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Historic Sex-Ratio Imbalances Predict Female Participation in the Market for Politicians

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Abstract

We analyze the long-term effects of gender imbalances on female labor force participation, in particular in the market for politicians. We exploit variation in sex ratios – the number of men divided by the number of women in a region – across Germany induced by WWII. In the 1990 elections, women were more likely to run for office in constituencies that had relatively fewer men in 1946. We do not find a significant effect of the sex ratio on the likelihood of a woman winning the election. These results suggest that while women were more likely to run for a seat in parliament in constituencies with lower historical sex ratios, voters were not more inclined to vote for them. Voter demand effects thus do not appear to be as strong as candidate supply effects.

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1   Introduction

Worldwide, only 22 percent of parliamentarians and 17 percent of government ministers are women.[1] In West Germany, the share of female members of parliament at the federal level has been well below 20 percent in the post-war decades. In the first federal election after the German Unification in 1990 it reached just 20.5 percent, and it is still below 37 percent (Bieber, 2013). Politicians' gender can have important consequences for policies (Beaman et al., 2009; Chattopadhyay and Duflo, 2004; Powley, 2006). If women are held back because of agency problems between party leaders and voters, welfare is decreased (Casas-Arce and Saiz, 2015). Further, exposure to female leaders can change perceptions about women's (lower) ability as politicians (Beaman et al., 2009). Because female politicians matter, more than 100 countries have introduced affirmative action programs for women in political office (Beaman et al., 2009).

The reasons why women are less likely to be active as members of parliament, and poorly represented in leadership positions more generally, are not well understood. A recent literature, reviewed below, stresses the role of past experiences and cultural norms as potential determinants of female labor force participation, especially in high-profile professions. Consistent with this notion, this paper highlights the fact that historical shocks to the gender balance still affect female participation in leadership professions after many decades. Our analysis shows that the drastic imbalances in the sex-ratio – defined as the number of men divided by the number of women in a region – induced in Germany by the Second World War (WWII) are strong predictors of the participation of female candidates in the first federal election after unification, more than four decades after the war ended. We argue that these

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[1]Numbers as of August 2016, see United Nations Women (n.d.).

post-war sex ratios exhibit exogenous variation across voting districts. Among the most affected cohorts (those who were drafted into the German army), up to 38 percent of men died but there was random variation across soldiers' home regions. The location of front lines and the allocation of prisoners of war when combat ceased also contributed to the regional variation in post-war sex ratios.

We collected data on sex ratios at the county level for the period immediately after the end of WWII and combined them with election data for the German federal parliament (*Bundestag*). The analysis focuses on the first election after re-unification in 1990 so that all current German states can be included. We first estimate a regression of the share of female candidates from all parties in the constituencies on the 1946 sex ratio, using several specifications. Our main result is that a one standard deviation decrease in the 1946 sex ratio was associated with an increase in the share of female candidates in the 1990 federal election of 3.9 percentage points. Probit regressions of gender on the sex ratio for nominated and elected candidates indicate that these results are mainly driven by candidate supply effects since only the effect on the number of candidates, not the effect on the number of elected women, is significant. If party leaders were holding back women at the expense of votes, then we would expect more women to be elected as soon as more are nominated. Since this is not the case, we argue that party leaders' preferences are unlikely to be main explanation for the effects we find.

While long-run labor market effects of sex-ratio imbalances have been documented before, we study a shock that is relatively localized. In particular, previous papers have suggested causal channels related to culture and institutions which in Germany did not change in the post-war period at the level of the identifying variation we use, that is, voting districts.[2]

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[2]There were of course major differences in the development of culture and institutions between East and

The premise of our analysis is that constituencies which experienced a more severe shortage of men relative to women after the war – in short, which had lower sex ratios – have a larger share of female nominees in the 1990 federal elections. The argument is as follows. The shortage of men right after the war made it necessary for women to step in.[3] Hence, people were exposed to women in occupations and positions that were previously dominated by men. The salience of female "role models" induced adolescent girls to raise their aspirations and aim for better jobs. Furthermore, the presence of women in high-level jobs may affect beliefs about their ability to perform well in these jobs. We present some evidence in support of this channel by showing that around the time of our elections, female labor market participation is also higher in regions with lower sex ratios. We find that the effect of unbalanced sex ratios on female nominees is larger than the effect on labor force participation (in absolute terms). Another potential channel, which we also discuss below, would be related to the larger share of female voters.

The remainder of this paper is structured as follows. We review the related literature in Section 2. In Section 3, we describe the data. Section 4 provides a detailed discussion of the sources of variation in post-war sex ratios and of potential channels for long-lasting sex-ratio effects. Our main results are presented in Section 5. We discuss two potential channels through which lower sex ratios led to an increase in the share of female politicians in Section 6. Robustness checks are presented in Section 7. Section 8 concludes.

West Germany but as we show below, this does not explain our findings.

[3]A comprehensive overview of the immediate post-war period in Germany can be found in Niehuss (2001).

2   Related literature

There are several reasons why an under-representation of women in politics is considered to be undesirable (see, e.g., Casas-Arce and Saiz (2015)). First, women make up half of the (voting) population. A more equal representation of women at the highest level can improve the protection of their rights and interests. Second, public goods provision may be different between male and female politicians. When women are elected, they often concentrate on social policies such as education, health and childcare. These policies tend to be more beneficial towards their own sex (Chattopadhyay and Duflo, 2004; Bratton and Ray, 2002). Other positive effects of a higher share of female politicians in parliament include lower levels of corruption (Dollar et al., 2001).

The literature identifies various reasons why fewer women occupy elected political offices. Baltrunaite et al. (2016), for instance, distinguish two channels that impact female representation: voter preferences and the parties' selection of candidates. Casas-Arce and Saiz (2015) find evidence that party leaders are less inclined to nominate female candidates even at the expense of receiving fewer votes. Additionally, they point out that women themselves might be more reluctant to enter the market for politicians. This channel is related to an emerging literature on women's reluctance to enter competitive environments, beginning with Niederle and Vesterlund (2007). Relatedly, established social norms typically attribute male characteristics to certain jobs or leadership positions (Akerlof and Kranton, 2000; Eagly and Karau, 2002). Such norms might discourage adolescent girls from aspiring for high-level (political) positions and from making the corresponding educational choices. This premise is supported, *inter alia*, by a randomized control trial that shows that prior exposure to female leaders leads to electoral gains for women, see Beaman et al. (2012).

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Besides these demand and supply factors, historically grown institutional settings can help or hinder the success of women. Matland and Studlar (1996) stress the importance of how the electoral system is organized, i.e., proportional representation versus winner-takes-all. Also, cultural and psychological aspects such as gender roles can influence female participation in the market for politicians.

Sex ratios have been widely used to study the consequence of imbalances in labor and marriage markets (Guttentag and Secord, 1983). Imbalances in sex ratios are also of interest *per se*: As the technology to control sex ratios at birth has become widely available, sex ratios are increasingly imbalanced in several countries. Such countries include India and China whose population makes up a large share of the world's population (Attané, 2010).

Prior literature has established that lower sex ratios, i.e., fewer men relative to women, imply higher female labor market participation rates. Angrist (2002) establishes this fact for second generation immigrant women in the early 20th century by using variation in immigrant sex ratios in the U.S. Acemoglu et al. (2004) use regional variation in the U.S. military mobilization for WWII to show that in states with higher mobilization rates more women had joined the workforce after the war. Even though in the U.S., unlike in Germany, the drop in the sex ratios caused by WWII was temporary rather than permanent, it has been shown to have a long-lasting impact on female labor force participation: Fernández et al. (2004) document that sons of women who entered the labor market to replace absent men were more likely to be married to working women later on. Thus, being exposed to a working mother seems to change attitudes towards working wives. Two recent papers imply that unbiased sex ratios can have long-term impacts on gender roles in the labor market. Teso (Forthcoming) documents that female-biased sex ratios caused by the slave trade have permanently altered gender roles in Africa. Grosjean and Khattar (Forthcoming)

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document that in areas in Australia that were more male-biased historically, people are more conservative with respect to female labor force participation, and that in these areas women work less often in high-ranking occupations.

In the analysis of sex ratios, it is difficult to establish causal effects as the presence of omitted variables or reverse causality usually cannot be ruled out. Men or women may move to regions of a country for reasons related to local marriage or labor markets that are correlated with outcomes of interest. To address this problem, variation in sex ratios outside of individual control can be exploited. As mentioned above, Angrist (2002) exploits changes in immigrant sex ratios in the US to study labor market outcomes. Abramitzky et al. (2011) use changes in sex ratios in France caused by World War I to investigate changes in mating patterns. We use a similar source of variation as considered by Acemoglu et al. (2004) and Brainerd (2017). Brainerd (2017) uses both sex ratios and outcomes measured in the first Russian postwar census of 1959 to document that the dramatic drops in sex ratios for several cohorts and regions in Russia led to lower rates of marriage and higher rates of out-of-wedlock births and divorces for women. Finally, in recent related work Kesternich et al. (2018) exploit variations in post-war sex ratios in Germany to document long-lasting effects of sex ratios on marriage and fertility patterns using individual-level data from the GSOEP.

3 Data

3.1 Outcome variables

In our subsequent analysis, the main outcome variable is the share of female candidates in the 1990 *Bundestag* election. As we explain below, each party selects one candidate per district in a winner-takes-all system. We then analyze whether a female candidate was elected. The unit of observation is the voting district. Voting districts in Germany are designed to roughly represent the same number of voters, and often correspond to political counties. In the 1990 elections, there were 328 districts.

Germany has a mixed election system. Voters cast two votes, one for a district candidate (this is often referred to as the "first vote" or the "direct mandate") and another for a political party (the "second vote"). The second vote determines the overall share of the parties in the parliament, which is however not relevant to the present analysis. Each party can nominate one candidate for the first vote per voting district. Additionally, independent candidates are allowed, but they typically command only very small shares of the vote.

Our dataset, obtained from the Federal Returning Officer, covers all 2,338 candidates nominated for the first vote in the 1990 elections (Bundeswahlleiter, 2016b). It includes the sex and party affiliation of all candidates as well as the vote shares of all parties by voting district. We also collected data on the 1987 West-German election and on the composition of the East-German *Volkskammer* before unification.[4] This allows us to determine whether the last election's incumbent runs for office again. Finally, we analyze data from the 1994 election as well as the last pre-unification election in West Germany in 1987 as robustness

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[4]For details on the data sources, see Data Appendix A.2.

checks. To obtain incumbent information for the 1987 election, we additionally collected data on the West German election of 1983. Data on these three elections was also provided by the Federal Returning Officer (Bundeswahlleiter, 2017a, 2016a, 2018).

Information on female labor force participation in 1997 is obtained from the INKAR database.[5] 1997 is the year closest to our election data for which we could obtain (female) employment indicators on the county level.

3.2 Sex ratios

With these data, we merged data on the sex ratios immediately after WWII, collected from the 1946 census which was conducted by the four occupation forces (U.S., U.K., France and the Soviet Union).[6] These data were digitalized from printed publications containing the final results of the census (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1949a). We also obtained data on the number of Catholics relative to Protestants from the census of 1946 (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1949b). We additionally collected data on pre-war sex ratios on the county level in order to compare pre-war and post-war sex ratios. Pre-war sex ratios stem from published results of the German census in May 1939 (Statistisches Reichsamt, 1941).

Figures 1a and 1b display the sex ratios of 1939 and 1946, respectively, for the counties situated within the present borders of Germany. The underlying map is based on the county borders of the German Reich before WWII. Hence, due to administrative and territorial

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[5]Indicators and maps on spatial and urban development in Germany (INKAR), 2017 edition, are provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) of the Federal Office for Building and Regional Planning (BBR). The database can be accessed on http://www.inkar.de.

[6]The state of Saarland (with five voting districts in 1990) is not included in our dataset since it was not part of the four occupation zones in 1946 and no comparable census data are available.

changes both in the 1930s and when compared to 1946, not all counties could be matched to the map. The non-matched counties are colored in grey.

Information on the numbers of men and women by year of birth is not available at the county level. However, to illustrate that the drafting pattern of the *Wehrmacht* had a strong impact on post-war sex ratios, we additionally collected data on sex ratios in 1939 and 1946 by birth cohort at state level from various printed publications. To assess the influence of expellees on the sex ratios, we collected data on expellees at the county as well as state level. At the state level (by year of birth), we were able to obtain this information for the states in the Soviet zone, North Rhine-Westphalia and Bavaria. Data on the number of expellees in a county are available for counties in the British, American and Soviet Zone, while they are not available for counties in the French zone.[7]

We end by illustrating the fact that in Germany, the shock to sex ratios brought about by WWII was much more long-lasting than in the U.S. where returning soldiers brought sex ratios back to normal values within a few years (see Acemoglu et al. (2004)). Figure 2 and Figure 3 show sex ratios by year of birth, state, and different points in time given by census years (1946, 1950 and 1964 for East Germany, and 1946, 1950, 1961 and 1970 for West Germany). The striking drop in sex ratios is evident even in the censuses of the 1960s and 1970s. Even though these figures display considerable variation across states, we should stress that we exploit more granular variation at the level of voting districts, controlling for state fixed effects and, as a robustness check, also stratifying by East and West Germany.

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[7]Detailed information on all historical data used in the analysis are given in the Data Appendix.

3.3 Mapping of county-level data into voting-district data

As these data are available at the level of the county, we constructed a mapping of the 1946 counties into the 1990 voting districts. For each voting district individually we searched for its geographical composition and linked it to one or more of the 1990 counties. Those were in turn matched to the 1946 counties.

Similarly, we recoded the 1997 INKAR employment numbers to the 1990 voting district level. Because there is no clear matching of 1990 voting districts to 1997 counties for Saxony-Anhalt, we drop its 13 voting districts for the female labor force participation variable.

3.4 Summary statistics

Summary statistics for all variables are reported in Table 1. It is clear that women were underrepresented in the 1990 German elections. Out of 2304 first vote candidates, 420 were women (18%) and the share of districts with a female winner was even lower at 12%. While the average number of candidates was a little over 7 per voting district, there were 72 districts with no female candidates. In only 2 districts more than half of the candidates were female. Many incumbent parliamentarians decide to run for office again. In three quarters of the districts, an incumbent is seeking re-election. Female labor force participation, measured as the percentage of women employed in the female population aged 15 to 65, is on average 43.3%. In East-Germany, the participation rate is 5.5 percentage points higher than in West-Germany (47.7% and 42.2% respectively).

Further details of the data construction are available, together with the data, from the authors.

4   Historical background and preliminary data analysis

In this section, we discuss the main premises on which our analysis rests. We present both historical facts and analyze supporting data. We describe the sources of variation in post-war sex ratios across counties and argue that it is not related to other determinants of later participation of females in the market for politicians. We first show that before the war, sex ratios did not display a distinct geographical pattern at the county level in Germany. We then describe how the onset of the war, and war itself, changed these sex ratios.

Figure 1a, above, shows sex ratios at the county level in May 1939, four months before the war started.[8] There was considerable geographic variation, but there were no distinct patterns – in particular, there are no differences between what would later become East and West Germany. The average sex ratio was about 0.95 with a standard deviation of 0.06. Men who were drafted for mandatory labor or military service at the time of the census were not included in the census. In May 1939, these men were predominantly from birth cohorts 1915–1920 (Reichsamt, 1940, pp. 313-314), as can be seen from Figure 4. The figure shows, separately for the later federal states, the sex ratios in May 1939 by year of birth.[9] Note that states are color-coded according to the four post-war occupation zones.[10] There is no systematic pattern across the four zones. Over the course of the war, 17.3 Million men were drafted into the German armed forces (Overmans, 2004, p. 226). In particular, the birth cohorts 1910–1927 were fully drafted (Kroener et al., 1988, p. 727).

In WWII, an estimated 5.3 million German soldiers died (Overmans, 2004, p. 232);

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[8]As discussed above, we could match most counties to the map, but not all; the missing ones are shown in grey.

[9]Unfortunately, numbers of men and women by year of birth are available only at the federal state level, so we cannot exploit this variation in our analysis below.

[10]States within the Soviet zone are colored red; states which were part of the American zone are yellow, French zone states are indicated green and the states of the British zone are blue; Berlin is purple.

around 2.7 million lost their lives at the Eastern front and about 340,000 at the Western front (Overmans, 2004, p. 265).[11] Figure 5, which is based on the Census of 1946, illustrates that the war deaths among the drafted cohorts resulted in dramatic declines, and also variation, in sex ratios after the war.

Given the different death rates at the Western and Eastern fronts, it is important to note that where soldiers lived before the war did not matter for where they fought during the war, and divisions were often re-grouped and deployed to different fronts over the course of the war (see e.g. Rass and Rohrkamp (2007); Overmans (2004)). Nevertheless, at the level of individual counties of origin, death rates varied[12] but there is no indication of any underlying systematic cause. In the census of 1946, which was carried out by the four allied powers, the average sex ratio at the county level had dropped to 0.79. For the group of counties where we could obtain a match from 1939 to 1946, the average decrease in the sex ratio was -0.16, with a standard deviation of 0.056.[13] A regression of 1946 sex ratios on 1939 sex ratios using all 705 matched counties yields a significant but small coefficient of 0.30 ($p < 0.00$) and relatively low explanatory power, $R^2 = 0.177$. Thus, less than a fifth of the cross-county variation in post-war sex ratios is explained by pre-war variation.

[11]104,000 German soldiers died in the Balkans, 151,000 in Italy, 459,000 in war imprisonment, 1.23 Million in the final battles, and 291,000 in other war zones. The number of deaths in war imprisonment entails only deaths registered as such. In these numbers, soldiers are assigned to the place from which the last sign of life was obtained (Overmans, 2004, p. 265).

[12]Data on war-related deaths at this geographic level is not readily available. The *Deutsche Dienststelle* (WASt) has information on 3.3 Million registered German casualties which can be accessed via individual names. They are, however, not sorted by regions. For a full coverage of military deaths at the county level, all registry offices in Germany would need to be contacted since casualties were registered at the last place of residence before soldiers were drafted.

[13]Altogether, there were 712 counties in the census of 1946 plus the 20 districts of Berlin (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1951, p. 8). Saarland is not contained, because it was not part of four occupational zones in 1946. There are 759 counties within the borders of Germany today in our data from 1939 (no data on the district level for Berlin is available for 1939 in the census results). We were able to get a mapping for 705 counties from 1939 and 1946.

The effect of the war on sex ratios was considerably worse in the Eastern part of Germany than in the West, as can be seen in Figure 1b, above. As there were no such differences before the war, this pattern is mainly a consequence of front lines at the end of war.[14] When the German army was pushed back in the last months of the war, fights were a lot fiercer on the Eastern front than on other fronts. Towards the end of the war, even old men and young boys from the local population were forced to fight on the Eastern front, with only very basic military training and without appropriate equipment and weapons. This led to very high numbers of casualties in the East (Steinberg, 1991, p. 144).

There was also a very strong fear of going into Soviet war imprisonment among German soldiers. During the final weeks of the war, German troops tried to surrender to the Americans rather than the Soviets forces (Henke, 1996). The U.S. Forces estimated that around 3 million German soldiers would surrender to them, while in fact more than 5 million did (Steinberg, 1991; Bischof and Ambrose, 1992, p. 5).

Another consequence of the war was the flow of expellees towards the remaining parts of Germany. In 1946, there were around 9.6 million Germans or ethnic Germans who had not lived in the four occupational zones before the war (Myers and Mauldin, 1952, p. 7). Due to the massive housing shortage after WWII and high inflow of expellees within a short period of time, expellees were primarily distributed according to housing and food availability right after the war (Myers and Mauldin, 1952, p. 41; Kift, 2008, p. 121). Figure 6 shows sex ratios for the native population compared to the sex ratios of the overall population at the state level, with and without expellees. Importantly, the sex ratios of the expellees did not have a sizeable impact on sex ratios at the state level.

Moving was heavily restricted for the civilian population in Germany right after the war.

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[14]See also discussion in Kesternich et al. (2018).

Free movement within and across zones was forbidden until 1947 through ordinances by the military government (Hottes and Teubert, 1977, p. 118). Freedom of movement was however not fully restored afterwards. Firstly, the so-called Law 18 (enacted by the Allied Control Council) allowed changing of residence only if housing space could be proved (Hottes and Teubert, 1977, p. 118). Secondly, German cities were heavily destroyed by aerial bombing. Hence, many cities and industrial regions imposed moving bans (*Zuzugssperren*) which were in place until the late 1940s (Krauss, 1985, pp. 149-150; Kift, 2008, p. 121). Freedom of movement was eventually fully restored in 1950 in West Germany.[15]

5   Results

Our main results concern the effect of post-war (1946) sex ratios on female participation in the market for politicians, as observed in the 1990 elections. We first present regressions that predict the share of female politicians in a voting district using historical sex ratios. We then present separate regressions for whether the elected and non-elected candidates were female. This allows us to differentiate between two channels through which sex ratios can affect female participation – voter demand and candidate supply.

5.1   The sex ratio effect on female participation

We first report the results of OLS regressions of the share of female candidates by voting district (in 1990) on the historical sex ratio (in 1946); see Table 2. Our baseline regression equation is specified as follows:

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[15]The legal text of Law 18 as well as exact dates of its repeal can be found in Verfassungen (2004).

$$\%\text{female}_i = \alpha + \beta \text{ sexratio}_i + X_i'\gamma + \text{state}_i'\delta + \varepsilon_i \qquad (1)$$

The dependent variable is the share of female nominees in voting district i. The parameter of interest is β. It captures the effect of the historical sex ratios on the supply of female candidates in the 1990 elections. Control variables at the voting district level are contained in the vector X and include a dummy variable for whether the incumbent politician runs again, the share of votes for left wing parties, and the share of Catholics.[16] In addition, we include a vector of state dummies, denoted by state$_i$. ε_i is the error term. Since we include state dummies in our analysis, the variation in the sex ratio we exploit stems from deviations from the mean sex ratio of a state.

The rationale for selecting the control variables follows arguments from the political science literature. Incumbents have a higher probability of getting re-elected (Hogan, 2004) and are less likely to be female (Matland and Studlar, 1996). As party officials who are skeptical of female participation might decide to nominate female candidates in those constituencies where they expect them to have the lowest probability of winning, we control for incumbency. Furthermore, gender roles in Catholic regions and conservative parties tend to lead to lower shares of female politicians; see Bieber (2013). We include the share of votes for the three left-wing parties as an additional control variable. By the 1990 elections, voluntary party quotas had been introduced by the left-wing parties SPD and PDS and the Green Party. These quotas were not enforceable and none of the parties reached their quota in the first vote. However, the existence of such quota could lead to a correlation of the share of left

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[16]We also ran the regressions including the share of expellees as an additional control variable. We do not have information on the number of expellees for the French occupation zone so including this variable reduces our number of observations by 61 voting districts. Since an F-test rejects the hypothesis that adding the share of expellees significantly changes the results, we leave this variable out.

wing votes with both the share of female candidates and the sex ratio.

Results for the regressions that include all constituencies are presented in Panel 2a. The first column shows the baseline specification, a regression of the share of female nominees on the 1946 sex ratio. Control variables are added sequentially in columns 2 to 4. The results are robust to the addition of control variables; in fact they strengthen the sex ratio effect. When we consider the specification that includes all control variables, the effect of the sex ratio on the share of female nominees is significant at the 5% level.[17] A decrease of the sex ratio by one standard deviation (i.e., by 0.047) is associated with an increase in the share of women nominated by approximately 3.9 percentage points. To illustrate, a decrease in the sex ratio from 0.82 to 0.72, which are the values of North-Rhine Westphalia and Brandenburg, respectively, is associated with an increase in the share of female nominees by 8.3 percentage points. As female representation in the Bundestag after the 1990 elections was around 20 percent and the share of female nominees for the first vote was around 18 percent, the effect of historic sex ratio imbalances is of relevant size.[18]

Panel 2b reports results for specifications that drop the districts located in the State of Bavaria. Bavaria has a special role in the German political system. First, it has a very high share of Catholics, and second, the conservative party (CSU) has had a commanding share of the vote over much of the post-war period. Leaving out the 45 Bavarian constituencies from the sample increases the sex ratio effect. For each 0.01 decrease in 1946 sex ratio, the share of female nominees now increases by 1 percentage point.

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[17]We also ran an OLS regression that does not include the share of left votes as a control variable. We find that our results are robust to leaving out this variable. The sex ratio effect remains statistically significant and of similar magnitude as in the base specification reported here.

[18]Separate regressions for East and West Germany suggest that the sex ratio effect is larger in West Germany (see Table 10). The estimated West German sex ratio effect is -0.95 and we find an insignificant sex ratio effect in East Germany. However, since there are only 80 voting districts in East Germany, its regression has a small sample size.

5.2 Candidate supply vs. voter demand effects

We now investigate whether female candidates were more likely to win in districts that had lower sex ratios. Figure 7 shows 1946 sex ratio densities, separately for voting districts with female and male winners in 1990. Sex ratios are substantially smaller than 1 for each constituency, illustrating the devastating effects of WWII on the German male population. One can see in the graph that constituencies where sex ratios were lower, i.e., where there were relatively more women than men in 1946, a female candidate was more likely to receive the majority of votes. This is especially the case when we exclude the 45 Bavarian constituencies. The null hypothesis of identical distributions, however, cannot be rejected (using non-parametric Kolmogorov-Smirnov tests).

To test whether elected candidates were more likely to be female in constituencies with lower historical sex ratios, we slightly modify regression equation (1) and estimate a probit regression,

$$\text{female}_j = \Phi(\alpha + \beta \, \text{sexratio}_i + \lambda \, \text{age}_j + X_i'\gamma + \text{state}_i'\delta + \varepsilon_j). \tag{2}$$

In this specification, the outcome is a binary variable that equals 1 if candidate j is female. Note that this analysis is conducted at the candidate rather than the voting district level. We can therefore add the candidate's age as an additional control variable. The two voting district control variables (vote share left and catholics ratio) remain the same as in regression equation (1). However, the "incumbent opposer" dummy differs slightly from the incumbency dummy. While the incumbency dummy is defined at the voting district level and indicates the presence of an incumbent politician in the constituency, the incumbent opposer dummy is defined at the candidate level. It indicates whether one of the other candidates in

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the constituency is an incumbent politician.[19, 20]

Table 3 presents the results of probit regressions for two subsets of the sample, all candidates and candidates elected by first vote. Columns 1 and 2 show the results for regressions using data on all nominees. We find that the sex ratio effect is negative and significant at the 5% level for the whole sample and significant at the 1% level for candidates outside of Bavaria. Average marginal effects of the sex ratio are displayed in Panel 3b and are in line with the results in section 5.1. A one percentage point increase in the 1946 ratio of men relative to women is associated with a 0.833 percentage point decrease in the likelihood that a nominee is female, a sex ratio effect similar in interpretation and size as the results from Table 2.

Note that we do not find a significant effect of the sex ratio on the likelihood of a woman winning the election in first vote, irrespective of whether Bavarian constituencies are included in the estimation (columns 3 and 4).[21] This suggests that while women were more likely to run for a seat in parliament in constituencies with lower historical sex ratios, voters were not more inclined to vote for them. As discussed above, the fact that there are few female candidates can be due to women's preferences, voters' preferences, or the preferences of parties leaders, see e.g. Casas-Arce and Saiz (2015). These three explanations are difficult

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[19]To illustrate the difference, suppose that candidate A in voting district B is the (only) incumbent. The incumbency dummy will be equal to 1 for voting district B since there is an incumbent candidate. The incumbent opposer dummy variable, on the other hand, is equal to 0 for candidate A since none of the other candidates in voting district B are incumbents.

[20]A linear probability model with the same outcome variable and regressors also predicts a negative relationship between sex ratios and the probability that a nominated candidate is female. Similar to the results from equation (1), a 0.01 increase in the sex ratio increases the probability of a female nomination by 0.84 percentage points ($p < 0.05$). The linear probability model finds no significant relationship between the district-level sex ratio and the gender of an elected candidate.

[21]There are 72 constituencies with only male nominees. When we re-run the probit regressions for the last two columns of Table 3 without those 72 constituencies where women cannot be elected, results remain far from being significant.

to disentangle, but our results provide some indication that party leaders' preferences are not decisive. As mentioned above, we would expect more women to be elected if party leaders were holding back women at the expense of votes before. Since this is not the case, we argue that party leaders' preferences are unlikely to be the driving factor behind our findings.

6 Channels for long-lasting sex-ratio effects

There are two main channels through which lower sex ratios after WWII could have led to an increase in the share of female politicians many years later: One is the increase in female employment in regions where many men were missing after WWII and the other an increase in the share of female voters in these regions.

We first discuss the effects of WWII on female labor force participation. During the war, the number of women who worked had increased only slightly – from 14.626 million in May 1939 to 14.897 million in September 1944 (i.e., less than 2%) (Kaldor, 1945). The fact that female employment increased so little during the war can be explained, in part, by the Nazi government's heavy reliance on forced labor and prisoners of war (Kaldor, 1945). This changed of course after the war when the Allied forces freed the surviving forced laborers. A second reason is that under the Nazi ideology, children and housework were seen as the essential activities of women (Moeller, 1993).

At the end of the war, there was a severe labor shortage, with so many men still being away (Niehuss, 2001, p. 77). Whether a woman looked for work in the official labor market in the immediate post-war period depended to a large extent on the individual situation and the availability of other options to secure survival of the family. Many women worked in the informal labor market. With wages frozen at the pre-war level of 1939, a flourishing black

market emerged (Moeller, 1993, pp. 22-23; Niehuss, 2001, p. 63). One reason for working in the formal sector was the desire to obtain a better ranking in the food rationing system, that is, to get out of category V which comprised housewives, pensioners, etc. and was called the "starvation or ascension category" (Moeller, 1993, p. 22). For divorced women (who only received alimony under certain conditions) or widows, employment was very important as well (Niehuss, 1993, p. 323; Niehuss, 2001, pp. 63-64).

Overall, around 500,000 more women were in the labor force in October 1946 than in 1939 (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1953, p. 19).[22] At the state level, a higher surplus of women in the population went along with a higher female employment rate in the census of 1946 (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1953, p. 16).

Many women had to take over the position of the head of household. As the food situation worsened drastically towards the end of the war and remained at an extremely poor level in the immediate post-war years, women had to bear the burden of ensuring the survival of their families. In the 1950 Census, 1.7 million of the overall 15.4 million households in West Germany consisted of women who lived alone and in 2.1 million households women were the head of household (Moeller, 1993, p. 32).

The phenomenon of women taking the economic responsibility for themselves and their families was called "forced emancipation" (Moeller, 1993, pp. 29 and 32). Society in Western Germany accepted this phenomenon, but only as it was seen as a response to the extraordinary hardships caused by the highly unbalanced sex ratios (the German term coined at the

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[22]This increase of 500,000 women in the work force compared to 1939 results from: (+) 65,205 workers, (+) 689,821 civil servants and employees, (-) 661,883 family workers, (+) 405,446 self-employed. This strong increase in self-employed women stems from the fact that women had to take over the family business temporarily or permanently if their husband was still in war imprisonment or had died in war (Ausschuss der deutschen Statistiker für die Volks– und Berufszählung 1946, 1953, p. 28).

time was *Frauenüberschuss*, or "excess women") (Moeller, 1993, p. 28). In general, however, the West German society remained quite conservative in their views on female roles (Moeller, 1993). At the other extreme, in Eastern Germany, the government tried to mobilize the female labor force as much as possible. In 1970, around 49% of women aged 15 to 60 were working in West Germany. In East Germany, around 69% of women in the same age range were economically active in 1971 (Minnesota Population Center, 2017).[23]

We illustrate the relevance of this channel by regressing female labor force participation (LFP) in 1997, the year closest to the election data for which we have county-level information on female employment indicators, on post-war sex ratios. Information on female LFP in earlier years is only available at the state-level. Female LFP is measured as the share of employed women in the female population aged 15 to 65. The regression results in Table 4 show a negative and significant correlation between post-war sex ratios and female LFP and suggest that a 1 percentage point increase in 1946 sex ratios led to a decrease of 0.538 number of employed women per 100 women aged 15 to 65. The sex ratio effect is weaker but still significant at the 1% level after controlling for East-West or state differences.

The effect of unbalanced sex ratios on female nominees is larger than that on female LFP, in both absolute and relative terms. A one percentage point decrease of the sex ratio corresponds to a 0.609 percentage point increase in female nominees and a 0.411 percentage point increase in female LFP in a specification where we only control for state effects. Since female labor force participation has a higher base rate, this translates into a relative increase of 3.36% in the share of female nominees and a 0.95% increase in female labor force participation (relative to the mean).

Parties in regions with low sex ratios might have adopted more female-friendly policies,

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[23]The underlying census data is provided by the Federal Statistical Office, Germany.

and thus would have been more open to female politicians, also for a second reason: Low sex ratios translate into higher shares of female voters. A quote by Elisabeth Selbert, one of the "mothers of the German constitution", illustrates that political parties were well aware of this fact: A "woman, who during the war years stood atop of the rubble and replaced men at the workplace, [and] has a moral right to be valued like a man." And this especially given the highly unbalanced sex ratios which "left 170 women voters for every 100 men" (Moeller, 1993, p. 51).

We believe that both these channels might have contributed to the sex-ratio effects we reported in the previous section. Distinguishing between these channels is, unfortunately, difficult, as we are not aware of any data that would allow us the assess the relevance of the second channel.

7 Robustness checks

One concern with our analysis so far is that the 1990 elections were special as they were conducted just after unification. As a robustness check, we therefore re-estimate the regressions reported above with the dependent variables replaced with the outcomes of the 1994 election. The results of OLS regressions of the share of female nominees in a constituency in the 1994 Bundestag elections on 1946 sex ratios are presented in Table 5 (all states) and Table 6 (excluding Bavaria). Table 7 reports the result of Probit regressions for the probability that a candidate is female in the 1994 Bundestag elections on 1946 sex ratio.[24] The effects of the post-war sex ratios on the 1994 election outcomes in all these robustness regressions

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[24]In these probit regressions, three states are dropped because they had only male politicians; this reduces the sample size by 39 voting districts.

are quantitatively very similar to those we obtained for the 1990 elections.

In the main part of the analysis, we did not use data on the elections before 1990 because the political system was not comparable in East and West Germany whereas from 1990 on, data from East and West can be combined. This is important since our sample is relatively small, and also because we have much more variation in the sex ratios when we also include East Germany. Before the public discussion about the low shares of female politicians and the introduction of quotas picked up in the 1980s, base rates were also small. The voting system in the first election after WWII, held in 1949, was not comparable to the current one. In 1953, only 9.7 percent of all candidates were female and only 3.7 percent of constituencies were won by women (Bundeswahlleiter, 2017b). The share of constituencies won by women stayed quite low throughout the 60s and 70s. It exceeded the 5 percent level not until 1987 when the share was 7.3 percent (Bundeswahlleiter, 2017b). Changes in female voting behavior and increased participation in political activities were associated with the introduction of party quotas in the 1980s in the Green Party as well as SPD (Kolinsky, 1991). Kolinsky (1991) summarizes the spirit of the time in the following way:

"The introduction of women's quotas has been preceded by a varied history of controversy and debate about the role of women in the respective political parties. In a broader context, however, quotas were designed to meet the expectations about equal opportunities among West German women of the post-war generations, that equal educational and professional qualifications should be matched by equal chances to participate in society and politics."(Kolinsky, 1991, p. 56)

As a further robustness check, we obtained data for the 1987 elections (and also on incumbents elected in 1983). The estimation of a sex ratio effect in this election corroborates our expectations as shown in Table 8. The sex ratio effect shows the same negative sign as

in the 1990 elections and is of smaller magnitude. However, we obtain larger standard errors and the effect is not significantly different from zero. This is at least partially a consequence of the decrease in sample size by 80 voting districts. Hence, a tentative explanation is that the public debate about female representation in political offices of the 1980s combined with the longer-run social norms effects had an impact on the outcome variable we consider that is large enough to be measured. Thus, there might well have been similar effects even before 1990, but these were likely smaller and less precisely estimated because of the smaller sample.

To shed some light on the effect of quotas, we split up the candidates between right (no quotas) and left parties (quotas) (see Table 9). We find that the sex ratio effect for nominees is significant for the SPD/PDS/Green party while there is no significant effect for CDU/CSU/FDP candidates.

As sex ratios were particularly low in East Germany, there is a concern that our findings might be driven by East Germany alone. This effect might be exacerbated by the fact that the share of female politicians was higher in East Germany where policies that encouraged female labor market participation had been implemented. We address this concern by presenting separate regressions for East and West Germany in Table 10. The sex ratio effect on the share of female nominees in the 1990 election is negative and statistically significant also when only data from West Germany are used. It is also negative but statistically insignificant for East Germany where the sample is rather small. This being said, we would have expected a smaller effect for East Germany because of gender equality policies that reduced the scope for the channel through which low sex ratios might have encouraged labor-market participation.

As a further robustness check, we investigate whether those cohorts that have been affected directly drive our results: In the 1990 elections, there were still some politicians who experienced the war-induced sex ratio imbalances themselves. The last fully-drafted

cohort was 1927, so the post-WWII sex ratio imbalances would have had a direct effect on the gender composition of politicians over the age of 63. While the share of female politicians is slightly higher for those cohorts than the average in the 1990 election (21% for politicians born 1927 or before and 18% for politicians born 1928 or later), this difference is not statistically significant and it also does not drive the sex ratio effect. When we re-run the probit regression from column 1 of Table 3a for the politicians born in 1928 or later (i.e. excluding those directly affected), we obtain a sex ratio effect of the same order of magnitude and level of significance (see Table 11).

Relatedly, we analyze the impact of the sex ratio on the age composition of the electorate. Regions with a lower share of elderly population at the time of the 1990 elections might have been those with many males dead or missing during the war. If such a link between the historic sex ratio and the age composition of the electorate existed, this would be an additional channel for the sex ratio's impact on the share of female nominees since a younger population might be more prone to accepting female politicians. To check this possibility, we regress the mean age of the population in 1995, the year closest to the election for which we have this information available on the district level, on the 1946 sex ratio. Table 12 shows that the effect of the sex ratio on the age composition of the electorate is insignificant.[25]

8   Conclusions

We exploit random variation in post-WWII sex ratios in Germany to analyze the long-term effects of gender imbalances on female labor force participation. The particular outcome

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[25]In a similar fashion, we checked if constituency size is affected by the 1946 sex ratio and we do not find a significant correlation between these two variables either.

we study is the representation of women in the German market for politicians. We find significant effects of the 1946 sex ratio on the share of female nominees in the 1990 federal election. This result provides evidence for the existence of a mechanism linking past gender imbalances to future participation of women in professional job markets. A plausible mechanism is based on the observation that due to a shortage of male workers after the war, women had to take up jobs that were previously ascribed to men, which in turn might have changed perceptions about the careers that are open to, and should be pursued by, women. Further, the data indicate that voter demand effects were not as strong as candidate supply effects.

Taken together, we interpret our results on female labor market participation, the share of female candidates, and the share of females elected as follows. The effect of historical sex ratios on female labor market participation cannot be driven by those directly affected since they will long have retired by 1997. Thus, we argue that the effect is likely to be driven by a change in norms about female labor market participation. We see that the increase in female participation in the market for politicians is more pronounced than the change in female labor market participation overall. Thus, female politicians profit more than proportionally from changes in norms about female labor market participation. However, while women are more likely to run for office, voters are not significantly more likely to vote for these female candidates.

Exposure to female leaders can change biased perceptions about women's ability as politicians (Beaman et al., 2009). If voters are risk-averse and they were never exposed to females in leading positions, they may refrain from voting for female politicians (Aigner and Cain, 1977). More generally, female labor force participation is in part determined by cultural beliefs about the role of women. These beliefs can be permanently altered through imbalances

in sex ratios and the resulting shift in female labor supply (Fernández et al., 2004; Teso, Forthcoming).

While we find the evidence for the existence of a link between past gender imbalances and current participation of women in a highly competitive labor market compelling, the limited data on intermediate outcomes do not allow us to investigate the specific causal channels that created this association. We believe that this an important topic for future research on gender imbalances. Nevertheless, our findings highlight the possibility that role models might have an encouraging effect on female participation in professional labor markets even today.

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Figure 1: Pre- and post-war county level sex ratio variation in Germany
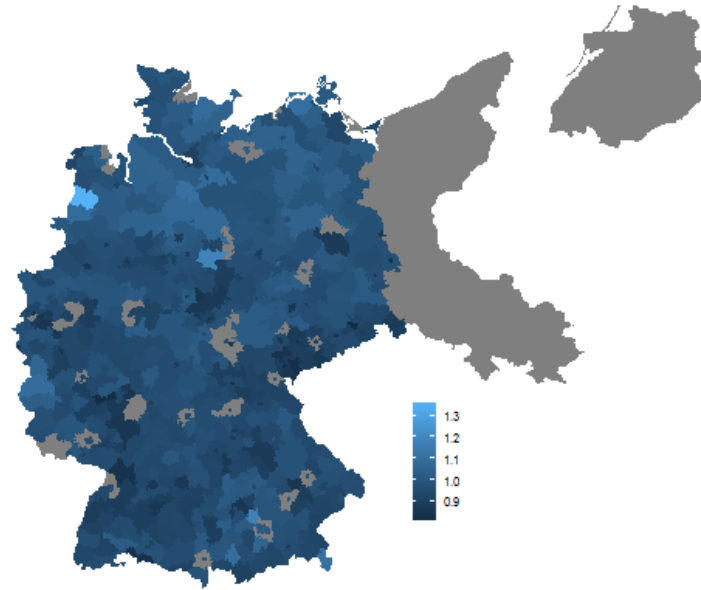
(a) 1939
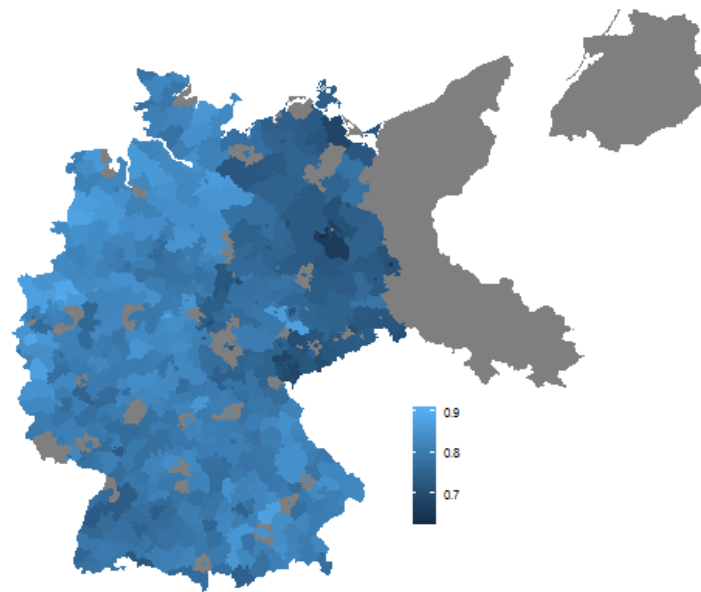
(b) 1946

Figure 2: Sex ratios in 1946, 1950 and 1964 by state
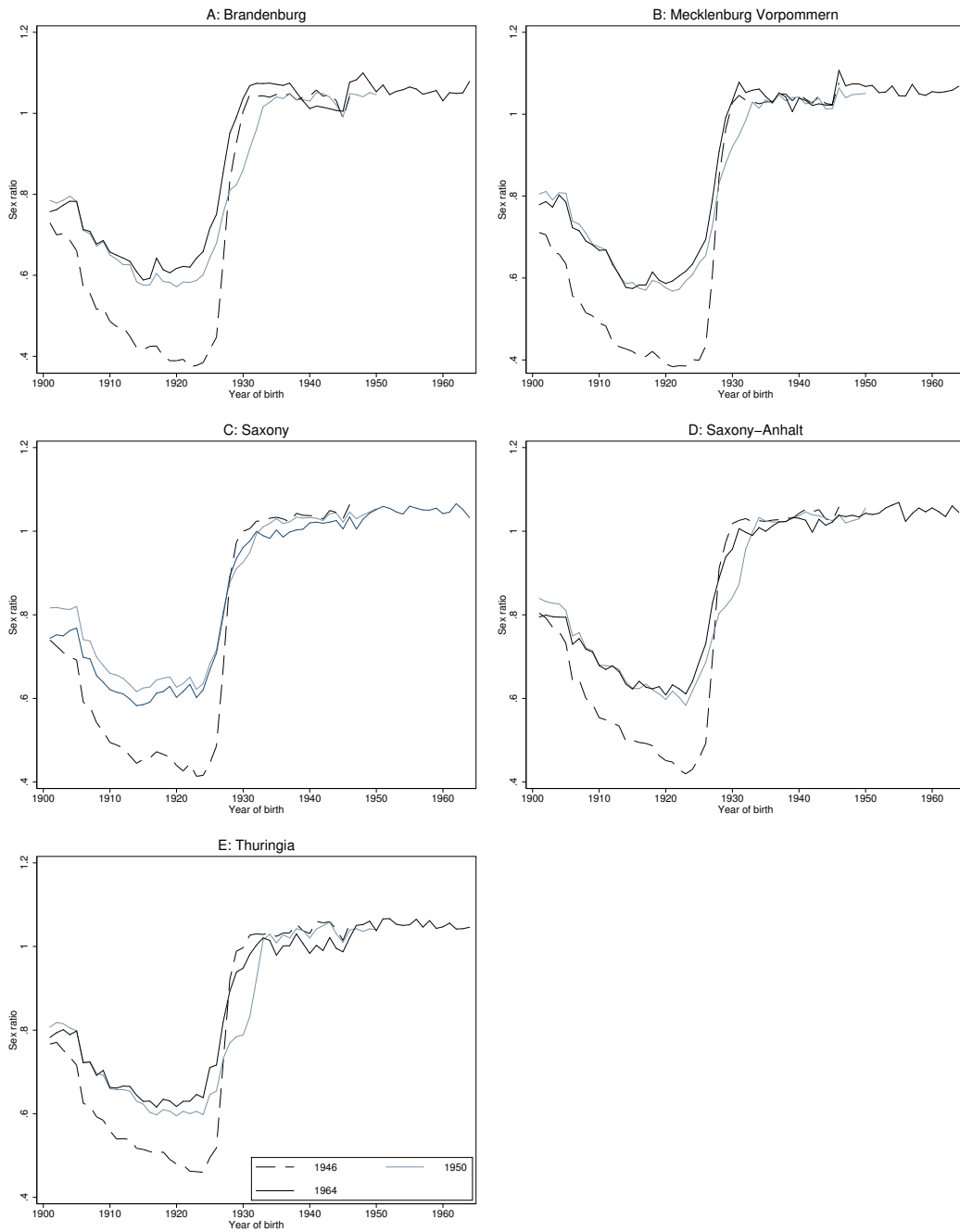
Figure 3: Sex ratios in 1946, 1950, 1961 and 1970 by state
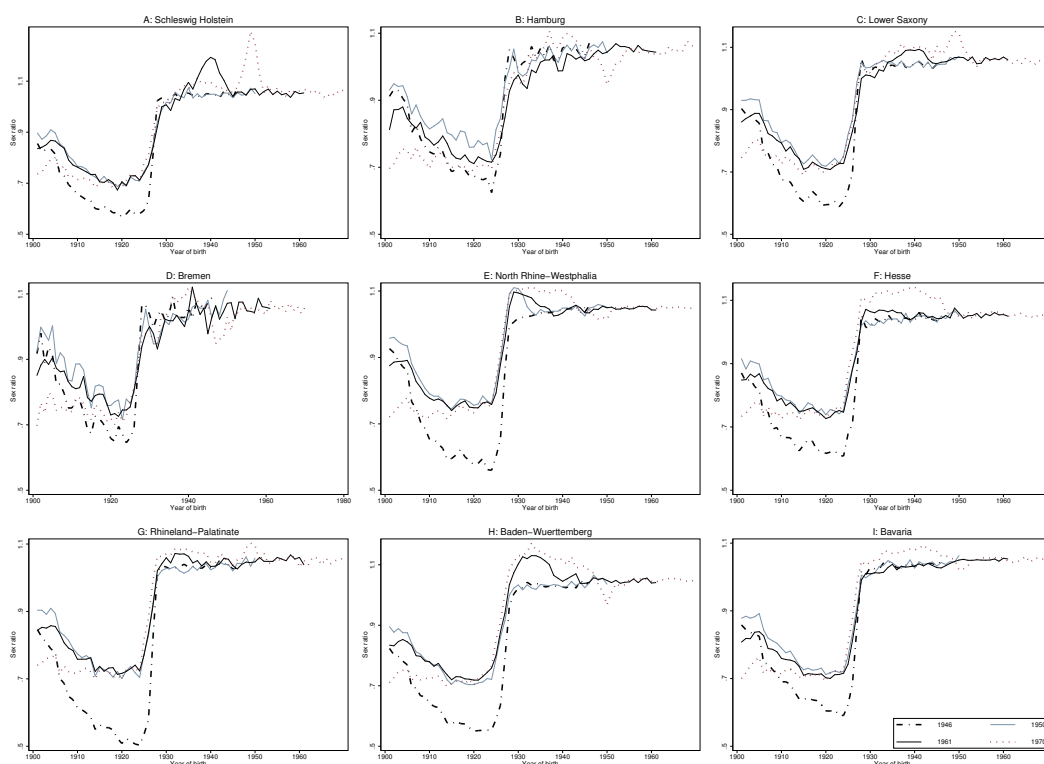
Figure 4: Sex ratios in 1939 by post-unification state and year of birth

Sex ratios by year of birth in 1939
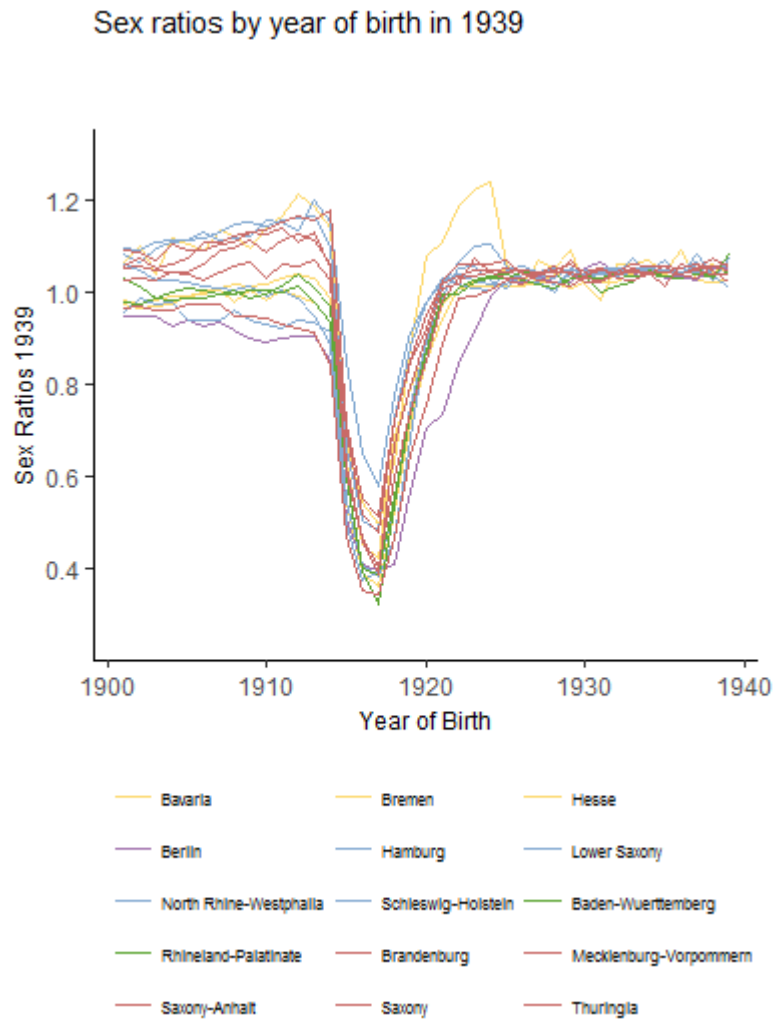
Figure 5: Sex ratios in 1946 by post-unification state and year of birth

Sex ratios by year of birth in 1946
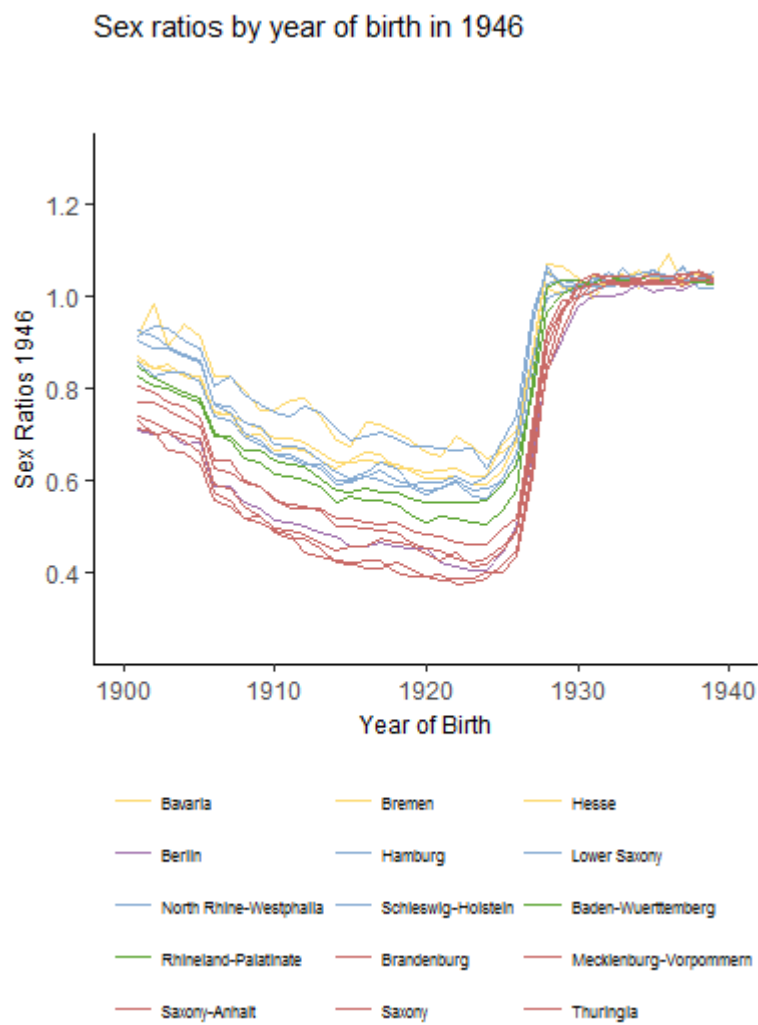
Figure 6: Sex ratios in 1946 of overall population compared to sex ratios of native population by post-unification state and year
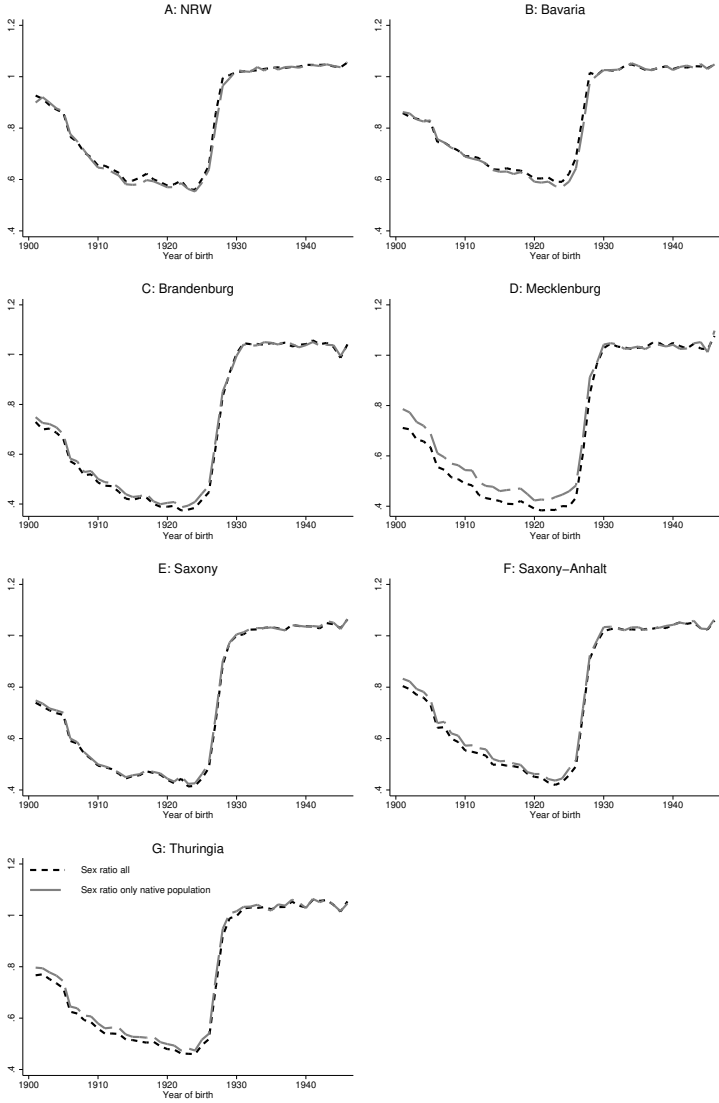
Figure 7: Sex ratio densities for constituencies with female/male winners
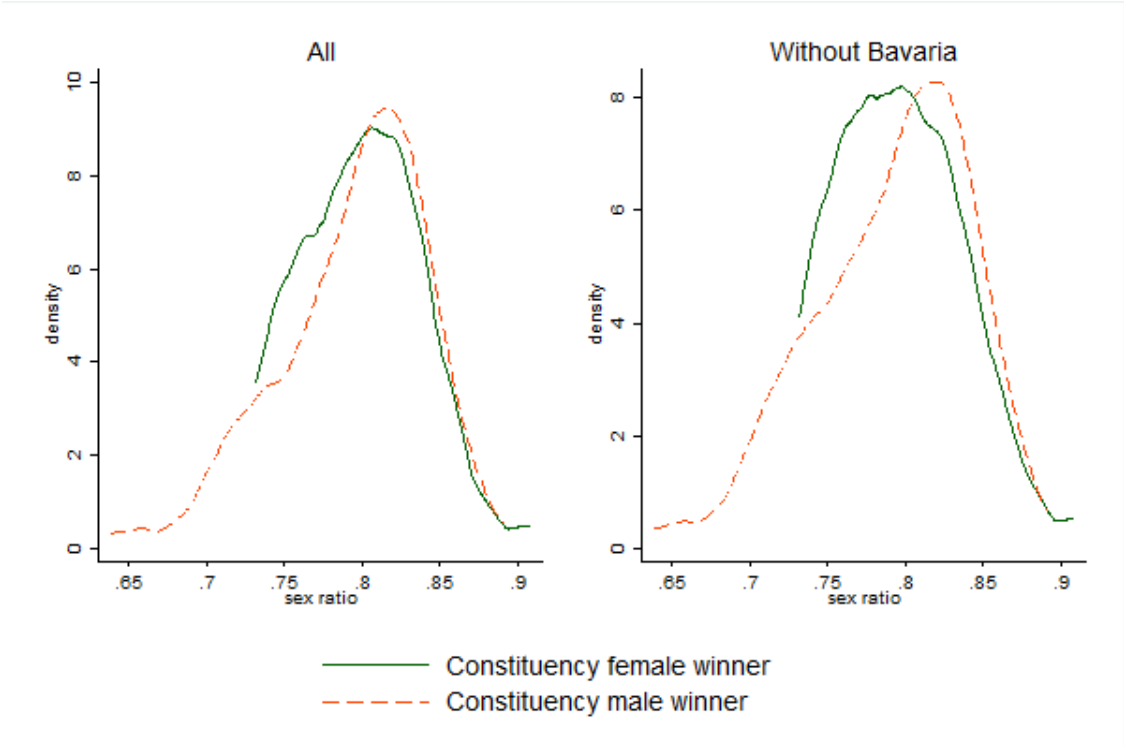
Variable		Obs	Mean	Std. Dev.	Min	Max
District level						
Share women	% female nominees	323	.181	.138	0	.667
Sex ratio	Men/Women	323	.795	.047	.638	.909
Catholics ratio	Catholics/Population	323	.38	.292	.045	.98
Vote share left	% votes SPD/PDS/Grüne/B90	323	.43	.092	.235	.659
Incumbency	Dummy, 1 = incumbent present	323	.743	.438	0	1
Female LFP	(women employed/women 15-65)*100	310	43.299	4.249	32.1	54.6
Candidate level						
Female	Dummy, 1 = female	2304	.182	.386	0	1
Age		2304	45.227	11.999	18	86
FV elected	Dummy, 1 = elected in first vote	2304	.14	.347	0	1

Table 1: Descriptive statistics: district and candidate level

	(1)	(2)	(3)	(4)
	% female	% female	% female	% female
Sex ratio	-0.609*	-0.609*	-0.741**	-0.831**
	(0.329)	(0.329)	(0.356)	(0.360)
Incumbency		-0.001	-0.000	0.001
		(0.019)	(0.019)	(0.019)
Vote share left			0.174	0.238*
			(0.124)	(0.133)
Catholics ratio				0.051
				(0.054)
Constant	0.666**	0.666**	0.705***	0.729***
	(0.257)	(0.257)	(0.266)	(0.266)
Observations	323	323	323	323
R-squared	0.036	0.036	0.043	0.046
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(a) Including Bavaria

	(1)	(2)	(3)	(4)
	% female	% female	% female	% female
Sex ratio	-0.864**	-0.864**	-0.942**	-1.006***
	(0.343)	(0.345)	(0.368)	(0.373)
Incumbency		-0.005	-0.005	-0.005
		(0.020)	(0.020)	(0.020)
Vote share left			0.101	0.159
			(0.119)	(0.133)
Catholics ratio				0.052
				(0.057)
Constant	0.867***	0.870***	0.894***	0.899***
	(0.268)	(0.269)	(0.276)	(0.277)
Observations	278	278	278	278
R-squared	0.045	0.045	0.047	0.051
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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(b) Excluding Bavaria

Table 2: OLS regression of the share of female nominees in a constituency on 1946 sex ratios

	Nominated		Elected	
	(1)	(2)	(3)	(4)
	Incl Bavaria	Excl. Bavaria	Incl Bavaria	Excl. Bavaria
Sex ratio	-3.176**	-4.006***	-0.262	-1.117
	(1.278)	(1.310)	(4.761)	(4.930)
Age	0.001	-0.001	-0.037***	-0.039***
	(0.002)	(0.003)	(0.013)	(0.014)
Incumbent opposer	0.121*	0.088	0.421	-0.022
	(0.066)	(0.070)	(0.355)	(0.361)
Vote share left	0.894*	0.556	0.968	-0.089
	(0.467)	(0.473)	(1.647)	(1.601)
Catholics ratio	0.197	0.191	-0.442	-0.505
	(0.198)	(0.209)	(0.605)	(0.640)
Constant	1.097	1.966*	0.735	1.952
	(0.956)	(0.990)	(3.427)	(3.615)
Observations	2,304	1,960	323	278
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(a) Coefficient estimates

	Nominated		Elected	
	(1)	(2)	(3)	(4)
	Incl Bavaria	Excl. Bavaria	Incl Bavaria	Excl. Bavaria
Sex ratio	-0.833**	-1.069***	-0.048	-0.205
	(0.334)	(0.346)	(0.868)	(0.903)
Observations	2,304	1,960	323	278

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(b) Average marginal effects

Table 3: Probit regression of the probability that candidate is female on 1946 sex ratio. Columns 1-2: candidate nominated for first vote, errors are clustered at the voting district level. Columns 3-4: candidate elected by first vote.

	(1) Female LFP	(2) Female LFP	(3) Female LFP
Sex ratio	-0.538***	-0.376***	-0.411***
	(0.0512)	(0.0777)	(0.0689)
East		2.385***	
		(0.674)	
Constant	86.15***	72.70***	77.05***
	(4.072)	(6.282)	(5.435)
Observations	310	310	287
R-squared	0.353	0.374	0.664
State dummies	NO	NO	YES

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4: OLS regression of 1946 sex ratio effect on 1997 female labor force participation.

	(1)	(2)	(3)	(4)
	% female	% female	% female	% female
Sex ratio	-0.648*	-0.640*	-0.720*	-0.697*
	(0.383)	(0.386)	(0.404)	(0.422)
Incumbency		0.057***	0.056**	0.056**
		(0.022)	(0.022)	(0.022)
Vote share left			0.128	0.110
			(0.135)	(0.150)
Catholics ratio				-0.014
				(0.054)
Constant	0.747**	0.695**	0.705**	0.701**
	(0.304)	(0.305)	(0.308)	(0.311)
Observations	323	323	323	323
R-squared	0.030	0.050	0.053	0.053
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: OLS regression of the share of female nominees in a constituency in the 1994 Bundestag elections on 1946 sex ratios. Sample includes Bavarian constituencies.

	(1) % female	(2) % female	(3) % female	(4) % female
Sex ratio	-0.747*	-0.737*	-0.793*	-0.786*
	(0.404)	(0.408)	(0.428)	(0.442)
Incumbency		0.050**	0.049**	0.049**
		(0.023)	(0.023)	(0.023)
Vote share left			0.084	0.077
			(0.144)	(0.160)
Catholics ratio				-0.006
				(0.056)
Constant	0.825**	0.777**	0.787**	0.787**
	(0.321)	(0.322)	(0.326)	(0.326)
Observations	278	278	278	278
R-squared	0.035	0.052	0.053	0.053
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: OLS regression of the share of female nominees in a constituency in the 1994 Bundestag elections on 1946 sex ratios. Sample excludes Bavarian constituencies.

	Nominated		Elected	
	(1)	(2)	(3)	(4)
	Incl Bavaria	Excl. Bavaria	Incl Bavaria	Excl. Bavaria
Sex ratio	-2.483*	-2.823**	-3.790	-5.823
	(1.308)	(1.352)	(4.621)	(4.879)
Age	0.001	0.000	-0.025**	-0.028**
	(0.003)	(0.003)	(0.012)	(0.013)
Incumbent opposer	0.319***	0.282***	-0.234	-0.103
	(0.066)	(0.070)	(0.505)	(0.531)
Vote share left	0.316	0.183	3.179*	2.722
	(0.464)	(0.492)	(1.732)	(1.722)
Catholics ratio	-0.037	0.002	-0.544	-0.660
	(0.168)	(0.174)	(0.583)	(0.636)
Constant	0.852	1.222	1.921	3.873
	(0.981)	(1.019)	(3.343)	(3.582)
Observations	2,265	1,934	284	239
State dummies	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(a) Coefficient estimates

	Nominated		Elected	
	(1)	(2)	(3)	(4)
	Incl Bavaria	Excl. Bavaria	Incl Bavaria	Excl. Bavaria
Sex ratio	-0.751*	-0.860**	-0.814	-1.287
	(0.395)	(0.411)	(0.989)	(1.071)
Observations	2,265	1,934	284	239

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(b) Average marginal effects

Table 7: Probit regression of the probability that candidate is female in the 1994 Bundestag elections on 1946 sex ratio. Columns 1-2: candidate nominated for first vote, errors are clustered at the voting district level. Columns 3-4: candidate elected by first vote.

| | (1) | (2) |
	% female	% female
Sex ratio	-0.194	-0.443
	(0.523)	(0.568)
Incumbency	-0.008	-0.014
	(0.029)	(0.034)
Vote share left	0.150	0.235
	(0.199)	(0.226)
Catholics ratio	-0.042	0.001
	(0.067)	(0.075)
Constant	0.334	0.481
	(0.377)	(0.410)
Observations	243	198
R-squared	0.020	0.015
state dummies	YES	YES
incl. Bavaria	YES	NO

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: OLS regression of the share of female nominees in a constituency in the 1987 Bundestag elections on 1946 sex ratios.

	(1)	(2)
	CDU/CSU/FDP	SPD/PDS/Grüne
Sex ratio	0.101	-4.495*
	(3.015)	(2.517)
Age	-0.020***	-0.007
	(0.007)	(0.006)
Incumbent opposer	0.276**	0.108
	(0.131)	(0.118)
Vote share left	0.085	0.275
	(1.021)	(0.848)
Catholics ratio	0.087	0.370
	(0.383)	(0.331)
Constant	-0.154	2.962
	(2.253)	(1.874)
Observations	646	700
state dummies	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Probit regressions of the probability that candidate, affiliated with a right (CDU/CSU/FDP) or left (SPD/PDS/Grüne) wing party, is female on 1946 sex ratio.

| | (1) | (2) |
	West	East
Sex ratio	-0.950**	-0.650
	(0.429)	(0.745)
Incumbency	0.00324	-0.00541
	(0.0224)	(0.0344)
Vote share left	0.306*	0.132
	(0.184)	(0.191)
Catholics ratio	0.0672	-0.206
	(0.0571)	(0.277)
Constant	0.788***	0.613
	(0.303)	(0.512)
Observations	243	80
R-squared	0.048	0.053
State dummies	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: OLS regression of the share of female nominees in a constituency on 1946 sex ratios: West- and East Germany.

	Female
Sex ratio	-3.570***
	(1.351)
Age	-0.002
	(0.003)
Incumbent opposer	0.122*
	(0.071)
Vote share left	0.894*
	(0.495)
Catholics ratio	0.251
	(0.207)
Constant	1.469
	(1.004)
Observations	2,121
state dummies	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Probit regression of the probability that elected candidate is female on 1946 sex ratio. Sample is restricted to candidates born in 1928 or after.

	Mean age pop.
Sex ratio	1.853
	(1.873)
Constant	38.174***
	(1.501)
Observations	302
R-squared	0.003

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: OLS regression of the mean population age in 1995 on 1946 sex ratio.

A Data appendix

A.1 Census data

(a) Census data 1939 (county level)

Statistisches Reichsamt (1941). Volkszählung. Die Bevölkerung des Deutschen Reichs nach den Ergebnissen der Volkszählung 1939. Heft 2: Geschlecht, Alter und Familienstand der Bevölkerung des Deutschen Reichs. Tabellenteil, Statistik des deutschen Reiches, volume 552, issue 2.

(b) Census data 1946 (county level)

Ausschuss der deutschen Statistiker für die Volks- und Berufszählung 1946 (1949a): Volks- und Berufszählung vom 29. Oktober 1946 in den vier Besatzungszonen und Gross-Berlin: Deutsches Gemeindeverzeichnis. Berlin and Munich: Duncker and Humblot.

Ausschuss der deutschen Statistiker für die Volks- und Berufszählung 1946 (1949b): Volks- und Berufszählung vom 29. Oktober 1946 in den vier Besatzungszonen und Gross-Berlin: Volkszählung Tabellenteil. Berlin and Munich: Duncker and Humblot.

Statistisches Amt der Vereinigten Wirtschaftsgebietes (1950). Die Flüchtlinge in Deutschland. Ergebnisse der Sonderauszählung aus der Volks- und Berufszählung vom 29. Oktober 1946, Statistische Berichte, Nr. VIII/0/4, Wiesbaden.

Statistisches Zentralamt für die sowjetische Besatzungszone (1949). Volks - und Berufszählung vom 29. Oktober 1946 in der sowjetischen Besatzungszone. Band III: Landes- und Kreisstatistik, issues 1-5.

(c) References for graphs

(I) Figure 2 (Sex ratios by state - I)

Ausschuss der Deutschen Statistiker für die Volks- und Berufszählung 1946 (1949b). Volks- und Berufszählung vom 29. Oktober 1946 in den vier Besatzungszonen und

Gross-Berlin. Volkszählung: Tabellenteil. Berlin and Munich: Duncker & Humblot.

Bundesarchiv Berlin, Referat DDR 3, Archivsignatur DE 2/33229, Die Bevölkerung nach Geburtsjahren für das gesamte Gebiet der DDR, für die Länder (1 x ohne Wismut und Volkspolizei, 1 x mit Wismut und Volkspolizei) sowie für die Bezirke und Kreise (nach dem Gebietsstand 04.12.1952).

Staatliche Zentralverwaltung für Statistik (1967). Ergebnisse der Volks- und Berufszählung am 31. Dezember 1964, Staatsverlag der Deutschen Demokratischen Republik.

(II) Figure 3 (Sex ratios by state - II)

Ausschuss der Deutschen Statistiker für die Volks- und Berufszählung 1946 (1949b). Volks- und Berufszählung vom 29. Oktober 1946 in den vier Besatzungszonen und Gross-Berlin. Volkszählung: Tabellenteil. Berlin and Munich: Duncker & Humblot.

Bayerisches Statistisches Landesamt (1952). Volks- und Berufszählung am 13. September 1950 in Bayern. Volkszählung. I. Teil: Gliederung der Wohnbevölkerung. Beiträge zur Statistik Bayerns, vol. 171, 26-29.

Hessisches Statistisches Landesamt (1952). Die Struktur der Bevölkerung in Hessen. Endgültige Ergebnisse der Volkszählung vom 13. September 1950. Beiträge zur Statistik Hessen. Sonderreihe Volkszählung 1950, issue 3, 12-15.

Niedersächsisches Amt für Landesplanung und Statistik (1953). Die Bevölkerung am 13. September 1950 nach Altersjahren und Geschlecht. Statistisches Jahrbuch für Niedersachsen, 1952.

Statistisches Landesamt Baden-Württemberg (1959). Ergebnisse der Volks- und Berufszählung vom 13. September 1950. Statistik von Baden-Württemberg, vol. 4.1, 46-51.

Statistisches Landesamt der Freien und Hansestadt Hamburg (1953). Die Volkszählung in Hamburg am 13. September 1950. Statistik des Hamburgischen Staates, issue 36, 13-14.

Statistisches Landesamt Nordrhein-Westfalen Düsseldorf (1952). Die Wohnbevölkerung in Nordrhein-Westfalen nach Alter, Familienstand und Wohnort am 1. September 1939. Ergebnisse der Volkszählung vom 13. September 1950. Beiträge zur Statistik des Landes Nordrhein-Westfalen, Sonderreihe Volkszählung 1950, issue 3, 16-19.

Statistisches Landesamt Rheinland-Pfalz (1953). Volkszählung am 13. September 1950. Die Wohnbevölkerung in Rheinland-Pfalz, Landesergebnisse. Statistik von Rheinland-Pfalz, vol. 17, Bad Ems.

Statistisches Landesamt Bremen (1953). Die Volks- und Berufszählung am 13.9.1950 im Lande Bremen. Statistische Mitteilungen aus Bremen. Sonderheft 4.

Statistisches Landesamt Schleswig-Holstein (1953). Die Bevölkerungsstruktur in Schleswig-Holstein. Ergebnisse der Volkszählung vom 13. September 1950. Statistik von Schleswig-Holstein, issue 8, 4-5.

Statistisches Bundesamt Wiesbaden (1966). Volks- und Berufszählung vom 6. Juni 1961 Heft 4. Bevölkerung nach Alter und Familienstand, Fachserie A, Bevölkerung und Kultur. W. Kohlhammer GmbH, Stuttgart und Mainz, p. 70-117.

Statistisches Bundesamt (2017). Bevölkerung nach Bundesländern 1970, Wiesbaden.

(III) Figure 4 (Sex ratios in 1939)

Statistisches Reichsamt (1940a). Weitere Teilergebnisse der Volks- und Berufszählung vom 17.Mai 1939. Die ständige Bevölkerung nach Geschlecht, Alter und Familienstand. Wirtschaft und Statistik, vol. 20, issue 12.

Statistisches Reichsamt (1940b). Weitere Teilergebnisse der Volks- und Berufszählung vom 17.Mai 1939. Die ständige Bevölkerung nach Geschlecht, Alter und Familienstand. Wirtschaft und Statistik, vol. 20, issue 15.

Statistisches Reichsamt (1940c). Weitere Teilergebnisse der Volks- und Berufszählung vom 17.Mai 1939. Die ständige Bevölkerung nach Geschlecht, Alter und Familienstand. Wirtschaft und Statistik, vol. 20, issue 16.

Statistisches Reichsamt (1940d). Weitere Teilergebnisse der Volks- und Berufszählung vom 17.Mai 1939. Die ständige Bevölkerung nach Geschlecht, Alter und Familienstand. Wirtschaft und Statistik, vol. 20, issue 17.

Statistisches Reichsamt (1940e). Weitere Teilergebnisse der Volks- und Berufszählung vom 17.Mai 1939. Die ständige Bevölkerung nach Geschlecht, Alter und Familienstand. Wirtschaft und Statistik, vol. 20, issue 19.

(IV) Figure 5 (Sex ratios in 1946)

Ausschuss der Deutschen Statistiker für die Volks- und Berufszählung 1946 (1949b). Volks- und Berufszählung vom 29. Oktober 1946 in den vier Besatzungszonen und Gross-Berlin. Volkszählung: Tabellenteil. Berlin and Munich: Duncker & Humblot.

(V) Figure 6 (Sex ratios on the state level in 1946 with and without expellees)

Bayerisches Statistisches Landesamt (1948). Statistisches Jahrbuch für Bayern 1947, vol. 23.

Statistisches Landesamt Nordrhein-Westfalen (1950). Landes- und Kreisergebnisse aus der Volks- und Berufszählung 1946, Beiträge zur Statistik des Landes Nordrhein-Westfalen, Issue 3.

Statistisches Zentralamt für die sowjetische Besatzungszone (1949). Volks - und Berufszählung vom 29. Oktober 1946 in der sowjetischen Besatzungszone. Band III: Landes- und Kreisstatistik, issues 1-5.

(d) Reference for map

The shapefile for the map was kindly provided to us by John O'Loughlin. It was created for the following publication: John O'Loughlin. The Electoral Geography of Weimar Germany: Exploratory Spatial Data Analysis (ESDA) of Protestant Support for the Nazi Party. Political Analysis 10, 3 (2002), 217-243.
The shapefile is available from: http://www.colorado.edu/ibs/intdev/johno/pubs.html

A.2 Election data

All data on the federal elections of 1983 and 1987 in West Germany and on the federal elections of 1990 and 1994 in reunified Germany was obtained from the Federal Returning Officer Bundeswahlleiter (2018), Bundeswahlleiter (2016a), Bundeswahlleiter (2016b) and Bundeswahlleiter (2017a), respectively; these data are © Der Bundeswahlleiter, Wiesbaden 2016, 2017, 2018.

Data on the members of the 10th East-German *Volkskammer* was obtained from the website Datenbank VOLKPARL (n.d.).