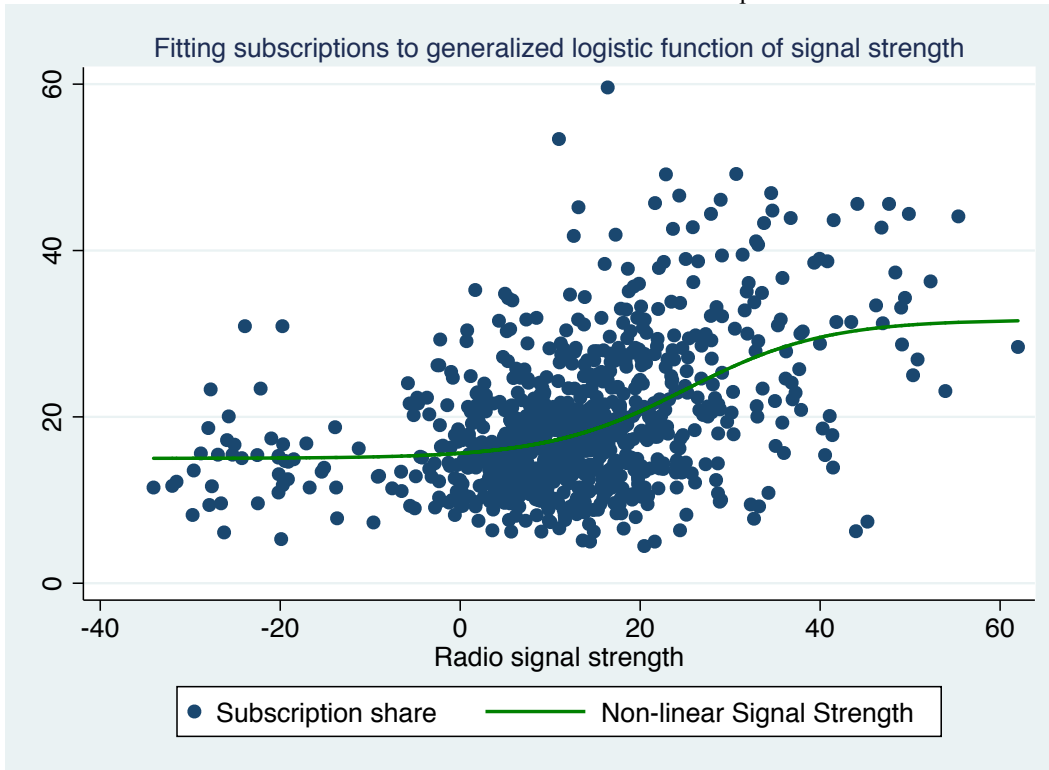
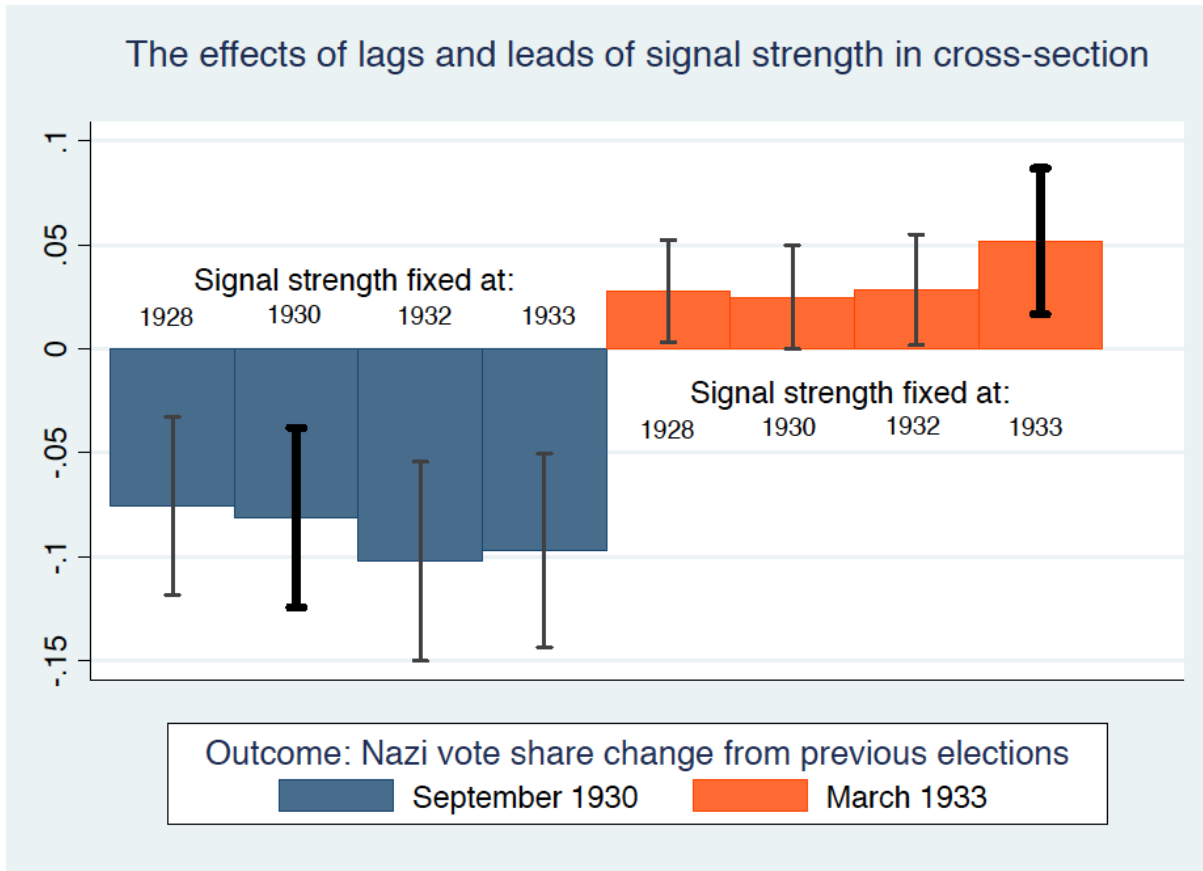


Figure 4. Radio Subscriptions and Signal Strength, 1931 (no controls)  
t-statistic for the linear bivariate relationship: 14.12



Source: "Teilnahme am Rundfunk in den einzelnen OPD-Bezirken in Orten mit mehr als 2500 Einwohnern am 1. April 1933," *Veröffentlichungen des Verbandes der Funkindustrie e.V.*, 12, 1933, data for the year 1931.

Figure 5. Leads and lags of the signal strength in cross-section



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, and March 1933 along with their confidence intervals. Thick CI lines indicate specifications with contemporaneous signal. 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. Source: own calculations.

**Table 1. Radio Subscriptions and Signal Strength**

|  | 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***<br>[0.030]   | 0.175***<br>[0.028] | 0.161***<br>[0.031] | 0.163***<br>[0.036] |
| 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                 |
| Region fixed effects                                   | Yes   | Yes                 | Yes                 | Yes                 |
| Observations   | 858   | 883                 | 883                 | 885                 |
| R2   | 0.576   | 0.531               | 0.526               | 0.514               |
| F-stat for the signal strength variable                | 50.19   | 36.13               | 24.53               | 20.30               |
| 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       | 0.671***<br>[0.096]   | 0.683***<br>[0.100] | 0.656***<br>[0.120] | 0.602***<br>[0.123] |
| 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                 |
| Region fixed effects                                   | Yes   | Yes                 | Yes                 | Yes                 |
| Observations   | 858   | 883                 | 883                 | 885                 |
| R2   | 0.579   | 0.533               | 0.525               | 0.513               |
| F-stat for the signal strength variable                | 46.62   | 42.41               | 26.38               | 23.05               |

Note: Standard errors clustered by Region (Wahlkreis) in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Dependent variable is the

**Table 2. Determinants of Radio Availability**

| <i>Election date:</i>   | Radio Signal Strength |                          |                      |                         |                      | Radio Signal Strength, non-linear transformation |                          |                      |                         |                      |
|---|-----------------------|--------------------------|----------------------|-------------------------|----------------------|--|--------------------------|----------------------|-------------------------|----------------------|
|   | <i>March</i><br>1928  | <i>September</i><br>1930 | <i>July</i><br>1932  | <i>November</i><br>1932 | <i>March</i><br>1933 | <i>March</i><br>1928                             | <i>September</i><br>1930 | <i>July</i><br>1932  | <i>November</i><br>1932 | <i>March</i><br>1933 |
|   | (1)                   | (2)                      | (3)                  | (4)                     | (5)                  | (6)  | (7)                      | (8)                  | (9)                     | (10)                 |
| Region fixed effects  | Yes                   | Yes                      | Yes                  | Yes                     | Yes                  | Yes  | Yes                      | Yes                  | Yes                     | Yes                  |
| <u>Determinants of transmitter location</u><br>(population, distance to the nearest city with population over 50k, city dummy, altitude):   |                       |                          |                      |                         |                      |  |                          |                      |                         |                      |
| Distance to the nearest city, log   | -3.187***<br>[0.650]  | -3.531***<br>[0.655]     | -2.747***<br>[0.599] | -2.580***<br>[0.568]    | -2.662***<br>[0.482] | -1.040***<br>[0.221]                             | -1.180***<br>[0.233]     | -0.619***<br>[0.166] | -0.538***<br>[0.140]    | -0.612***<br>[0.140] |
| Altitude  | -0.007*<br>[0.004]    | -0.006<br>[0.004]        | -0.009**<br>[0.004]  | -0.008**<br>[0.004]     | -0.008*<br>[0.004]   | -0.002<br>[0.001]                                | -0.002<br>[0.001]        | -0.002*<br>[0.001]   | -0.002<br>[0.001]       | -0.002**<br>[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   | 9.184                 | 9.392                    | 10.85                | 8.271                   | 13.55                | 9.230  | 10.28                    | 12.28                | 11.03                   | 13.88                |
| <u>Socioeconomic controls</u><br>(shares of Jews and Catholics, shares of blue-collar and white-collar workers, share of war participants, share of welfare recipients, share of renters of social housing, property tax, unemployment, share of unemployed, partial employment): |                       |                          |                      |                         |                      |  |                          |                      |                         |                      |
| Socioeconomic controls  | Yes                   | Yes                      | Yes                  | Yes                     | Yes                  | Yes  | Yes                      | Yes                  | Yes                     | Yes                  |
| F-stat for socioeconomic variables  | 5.008                 | 4.668                    | 2.867                | 2.453                   | 3.104                | 5.423  | 5.509                    | 6.282                | 3.666                   | 3.495                |
| <u>Voting results in 1924</u><br>(turnout and shares of vote received by DNVP, NSFP, SPD, and Zentrum):   |                       |                          |                      |                         |                      |  |                          |                      |                         |                      |
| Voting results in 1924  | Yes                   | Yes                      | Yes                  | Yes                     | Yes                  | Yes  | Yes                      | Yes                  | Yes                     | Yes                  |
| F-stat for voting in 1924   | 2.863                 | 3.224                    | 5.981                | 6.822                   | 5.896                | 1.358  | 1.993                    | 3.248                | 2.039                   | 4.192                |
| R-squared   | 0.668                 | 0.680                    | 0.598                | 0.609                   | 0.570                | 0.545  | 0.555                    | 0.573                | 0.532                   | 0.489                |
| 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  | 38.62%                | 41.18%                   | 43.81%               | 37.11%                  | 51.93%               | 57.98%   | 62.52%                   | 44.85%               | 47.37%                  | 57.06%               |
| Determinants of transmitter location and Region fixed effects   | 97.75%                | 97.50%                   | 97.16%               | 98.36%                  | 97.02%               | 98.90%   | 98.20%                   | 98.08%               | 99.62%                  | 97.14%               |
| Socio-economic controls and voting results in 1924  | 30.69%                | 30.15%                   | 29.26%               | 28.74%                  | 34.21%               | 37.61%   | 36.94%                   | 30.54%               | 32.89%                  | 39.88%               |



**Table 3. Radio Availability and Voting for the Nazis: District Fixed Effects**

|   | Nazi Vote Share                                     |                     |  |                     | Change in the Nazi Vote Share                   |                              |
|---|---|---------------------|--|---------------------|---|------------------------------|
|   | <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>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> |
| <i>Time span of the sample:</i>                               | (1)   | (2)                 | (3)  | (4)                 | (5)   | (6)                          |
| Radio Signal Strength   | -0.079**<br>[0.034]                                 |                     |  |                     |   |                              |
| Radio Signal Strength, non-linear transformation              |   | -0.227**<br>[0.088] |  |                     |   |                              |
| Radio signal strength x pro-Nazi slant                        |   |                     | 0.028***<br>[0.007]                                      |                     |   |                              |
| Non-linear transformation of signal strength x pro-Nazi slant |   |                     |  | 0.123***<br>[0.027] |   |                              |
| Change in subscription rate between April 1931 and April 1932 |   |                     |  |                     | -0.104<br>[0.098]                               | -2.127**<br>[0.873]          |
| Baseline controls, interacted with time fixed effects         | Yes   | Yes                 | Yes  | Yes                 | No  | No                           |
| Baseline controls   | No  | No                  | No   | No                  | 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               | 827   | 827                          |
| Number of districts   | 959   | 959                 | 959  | 959                 | 827   | 827                          |
| R-squared   | 0.939   | 0.939               | 0.972  | 0.972               | 0.658   |                              |
| F-statistics for instrumental variable                        |   |                     |  |                     |   | 26.44                        |

Note: Standard errors clustered at the region level in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Pro-Nazi slant equals 0 in 1928, -1 between 1930 and 1932, +1 in 1933. Controls include 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, share of unemployed and partially employed, distance to the nearest city with population over 50k, turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924. Number of observations changes between elections because of redistricting. In column 8 change in radio subscription rate is instrumented using change in non-linear transformation of the signal strength.

**Table 4. Radio and an Increase in Nazi Vote Share**

| <b>Panel A. Reduced form estimation</b>                        |   |                      |                                    |                    |
|--|---|----------------------|------------------------------------|--------------------|
|  | Change in Vote Share of the Nazi Party Since Previous Elections |                      |                                    |                    |
|  | <i>Election dates:</i> Sep 1930<br>(Change from May 1928)       |                      | Mar 1933<br>(Change from Nov 1932) |                    |
|  | (1)   | (2)                  | (3)                                | (4)                |
| Radio signal strength  | -0.061***<br>[0.022]  |                      | 0.044**<br>[0.020]                 |                    |
| Radio Signal Strength, non-linear transformation               |   | -0.217***<br>[0.071] |                                    | 0.126*<br>[0.070]  |
| Region fixed effects   | Yes   | Yes                  | Yes                                | Yes                |
| Baseline controls  | Yes   | Yes                  | Yes                                | Yes                |
| Observations   | 958   | 958                  | 918                                | 918                |
| <b>Panel B. OLS and IV results</b>                             |   |                      |                                    |                    |
|  | Change in Vote Share of the Nazi Party Since Previous Elections |                      |                                    |                    |
|  | <i>Election dates:</i> Sep 1930<br>(Change from May 1928)       |                      | Mar 1933<br>(Change from Nov 1932) |                    |
|  | <i>Specification:</i> OLS                                       |                      | IV                                 |                    |
|  | <i>Date for the subscription rate variable:</i> Apr 1931        |                      | Apr 1933                           |                    |
| Radio subscription rate, %                                     | -0.086*<br>[0.045]  | -0.347***<br>[0.095] | 0.031*<br>[0.017]                  | 0.218*<br>[0.115]  |
| Region fixed effects   | Yes   | Yes                  | Yes                                | Yes                |
| Baseline controls  | Yes   | Yes                  | Yes                                | Yes                |
| Observations   | 857   | 855                  | 853                                | 851                |
| F-statistic for the exclusion of the instrument                |   | 50.43                |                                    | 20.48              |
| <b>Panel C. Altonji-Elder-Taber Tests</b>                      |   |                      |                                    |                    |
|  | Change in Vote Share of the Nazi Party Since Previous Elections |                      |                                    |                    |
|  | <i>Election dates:</i> Sep 1930<br>(Change from May 1928)       |                      | Mar 1933<br>(Change from Nov 1932) |                    |
|  | (1)   | (2)                  | (3)                                | (4)                |
| Index of observables (predicted signal strength)               | -0.037<br>[0.070]   |                      | -0.043<br>[0.049]                  |                    |
| Index of observables<br>(predicted non-linear signal strength) |   | 0.014<br>[0.209]     |                                    | -0.341*<br>[0.199] |
| Population, fifth-order polynomial                             | Yes   | Yes                  | Yes                                | Yes                |
| Observations   | 958   | 958                  | 918                                | 918                |
| R-squared  | 0.432   | 0.432                | 0.573                              | 0.576              |

Note: Standard errors clustered by Region (Wahlkreis) in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Baseline controls include 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, share of unemployed and partially employed, distance to the nearest city with population over 50k, turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924. Number of observations changes between elections because of redistricting. In Panel B radio subscription rate is instrumented using non-linear transformation of the signal strength.

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

| <b>Panel A. Radio availability and other voting outcomes.</b>                    |  |          |  |           |                   |          |
|--|--|----------|--|-----------|-------------------|----------|
|  | Referendum on the "Law<br>against the Enslavement of the<br>German People" |          | 1932 Presidential Elections, 1st round |           |                   |          |
|  | Voted "Yes" in the Referendum<br>(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                                 |  | -0.241** |  | 0.194     |                   | -0.239   |
|  |  | [0.096]  |  | [0.119]   |                   | [0.149]  |
| Nazi party vote share in 1928  | 0.644***   | 0.636*** | -0.459***                              | -0.459*** | 0.580***          | 0.581*** |
|  | [0.089]  | [0.089]  | [0.070]                                | [0.071]   | [0.065]           | [0.065]  |
| Region 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  | 0.729  | 0.730    | 0.788                                  | 0.788     | 0.796             | 0.797    |
| <b>Panel B. Altonji-Elder-Taber tests</b>  |  |          |  |           |                   |          |
|  | Voted "Yes" in the Referendum<br>(share of eligible voters)                |          | Von Hindenburg Vote Share              |           | Hitler Vote Share |          |
|  | (1)  | (2)      | (5)                                    | (6)       | (7)               | (8)      |
| Index of observables (predicted signal strength)                                 | -0.143   |          | -0.100                                 |           | -0.165            |          |
|  | [0.134]  |          | [0.174]                                |           | [0.159]           |          |
| Index of observables<br>(predicted non-linear transformation of signal strength) |  | -0.530   |  | -1.290*   |                   | -0.116   |
|  |  | [0.393]  |  | [0.694]   |                   | [0.637]  |
| Nazi party vote share in 1928  | 1.275***   | 1.282*** | -1.490***                              | -1.509*** | 1.490***          | 1.526*** |
|  | [0.091]  | [0.090]  | [0.129]                                | [0.118]   | [0.128]           | [0.123]  |
| Population, fifth-order polynomial   | Yes  | Yes      | Yes                                    | Yes       | Yes               | Yes      |
| Observations   | 949  | 949      | 952                                    | 952       | 952               | 952      |
| R-squared  | 0.561  | 0.562    | 0.553                                  | 0.559     | 0.527             | 0.526    |

Note: Standard errors clustered by Region (Wahlkreis) in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Controls include 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, share of unemployed and partially employed, altitude, distance to the nearest city with population over 50k, turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924, and Nazi party vote share in 1928.

**Table 6. Discrimination and violence against Jews**

|   | Incidence of discrimination and violence against Jews |                     |                                    |                      |
|---|---|---------------------|------------------------------------|----------------------|
|   | <i>Time span of the sample:</i>                       | 1929-1932           | 1933-1934                          | 1929-1934            |
|   | <i>Specification:</i>                                 | <i>Panel</i><br>(1) | <i>Pooled cross-section</i><br>(2) | <i>Panel</i><br>(3)  |
| Radio Signal Strength                                 |   | -0.0020<br>[0.0019] | 0.0024**<br>[0.0011]               |                      |
| Radio signal strength x pro-Nazi slant                |   |                     |                                    | 0.0013**<br>[0.0006] |
| Baseline controls, interacted with time fixed effects |   | Yes                 |                                    | Yes                  |
| City fixed effects                                    |   | Yes                 |                                    | Yes                  |
| Time fixed effects                                    |   | Yes                 | Yes                                | Yes                  |
| Region fixed effects, baseline controls               |   |                     | Yes                                |                      |
| Observations  |   | 5,328               | 2,664                              | 7,992                |
| Number of cities                                      |   | 1332                | 1332                               | 1332                 |
| R-squared   |   | 0.129               | 0.334                              | 0.407                |

Note: Standard errors clustered by city in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Pro-Nazi slant equals -1 between 1929 and 1932 and +1 between 1933 and 1934. Baseline controls include log(population), altitude, dummy for being located on a navigable river, 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 the data source, number of war participants per 1,000, number of welfare recipients per 1,000, number of pensioners with social assistance per 1,000, turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924.

**Table 7. Radio Availability and Nazi Party Membership**

| <b>Panel A. Cross-sectional estimates</b>        |   |                    |                       |                      |                      |                      |
|--|---|--------------------|-----------------------|----------------------|----------------------|----------------------|
|  | 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<br>[0.0020]                              |                    | 0.0053**<br>[0.0019]  |                      | 0.0052**<br>[0.0020] |                      |
| Radio Signal Strength, non-linear transformation |   | 0.0001<br>[0.0098] |                       | 0.0202**<br>[0.0077] |                      | 0.0203**<br>[0.0079] |
| Log of new party membership in 01/1932-01/1933   |   |                    |                       |                      | 0.0545*<br>[0.0291]  | 0.0580*<br>[0.0288]  |
| Region 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  | 0.676   | 0.676              | 0.345                 | 0.345                | 0.348                | 0.349                |

| <b>Panel B. Altonji-Elder-Taber tests</b>                      |   |                   |                       |                   |                   |                   |
|--|---|-------------------|-----------------------|-------------------|-------------------|-------------------|
|  | 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<br>[0.006]                               |                   | 0.0006<br>[0.004]     |                   | 0.0009<br>[0.004] |                   |
| Index of observables<br>(predicted non-linear signal strength) |   | 0.0051<br>[0.032] |                       | 0.0025<br>[0.016] |                   | 0.0033<br>[0.016] |
| Log of new party membership in 01/1932-01/1933                 |   |                   |                       |                   | 0.0269<br>[0.027] | 0.0269<br>[0.027] |
| Population, fifth-order polynomial                             | Yes   | Yes               | Yes                   | Yes               | Yes               | Yes               |
| Observations   | 613   | 613               | 613                   | 613               | 613               | 613               |
| R-squared  | 0.608   | 0.608             | 0.305                 | 0.305             | 0.306             | 0.306             |

Note: Standard errors clustered by Region (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, share of unemployed and partially employed, altitude, distance to the nearest city with population over 50k, turnout and vote shares of DNVP, NSFP, 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 8. Radio Availability and Anti-Semitism**

| <b>Panel A. Baseline results.</b>                       |                                  |                               |   |
|---|----------------------------------|-------------------------------|---|
|   | Log(deportations<br>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<br/>synagogues in 1933</i> |
|   | (1)                              | (2)                           | (3)   |
| Radio signal strength in 1937                           | 0.019***<br>[0.007]              | 0.019***<br>[0.007]           | 0.001<br>[0.001]                              |
| Log (population)  | 0.250***<br>[0.074]              | 0.363***<br>[0.055]           | -0.007<br>[0.014]                             |
| Altitude  | -0.001*<br>[0.001]               | -0.001<br>[0.001]             | -0.000<br>[0.000]                             |
| City located at navigable river                         | 0.363***<br>[0.070]              | 0.750***<br>[0.120]           | 0.048**<br>[0.019]                            |
| Socioeconomic controls                                  | Yes                              | Yes                           | Yes   |
| Voting controls, 1924                                   | Yes                              | Yes                           | Yes   |
| Region fixed effects                                    | Yes                              | Yes                           | Yes   |
| Observations  | 1,325                            | 1,391                         | 1,134   |
| R-squared   | 0.374                            |                               | 0.102   |
| <b>B. Altonji-Elder-Taber style test.</b>               |                                  |                               |   |
|   | Log(deportations<br>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<br/>synagogues in 1933</i> |
| Index of observables<br>(Prediction of signal strength) | -0.001<br>[0.027]                | 0.035<br>[0.028]              | 0.003<br>[0.007]                              |
| Population  | Yes                              | Yes                           | Yes   |
| Geographic variables                                    | Yes                              | Yes                           | Yes   |
| Region fixed effects                                    | Yes                              | Yes                           | Yes   |
| Observations  | 1,325                            | 1,391                         | 1,133   |
| R-squared   | 0.197                            |                               | 0.0613  |

Note: Results of ordinary least squares estimation in columns (1) and (3) ; Results of negative binomial maximum likelihood estimation in column (2). Standard errors are clustered by Region (Wahlkreis). \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Unit of observation is city in Voigtländer and Voth (2012) sample. Socioeconomic controls include share of Jewish and Catholic population, shares of blue- and white-collar workers in 1925, 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. Voting controls include voter turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924. Geographic controls include altitude and dummy for being located on a navigable river.

**Table 9. Radio Availability and Anti-Semitism, the Role of Historic Predispositions**

|   | Log(deportations<br>before 1942)                       | Letters to <i>Der<br/>Stürmer</i>   | Attacks on<br>synagogues |
|---|--|-------------------------------------|--------------------------|
| <i>Model:</i>   | OLS  | ML                                  | OLS                      |
|   | (1)  | (2)                                 | (3)                      |
| <b>Panel A. Interactions with pogroms</b>                         |  |                                     |                          |
| <i>Sample:</i>  | Sub-sample of cities with historical Jewish settlement |                                     |                          |
| Pogroms in 1349 * Radio signal strength, demeaned                 | 0.049***<br>[0.015]                                    | 0.082***<br>[0.018]                 | 0.004<br>[0.007]         |
| Radio signal strength, 1937                                       | -0.035*<br>[0.017]                                     | -0.065***<br>[0.019]                | -0.005<br>[0.007]        |
| Pogroms in 1349   | 0.844***<br>[0.185]                                    | 0.656***<br>[0.234]                 | 0.173**<br>[0.069]       |
| All baseline controls   | Yes  | Yes                                 | Yes                      |
| Region fixed effects  | Yes  | Yes                                 | Yes                      |
| Observations  | 296  | 319                                 | 274                      |
| R-squared   | 0.626  |                                     | 0.241                    |
| <b>B. Interaction with NSFP vote in 1924</b>                      |  |                                     |                          |
| <i>Sample:</i>  | Full sample of cities                                  | Sample of cities with<br>synagogues |                          |
| Vote for NSFP in 1924*Radio signal strength, demeaned             | 0.182**<br>[0.081]                                     | 0.175***<br>[0.040]                 | 0.015<br>[0.017]         |
| Radio signal strength, 1937                                       | 0.007<br>[0.008]                                       | 0.007<br>[0.008]                    | -0.000<br>[0.002]        |
| Vote for NSFP in 1924   | 6.447**<br>[3.079]                                     | 8.890***<br>[2.624]                 | 0.861*<br>[0.456]        |
| All baseline controls   | Yes  | Yes                                 | Yes                      |
| Region fixed effects  | Yes  | Yes                                 | Yes                      |
| Observations  | 1,325  | 1,391                               | 1,134                    |
| R-squared   | 0.385  |                                     | 0.105                    |
| <b>Panel C. Interactions with historical inequality</b>           |  |                                     |                          |
| <i>Sample:</i>  | Full sample of cities                                  | Sample of cities with<br>synagogues |                          |
| Land inequality in 1895 *Radio signal strength, demeaned          | 0.133***<br>[0.040]                                    | 0.099***<br>[0.036]                 | 0.032***<br>[0.010]      |
| Radio signal strength, 1937                                       | -0.072**<br>[0.027]                                    | -0.049*<br>[0.026]                  | -0.022***<br>[0.007]     |
| Land inequality in 1895   | 1.730*<br>[0.944]                                      | 0.124<br>[1.177]                    | -0.441*<br>[0.230]       |
| All baseline controls   | Yes  | Yes                                 | Yes                      |
| Region fixed effects  | Yes  | Yes                                 | Yes                      |
| Full radio effect for minimal level of inequality (Gini index 45) | -0.011   | -0.004                              | -0.007***                |
| Observations  | 1,306  | 1,372                               | 1,116                    |
| R-squared   | 0.367  |                                     | 0.113                    |

Note: Results of ordinary least squares estimation in columns (1) and (3); Results of negative binomial maximum likelihood estimation in column (2). Standard errors are clustered by Region (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), altitude, dummy for being located on a navigable river, 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 war participants per 1,000, number of welfare recipients per 1,000, number of pensioners with social assistance per 1,000, turnout and vote shares of DNVP, NSFP, SPD, and Zentrum in 1924.