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Abstract

We merge several historical data sets from Germany to show that influenza mortality in 1918-1920 is correlated with societal changes, as measured by municipal spending and city-level extremist voting, in the subsequent decade. First, influenza deaths are associated with lower per capita spending, especially on services consumed by the young. Second, influenza deaths are correlated with the share of votes received by extremist parties in 1932 and 1933. Our election results are robust to controlling for city spending, demographics, war-related population changes, city-level wages, and regional unemployment, and to instrumenting influenza mortality. We conjecture that our findings may be the consequence of long-term societal changes brought about by a pandemic.

Key words: influenza, pandemic, municipal spending, voter extremism

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1 Introduction

The recent spread of the viral infection known as *COVID-19* has renewed age-old questions about the economic and social effects of pandemics. We contribute to this literature by analyzing how the influenza outbreak of 1918-1920 affected cities in the years after the pandemic. In particular, we analyze (i) city spending on amenities as well as (ii) voting for extremist parties in Germany between 1925 and 1933. Both represent tangible differences between municipalities that reflect the preferences of inhabitants. Germany represents the ideal case study for such an analysis, given that it suffered a high number of influenza deaths, recorded detailed information on disease fatality, city expenditures, voting behaviour, etc., and saw a dramatic increase in extremist voting in the 1920s and 1930s.

We are able to document several important findings. First, we show that areas which experienced a greater relative population decline due to the spread of influenza spend less, per-capita, on their inhabitants in the following decade. This holds especially for spending on amenities more likely to be consumed by the young, for example school funding.¹ Second, influenza deaths of 1918 are correlated with an increase in the share of votes won by right-wing extremists, such as the National Socialist Workers Party (aka. the Nazi Party), in the crucial elections of 1932 and 1933. This holds even when we control for a city's ethnic and religious makeup, regional unemployment, past right-wing voting, and other local characteristics assumed to drive the extremist vote share. A one std. deviation increase in the proportion of the population killed by influenza was associated with an up to 3% increase in the share of the vote won by the national socialist party. This phenomenon is not observed for other parties also considered "extremist", such as the communists, or influenced by deaths due to common diseases, such as tuberculosis. Moreover, while we corroborate evidence by Galofré-Vilà et al. (2019) and show that the amount local governments spend on their inhabitants is correlated with the share of the vote won by extremist parties, we also show that this is not the driver of our results.²

Our results on the correlation between influenza mortality in 1918 and extremist voting in 1932/33 hold for a number of important tests. Firstly, we can instrument influenza mortality using the length and density of local railway lines in 1918. Holding population density and wealth constant, pandemics are more likely to spread in areas that are more densely connected. We argue that our instrument does not influence election results directly, as the vote share won by right wing extremist was actually

¹After all, the pandemic affected the young disproportionately in 1918.

²We extend our paper along these dimensions because an understanding of how local government spending impacts voting is important in light of the fact that pandemics shape government spending. Swanson and Curran (1976) study municipal spending and economic outcomes during this period and highlight some of the associated complications.

slightly higher in rural areas with less dense train networks. Secondly, following Voigtländer and Voth (2012a), we show that the correlation between influenza mortality and the vote share won by right-wing extremists is stronger in regions that had historically blamed minorities, particularly Jews, for medieval plagues. Our findings are possibly tied to the type of victims most directly affected by the virus. Given that it was disproportionately fatal for young people, the change in demographics may have affected regional attitudes going forward. Moreover, the disease may have fostered a hatred of "others", as it was perceived to come from abroad.³ An increase in foreigner/minority hate has been shown by Cohn (2012) or Voigtländer and Voth (2012a) to occur during some severe historical plagues. Regions more affected by the pandemic may have gravitated towards political parties aligned with anti minority sentiment.

Our analysis faces a number of econometric challenges and we are careful about the interpretation of our results. Data on city spending, regional employment, historical pogroms, and disease mortality are all collected from various sources that do not map onto one another perfectly. Disease and employment data, for instance, are collected at the level of autonomous regions⁴. Often, a city was an individual administrative region. In some cases, however, an administrative region encompassed several towns. This means that, in some parts of the country, several cities will be assigned the same unemployment rates and disease fatality statistics in our data. Secondly, data is not available at the same frequency or granularity throughout our sample period. This means our analysis is based on a relatively small sample of about 60 cities per year for 6 years between 1925 and 1932. We have no data on city spending during the war or the hyperinflation period before 1925, which makes it difficult to control for certain city-differences. Finally, the end of the first world war brought several changes to Germany, which, combined with the war deaths themselves, reshaped populations. We attempt to account for war related population changes, but acknowledge that perfectly disentangling the effects of war and disease is difficult. It is possible that our results are the result of omitted variables, unrelated to the spread of the influenza pandemic. Nevertheless, our results are robust to a number of alternate specifications. Moreover, we find that our results hold only for influenza, and not other types of diseases or causes of death. These results consequently offer a novel contribution and possible foundation for a discussion on the effects of pandemics.

For this paper, we digitize several distinct archival data sources. Our data on city spending comes

³See <https://www.faz.net/aktuell/wissen/spanische-grippe-wie-eine-epidemie-gesellschaften-veraenderte-15479161.html> for a discussion of how the virus was perceived to have come from foreign, particularly American, troops. Moreover, pandemics of this type are usually blamed on minorities.

⁴These were typically states, duchies, or kingdoms such as Bavaria, Baden, Oldenburg, etc. outside of Prussia and small administrative regions such as Berlin, Brandenburg, East-Prussia, etc. inside of Prussia

from annual books recording statistics for German cities⁵. The book was first published with data for the year 1925. The book records detailed city expenditures on such things as police departments, fire services, tram and bus services, street and building maintenance, cultural institutions and museums, parks and pools, etc. The book includes data on almost 80 cities, though the granularity of available data may vary by city and year. Data on regional statistics come from an annual book on the statistics of the German Reich. This book was published continuously, including during the war and period of hyperinflation. It records, among other things, local populations as well as deaths attributable to various causes. It contains separate data-sets for men and women for 33 regions in Germany. Influenza deaths are recorded as a separate category in the years 1918, 1919, and 1920 given their prevalence. Data on historical programs is taken from Voigtländer and Voth (2012a). Finally, our voting data is obtained from ICPSR, maintained by the University of Michigan. We map the voting districts to cities, aggregating up from more granular districts where necessary.

We contribute to a broad and rapidly growing literature. Firstly, we contribute to recent papers dealing with the effects of the spread of disease on various social and economic outcomes. Papers on such topics have grown in importance, as the effects of COVID-19 become more pronounced. Eichenbaum et al. (2020), for instance, show that less consumption (brought about by social distancing and forced store closures during the COVID pandemic) will reduce the severity of the pandemic, but may deepen subsequent recessions. Alfaro et al. (2020) show that changes in the progression and spread of the COVID-19 virus lead stock market returns. Bartik et al. (2020) survey small and medium sized enterprises. They document a significant heterogeneity in the degree to which firms are affected and in the beliefs of these SMEs about their own future and the aggregate economic recovery.⁶ Hamermesh (2020), shows that the approaches taken to combat the virus, such as social distancing, can have long lasting effects on people’s mental health and attitudes.

Secondly, we contribute to literature that specifically analyzes the implications of the 1918 influenza pandemic. This pandemic may contain valuable lessons for policy makers and academics alike. Barro et al. (2020), for instance, shows that extrapolations of the effect of the 1918 pandemic could show an upper bound for the ultimate GDP effects of the current pandemic. Correia et al. (2020) use the 1918

⁵Statistisches Jahrbuch fuer Deutsche Staedte

⁶Many studies deal with the spread of pandemics more directly. Markowitz et al. (2018) shows that employment can be a vector for the spread of influenza. This may lead to an inverse correlation, in our data, between regional employment and the spread of influenza. In a similar vein, Kuchler et al. (2020) show that social networks can help propagate a shock. Regions with denser social networks and more direct link to outbreak hotspots may be more affected than people in other regions. Atkeson (2020) also models the spread of viral infections through a society and highlights the importance of contacts.

pandemic to show that public safety interventions, such as lock-downs, can have long term economic benefits. They show that counties, which better combated the influenza pandemic, saw better economic recoveries.⁷ Brainerd and Siegler (2003) show that the 1918 epidemic had long lasting implications for the GDP of US states. However, they find a positive correlation between the severity of the epidemic and subsequent economic growth. Almond (2006) and Guimbeau et al. (2020) both show that the pandemic can have long term implications on the development of people, especially those born/in-utero during the pandemic. Overall, both MacKellar (2007) and Garrett (2008) provide good overviews of the influenza pandemic, and many of its consequences, for the US context.

Finally, our work ties to an older, though ever-growing body of research that analyzes the gains made by the extremists, first and foremost the National Socialist party, in the elections of 1932 and 1933. Geary (2002) summarizes some of the literature on the extremist right-wing successes in capturing working class votes. Voigtländer and Voth (2012a) and Voigtländer and Voth (2012b) highlight the importance of antisemitism in driving extremist voters. Importantly, they show how persistent certain sentiments, especially those pertaining to hate of "others" (such as antisemitism), can be. Satyanath et al. (2013) show the rise of fascism was associated with the city-level density of associations. Ferguson and Voth (2008)⁸ show the importance of links between the National Socialist party and the largest industrial firms. We contribute to the above research by showing that pandemics may not only affect the provision of public goods, but that they may have a direct effect on extremist voting.

2 Data and Methodology

2.1 Data

We make use of a variety of data sets that are manually digitized and merged with one another. Our data on the expenditures of individual cities comes from the *Statistisches Jahrbuch Deutscher Staedte* (German: Annual statistics of German cities). These are a series of books, published annually, that record various statistics for German towns with a population of more than 100,000 inhabitants. We obtain these books from the German national archives in Berlin. The data in these books includes details on city spending on the police force, fire brigade, street and building maintenance, utilities, general administration, cultural institutions (such as theaters or museums), as well as amenities such as parks

⁷Markel et al. (2007) also study (and find favorable results for) the efficacy of nonpharmaceutical interventions

⁸Similar arguments are made by Voigtlaender and Voth (2014) when analyzing the economic competence displayed by the National Socialist party during its rise.

and swimming pools. The books are published with a lag of between one and two years and do not exist for every consecutive year. We have data on spending for the years 1925, 1927, 1928, 1930, 1931, 1932/33⁹. The amount a city spent on various amenities was not merely a function of taxes it collected. The period after the end of hyperinflation and before the start of the great depression in Germany was marked by cheap credit, partly spurred by foreign investment and an increase in borrowing. This included an increase in borrowing by some cities. The spending of certain cities grew to the point that the treasury minister of Germany at the time admonished cities for frivolous spending (Born, 1967).

We additionally collect data on regional mortality and unemployment from the *Statistisches Jahrbuch fuer das Deutsche Reich* (German: Annual Statistics for the German Reich). It separates out various causes for mortality, including: childbirth, cancer, heart disease, violence, tuberculosis, communicable diseases, accidents, etc. Importantly, it lists death by influenza separately for the years 1918-1920. 1918 saw the largest spike in influenza deaths, while 1919 and 1920 saw smaller, though sizeable, recurrences of the disease. The data is recorded separately for men and women, affording us an additional level of granularity. We calculate an **influenza mortality rate** by dividing the total number of confirmed influenza deaths in a region by the total population of that region. We additionally compute the share of influenza deaths that were female.

Unfortunately, as indicated above, the data on influenza deaths is only available at a *regional level*. We assign each city for which we have data to a region and assume that the city experiences the same mortality rate as the entire region. There were 33 distinct regions in Germany in 1918 and they reflect the complicated geographical makeup of the country at the time. We use the term region broadly, to mean independent zones that include states, independent cities, and administrative areas within the large state of Prussia. Some regions are individual cities, such as Berlin, Hamburg or Bremen; in these cases, a mapping of city data and region data is simple. Other regions are geographically very small, no larger than modern US counties, and contain only one town or city of note, such as non-Prussian Hessen, Anhalt, or Hohenzollern. Here, a mapping of city to region is, again, relatively simple. Other regions, however, are either geographically large, such as Bavaria, or densely populated, such as Westfalen. Bavaria, in particular is almost three times the size of the next largest region and contains several distinct cities. Westfalen, on the other hand, is much smaller but densely populated. The Ruhr region of Westfalen, for instance, could arguably be considered a single continuous city. For densely populated regions, our assumption of homogeneous mortality rates is likely accurate. This

⁹It appears that the final year may contain some mixed data over two years for some cities.

assumption might prove less true in larger, rural, states like Bavaria. We are careful to show that our results are not driven solely by mortality in any one region.

Unemployment data is obtained from the same source as mortality data. Given changes in how unemployment was recorded, the most accurate information comes from 1930 and 1931.¹⁰ We make use of data for 1930 and 1932 in our primary specifications but conduct robustness analyses using application data. However, unemployment data poses an additional challenge as it is somewhat less granular than mortality data. Independent cities are subsumed into the unemployment statistics of the nearest state. We map unemployment information to the regions and assume that all cities in a region observe the same unemployment rate. This assumption is, again, defensible in small regions if we assume that people could attempt to commute some distance to a job. We attempt alternate definitions of local employment and earnings by looking at city-level wages. We hereby assume that city wages reflect labor market conditions in an area. This measure may additionally capture the impact on people who are underemployed or underpaid in the lead-up to more extremist voting. We obtain city-level wages on a variety of industries for a number of years from labor statistics published at the time.

Our data on pogroms is taken from Voigtländer and Voth (2012a) as well as Haverkamp (2002). We define cities as having had a "severe" pogrom if they murdered a portion of their Jewish population in 1350, after blaming them for the plague. We also define a city as having had any form of pogrom, if they killed, expelled, or disowned their Jewish population around 1350. Pogroms were particularly common in the Rheinland area as well as in Bavaria. The Rheinland, however, saw a smaller share of votes for the Nazi party.

Our data on voting behaviour comes from ICPSR data on German elections. We are particularly interested in the share of votes received by parties considered extremist, such as the communists, the nationalists, or the national socialist party. Particularly the elections of 1932 and 1933¹¹ saw a stark increase in the share of the vote won by extremist (primarily right-wing extremist) parties. We map the election data onto cities. For some cities, election data is more granular than the city itself (such as Berlin). In these cases we aggregate individual election zones to the city level. ICPSR data contains a few additional demographic details, such as the share of a local population that was Jewish or Catholic, during the most recent census of 1925.

¹⁰Prior to 1930, only the number of distinct job applications with the local employment office were recorded. It is possible that some individuals applied for multiple jobs while others applied for none.

¹¹Parliamentary the presidential elections, respectively.

[TABLE 1 ABOUT HERE]

We present summary statistics for some key variables for our entire sample period in Table 1. We observe data on 66 distinct cities (and employment data for 65 of these cities). While this is a relatively small sample, we nevertheless observe significant heterogeneity across cities in terms of our variables of interest. City spending per inhabitant ranges from 85 Reichsmark to over 272 Reichsmark. While we observe total city expenditures per inhabitant, we do not observe details for each sub-category in every city. Nevertheless, spending on cultural amenities ranges from practically zero to over 28 Reichsmark per person. We also observe a significant heterogeneity in the contraction of spending per inhabitant between 1930 and 1933, with the average city shrinking its expenditures by 13%, while select cities continue to grow their spending. Finally, influenza mortality in German regions, particularly in 1918, ranges from 0.17% to 0.35% of the population. These figures reflect the share of a local population that died because of an influenza infection in a given year. These rates are lower than the disease-mortality itself, often considered to be close to 5%, given that not every inhabitant contracts influenza. Influenza mortality is higher in more urban areas, such as the Ruhr and Rhine valleys, though it is high even in some rural regions. In total, Germany experienced about 188 thousand Influenza deaths in 1918 and another 42 thousand and 57 thousand in 1919 and 1920, respectively.

2.2 Methodology

2.3 Influenza, spending, and extremism

We run several distinct regressions. In a first step, we analyze the relationship between the share of the population killed by influenza in 1918 (or between 1918 and 1920) and city expenditures in the years between 1925 and 1932. We assume that such a relationship may exist because influenza deaths were concentrated among younger people. Their absence from the population and the shock caused by their demise may affect priorities of cities, and of their constituent voting households, going forward. We attempt to hold constant as many confounding influences as possible, and so our regressions take the following form:

$$Spending_{c,r,t} = \beta_0 + \beta_1 InfluenzaMortality_{r,1918-20} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

$Spending_{c,r,t}$ captures the spending per inhabitant of city c in region r at time t . We make use of aggregate spending in our baseline regression but differentiate out various sub-categories, such as spending on police, culture, or amenities in our robustness section. Our coefficient of interest is β_l , which measures the relationship between spending per inhabitant and the share of the population that died from influenza in region r . $\mathbf{X}_c$ are additional city characteristics. These include, for instance, the share of the city that is Jewish or Catholic in the year 1925, the size of the city as well as fixed effects for the "city-tier group". Germany classified its cities into three broad and five narrower tiers based on size and development-level. These fixed effects therefore absorb important differences between types of cities. We additionally include the share of all local influenza deaths that are female. θ_t are year fixed effects while ξ_r are either region fixed effects or region controls, such as unemployment in 1930 or 1931.

In order to test our hypothesis, that demographic changes are partly responsible for the changes in spending, we look at sub-categories of spending more closely. The data for more granular spending is available for fewer cities, however we are still able to differentiate a variety of categories, such as schooling, cultural amenities, such as museums or theaters, and spending on the police or fire brigade.

Our main analysis relates the regional mortality rate due to influenza in 1918-20 to the share of votes obtained by extremist parties in 1932-33. As above, the regression takes the following form:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_l InfluenzaMortality_{r,1918} + \beta_2 CitySpending_{c,t-1} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

$ExtremistVote_{c,r,t}$ relates the share of the vote won by extremists, in elections of 1932, 1933 or both elections combined. We define nationalist-, national socialists-, and communist-parties as extremist parties and analyse their combined as well as their individual vote shares. In our primary tables, we focus on the national socialists, given their rise to power in this period. Our controls are the same as those discussed in Section 2.3 above. Our coefficients of interest is β_l , which represents the correlation between the share of a population that died due to influenza in 1918 and extremist voting nearly 14 years later. As discussed, the particular strain of influenza that raged in 1918-1920 largely affected younger people and thereby reshaped demographics. Regions most heavily affected lost a relatively larger share of their youth, which compounded the effects of the war. This may have changed the development of societal attitudes going forward. Moreover, given the virus's perceived foreign origins, it may have fostered a resentment of foreigners who were seen as responsible for the pandemic. These

changes in attitudes and perceptions may be reflected in voting behaviour.¹²

The regression includes β_2 , which tracks the correlation between city expenditures and extremist voting. We know that city spending is correlated with extremism (see below). This regression is thereby akin to a horse race specification. It compares the direct effect of both spending and influenza.

2.4 Extension

After documenting a relationship between influenza mortality and various spending, we extend our analysis along an important dimension by regressing spending on the vote share received by extremist parties. This follows a growing body of work on the effects of austerity on voting behaviour. The assumption is that spending, or the change in spending, on the local population impacted voting behaviour. Inhabitants might have gravitated towards parties that promise spending on amenities (even if such promises are ultimately unrealistic). This type of analysis may be of interest to academics and policymakers, given large fluctuations in and possibly uneven regional application of government expenditure during the current pandemic. Our regressions here take a similar form to those above:

$$ExtremistVote_{c,1932-33} = \beta_0 + \beta_l CitySpending_{c,1931-32} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Our outcome variable is a measure of the vote share won by extremist parties in either 1932, 1933, or both elections combined. As above, we focus on national socialists in particular, given their eventual rise to power. Here β_l is again our coefficient of interest. It relates a city's total spending on its population in the year prior to the election to extremist votes. As discussed above, city spending boomed in many parts of the country from the end of hyperinflation in 1924 to the onset of the economic crisis in 1929 or 1930. The onset of the great depression brought about a sharp and pronounced contraction in public spending for many cities. To test the impact of changes in public spending on extremist voting, we use the change in a city's spending from its highest levels in 1930 to its lowest levels in 1932/33 as the variable of interest in some specifications. For both types of regressions, we employ the same controls as in Section 2.3 above. Arguably, the most important of these controls are the regional share of the population that is unemployed as well as changes in a city's population following the effects of WWI. After all, these factors may themselves be drivers of extremist sympathies.

¹²As discussed in Voigtländer and Voth (2012a), some preferences are very persistent across time. It is more than reasonable that such preferences crystallized over the course of a decade.

3 Results

3.1 Influenza and City Spending

In this section we show that per-capita spending on inhabitants after 1925 is related to influenza mortality during the pandemic of 1918 to 1920.

[Figures 1 and 2 about here]

Figure 1 depicts the average city's spending, per inhabitant, in a given year. Panel (a) indexes spending to 1925 while panel (b) shows actual per-inhabitant spending in Reichsmark. We split cities into three buckets based on the share of the population that died from influenza, i.e. the city's influenza mortality rate, between 1918 and 1920. We depict the spending for the highest and lowest buckets of influenza mortality. As can be seen, cities with a lower influenza mortality rates grew their per-capita spending more; particularly during to the boom-period between 1928 and 1930. This, in turn, lead to a larger relative collapse in per-capita spending after 1930 (i.e. after the onset of financial crisis). It is evident, from panel (b), that the per-capita spending of cities with lower influenza mortality was always higher. We are unable to ascertain whether this difference existed before the onset of the pandemic; as such we acknowledge difference may simply be related to city characteristics, such as its density or size. However, it is worth highlighting, again, that for the period we do observe, per-capita city expenditures grew more strongly among cities with fewer relative influenza deaths.

We formalize our analysis more in Figure 2. Here we show that the expenditure per person were strongly related to influenza mortality, especially when we account for the influence of city size, the percentage of the local population that was Jewish or Catholic in 1925, the share of the population that is unemployed in 1930 or 31, the share of total influenza deaths that were female, as well as city-tier and year fixed effects. In panel (a) we depict expenditure for all the years between 1925 and 1932. In panel (b) we focus only on the years following the onset of the great depression, 1930-1932/33.

[Table 2 and 3 about here]

We present the results for the above discussion in regression form in Table 2. We show that the mortality rate of influenza had a statistically significant effect on per-capita spending, despite our small sample size and a relatively well saturated regression. Column (1) makes use of the entire sample period. A one standard deviation increase in the influenza mortality rate changed (lowered) per-capita spending by just over 7 Reichsmark. Columns (2) and (3) focus on the boom period between 1925 and 1930 and

the onset of the great depression, after 1930, respectively. We can see that our result on per-capita spending holds during both the boom and post boom period. Column (4) includes a measure of taxes collected by the city. We are careful in our use of this control, given that taxes will be a function of desired spending. However, the result is robust to the inclusion of collected taxes, if statistically weaker and somewhat smaller. It suggests that, taxes held equal, affected cities were less likely to engage in borrowing and spend on their population¹³ Ultimately, cities with a greater number of influenza patients spent less on their population. We see that the share of all influenza deaths attributable to females was a significant additional driver of the decrease in spending. This idea lends credence to the notion that societal change, brought about by the influenza pandemic, is a larger driver of our results.

We explore this aspect of our results in Table 3. Here we make use of the same specification and sample as in column (1) of Table 2, but focus on a number of different sub-categories of per-capita city expenditure. The number of observations falls a little for this analysis, given less detailed data reported by some cities. We show that the influenza mortality rate of 1918 decreased spending on schools to a large extent. This is true for primary schools as well as all other types of schools. Influenza mortality was also correlated with lower street maintenance expenditures, though this effect is less pronounced. Finally, influenza mortality was correlated with only slightly reduced spending on fire services and police protection (not shown), though this relationship is insignificant in many specifications. Instead, these cities spend more on cultural institutions such as theaters and museums. These results further support the notion that the pandemic changed the preferences of cities, on aggregate.

3.2 Influenza and Extreme Voting

In this section, we show that the 1932 and 1933 vote share won by extremists was related to influenza mortality of a decade earlier. This mortality was positively associated with right-wing extremist vote shares, such as the national socialists, and negatively (though insignificantly) with the share won by left-leaning extremists.

[Figure 3 about here]

In Figure 3, panel (a) we show that the share of votes obtained by the national socialist party in 1933 is correlated with influenza death-rate from over a decade earlier. In the election of 1933, the national socialists were the clear party of the extreme right. Our result holds despite our small sample and even

¹³Tax data is not available in every year. We interpolate if tax data is not available.

when accounting for city characteristics such as size, per-capita expenditure, and the percentage of the population that is Jewish or Catholic, as well as region-level controls such as change in unemployment just prior to the election. We do not see the same effect of influenza mortality on the vote share obtained by left-leaning extremist parties. The vote share obtained by the communists, as can be seen in panel (b), was negatively correlated with the influenza mortality rate of the region. This relationship was weaker, however, and not always statistically significant.

[Tables 4 and 5 about here]

We confirm the observation, that the share of the vote won by right wing extremist parties correlated with influenza mortality in Tables 4 and 5. In Table 4, we regress the share of the vote obtained by the national socialist party in 1933 on a number of regional and city characteristics. In column (1) we make use of the most basic specification that includes only a measure of town size, the change in population from before to just after the war, and the percentage of the population that is Jewish or Catholic. Our variable of interest is the share of the regional population that died of influenza in 1918. In successive columns we add additional regressors. These include the share of influenza deaths that were female, and, crucially, changes in city expenditure per person. These are measured as changes in per-capita city spending between the high-point of city spending in 1930 and the low point just prior to (or in the year of) the election. In columns (5) we include a measure of regional unemployment and in column (6) a measure of the change in regional unemployment.

We find that the share of votes obtained by the national socialist party was positively related to the share of the population that died from influenza in 1918. Our baseline result remains significant in each specification. A one standard deviation increase in the share of the population that died from influenza lead to a between 1.3 and 3%-point increase in the national socialist party vote share. An increase in the share of the population that is unemployed is also strongly related to an increase in the share of the vote obtained by the national socialist party; however, including changes in unemployment does not remove the direct effect of influenza-mortality. Finally, we see that changes in city-level expenditures also have a direct effect on the share of the vote won by Nazi party. Clearly, austerity has an influence on extremism even in the face of the influenza pandemic. However, it is also evident that changes in regional spending are not the (only) channel through which influenza mortality affects voting behaviour.

The strength of our baseline influenza result is particularly striking, given that we make use of very few observations and a large number of controls. In Table 5, we combine the elections of '32 and '33.

This increases the number of observations available. It further allows us to include year fixed effects to absorb election-specific anomalies. The specifications are otherwise similar to the specification in Table 4. We see that our baseline estimation on the effect of influenza mortality in 1918 remains largely unchanged.

4 Robustness, and Extensions

4.1 Robustness

Our analysis faces several challenges, many of which were touched upon above. Firstly, our regressions are based on a small sample of cities. Secondly, the effects of influenza mortality may be hard to disentangle from other deaths, many related to the end of World War I, which might have had similar societal impacts. We recognize that this challenge may not be sufficiently circumvented by controlling for population changes between 1910 and 1918. Finally, the granularity of the collected data is not the same across each data source. This may call into question our assumptions regarding the death rate in some areas. We acknowledge that it is not possible to address each of these concerns. However, there are several tests we attempt in order to ensure the validity of our results.

[Table 6 about here]

We present perhaps the clearest defense of our results in Table 6. Here, we make use of our baseline specification from Table 4 (columns 1 and 3 of Table 6) and our most saturated specification from Table 5 (columns 2 and 4 of Table 6). However, we replace, as our variable of interest, the share of the population that died from influenza in 1918, with the share of the population that died from "tuberculosis" or from "accidents". This is a placebo test. Tuberculosis was still rampant and a cause of death for many people during and immediately following the first world war. In fact, it killed a similar number of people as influenza in 1918. However, mortality from tuberculosis was a well established part of life in the early twentieth century. Moreover, it did not have the same concentrated death rate among one segment of the population. Similarly, death by accidents are tragic and, unfortunately, frequent. However, accidents were also relatively constant over time and not concentrated in certain regions of the country or among certain demographic groups. We see in Table 6 that neither tuberculosis nor accidents had an effect on the share of votes obtained by the national socialist party. Given that both accident and tuberculosis mortality are calculated using the same data-set, and therefore vary at the same geographical level, as

influenza mortality, these results support the notion that our main findings are not simply driven by an inaccurate assignment of cities to regions.

[Table 7 about here]

Another interpretation of our results may be that we are missing key variables that drove influenza fatality and extremist voting. Influenza deaths might have been affected by long-standing health issues in some communities. These may have been linked to wealth and, in turn, to extremist voting. We attempt to control for regional health and wealth data by including pre-war measures on mortality rates, information on the share of a region's population registered with a "Krankenkasse" aka health insurers, the number of doctors per 1000 inhabitants, as well as data on the per-capita income taxes raised collected by a state in 1920. The information on doctors is taken from a handbook for Doctors issued in 1919; it records the number of practicing physicians per 1000 inhabitants at the "state" level. The number of doctors may reflect how easy it was for members of a community to access health services. Insurance is usually provided by an employer or a union for workers and their families. The system is not analogous to today's systems. However, being a member of a health insurer would allow a person to more easily access healthcare services at a lower cost (from the perspective of the person seeking medical care). Finally, state taxes may be one small glimpse at state-level wealth.¹⁴ We present our results in table 7 and show a strong correlation between influenza deaths of right-wing extremist voting, even in the face of healthcare controls. We make use of the most saturated regression from Table 5, above, but depict only the coefficients of interest, for convenience.

[Table 8 about here]

Using concepts developed by Voigtländer and Voth (2012a), we test whether the correlation between influenza mortality and the vote-share of right wing extremists was affected by the historical anti-semitism of towns. Jewish inhabitants of towns were frequently blamed for plagues throughout history; most notably the black death in 1350. Following the spread of the black death, many communities persecuted and killed their Jewish minority populations. Voigtländer and Voth (2012a) show that such antisemitism, at the community level, persisted until the early 20th century. We conjecture that the correlation between influenza mortality and extremist voting should be greater in areas pre-disposed towards hatred of their minority population, especially following the outbreak of disease. We corroborate

¹⁴We address the issue of taxes earlier, in that taxes raised may be a function of local preferences. However, state level-taxes are one layer removed from city taxes.

this in Table 8. Here, following Voigtlaender2012, we interact our variable of interest with a measure of whether a community engaged in a pogrom against its Jewish population around the time of the black death in 1350. The variable is a dummy that takes the value of one if the community engaged on either a severe pogrom, which led to the murder of members of the Jewish faith in columns (1-3), or a pogrom in general, often associated with the expulsion or imprisonment of members of the Jewish community in column (4). We find that the correlation between influenza mortality and the vote share won by right-wing extremists was greater in areas with pre-existing anti-semitism. In this robustness test, we again make use of our full set of controls, but depict only variables of interest for convenience.

[Table 9 about here]

Finally, we attempt to instrument the influenza mortality rate of 1918 to circumvent missing variable bias. We use, as instruments, the distance (in km) and the density (per square-km or per inhabitant) of railway lines in 1918. We control for the density of a local population and argue that, population density and wealth held equal, the spread of influenza would likely have been facilitated by transport connections. We assert that our instrument was not itself a driver of extremist voting due to the fact that more rural regions, with fewer train lines, were more likely to vote for the national socialists. For instance, the share of the vote won by right-wing extremists was much higher in agrarian eastern Prussia or Pommerania (nearly 60% NS vote) than in the heavily industrialized Ruhr valley (<35% NS vote).¹⁵ Our results are depicted in Table 9. We show the key variables for the first stage regression in column 1. In column 1 and 2 we make use of the length and the density per square km of train lines in 1918. We control for city-level wages and the change in wages between 1930 and 1932 in these regressions (see below). In column (3) we use a different instrument and change how we control for local unemployment and wages. Specifically, we make use of train-line distance per inhabitant as an instrument and substitute city-level wage for regional unemployment measures (as we use in most regressions above). Our results are confirmed in each case. A one standard deviation increase in influenza mortality is associated with a 4% increase in the share of the vote won by the Nazi party. The magnitude of our effect is larger than in our baseline specifications. This suggests that our baseline OLS-effect is possibly mitigated by other factors, such as local amenities and public services in some of the more densely populated cities.

We perform a few additional tests, which we do not include for brevity. For instance, we can show that our results are robust to removing individual regions from our regressions. This means that large

¹⁵Regions with denser infrastructure invest more in their population and see higher rates of influenza mortality, which in turn mitigates investment. For this reason, we control for regional expenditure in our IV regressions.

states, such as Bavaria, or populated states, such as Westfalen, are not driving our result. We make use of digitized voter data for the election of 1912 provided by Gesis and map it to our data at the city level. As such, we are able to control for the vote share obtained by anti-semitic parties as well as strongly conservative parties. These controls are largely insignificant in the face of all other controls and do not affect our baseline results. We further find that using the wages of metal workers in 1930, as indicators of wealth, as well as the changes such wages underwent between 1930 and 1932 as indicators of wealth changes does not influence results. After all, wages dropped by between 10 and 40% in two years, with great variance across cities. Importantly, our results still hold for the election of 1928 (although the effects are slightly weaker). This was the first election in which the national socialists truly contested seats in a meaningful way. Unfortunately, we do not have unemployment data for this period, meaning we must rely on our most basic specification. Finally, we can show that our results hold if we use cumulative influenza deaths between 1918-20, as opposed to 1918 alone.

4.2 Extension: City Spending and Extreme Voting

In this section we show that voting for extremist parties is correlated with per-capita spending by cities. As discussed, this represents an important extension of our paper that may be of interest to policy makers and academics alike. After all, pandemics may lead to large changes in government spending over time as well as heterogeneity in the application of such spending to various regions.

[Figure 4 and Table 10 about here]

In Figure 4 we see a relationship between the per-capita spending on inhabitants and extremist voting. For this set of Figures, we make use of voting for the national socialists, as the effects are the most pronounced for this party. In panel (a) we show the effect of the level of per-capita spending on the share of the vote. Higher levels of city spending lead to a lower share of the vote for the extreme right. However the effect is economically small and only marginally statistically significant. We see from Panel (b) that the changes in per-capita city spending, from its high in 1920 to low in 32/33, is more significantly correlated with the share of votes obtained by extremist parties. The larger the contraction in spending, the more voters gravitate towards extremists such as the national socialist party. Both the absolute and the change in spending impact the vote share - smaller spending as well as larger contractions boost their vote share. This result is stronger for right-wing extremists, and largely non-existent for left-wing extremists.

We corroborate the baseline graphical result in Table 10. Here we show that the level of spending (columns 1 and 2) as well as the changes in spending (columns 3 and 4) are correlated with the share of votes obtained by the national socialists in the elections of 1932 and 1933. We can see that the unemployment share of 1931, as well as the growth in unemployment between 1930 and 1931 is a driver in share of votes obtained by the Nazi party (and extremists in general). However, we also observe that there remains a small direct effect of city spending.

Our results are somewhat counter-intuitive when we look at them through the lens of influenza mortality. Influenza mortality is associated with cities spending less on their inhabitants. However, influenza mortality is also associated with a less severe contraction in city spending, after the onset of the great depression. However, the direct effect of influenza mortality on the contraction in city spending on its inhabitants is negligible, when we control for city specific characteristics (results not reported for brevity). As a consequence, the pass-through of influenza mortality on extremist voting - via city expenditures - is relatively small.

5 Conclusion

We show that the deaths brought about by the influenza pandemic of 1918-1920 profoundly shaped German society going forward. Regional variation in influenza mortality was related to subsequent city spending on various amenities for its population. Cities that saw a greater share of their population die due to influenza spend less, per-capita, going forward. We tie in to literature on the effects of austerity by showing that lower expenditures by local municipalities affect voting for more extremist parties. However, we also show that influenza deaths themselves had a strong effect on the share of votes won by extremists, specifically the extremist national socialist party. This effect dominates many other effects and is persistent even when we control for the influences of local unemployment, city spending, population changes brought about by the war, and local demographics or when we instrument for influenza mortality. The same patterns were not observable for the votes won by other extremist parties, such as the communists. Our results are striking in part because they are robust to a large battery of alternate specifications despite being based on a relatively small sample.

We argue that our results are likely the consequence of changes in societal preferences following a pandemic. In particular, the fact that the pandemic affected predominantly one part of the demographic spectrum, in this case younger people, may have altered preferences in communities. It may also have

spurred resentment of foreigners among the survivors (as has happened in past pandemics), driving voters towards parties whose platform matched such sentiments. Given a number of econometric challenges, we are cautious about the interpretation of our results. Nevertheless, the study offers a novel contribution to the discussion surrounding the long-term effects of pandemics.

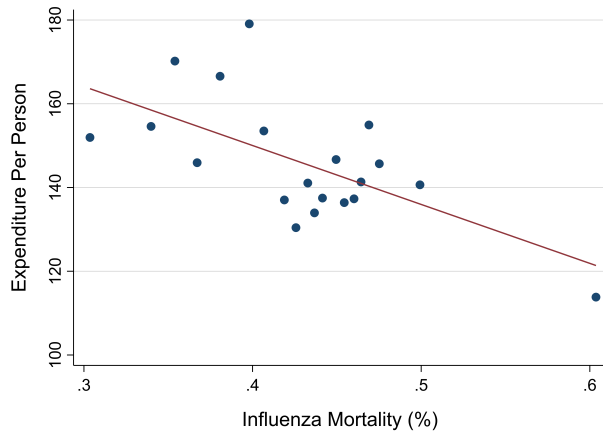


(a) Indexed spending of cities, highest vs. lowest tercile of influenza mortality.

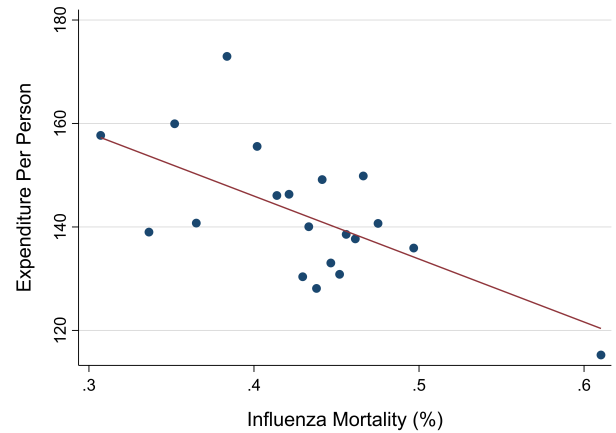


(b) Spending per inhabitant, highest vs. lowest tercile of influenza mortality.

Figure 1: City Spending over Time Average spending on inhabitants by cities in each year. Cities are split into three groups based on share of population to die from influenza in 1918-1920. Figure shows highest and lowest tercile.

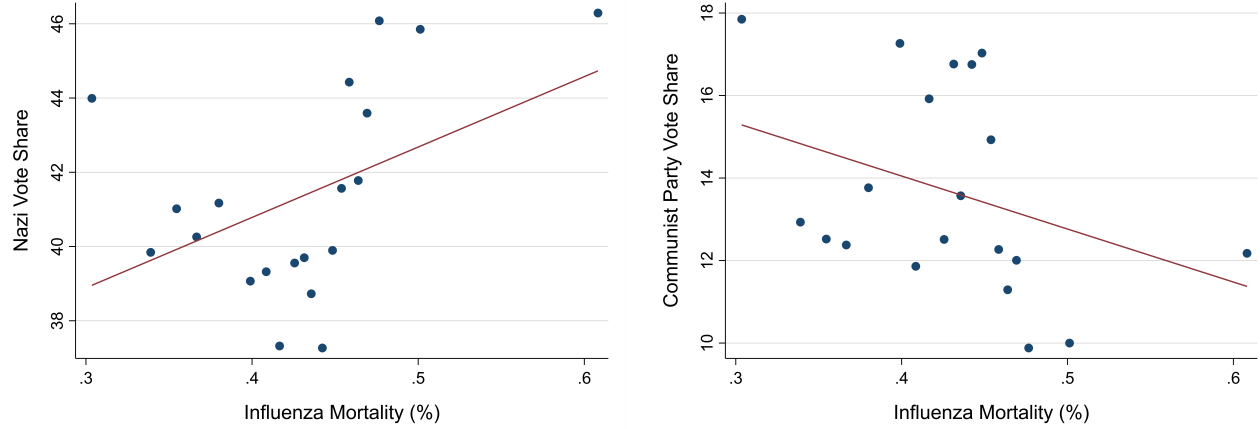


(a) Total city spending per inhabitant 1925-1932 vs. influenza mortality 1918 -1920



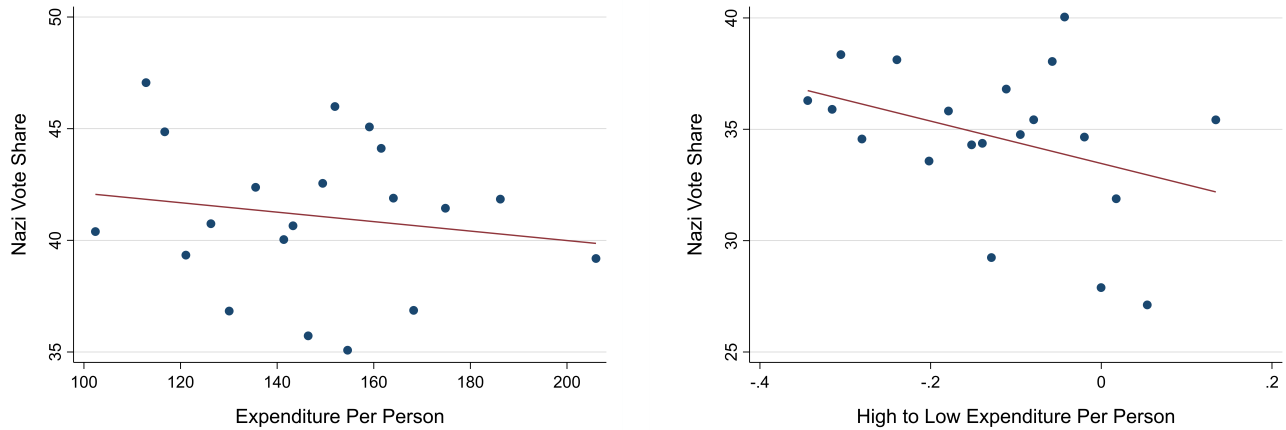
(b) Total city spending per inhabitant 1930-1932 vs. influenza mortality 1918 -1920

Figure 2: Spending v. Influenza Mortality Per-capita spending of cities. Panel a depicts the years 1925-1932 and panel b depicts the post crisis 1930-1932 period, relative to share of population that dies from influenza between 1918 and 1920. The scatterplot represents residuals, as we control for city-tier, year, town-size, percent of local population that is Jewish and Catholic, share of population that is unemployed, and share of influenza deaths that were female.



(a) Nat. Soc. vote share 1933 vs. influenza mortality 1918 -1920 (b) Communist vote share 1933 vs. influenza mortality 1918 -1920

Figure 3: Extremist Vote Share v. Population Influenza Deaths 1918-1920 Here we relate the share of votes obtained by the national socialist party in 1933 (panel a) or the communist party in 1933 (panel b) to the share of the population that died from influenza in 1918. The scatterplot represents residuals as we control for city-tier, year, town-size, percent of local population that is Jewish and Catholic, share of population that is unemployed, per capita spending of city, and share of influenza deaths that were female.



(a) Nat. Soc. vote share 1933 vs. city spending in 1932

(b) Nat. Soc. vote share 1933 vs. change in city spending in 1929 to 1932

Figure 4: Nat. Soc. Vote Share v. City Spending per Capita Per-capita spending of cities in 1932 in panel (a) or change in city spending between its high point in 1929/30 and 1932 in panel (b) relative to the share of the vote obtained by the National socialist party in 1933. The scatterplot represents residuals as we control for city-tier, year, town-size, percent of local population that is Jewish and Catholic, share of population that is unemployed, and share of influenza deaths that were female.

Table 1: Summary Statistics

	N	Mean	StDev.	Min	Max
Nazi Vote '33	349	40.05163	9.388689	24.4	62.4
Nazi Vote '32	349	29.35396	9.594724	13	50.1
Extreme vote '33	349	60.81753	10.17928	37.6	83.55
Extreme vote '32	349	55.45798	11.01789	28.55	76.8
Expenditure per inhabitant	349	147.9495	33.24262	84.53	272.525
Expenditure per inhabitant on schools	251	25.34373	7.750433	3.89	45.49729
Expenditure per inhabitant on culture/theater/museum	305	4.676445	4.183753	.02	28.38298
Change in per capita spend. 1930-1932	344	-.1331621	.1454339	-.4058214	.2529748
Influenza mortality 1918-20 (%)	349	.4393996	.0422601	.353879	.5454923
Influenza mortality 1918 (%)	349	.2725693	.0424653	.1788912	.3507176
Share of female influenza deaths	349	.5484624	.025067	.4990509	.5924072
Log town size	349	11.80968	.7519452	10.84155	13.53814
Change in population 1910-18	349	11.70545	1.326097	4.867535	12.80221
Percent of population Jewish	349	.8242407	.8721931	.05	6.3
Percent of population Catholic	349	39.16938	29.82605	1.8	94.5
Share unemployed pop. '31	344	.0786767	.020953	.0369189	.2208258
Share of unemployed pop. '30	344	.0495417	.0142127	.0292761	.1487352
Log change unemployment 30-31	344	.4623988	.1487216	.2319517	.6601584

Note: This table shows summary statistics for key variables in our sample over the entire sample period. We observe data for 66 distinct cities and employment data for 65 cities. The sample of cities that report spending data on individual items is somewhat smaller and varies over time.

Table 2

	(1)	(2)	(3)	(4)
	Spend. per inh.	Spend. per inh.	Spend. per inh.	Spend. per inh.
Influenza mortality 1918	-219.8*** [62.51]	-211.7** [97.46]	-226.3** [90.56]	-99.50* [54.75]
Share of female influenza deaths	-192.5** [93.65]	-266.7** [127.4]	-68.45 [136.8]	-232.4*** [78.91]
Log town size	15.32*** [4.262]	15.75*** [5.397]	16.68** [7.985]	24.51*** [4.037]
Change in population 1910-18	-0.520 [2.060]	-4.517* [2.389]	1.913 [2.689]	-0.397 [2.010]
Percent of population Jewish	16.32*** [1.922]	17.19*** [2.304]	13.02*** [3.398]	9.998*** [1.805]
Percent of population Catholic	-0.0478 [0.0648]	-0.00583 [0.100]	-0.0677 [0.0933]	-0.0859 [0.0570]
Log change unemployment 30-31	-87.92*** [16.60]	-74.73*** [25.38]	-83.16*** [23.74]	-81.64*** [14.48]
City taxes per capita				711.3*** [96.22]
Constant	167.6*** [63.85]	238.1*** [84.39]	53.95 [105.9]	-4.248 [61.61]
Observations	350	156	129	350
Adjusted R^2	0.459	0.501	0.351	0.551

Note: This table shows the coefficients for equation:

$$Spending_{c,t} = \beta_0 + \beta_1 InfluenzaMortality_{r,1918} + \mathbf{X}_c + \theta_t + \zeta_r + \epsilon_{c,t}$$

The dependent variable is the city's total spending per inhabitant. The coefficient of interest are region-level influenza mortality rates, as a share of the population, in 1918. The specification includes city-tier and year fixed effects. Column (1) makes use of all available years, column (2) focuses on pre-1929 years (i.e. the boom period) while column (3) focuses on the post 1929 period. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3

	(1)	(2)	(3)	(4)	(5)
	Cultural institutions	Fire department	Schools (primary)	Schools (all)	Street maintenance
Influenza mortality 1918	18.60* [9.930]	-2.756 [2.764]	-22.89*** [8.169]	-40.50** [16.26]	-9.393 [6.255]
Share of female influenza deaths	-28.16* [15.31]	-1.102 [2.626]	-8.798 [13.24]	-36.88 [27.43]	12.31 [8.697]
Log town size	1.156* [0.651]	0.457*** [0.110]	-2.069*** [0.673]	-2.181** [0.988]	1.507*** [0.546]
Change in population 1910-18	-0.707*** [0.199]	0.00826 [0.0448]	0.589*** [0.216]	1.286** [0.591]	0.159 [0.116]
Percent of population Jewish	1.074*** [0.283]	0.0190 [0.0418]	0.462** [0.221]	1.819*** [0.306]	0.261 [0.175]
Percent of population Catholic	0.0178 [0.0113]	-0.00681*** [0.00151]	-0.0262** [0.0105]	-0.106*** [0.0200]	0.0106 [0.00716]
Log change unemployment 30-31	2.063 [3.176]	-3.760*** [0.779]	13.87*** [1.839]	2.541 [4.315]	-1.017 [1.733]
Constant	7.124 [10.57]	-0.522 [1.481]	34.54*** [8.859]	68.64*** [16.19]	-17.16** [7.093]
Observations	306	292	349	252	302
Adjusted R^2	0.215	0.558	0.584	0.528	0.472

Note: This table shows the coefficients for equation:

$$Spending_{c,r,t} = \beta_0 + \beta_1 InfluenzaMortality_{r,1918} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

The dependent variable is the city's spending, per inhabitant, on a number of different expenditure categories. The coefficient of interest are region-level influenza mortality rates, as a share of the population, in 1918. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4

	(1)	(2)	(3)	(4)	(5)	(6)
	NS Vote '33	NS Vote '33	NS Vote '33	NS Vote '33	NS Vote '33	NS Vote '33
Influenza mortality 1918	64.45*** [21.28]	102.3*** [17.57]	65.42*** [20.89]	90.45*** [18.43]	68.58* [35.70]	29.81** [12.32]
Change in per capita spend. 1930-1932			-12.55** [5.404]	-13.33** [5.734]	-12.67** [5.501]	-8.540* [5.068]
Log town size	-4.392 [2.832]	-5.203** [2.497]	-1.579 [3.095]	-2.625 [2.876]	-1.638 [3.316]	-1.569 [2.752]
Change in population 1910-18	-0.701 [0.575]	-0.336 [0.512]	-0.298 [0.565]	0.106 [0.568]	-0.206 [0.916]	0.629 [0.537]
Percent of population Jewish	-0.132 [0.547]	-0.274 [0.566]	-0.801 [0.649]	-1.075 [0.702]	-0.811 [0.680]	-1.395 [0.886]
Percent of population Catholic	-0.206*** [0.0284]	-0.216*** [0.0286]	-0.225*** [0.0293]	-0.217*** [0.0295]	-0.227*** [0.0321]	-0.219*** [0.0256]
1912 share ext. right	0.0625 [0.0914]	0.0573 [0.0966]	0.0877 [0.0853]	0.113 [0.0975]	0.0861 [0.0847]	0.0546 [0.0921]
Share of female influenza deaths		-20.70 [30.81]		20.06 [33.56]		
Share unemployed pop. '31					11.11 [54.88]	
Log change unemployment 30-31						-24.67*** [5.347]
Constant	90.83*** [32.94]	97.61*** [36.50]	52.10 [36.02]	41.50 [43.31]	50.05 [42.72]	63.13* [33.10]
Observations	65	64	64	63	63	63
Adjusted R^2	0.594	0.639	0.626	0.669	0.618	0.687

Note: This table shows the coefficients for variants of equation:

$$ExtremistVote_{c,t,1933} = \beta_0 + \beta_1 InfluenzaMortality_{r,1918} + \beta_2 ChangeCitySpending_{c,1930-32} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Extremist Vote tracks the share of votes obtained by the national socialist party in 1933. The coefficients of interest are β_1 and β_2 which show the impact of the influenza mortality rate in 1918 as well as the change in per-capita city spending between 1930 and 1932, respectively. The specification includes city-tier fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 5

	(1)	(2)	(3)	(4)	(5)	(6)
	NS Vote	NS Vote	NS Vote	NS Vote	NS Vote	NS Vote
Influenza mortality 1918	54.86*** [11.91]	85.53*** [12.26]	55.11*** [11.88]	76.09*** [13.08]	62.31*** [20.96]	26.84*** [7.757]
Change in per capita spend. 1930-1932			-10.97*** [3.619]	-11.29*** [3.868]	-11.32*** [3.630]	-7.891** [3.546]
Log town size	-2.654 [1.879]	-3.546** [1.747]	-1.135 [1.975]	-2.104 [1.893]	-1.360 [2.088]	-1.447 [1.823]
Change in population 1910-18	-0.917** [0.382]	-0.649* [0.367]	-0.580 [0.382]	-0.284 [0.399]	-0.358 [0.571]	0.120 [0.400]
Percent of population Jewish	0.110 [0.354]	0.0405 [0.371]	-0.449 [0.406]	-0.615 [0.446]	-0.454 [0.420]	-0.857* [0.488]
Percent of population Catholic	-0.221*** [0.0198]	-0.230*** [0.0208]	-0.230*** [0.0203]	-0.226*** [0.0215]	-0.235*** [0.0216]	-0.225*** [0.0187]
1912 share ext. right	0.129* [0.0753]	0.119 [0.0740]	0.152** [0.0730]	0.167** [0.0759]	0.148** [0.0712]	0.126* [0.0735]
Share of female influenza deaths		-22.85 [22.61]		9.032 [24.63]		
Share unemployed pop. '31					27.46 [35.54]	
Log change unemployment 30-31						-18.92*** [3.675]
Constant	70.15*** [22.09]	82.08*** [25.85]	47.55** [23.31]	44.64 [28.97]	43.66 [27.25]	60.12*** [22.17]
Observations	129	127	128	126	126	126
Adjusted R^2	0.740	0.759	0.755	0.772	0.754	0.780

Note: This table shows the coefficients for equation:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_1 InfluenzaMortality_{r,1918} + \beta_2 ChangeCitySpending_{c,1930-32} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Our sample encompasses the years 1932 and 1933. Extremist Vote tracks the share of votes obtained by the national socialist party. The coefficients of interest are β_1 and β_2 , which show the impact of the local population to die from influenza in 1918 as well as the change in per-capita city spending between 1930 and 1932, respectively. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 6

	(1)	(2)	(3)	(4)
	NS Vote '33	NS Vote	NS Vote '33	NS Vote
Tuberculosis mortality 1918	-31.78 [29.84]	5.177 [15.29]		
Accident mortality 1918			-17.44 [24.85]	-19.74 [15.60]
Log town size	-6.036* [3.334]	-2.135 [1.817]	-5.986* [3.338]	-2.603 [1.778]
Change in population 1910-18	-0.593 [0.618]	0.238 [0.420]	-0.745 [0.624]	0.526 [0.472]
Percent of population Jewish	1.235* [0.706]	-0.702 [0.480]	0.960 [0.671]	-0.763 [0.494]
Percent of population Catholic	-0.152*** [0.0368]	-0.218*** [0.0225]	-0.175*** [0.0318]	-0.213*** [0.0184]
1912 share ext. right	0.124 [0.108]	0.115 [0.0791]	0.0910 [0.106]	0.127 [0.0790]
Change in per capita spend. 1930-1932		-6.553 [3.954]		-7.921** [3.606]
Log change unemployment 30-31		-26.01*** [3.805]		-24.76*** [3.442]
Constant	129.3*** [39.54]	76.16*** [21.75]	128.0*** [39.72]	81.60*** [21.16]
Observations	65	126	65	126
Adjusted R ²	0.471	0.771	0.463	0.774

Note: This table shows the coefficients for equation:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_1 Mortality_{r,1918} + \beta_2 ChangeCitySpending_{c,1930-32} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Our sample encompasses the years 1933 (columns 1 and 3), or 1932 and 1933 (columns 2 and 4). Extremist Vote tracks the share of votes obtained by the national socialist party. The coefficient of interest is β_1 which show the impact of the share of the local population to die from tuberculosis or accidents in 1918. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 7

	(1)	(2)	(3)	(4)
	NS Vote	NS Vote	NS Vote	NS Vote
Influenza mortality 1918	21.93*** [7.121]	23.82*** [7.260]	21.47*** [8.001]	23.09*** [7.603]
Spend. per inh.	-0.0138 [0.0258]	-0.0332 [0.0237]	-0.0420* [0.0227]	-0.0327 [0.0248]
Mortality rate in 1911	479.1* [278.8]			
Doctors per Tsd.		0.0900 [0.551]		
Pct. insured pop.			36.01** [15.36]	
Per Cap. State Inc.				0.0865 [27.42]
R2	.79	.79	.8	.79
N	129	129	129	129
Basic Controls	Yes	Yes	Yes	Yes
Unemployment Controls	Yes	Yes	Yes	Yes

Note: This table shows the coefficients for equation:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_1 Mortality_{r,1918} + \beta_2 ChangeCitySpending_{c,1930-32} + \beta_3 PreWarHealth + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Our sample encompasses the years 1932 and 1933. Extremist Vote tracks the share of votes obtained by the national socialist party. The coefficients of interest are β_1 , which show the impact of the share of the local population to die from influenza in 1918, and β_3 , which is a measure of local pre-war health conditions. It measures either 1911 mortality rates, the number of physicians per 1000 inhabitants, the number or share of the population that is insured in 1913, or state level taxes. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 8

	(1)	(2)	(3)	(4)
	NS Vote	NS Vote	NS Vote	NS Vote
Influenza mortality 1918	42.49*** [11.19]	42.64*** [11.78]	41.08*** [10.88]	48.12*** [10.83]
Interaction: Severe Pogrom * Influenza Mortality	53.40** [23.77]	49.23* [24.89]	55.89** [24.36]	
Interaction: Pogrom * Influenza Mortality				199.0*** [45.90]
Severe Pogrom 1350	-12.83** [6.370]	-11.64* [6.586]	-14.03** [6.479]	
Pogrom 1350				-55.48*** [13.65]
Change in per capita spend. 1930-1932			-11.18*** [4.188]	-11.84*** [3.945]
Basic Controls	Yes	Yes	Yes	Yes
Wage/employment Controls	No	Yes	Yes	Yes

Note: This table shows the coefficients for equation:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_1 Mortality_{r,1918} + \beta_2 Pogrom_{1350} * Mortality_{r,1918} + \beta_3 Pogrom_{1350} + \mathbf{X}_c + \theta_t + \xi_r + \epsilon_{c,t},$$

Our sample encompasses the years 1932 and 1933. Extremist Vote tracks the share of votes obtained by the national socialist party. The coefficients of interest are β_1 which shows the impact of the share of the local population to die from influenza in 1918 and β_2 , the coefficient on the interaction of influenza mortality and a dummy, denoting whether the city engaged in medieval pogroms against its Jewish minority in response to the plague. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9

	(1)	(2)	(3)
	Influenza mortality 1918	NS Vote	NS Vote
State owned railway (km)	0.0000149** [0.00000676]		
Railway density	-0.000367* [0.000193]		
Influenza mortality 1918		117.0*** [26.63]	104.0*** [27.57]
Spend. per inh.	0.000330** [0.000164]	-0.0265 [0.0280]	0.00201 [0.0229]
Population density	-0.0000318*** [0.00000809]	0.00230 [0.00194]	-0.0180 [0.0130]
R2	.39	.69	.74
N	131	131	131
Basic Controls	Yes	Yes	Yes
Wage Controls	Yes	Yes	No
Unemployment Controls	No	No	Yes
Kleibergen-Paap rk LM		18.6	21.3
Kleibergen-Paap rk Wald F		32.2	17.6

Note: This table shows the coefficients for a two-staged least squares regression. We make use of the same controls as in the saturated regressions, depicted above, and includes population density as an additional regressor. We instrument the influenza mortality rate of 1918 with the distance (in km) and density (per square km (column 1 2) or per inhabitant (column 3)) of train lines in 1918. Extremist Vote tracks the share of votes obtained by the national socialist party. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10

	(1)	(2)	(3)	(4)
	NS Vote	NS Vote	NS Vote	NS Vote
Spend. per inh.	-0.0223 [0.0238]	-0.0374* [0.0208]		
Change in per capita spend. 1930-1932			-9.396** [4.144]	-6.125 [3.754]
Log town size	-4.176* [2.345]	-2.608 [2.047]	-3.285 [2.262]	-2.560 [1.774]
Change in population 1910-18	-1.692*** [0.438]	0.0427 [0.402]	-1.387*** [0.450]	0.115 [0.396]
Percent of population Jewish	1.251 [0.766]	0.0694 [0.691]	0.474 [0.483]	-0.649 [0.504]
Percent of population Catholic	-0.195*** [0.0215]	-0.209*** [0.0188]	-0.201*** [0.0211]	-0.209*** [0.0179]
Share unemployed pop. '31	-66.22*** [24.29]		-61.50*** [20.84]	
Log change unemployment 30-31		-27.42*** [3.921]		-25.28*** [3.465]
Constant	118.8*** [27.27]	91.11*** [23.95]	100.8*** [26.55]	83.20*** [20.92]
Observations	129	129	128	128
Adjusted R^2	0.692	0.768	0.701	0.765

Note: This table shows the coefficients for equation:

$$ExtremistVote_{c,r,t} = \beta_0 + \beta_1 CitySpending_{r,t-1} + \mathbf{X}_c + \theta_t + \zeta_r + \epsilon_{c,t},$$

Our sample encompasses the years 1932 and 1933. Extremist Vote tracks the share of votes obtained by the national socialist party. The coefficient of interest is β_1 which shows the impact of lagged per-capita city spending in the city or, alternatively, the change in per capita spending between 1930 and 1932. The specification includes city-tier and year fixed effects. Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

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