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**Article — Published Version**

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Journal of Regional Science

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*Suggested Citation:* Peter, Julia; Uebelmesser, Silke (2025) : Regional Determinants of Attitudes Toward Immigrants in Germany, Journal of Regional Science, ISSN 1467-9787, Wiley, Hoboken, NJ, Vol. 65, Iss. 3, pp. 780-817,  
<https://doi.org/10.1111/jors.12763>

This Version is available at:

<https://hdl.handle.net/10419/323882>

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## RESEARCH ARTICLE OPEN ACCESS

# Regional Determinants of Attitudes Toward Immigrants in Germany

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## ABSTRACT

Attitudes toward immigrants play a crucial role in voting behavior. Such attitudes are shaped by individual characteristics, but also by the environment. This paper examines the role of regional factors in Germany. We use individual-level survey data and district-level administrative data. Specifically, we examine regional differences in economic growth, voting patterns, and immigrant characteristics and their relation to beliefs about and attitudes toward immigrants. We also use an information experiment about the immigrant population and assess its impact on attitudes. We find that regional effects—over and above individual characteristics—are small and depend on the attitudes.

**JEL Classification:** C90, D83, F22, J15, R11, R23

## 1 | Introduction

Public attitudes toward immigrants remain a complex and multifaceted issue, influenced by a combination of economic, political, and social factors. Recent waves of immigration have sparked controversial debates among the public and policy-makers in host countries (Halla et al. 2017; Dustmann et al. 2019; Tabellini 2020). Attitudes are likely to be an important determinant of voting behavior and policy choices, particularly in relation to immigration. They can be linked to concerns about labor market competition and negative effects on the welfare state (Mayda 2006). However, people often lack accurate and complete information about the immigrant population and the impact of immigrants on the host economy (Dustmann and Preston 2007; Facchini and Mayda 2009; Ortega and Polavieja 2012; Polavieja 2016). Individual characteristics are important determinants of these beliefs and the resulting attitudes toward immigrants, but the regional environment in which an individual lives can also contribute to both beliefs and attitudes (Markaki and Longhi 2013).

Individuals often identify with the region in which they live, and this can shape their sense of identity and their attitudes. Additionally, a person's individual outcomes can be influenced by the economic and social environment of their region (Proshansky et al. 1983; Paasi 2002; Rustenbach 2010; Kremer 2022), that is, one's place of birth and later the neighborhood can be predictive of future economic outcomes (Kling et al. 2007; Bosquet and Overman 2019). Moreover, McNeil et al. (2023) show that the economic situation at the birthplace can shape attitudes toward governmental interventions and voting behavior.

The aim of this paper is to explore how regional characteristics of the economic and political environment and the immigrant population shape individuals' attitudes toward immigrants and how these attitudes can be changed by providing information about the immigrant population in Germany.<sup>1</sup> So far, the literature on attitudes toward immigrants has mainly focused on individual-level determinants (see Mayda 2006; Alesina et al. 2023; Dylong and Uebelmesser 2024). We aim to extend this

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literature by shedding light on the role of regional and, in particular, district-level determinants for individual beliefs about the characteristics of the immigrant population and the resulting individual attitudes toward immigrants with respect to the welfare state and labor market competition as well as views on immigration advantages and preferences for immigration policy. We use data from two large-scale representative surveys of the German population, conducted in 2020 and 2021, with a total number of observations of more than 5700 participants which we combine with administrative data at the district level.

Our analysis consists of three steps: first, we examine the regional determinants of beliefs about immigrants. We then examine how these beliefs and other individual-level variables affect individual attitudes toward immigrants and policy preferences, paying particular attention to the role of the regional environment. Finally, we use an information provision experiment in which respondents were provided with information about the characteristics of the immigrant population in Germany. Because regional characteristics may shape individual beliefs and attitudes, the effect of providing information about the immigrant population may also vary by region. Respondents from different regions may be more or less receptive to the information and draw different conclusions. In particular, we are interested in economic and political differences, as well as differences in the characteristics of the immigrant population.

We hypothesize that the local economy may play a role in shaping attitudes toward immigration. The underlying mechanism may operate through the availability of jobs in a region, where respondents from districts with higher economic output and more available jobs may be less concerned about labor market competition from immigrants or adverse effects on the welfare state. In addition, attitudes may vary depending on whether a district is experiencing economic growth or downturn. More generally, times of crisis, like the COVID-19 pandemic, may have affected regions differently leading to different prospects for the future. Overall, as a consequence, concerns may increase in less prosperous regions with less positive outlooks, which may translate into less supportive views on immigration (Poutvaara and Steinhardt 2018). Similarly, the effect of providing information on respondents' attitudes may depend on the regional economy.

In addition to economic differences, other regional aspects can be associated with attitudes toward immigrants, above all political differences. Most parties have immigration as part of their party platforms, but with different emphases. Clearly anti-immigration platforms are widespread among German right-wing parties (Marx and Naumann 2018). One example is the *Alternative for Germany* (AfD), which has a clear far-right and populist agenda with a strong anti-immigration focus. This party won 10.3% of the votes in the last federal election in 2021 (The Federal Returning Officer 2023).<sup>2</sup> At the district level, the share of the votes ranged from 2.8% in the city of Münster (North Rhine-Westphalia) to 32.5% in the district of Görlitz (Saxony). In particular, “left-behind” regions (Ford and Goodwin 2017) and regions experiencing economic hardship show an increase in right-wing populist voting (Gozgor 2022).<sup>3</sup> Thus, a region's political environment may also influence

narratives about immigration and shape attitudes. Furthermore, respondents from right-leaning regions may be less responsive to information about the immigrant population and thus less likely to adjust their attitudes.

Another dimension of our analysis concerns regional differences in the characteristics of the immigrant population. We operationalize this by looking at the regional share of immigrants, the regional unemployment rate of immigrants, and the regional share of refugees in the immigrant population. According to the contact hypothesis, contact with immigrants can change individual attitudes (Allport 1958; Pettigrew 1998; Paluck et al. 2019). German regions differ in the share of immigrants, with regions in the western parts of Germany having higher shares compared to the eastern parts of Germany. Therefore, a higher presence of immigrants in one's own region may also contribute to shaping individual attitudes and may affect the need for—and the responsiveness to—information about the immigrant population.

We aim to provide insights into the role of these district-level characteristics in the beliefs about and the attitudes toward the immigrant population by focusing on the relationship with individual-level characteristics. We find evidence that regional characteristics are correlated with the formation of beliefs about immigration. Respondents living in regions with a higher share of immigrants tend to have higher and more biased beliefs of the share of immigrants in Germany, while respondents living in regions with a higher unemployment rate of immigrants hold lower, and less biased beliefs of the unemployment rate among immigrants. When examining district-level characteristics and attitudes toward immigration, we observe that respondents in more densely populated districts tend to see more the benefits of immigration. Conversely, those in more right-wing districts view more the disadvantages linked to immigration and consider immigrants as a burden on the welfare state. However, the significant regional correlations are mostly offset when we introduce individual-level covariates. Thus, the regional impact beyond individual characteristics is relatively small and depends on the outcome examined. Providing information about the immigrant population generally leads to more positive attitudes toward immigration. The changes in attitudes are greater in regions with lower AfD vote shares and higher economic growth. The results for the regional share of immigrants are more mixed.

Overall, while the correlational evidence points to a role for the regional environment, we must refrain from a causal interpretation of our regional-level findings regarding biases in prior beliefs and concerns about immigration. The regional environment may shape individual attitudes, but at the same time, individuals may shape the characteristics of their regional environment. Moreover, individuals, both natives and immigrants, are not randomly distributed across regions. Rather, they choose to live in particular places according to certain individual and regional characteristics. We will return to this issue later.

The remainder of the paper is organized as follows. Section 2 discusses the literature. Section 3 presents our data. In Section 4, we give an overview of the descriptive statistics and

institutional setting. The empirical model is explained in Section 5 and our results are discussed in Section 6. Section 7 concludes.

## 2 | Literature

Our paper relates to several strands of the literature. First, economic studies often focus on individual determinants of attitudes toward immigrants. But a person's regional and social environment also contributes to shaping attitudes. Czaika and Di Lillo (2018) show that anti-immigrant attitudes are spatially linked across Europe. In other words, closer regions have more similar attitudes than more distant regions. However, the economic literature is rather sparse on this point. Hatton (2016) finds that the share of immigrants and the share of social benefits in GDP play an important role for attitudes toward immigrants. Both a higher share of immigrants and a higher share of social benefits in GDP are associated with more negative attitudes. Brenner and Fertig (2006) find that average attitudes toward immigrants in a country are positively correlated with GDP per capita. For Latvia, IvĶevs (2012) shows that people from regions with lower local birth rate tend to have more positive views on immigration. Fratesi et al. (2019) analyze the distribution of asylum seekers in Italy, where they show that economic and political characteristics of the provinces are associated with the willingness to host asylum seekers. Gallegos Torres (2023) finds that concerns about immigrants in Germany declined in districts with a higher share of asylum seekers after the influx of refugees in 2015. Similarly, for Italy, Gamalerio et al. (2023) have linked the presence of locally administered refugee centers in municipalities to lower levels of right-wing voting and prejudice. Conversely, Hangartner et al. (2019) find that residents of a Greek island with higher exposure to refugees developed lasting negative attitudes toward immigrants.

Other studies find a link between regional characteristics and political attitudes more broadly. In the context of the Brexit referendum, Becker et al. (2017) find that at the district-level, people in areas with lower incomes and employment were more likely to vote to leave the European Union. Similarly, Dijkstra et al. (2020) show that individuals in structurally weak regions are more opposed toward EU politics. Moreover, Lechler (2019) uses panel data regression and an instrumental variable approach to show that, in particular, unemployed and low-skilled individuals living in regions with a higher share of immigrants from EU member states have negative attitudes toward the European Union. Entorf and Lange (2023) attribute hate crimes, as a form of anti-immigrant attitudes, to areas with low shares of immigrants and a historical pattern of right-wing voting. Moreover, Mehic (2022) finds that municipalities in Sweden with a history of anti-immigrant attitudes are more likely to vote for right-wing populist parties. Our paper contributes to this strand of literature by providing insights into the role of regional characteristics for attitudes toward immigrants in Germany.

Second, there are studies that focus on how economic circumstances affect people's attitudes toward immigrants, especially during times of economic crisis. Kuntz et al. (2017) show that anti-immigrant sentiment increases when people perceive

greater economic insecurity. McGinnity and Kingston (2017) find that in Ireland, attitudes toward immigrants became more negative as unemployment increased during the financial crisis. They also show that a recession particularly affects the attitudes of the less educated. Another aspect is highlighted by Dancygier and Donnelly (2013), who take a look at the financial crisis of 2008. They show that in times of economic hardship, individuals reduce their support for immigration if their employment sector experiences an influx of immigrants. The political science literature emphasizes that attitudes toward immigrants are shaped not only by economic considerations but also by norm-based and cultural concerns. Studies show that people are more concerned about the cultural implications of immigration in their country than about its economic effects, such as the impact on labor market competition and the redistribution of resources within the welfare state (Hainmueller and Hopkins 2014; Bansak et al. 2016; Hainmueller and Hiscox 2007, 2010; Hainmueller and Hopkins 2015; Sniderman et al. 2004; Bastiaens and Postnikov 2020). This perspective also highlights that individuals hold stereotypes and prejudices against immigrants (Burns and Gimpel 2000; Hjorth 2016). In this paper, we consider economic rationales which may operate through the local economy and labor market, but we also consider the political leanings of a region and the characteristics of the immigrant population, both of which may highlight different noneconomic rationales.

Third, studies that use survey experiments with information provision in the context of migration attempt to counter given misperceptions. Such experiments are frequently conducted in economics and political science. In general, these studies show that providing information about the immigrant population can improve people's beliefs about immigration and make them more supportive of immigration policies (see, e.g., Grigorieff et al. 2020; Haaland and Roth 2020; Facchini et al. 2022; Dylong and Uebelmesser 2024 in the economics literature or Hainmueller and Hiscox 2010, 2007; and Hangartner et al. 2019 in the political science literature). Alesina et al. (2023) do not find that respondents change their support for redistribution after being provided with statistical information about the immigrant population. However, information in the form of narratives shapes people's attitudes toward immigration. Against the background of demographic change, Boeri et al. (2024) provide information about the functioning of the pension system to see how this affects attitudes toward immigrants. This intervention was only effective for respondents who did not identify with anti-immigrant and populist political movements. We add to this literature by providing insights into regional differences in the treatment effects of information provision.

Moreover, the above survey experiments also document that individuals hold biased beliefs about the immigrant population, that is, inaccurate estimates of the share of immigrants or other indicators, and that these are important drivers of attitudes. This links to the literature on immigrant innumeracy. Misperceptions about minority groups are systematic and widespread, and can lead to feelings of threat (Herda and Divadkar 2023). Overestimation is typically associated with preferences for a more restrictive immigration policy (Citrin and Sides 2008; Gorodzeisky and Semyonov 2020; Lutz and Bitschnau 2023). Herda (2010) shows that innumeracy is driven among others by

exposure to immigrants in the neighborhood and watching television. The local context of an individual can matter for the accuracy of estimates, as shown by Wong (2007) for the United States. In this paper, we highlight the relationship between the accuracy of individual perceptions and the regional environment including the characteristics of the immigrant population. Furthermore, the perceived feeling of threat may also translate into welfare chauvinistic attitudes toward immigrants, in particular lower preferences for redistribution (Careja and Harris 2022). This literature finds that these attitudes depend on the generosity of the welfare state (Diermeier et al. 2021), individual characteristics (Hjorth 2016; Ford and Goodwin 2017) and economic conditions (Bell et al. 2023). By focusing on attitudes toward the welfare state and views on immigration advantages as two of our four outcomes, we also put some emphasis on this aspect.

### 3 | Data and Experimental Design

In our analysis, we aim not only to capture individual-level determinants of beliefs about and attitudes toward immigrants, but also to focus on regional characteristics and how they relate to individual-level outcomes. We use individual-level data from two representative surveys of the German population and match them with district-level data based on NUTS-3 regions. There are 401 districts in Germany, of which 294 are counties (*Landkreise*) and 107 are independent cities (*Kreisfreie Städte*).

In total, our data set consists of 5698 individuals from all 401 German districts. In the survey and the regional data, an immigrant is defined as a person living in Germany who does not have German citizenship. Here we follow the definition of the Federal Statistical Office (Federal Statistical Office 2024).

See Table A1 in the appendix for a description of the variables and Table A3 for summary statistics.

#### 3.1 | District-Level Data

In addition to individual-level factors, the regional environment may shape individuals' beliefs and attitudes. We use administrative data for the 401 counties in Germany. District-level data are obtained from INKAR (BBSR Bonn 2023) and the statistical offices of the federal and state governments (Statistical Offices of the Federal and State Governments 2024). Our set of district-level covariates includes indicators for regional characteristics of the immigrant population as well as economic and political characteristics. For immigrant population characteristics, we report the share of immigrants, the unemployment rate of immigrants, and the share of refugees in the immigrant population, all for 2020 and at the district level. To capture economic conditions, we include GDP per capita in 2020 to highlight a district's overall economic output, and regional growth in GDP per capita from 2019 to 2020 to account for changes in output in the district. For the political dimension, we use the district-level vote share of the right-wing AfD party in the 2021 federal election. With this variable, we aim to proxy the political climate and voting behavior in a district with respect to right-wing

parties with anti-immigrant platforms. In addition, we include population density measured in inhabitants per km<sup>2</sup> for each district in 2020 to capture whether respondents live in rural or urban areas. We also include an East German dummy to account for differences between East and West Germany.

#### 3.2 | Individual-Level Data

Data on individual-level characteristics come from two large-scale representative surveys on attitudes toward immigrants in Germany, conducted in November/December 2020 and September 2021 among the German adult population. The surveys are representative in terms of age, gender, education, and residence in East or West Germany. The data set includes variables on the assessment of the general economic situation, beliefs about immigration, economic concerns about immigration, and immigration policy preferences, variables on the COVID-19 crisis, and a large number of socio-demographic characteristics.<sup>4</sup> Informed consent was given by all participants at the beginning of the survey; this was a prerequisite for starting the survey.

#### 3.3 | Experimental Design

In addition, the representative surveys include an information provision experiment. In the first step, we elicit prior beliefs about the immigrant population in Germany and thus at the national level. Respondents are asked about the share of immigrants and the unemployment rate of immigrants in Germany. We calculate the absolute bias in prior beliefs as the difference between the actual value and the respondents' estimates.

In the second step, respondents are randomly assigned to one of three treatment groups or to the control group. In the first treatment group, respondents are provided with information on the actual share of immigrants in Germany. In the second treatment group, respondents are provided with information on the actual unemployment rate of immigrants in Germany. Finally, individuals in the third treatment group receive information on both the share of immigrants and the unemployment rate of immigrants. The control group receives no information.<sup>5</sup>

In the third step of the experiment, respondents answer questions about their attitudes toward immigrants and policy preferences. The questions and responses are as follows:

- Welfare state attitudes: "Immigrants pay taxes and receive social benefits from the health care and social insurance systems. On balance, do you think that immigrants in Germany receive more social benefits than they pay taxes, or that they pay more taxes than they receive social benefits?" Answers: "Receive more social benefits" (0) to "Pay more taxes" (10).
- Labor market attitudes: "Do you think that immigrants rather take away jobs from workers in Germany, or that they rather help to create new jobs?" Answers: "Take jobs away" (0) to "Create new jobs" (1).

- Immigration (dis-)advantage: “Do you think immigrants have created more disadvantages or more advantages for Germany in the last 10 years? Answers: “more disadvantages” (0) to “more advantages” (10).
- Immigration policy preferences: “Do you think that the number of immigrants coming to Germany each year should be:” Answers: “decreased a lot/decreased slightly/stay the same/increased slightly/increased a lot?”

The outcome variables are coded so that higher values indicate more positive attitudes. We measure attitudes toward the welfare state and attitudes toward the labor market as well as immigration (dis)advantage on an 11-point scale. Immigration policy preferences are measured on a 5-point scale.

## 4 | Descriptive Statistics

In the following, we present descriptive statistics on the regional context in Germany and on beliefs about immigrants. In particular, we focus on how individual beliefs as well as economic and political characteristics and characteristics of the immigrant population differ across districts. Descriptive statistics are presented in Table A3 in the appendix.

### 4.1 | Regional Heterogeneity

German regions differ substantially when it comes to economic and political indicators but also characteristics of the immigrant population. Those differences are further described below together with some information about the institutional setting.

Figure 1a shows the regional distribution of the AfD's share of the vote in the federal election in September 2021. The *Alternative für Deutschland* (AfD) was founded in 2013 with a conservative and Eurosceptic focus. In the wake of the 2015 refugee crisis, the party shifted to the far right with a populist agenda and a strong anti-immigration focus. The party entered the German parliament in 2017, where it became the third largest party and the largest opposition party. Over the years, the party has moved further to the right. It is also represented in state and local governments. The party has been particularly successful in eastern Germany, but also in the south and south-west of the country (Federal Agency for Civic Education 2024). This East-West divide is also clearly visible in Figure 1a. The party did better in eastern Germany than in other parts of the country, with its highest vote share of around 30% in eastern and southern Saxony. We expect a positive relationship between the AfD vote share and beliefs about immigration, i.e. higher estimates for the share and the unemployment rate, and a negative relationship with attitudes toward immigrants as well as policy preferences.<sup>6</sup>

German regions also differ in terms of economic performance, as measured by GDP per capita growth and shown in Figure 1b. Our surveys were conducted during the COVID-19 pandemic in 2020 and 2021, a period characterized by significant economic turbulence. During this time, Germany experienced a pronounced economic slowdown, marked by a decline in GDP and

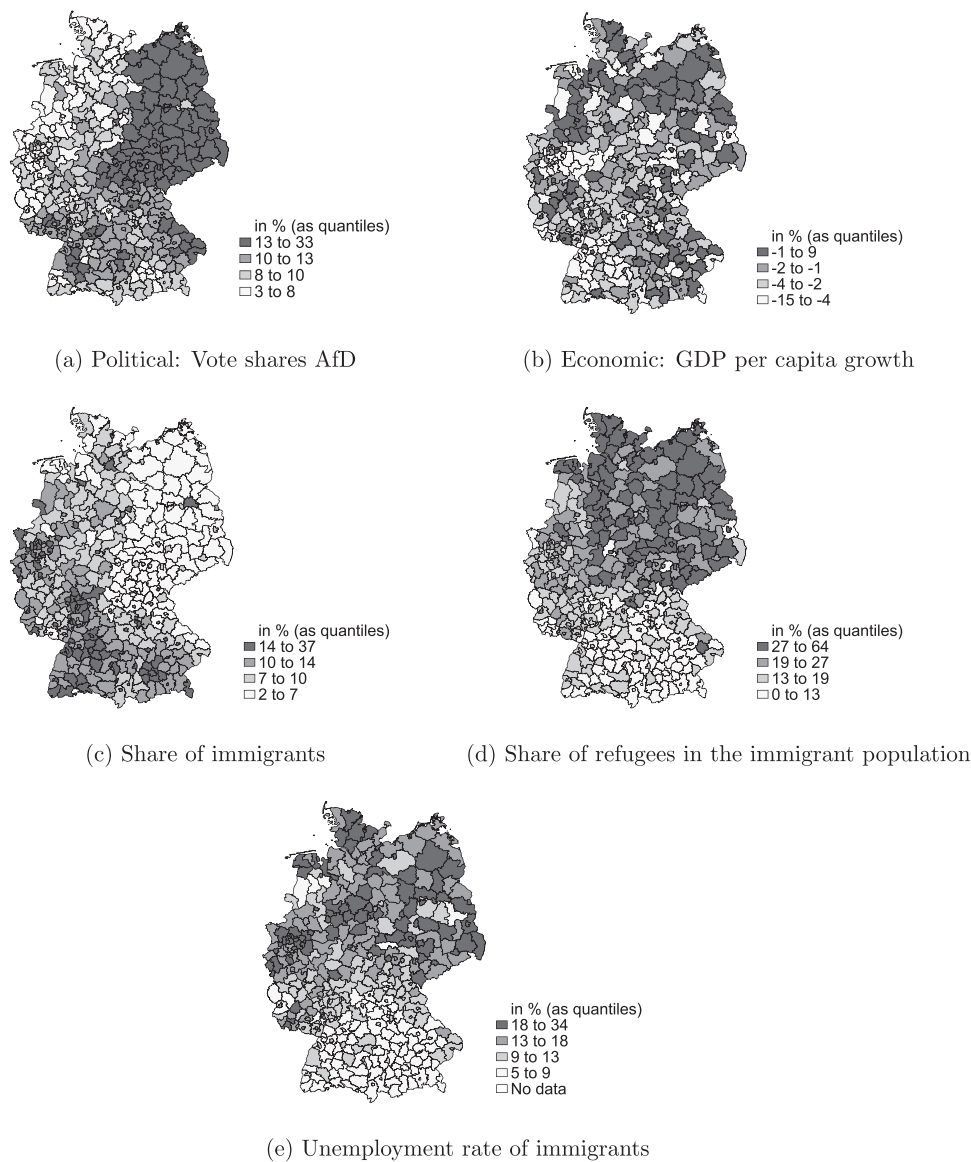
widespread disruption across various industries. The impact of the pandemic was not uniform. Different sectors of the economy were affected to different degrees. For example, the tourism and hospitality sectors were particularly hard hit by travel restrictions and lockdowns, leading to a significant decline in business activity and a sharp rise in unemployment. The manufacturing sector also suffered from large supply chain problems. In addition, the geographical concentration of economic activity in Germany contributed to regional differences in the impact of the pandemic, with some areas experiencing more severe economic consequences than others (German Council for Economic Experts 2020). Figure 1b shows that regions with higher growth rates are located in the south-east and north of Germany, while districts with lower growth rates are mainly in the center and south-west. GDP per capita fell by around 12%–15% in districts with a high density of manufacturing in Baden-Württemberg and Lower Saxony and increased by up to more than 9% in districts in Bavaria and Lower Saxony. Given the economic performance of a district, we expect a positive relationship between GDP per capita growth and attitudes toward immigrants as well as policy preferences.

Figure 1c,d shows that the immigrant population and the share of refugees in the immigrant population vary considerably within Germany. About 13% of the German population are immigrants, that is, people living in Germany without German citizenship. The majority, around two-thirds, are nationals of other EU and European countries. In 2021, the largest non-European immigrant groups were nationals from Turkey, Syria and Afghanistan (Federal Office for Migration and Refugees 2024a). When immigrants move to Germany, they tend to concentrate in urban areas, but also in areas with a higher shares of fellow nationals (Demography Platform 2024). Since 2015, Germany has also experienced a large inflow of refugees, mainly from Syria and Afghanistan, and since 2022 also from Ukraine (Federal Office for Migration and Refugees 2024a). Asylum seekers are distributed across the federal states according to the “Königstein Key,” which is based on the tax revenues and population of a federal state (Federal Office for Migration and Refugees 2024b). Hence, this results in a different regional composition of immigrants.

Figure 1c shows that the share of immigrants is higher in the western and southern parts of Germany, among other reasons due to historical settlement patterns or more favorable economic conditions. On the other hand, the share of refugees in the immigrant population, as shown in Figure 1d, is considerably higher in the northern and eastern regions of Germany, despite the lower share of immigrants, according to the “Königstein Key.” As for the unemployment rate of immigrants, Figure 1e shows that it is relatively high in the east and north-east of Germany, despite the lower share of immigrants in these areas. In line with the contact hypothesis (Allport 1958), we expect a higher share of refugees and immigrants to be associated with more favorable attitudes toward immigrants and policy preferences.

We find some important correlations for the regional characteristics considered. Right-wing voting tends to occur more in eastern regions with lower GDP growth per capita. There, the





**FIGURE 1** | Regional heterogeneity. Due to data restrictions, the unemployment rate of immigrants for Kyffhäuserkreis is not available. The respective year for the regional variables is 2020, except for AfD vote share, which is taken from the federal election in 2021. *Source:* Data used for (a–d) come from BBSR Bonn (2023). Data used for (e) come from Statistical Offices of the Federal and State Governments (2024).

share of immigrants is relatively low, while the share of refugees is rather high as is the unemployment rate of immigrants. All of this may shape the beliefs and attitudes of respondents differently from other German regions.

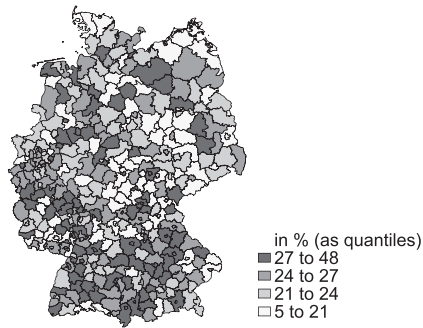
## 4.2 | Prior Beliefs

In general, respondents have biased beliefs about the immigrant population. At the time of the survey, the actual share of immigrants in Germany was about 13% and the actual unemployment rate of immigrants was about 15%. Figure 2 shows the average beliefs by district. Both the share and the unemployment rate of immigrants are greatly overestimated in all districts with about 72% of respondents overestimating the share of immigrants and about 64% overestimating the unemployment rate. On average, respondents believe that the

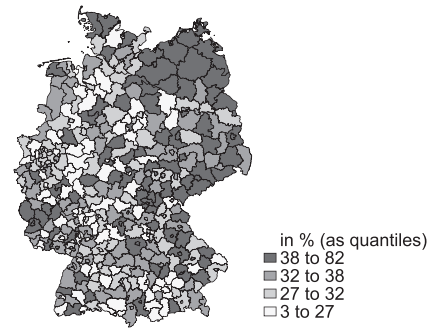
share of immigrants is about 20% and the unemployment rate of immigrants is about 30%. However, beliefs vary considerably at the district level. Beliefs about the share of immigrants range from under 20% in eastern German districts to over 27% in western German districts. Conversely, beliefs about the unemployment rate of immigrants range from under 27% in southern and western German districts to over 38% in eastern German districts. In the eastern regions, beliefs about the unemployment rate are much more upwardly biased than in the western regions, while beliefs about the share of immigrants are on average less biased.

Respondents are likely to base their attitudes on regional characteristics of the immigrant population. Regional characteristics may therefore be more explanatory than national averages (Anselin 1988). The number of immigrants living in a district and their unemployment rate may influence respondents' estimates of both at the national level. Figure 3 puts this

(a) Prior Beliefs: Share of Immigrants



(b) Prior Beliefs: Unempl. Rate of Immigrants



**FIGURE 2** | Regional distribution of prior beliefs. This figure shows the answer of respondents to the questions “Now it is about the share of immigrants in Germany. What do you estimate, please answer spontaneously: What percentage of people living in Germany do not have German citizenship?” and “Now it is about the unemployment rate of working-age immigrants in Germany. What do you estimate, please answer spontaneously: What percentage of these people are unemployed?”.

into perspective by relating the share of immigrants at district level (Figure 3a) and the unemployment rate of immigrants at district level (Figure 3b) to the respective estimates (beliefs) for Germany. In both cases we find positive relationships. Respondents from districts with a higher regional share of immigrants tend to expect an even higher share of immigrants in Germany, and similarly for the unemployment rate of immigrants. We also see that in most eastern districts the share of immigrants is lower than in western districts (see Figure 3a), while in most eastern districts the unemployment rate of immigrants is larger (see Figure 3b). This is in line with our observations in Figure 1c,e.

In general, for both statistics, respondents seem to base their estimates on their perception of the regional environment. However, respondents estimate the share of immigrants more accurately than the unemployment rate, as can be seen from the more dispersed scatter plot for the unemployment rate in Figure 3b compared to the less dispersed scatter plot for the share of immigrants in Figure 3a.

## 5 | Empirical Method

### 5.1 | Prior Beliefs

We use a linear regression model to estimate the correlation between prior beliefs about immigration and potential individual and regional determinants of those beliefs as part of Step 1 of our analysis. We estimate the following OLS model

$$beliefs_i = \beta_0 + \beta_1 X_i + \beta_2 Z_i + \varepsilon \quad (1)$$

where  $beliefs_i$  denotes prior beliefs about the share of immigrants and the unemployment rate of immigrants, respectively.  $X_i$  is a vector of individual covariates and  $Z_i$  is a vector of regional covariates. Regional determinants include GDP per capita, GDP per capita growth, right-wing voting, population density, regional characteristics of the immigrant population such as the share of immigrants, the unemployment rate of immigrants, and the share of refugees in the foreign population,

and a dummy for living in East Germany. Standard errors are clustered at the district level.<sup>7</sup>

### 5.2 | Attitudes about Immigration

The relationship between individual and regional covariates with attitudes about immigrants and policy preferences are estimated with the following OLS model

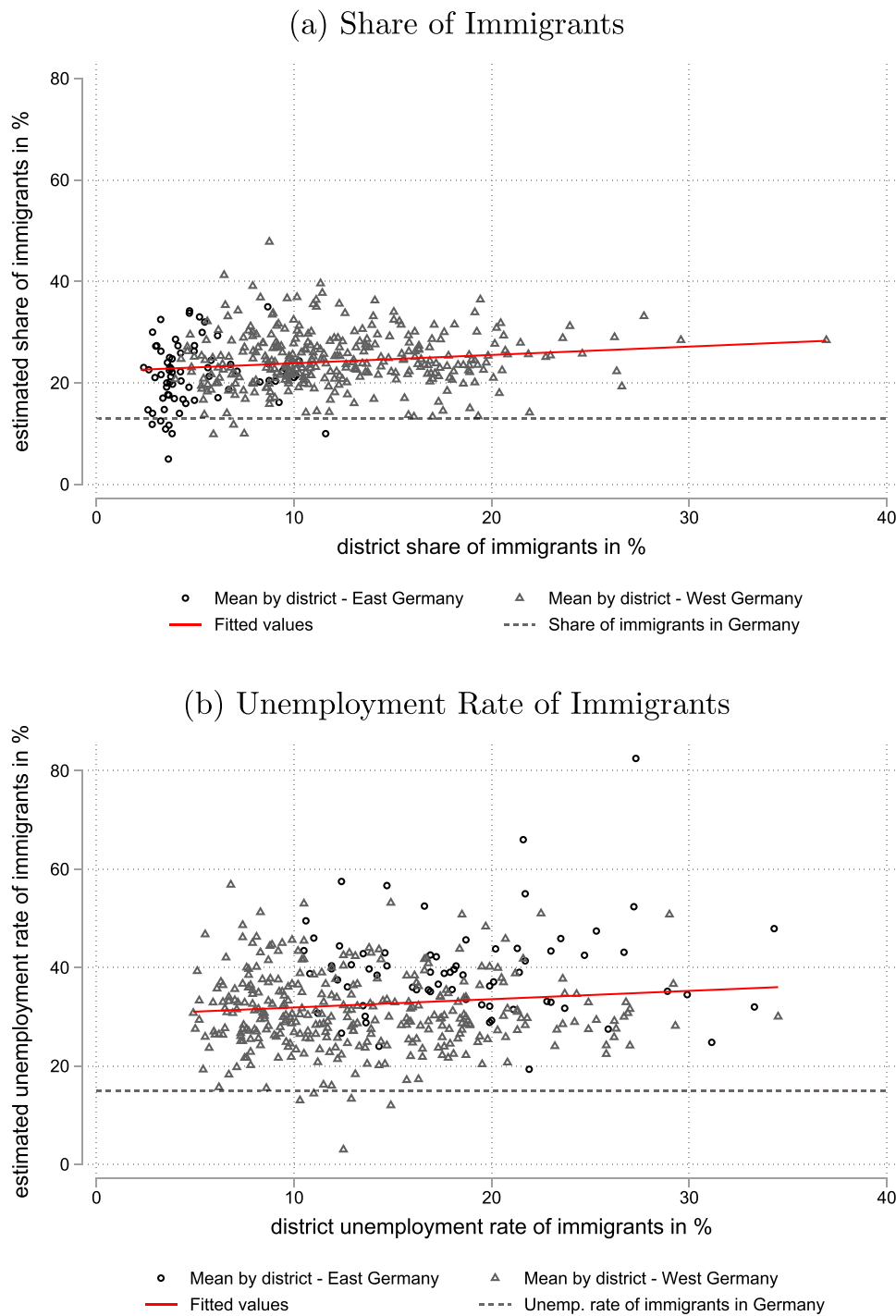
$$attitude_i = \beta_0 + \beta_1 treat1_i + \beta_2 treat2_i + \beta_3 treat3_i + \beta_4 X_i + \beta_5 Z_i + \varepsilon \quad (2)$$

where  $attitude_i$  represents the four outcome variables—attitudes toward the welfare state, attitudes toward the labor market, views about immigration advantage as well as immigration policy preferences. The individual and regional covariates are again denoted by  $X_i$  and  $Z_i$ , respectively. The model now also includes indicator variables for the three different treatment arms of our information treatment to estimate average treatment effects (ATE). The indicator variables take the value 1 if a respondent was assigned to the respective treatment arm and 0 otherwise. The error term is  $\varepsilon_i$ . The standard errors are again clustered at the district level.<sup>8</sup>

Equation (2) is the basis for Steps 2 and 3 of our analysis. Related to Step 2, it allows us to analyze how individual and region-specific factors correlate with attitudes toward immigrants and policy preferences. For these baseline results, we consider only the control group, i.e., untreated individuals, to avoid any interaction with the information treatment. Related to Step 3, we examine the treatment effects. We use the full sample and focus on the ATEs. We are interested in the heterogeneity of treatment effects due to regional differences.

## 6 | Results

In this section, we first examine the role of regional determinants of biases in prior beliefs. In the second step, we

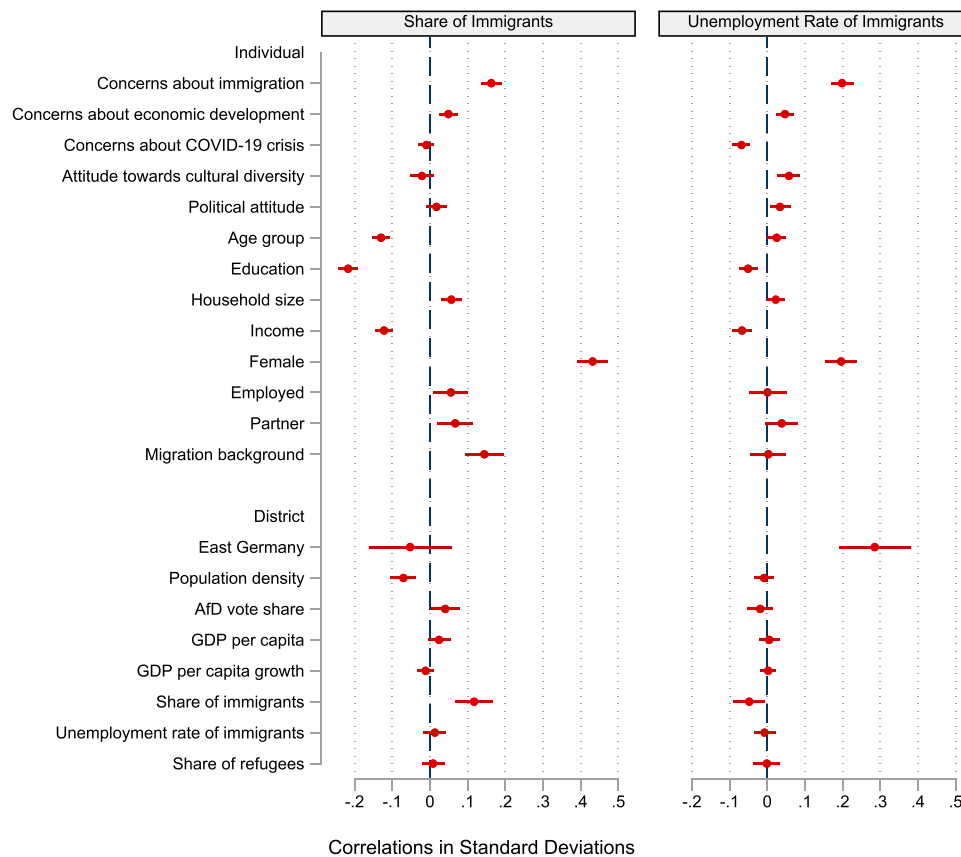


**FIGURE 3** | Prior beliefs about immigration and the actual regional values. The figures show the relationship between the share of immigrants at district level (a) and the unemployment rate of immigrants at district level (b) with the respective estimates (beliefs) for Germany. The slope of the regression lines is 0.16 ( $p = 0.002$ ) in (a) and 0.17 ( $p = 0.018$ ) in (b).

look at the outcomes, that is, attitudes toward immigration and policy preferences. We consider the untreated outcomes of the control group as well as the treatment effects, again focusing on regional differences. For better comparability, we have standardized all outcome variables according to the mean and standard deviation of the control group.

## 6.1 | Prior Beliefs

Figure 4 shows the individual and regional determinants of biases in prior beliefs about immigration (see also Table B1 in the appendix). Biases in beliefs are calculated as the absolute difference between the respondent's answer and the true value. Positive values indicate a greater bias in prior beliefs, that is, a



**FIGURE 4** | Prior beliefs: Individual and regional determinants. Standard errors clustered by districts. The 90% confidence intervals displayed. Number of observations is 5698. Concerns/attitudes are measured on an 11-point scale where higher values indicate more concerns/more positive attitudes. Political attitudes are measured on an 11-point scale from 0 for “Left” to 10 for “Right.” Age group and income are categorical variables measured from 1 to 5. Education is a categorical variable for low, medium, and high levels of education. Household size indicates the number of persons living in a household. The covariates female, employed, partner, migration background, and East Germany are binary indicators. Not shown here is a binary indicator for the survey wave. Population density is measured as population per km<sup>2</sup>. GDP per capita is the gross domestic product in EUR 1000 per inhabitant. The share of refugees is the share of refugees in the immigrant population (see Table A1 for a more detailed description of the variables.) The outcome variables and covariates are standardized in terms of their mean and standard deviation.

respondent’s answer is further away in absolute terms from the true value about the share or the unemployment rate of immigrants. Negative values indicate a smaller bias in absolute terms.<sup>9</sup>

Focusing first on district-level factors, we find a positive and significant correlation with the bias in prior beliefs about the unemployment rate for respondents from East Germany (see also Figure 3b above). As the share of immigrants is lower in the eastern part of Germany, the larger bias about the labor market integration of immigrants may be explained by the contact hypothesis (Allport 1958). Due to the lower regional exposure to immigrants, respondents seem to expect less labor market integration (Paluck et al. 2019). In addition, we observe that respondents from districts with higher population density tend to have less biased beliefs about the share of immigrants. This points at a difference between urban and rural regions.

For the political and economic dimension, we find rather small and statistically insignificant results. This may be due to the fact that districts with high AfD vote shares and comparatively low economic performance are clustered in the eastern parts of

Germany (see Figure 1a,b above). To test this and, more generally, to study the East–West differences, we correlate our regional determinants with the East German dummy. Table A4 in the appendix reports the results. Indeed, we find a strong positive correlation with the AfD vote share and a negative, albeit less strong, correlation with GDP per capita (even though GDP per capita growth is positively correlate with the East Germany dummy). It also shows that regions in East Germany are less densely populated, and thus less urban, and have a lower share of immigrants, albeit with a higher unemployment rate, and a larger share of refugees.

Continuing with the characteristics of the immigrant population, we find that districts with higher shares of immigrants are associated with more biased beliefs about the national share of immigrants, but less biased beliefs with respect to the labor market integration of immigrants. This may indicate that beliefs about the share of immigrants are influenced by what respondents experience in their immediate environment. However, the unemployment rate of immigrants and the share of refugees in a district’s foreign population is not statistically significant for either outcome.



Individual-level characteristics are more strongly correlated with biases in prior beliefs. We see that higher education and higher income lead to less biased estimates of both statistics and older age is associated with less biased beliefs about the share of immigrants. Political attitudes are barely related to either belief, while being female indicates greater bias for both statistics. A larger household size, having a partner or having a migrant background are other examples of factors associated with a greater bias in the beliefs about the share of immigrants. Concerns about immigration and economic development are also positively correlated with more biased beliefs about both the share of immigrants and the unemployment rate of immigrants.

## 6.2 | Attitudes About Immigration and Policy Preferences

Prior beliefs about the immigrant population are a first step in shaping attitudes toward immigrants. In the following section, we take a closer look at the regional determinants of attitudes toward immigration and policy preferences. We restrict observations to the control group to ensure that there is no interaction with the information experiment. Our sample is reduced to 1438 respondents.

The correlations with the district-level variables are in general small. Table 1 shows the correlations for our four outcome variables with the district-level determinants, first without individual controls and then with these controls. See Tables C1 and C2 in the appendix for the details.

For the specifications without individual control variables, we observe that the regional political environment may contribute to shaping narratives about immigration, as living in a district with a higher AfD vote share is associated with more negative attitudes toward immigrants for all of our four outcome variables. In particular, respondents from these districts are more likely to perceive immigrants as a burden on the welfare state and as competitors in the labor market. Moreover, these respondents are more likely to see disadvantages of immigration and are more likely to support a restrictive immigration policy. GDP per capita shows a negative relationship with the outcome variables (slightly significant for labor market attitudes and immigration policy), while GDP growth is associated with more positive attitudes (slightly significant for immigrant advantage). In other words, regional economic growth, especially during the economic downturn in 2019–2020, may have fostered more positive attitudes toward immigrants. However, respondents who live in an economically strong regional environment have less supportive views on immigration. We find a positive correlation between living in eastern Germany and our outcome variables. This may be due to a correlation between the East Germany dummy and our regional variables (see Table A4 in the appendix).

For the district level of the immigrant unemployment rate, we report a positive correlation with immigration advantages and immigration policy preferences. This seems counter-intuitive. One possible explanation may be that the unemployment rate of immigrants is not very salient in Germany (see also Figure 3b above).

When we add individual controls, our regional determinants are no longer significant. Nevertheless, the signs and magnitudes of the correlations remain the same for most of the regional factors. The correlations for the individual controls are displayed in Tables C1 and C2 in the appendix. From this, we can see that prior beliefs, concerns about immigration, attitudes toward cultural diversity, and individual political attitudes are significantly negatively correlated with our outcome variables. Regarding the socioeconomic variables, we observe that more educated individuals tend to have more positive attitudes. Additionally, in our sample, women tend to have more negative attitudes toward immigrants compared to men. Given the rather low adjusted  $R^2$  for the specifications without individual controls, we conclude that despite regional heterogeneity, individual covariates are more explanatory of attitudes toward immigrants and policy preferences.

We are aware that there may be endogeneity issues arising from the location choices of both immigrants and natives. Immigrants may select regions with a higher share of conationals, resulting in a concentration of immigrants in specific regions. This concentration may thus not be exogenous, but instead dependent on the past settlement patterns of conationals. To address this potential source of endogeneity, we could use a shift-share instrument based on the inflow of immigrants in the past, following Card (2009). In addition, natives may have specific motives for choosing where to live, and some of those motives may be related to immigration issues. As a result, the composition of the regional population may be shaped as a function of immigration. However, the literature provides mixed evidence on this topic. Card and DiNardo (2000) find no evidence of out-migration of the native population following a regional increase in immigrants. In contrast, Borjas (2006) finds that immigration is associated with an outflow of native workers. With our data set, we cannot address this issue since our data set does not cover the mobility patterns of our respondents. Consequently, we abstain from implementing a shift-share instrument related to the district-level immigrant population.

## 6.3 | Treatment Effects: Regional Heterogeneity

As a final step in our analysis, we examine whether treatment effects differ by regional characteristics. Overall, in line with other studies (e.g., Grigorieff et al. 2020; Haaland and Roth 2020; Facchini et al. 2022; Dylong and Uebelmesser 2024), we find that providing information can improve attitudes toward immigrants. The results are shown in Figure 5 (see also Table D1 in the appendix).<sup>10</sup> This figure shows the point estimates and confidence intervals from the regression Equation 2. We run a separate regression for each of our outcomes. If a confidence interval for a coefficient crosses the 0-line, it indicates that the effect of that variable is not statistically significant at the 90% confidence level. However, a closer look reveals that treatment effects vary across treatment groups and outcomes. Specifically, receiving information about the share of immigrants significantly increases attitudes for all of our outcome variables by about 6%–10% of a standard deviation. We get similar results when respondents are provided with information about the unemployment rate of immigrants for most of our

**TABLE 1** | Regional determinants of attitudes toward immigrants – control group.

	Welfare state		Labor market	
	(1)	(2)	(3)	(4)
<i>Panel A: Economic attitudes</i>				
East Germany	0.382*** (0.146)	0.078 (0.122)	0.326** (0.154)	−0.043 (0.135)
Population density	0.005 (0.047)	−0.020 (0.043)	−0.014 (0.035)	−0.043 (0.032)
AfD vote share	−0.176*** (0.056)	−0.061 (0.053)	−0.107* (0.055)	0.028 (0.049)
GDP per capita	−0.057 (0.036)	−0.026 (0.035)	−0.079** (0.032)	−0.046* (0.027)
GDP per capita growth	0.041 (0.030)	0.029 (0.027)	0.036 (0.028)	0.025 (0.024)
Share of immigrants	0.011 (0.108)	0.051 (0.095)	0.081 (0.108)	0.147 (0.098)
Unemployment rate of immigrants	0.071 (0.088)	−0.005 (0.074)	0.088 (0.091)	−0.006 (0.084)
Share of refugees	−0.035 (0.032)	−0.048 (0.029)	0.041 (0.035)	0.027 (0.031)
Individual controls	No	Yes	No	Yes
Observations	1438	1438	1438	1438
R <sup>2</sup>	0.016	0.355	0.014	0.371
Adjusted R <sup>2</sup>	0.010	0.345	0.008	0.361
	Immigration advantage		Immigration policy	
	(1)	(2)	(3)	(4)
<i>Panel B: Societal acceptance and policy preferences</i>				
East Germany	0.364** (0.144)	−0.030 (0.098)	0.435*** (0.144)	0.029 (0.101)
Population density	0.057 (0.041)	0.035 (0.034)	0.029 (0.036)	0.001 (0.029)
AfD vote share	−0.167*** (0.050)	−0.010 (0.036)	−0.154*** (0.056)	0.004 (0.040)
GDP per capita	−0.042 (0.033)	−0.009 (0.026)	−0.053* (0.031)	−0.021 (0.024)
GDP per capita growth	0.045* (0.027)	0.032 (0.022)	0.044 (0.029)	0.029 (0.021)
Share of immigrants	−0.145 (0.101)	−0.085 (0.081)	−0.113 (0.102)	−0.040 (0.075)
Unemployment rate of immigrants	0.146* (0.081)	0.047 (0.063)	0.176** (0.087)	0.070 (0.064)
Share of refugees	−0.011 (0.035)	−0.020 (0.024)	−0.030 (0.034)	−0.038 (0.023)
Individual controls	No	Yes	No	Yes
Observations	1438	1438	1438	1438

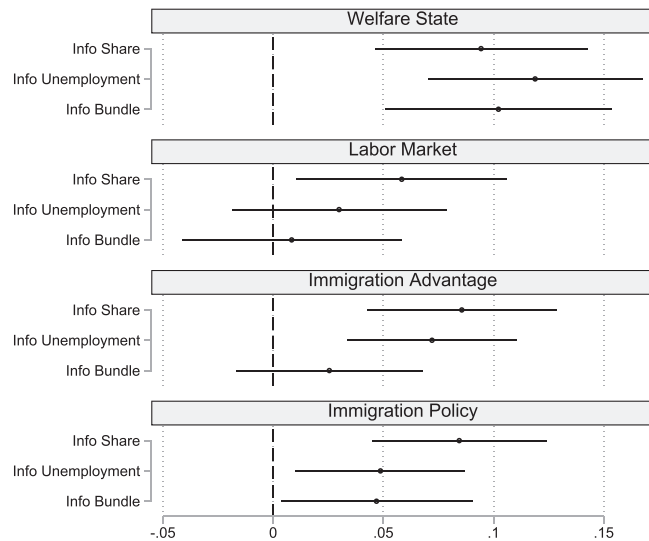
(Continues)

TABLE 1 | (Continued)

	Immigration advantage		Immigration policy	
	(1)	(2)	(3)	(4)
$R^2$	0.016	0.536	0.015	0.549
Adjusted $R^2$	0.011	0.528	0.010	0.542

Note: Standard errors clustered at district level. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, gender, employed, partner, migration background, income, and survey wave.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .



**FIGURE 5** | Treatment effects of information provision. Standard errors clustered by districts. The 90% confidence intervals displayed. This regression contains the full sample of 5698 observations. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, gender, age, education, income, partner, household size, employment status, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees.

outcomes. The information bundle, however, only significantly increases attitudes toward the welfare state and policy preferences in our sample. For labor market attitudes and views on immigration advantages we find insignificant effects of the information bundle. The observed results for labor market attitudes and possibly also for immigration advantages may suggest a trade-off: providing information about both the share and the unemployment rate of immigrants, the estimates are very close to zero. A lower unemployment rate of immigrants may indicate more labor market competition; a smaller size of the immigrant population may indicate less competition. Taken together, the individual effects may cancel each other out.<sup>11</sup> In the following, we examine treatment heterogeneity based on district-level variation in the share of immigrants, AfD vote share, and GDP growth.

### 6.3.1 | Regional Share of Immigrants

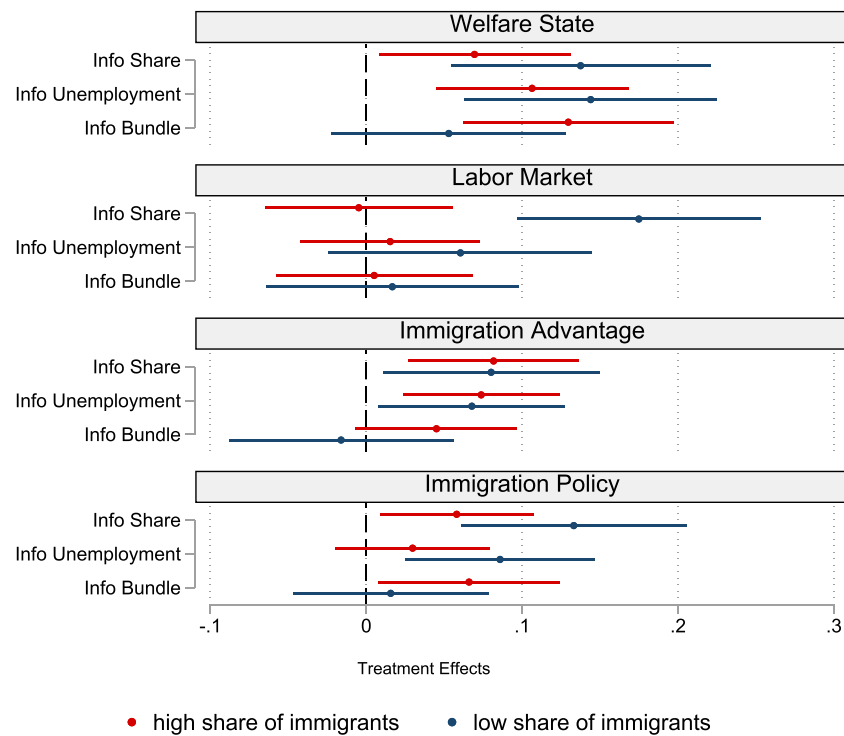
Immigrants are distributed unevenly across German districts (see Figure 1c). Therefore, different exposure to immigrants in one's own district may affect the perception of immigrants and may also have an effect on the treatment. We divide districts into two groups based on the district-level share of immigrants. Districts with shares above the median are coded as "high immigrant share" districts and districts with shares below or equal to the median are coded as "low immigrant share" districts. The results are shown in Figure 6. Further details can be found in Table D3 in the appendix.

Looking at the point estimates, respondents from districts with low immigrant shares have mostly significant and somewhat higher treatment effects than respondents from districts with high immigrant shares.

Attitudes toward the welfare state and views on immigration advantages are not significantly different for the two subgroups. In general, providing information about the share and unemployment rate of immigrants increases welfare state attitudes and views on immigration advantages, regardless of the district-level share of immigrants. However, the information bundle only produces an (almost) significant result for these two outcomes for districts with a high share of immigrants.

Looking at labor market attitudes, we find a rather inelastic response from individuals living in districts with a high share of immigrants. The response is more elastic for respondents from districts with a low share of immigrants. In particular, these respondents have significantly higher treatment effects than respondents from high-share districts when receiving information about the share of immigrants in Germany. Thus, knowing the true share of immigrants in Germany, which in most cases is lower than the perceived one, leads to less concern about labor market competition for respondents in low-share districts.

This pattern may be explained by how respondents are exposed to immigrants in their daily lives. Respondents who live in districts with a high share of immigrants may not be convinced by the information because they experience a different reality. Respondents from districts with a low share of immigrants may be more convinced when they receive information about a low share of immigrants in Germany as the shares for Germany and for the district may be more aligned. We also find similar, albeit not significant, results when providing information about the unemployment rate of immigrants.



**FIGURE 6** | Treatment effect heterogeneity: share of Immigrants. Standard errors clustered by districts. The 90% confidence intervals displayed. Districts with a high share of immigrants contain 3657 observations and districts with a low share of immigrants contain 2041 observations. The regression includes individual and regional control variables (see the legend of Figure 5).

Policy preferences increase for both groups only when information on the share of immigrants is provided. Information about the unemployment rate leads to significant treatment effects only for respondents from districts with a low share of immigrants, and the provision of the information bundle leads to a borderline significant treatment effect for respondents from districts with a high share of immigrants.

### 6.3.2 | Regional AfD Vote Turnout

The political environment in a region can also shape the regional narrative on immigration (Rustenbach 2010). In particular, immigration is an important issue in the party platforms of populist and right-wing conservative parties. To test whether this plays a role for the effects of our information treatment, we divide districts into two groups based on AfD vote share. Districts with a vote share above the median are coded as “high AfD vote share” districts, and districts with a vote share below or equal to the median are coded as “low AfD vote share” districts. The results are shown in Figure 7 (see Table D4 in the appendix for further details).

Comparing the confidence intervals of the estimated treatment effects, we do not find significantly different effects for districts with high and low AfD vote shares. However, the point estimates indicate that individuals living in districts with low AfD shares tend to increase their positive attitudes toward immigrants more in response to the treatment. The treatment effects for both groups on attitudes toward the welfare state and views on immigration advantage appear to be comparatively similar, as we observe similar point estimates and largely

overlapping confidence intervals. This suggests that despite local differences in the political environment, providing information about the immigrant population can foster more positive attitudes about the impact of immigration on the welfare state and about the advantages that immigration brings to Germany.

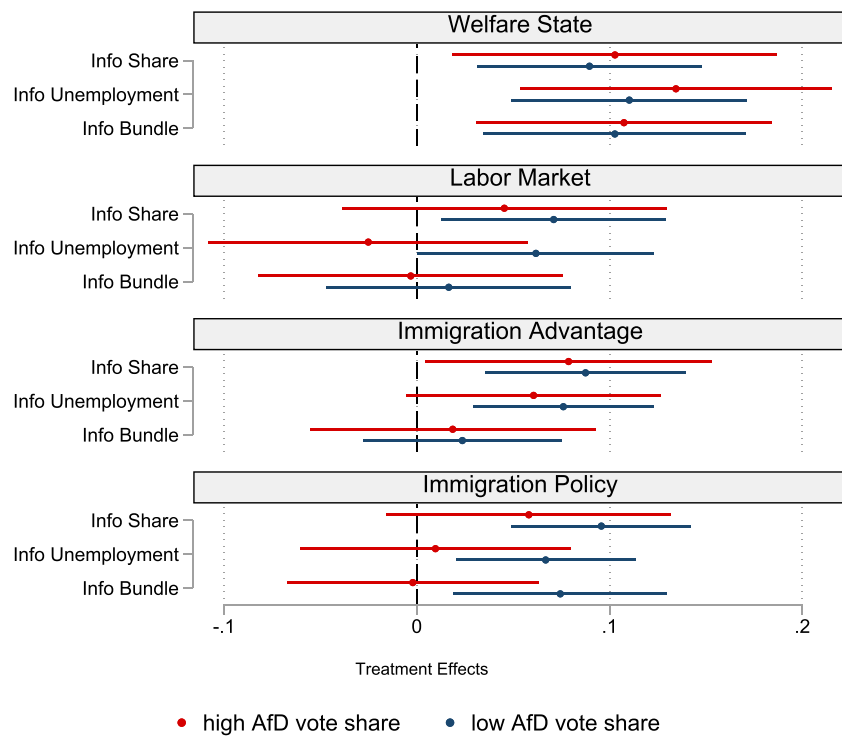
On the contrary, labor market attitudes and policy preferences are somewhat inelastic to the treatment for individuals living in districts with high AfD voting shares. Only individuals from districts with low AfD vote shares report significant and positive treatment effects. The AfD received high vote shares especially in “left-behind” regions, which are often rural or former industrial areas that have undergone significant social and economic change.<sup>12</sup> These regions are characterized by a declining or stagnating economy and reduced labor market opportunities. This often leads to feelings of marginalization and economic insecurity that translate into right-wing voting (Ford and Goodwin 2017; Dijkstra et al. 2020) and may make individuals less willing to change their attitudes after receiving the information.

### 6.3.3 | Regional GDP Growth

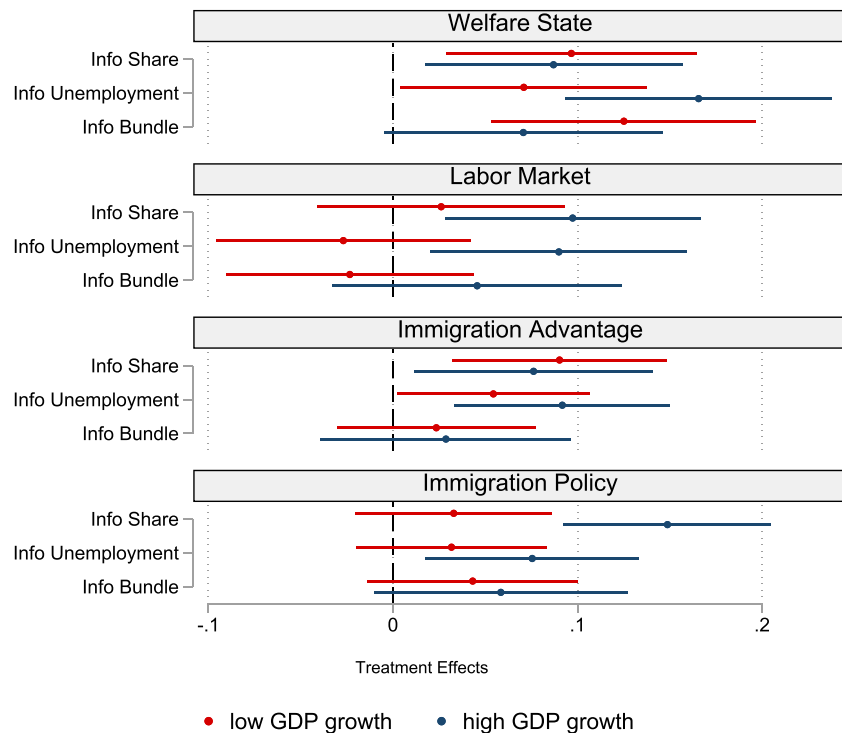
Treatment effects may also differ according to the economic characteristics of the districts. Higher GDP growth, that is, better performing districts, may facilitate better economic integration of immigrants due to greater availability of jobs, which may affect how strongly individuals react to the information treatment. Districts with GDP per capita growth above the median are coded as “high GDP growth

districts,” and districts with GDP growth below or equal to the median are coded as “low GDP growth” districts. The results are shown in Figure 8 (see Table D5 in the appendix for further details).

Similar to before, we see that attitudes toward the welfare state and views on immigration advantages do not differ much for the two subgroups in reaction to the treatments. Providing information about the actual values separately leads to more



**FIGURE 7** | Treatment effect heterogeneity: AfD vote share. Standard errors clustered by districts. The 90% confidence intervals displayed. Districts with high AfD vote shares contain 2066 observations and districts with low AfD vote shares contain 3632 observations. The regression includes individual and regional control variables (see the legend of Figure 5).



**FIGURE 8** | Treatment effect heterogeneity: GDP per capita growth. Standard errors clustered by districts. The 90% confidence intervals displayed. Districts with high GDP per capita growth contain 2666 observations and districts with low GDP per capita growth contain 3032 observations. The regression includes individual and regional control variables (see the legend of Figure 5).

positive attitudes toward the welfare state and more positive views on immigration advantages for both types of districts.

Labor market attitudes of respondents living in districts with low GDP growth seem to be inelastic to information provision. That is, these respondents do not respond to the treatment, as they report insignificant treatment effects. On the contrary, districts with high GDP growth show a more elastic response to the treatment. They report significant and positive treatment effects after receiving information on the share of immigrants or the unemployment rate of immigrants. The information bundle does not lead to significant treatment effects for either group.

We observe significant differences in the treatment effect between the two types of districts on immigration policy preferences when information on the share of immigrants is provided. Similar to before, respondents from districts with high GDP growth react more significantly positively than respondents from districts with low GDP growth. The difference in the treatment effects between the two types of districts is smaller when information on the unemployment rate of immigrants is provided, while providing both types of information does not lead to different and significant effects.

#### 6.3.4 | Robustness Checks

We check the robustness of our results in several ways (see Appendix E for the respective tables and figures). First, we rerun our analysis with regional variables at the NUTS 2 level to see if the results hold at a more aggregated level. There are some changes related to the differences in treatment effects across regions. However, this does not change the overall interpretation of our results. Second, there may be variations at the state level that affect our results. When we include categorical variables for the federal states, our results do not change. Third, our outcome variables are measured on an ordinal scale. Therefore, we use ordered probit regression to analyze the robustness of our results. Compared to our OLS specification, the interpretation of the treatment effects remains the same.

## 7 | Conclusion

This paper examines how individual attitudes toward immigration and policy preferences are shaped by the regional environment. The analysis is based on two representative surveys of the German population and administrative data at the district level. We analyze regional determinants of biases in beliefs about the immigrant population and attitudes. We also examine how providing information about the characteristics of the immigrant population in Germany, that is, their share and unemployment rate, changes attitudes differently in regions that differ in economic and political characteristics and in the characteristics of their immigrant population.

We find that regional characteristics are correlated with the formation of beliefs about and attitudes toward immigration. However, the correlations depend on the type of attitudes examined and become insignificant when individual controls are added.

Focusing on the information effects, we find that informing respondents about the characteristics of the immigrant population can increase positive attitudes toward immigration. The treatment effects appear to be relatively similar for different district-level characteristics, as the confidence intervals between the subgroups mostly overlap. However, there is some evidence that different types of information are perceived differently in different districts. Broadly speaking, respondents from districts that are economically better off, have lower shares of right-wing voters and lower shares of immigrants seem to respond more positively to the treatment. Furthermore, attitudes toward the labor market seem to be most influenced by the regional environment. This may be because respondents perceive labor market competition with immigrants at the district level, and thus the regional context, in addition to individual characteristics, and this contributes to shaping these attitudes.

Policy makers should take into account that beliefs about and attitudes toward immigrants are shaped not only by individual characteristics but also by the regional context. Therefore, information campaigns or policy interventions may have different effects depending on the region in which they are implemented. However, it should be noted that the local political environment is also endogenously shaped by individual characteristics and the regional context.

So far we have only examined the short-term relationship between the regional environment and beliefs about and attitudes toward immigrants. Areas for future research would be to examine changes in beliefs and attitudes over time and the role of the regional economic and social context. In addition, our analysis is based on representative surveys of the German population. Extending our analysis to other countries would therefore provide insights into whether the relationship between beliefs about and attitudes toward immigration is more region or country specific.

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#### Acknowledgments

We thank the participants of the Jena Economic Research Workshop (JERW), the Workshop on Empirical Microeconomics and Applied Econometrics, the Workshop of the Central-German Doctoral Program Economics (CGDE), the Young Economists' Meeting (YEM), the Annual Meeting of the Verein für Socialpolitik (VfS) and the Ruhr Graduate School Doctoral Conference (RGS) for helpful comments and discussions. IRB approval for the two surveys including the information experiment was obtained at the Institutional Review Board (IRB) of the Faculty of Economics and Business Administration at Friedrich Schiller University Jena (dated November 25, 2020 and September 11, 2021). This work is supported by the Free State of Thuringia and the European Social Fund (Grant Number WBV180515). Open Access funding enabled and organized by Projekt DEAL.

#### Conflicts of Interest

The authors declare no conflicts of interest.

#### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.



## Endnotes

- <sup>1</sup>In our study, immigrants are regarded as people living in Germany without German citizenship.
- <sup>2</sup>At the federal elections in September 2021, campaigns mostly revolved around issues such as the COVID-19 pandemic or climate change.
- <sup>3</sup>In the recent state elections, the AfD came first in Thuringia and second in Saxony and Brandenburg—in each case with close to or slightly above 30% of the votes.
- <sup>4</sup>We dropped respondents from the second wave if they had already participated in the first wave, as we used the same survey provider for both waves.
- <sup>5</sup>All individuals are also asked about their posterior beliefs about both facts at the end of the survey.
- <sup>6</sup>Remember that we have coded the variables so that higher values indicate more positive attitudes toward immigration.
- <sup>7</sup>Our results do not change when we use different clustering methods.
- <sup>8</sup>As a robustness checks, we present results for a specification with district fixed effects in Table D2; different regional specifications are presented in Section 6.3.4.
- <sup>9</sup>To better understand if determinants of prior beliefs differ between overestimators or underestimators, we split up the sample into a group which includes those who have overestimated both the share of immigrants and the unemployment rate of immigrants, and a group which includes those who have underestimated both. Tables B2 and B3 in the appendix show the determinants for biased beliefs respectively for respondents who jointly over- or underestimate prior beliefs. Respondents who jointly overestimate show a similar pattern in determinants for prior beliefs about the share of immigrants. For the unemployment rate of immigrants, negative correlations with the population density and AfD vote share persist, even after adding individual covariates. For respondents who jointly underestimate, regional covariates do not seem to play a role for determinants of prior beliefs. This may also be due to the lower sample size.
- <sup>10</sup>Table D2 presents results with district fixed effects.
- <sup>11</sup>For better understanding if different treatment effects for overestimators or underestimators may explain the observed patterns, we split up the sample into one group which includes those who have overestimated both the share of immigrants and the unemployment rate of immigrants and one group which includes those who have underestimated both. Figure D1 shows that joint overestimators respond significantly and positively to all our information treatments with the exception of attitudes toward the labor market where we find the same trade-off pattern as for the full sample. For joint underestimators, on the contrary, we find mostly insignificant effects. This means that informing these participants that the share of immigrants and the unemployment rate are higher than estimated does not lead to more negative attitudes. The only exception is their view on immigration advantage which significantly decreases when the information bundle is provided and which may explain the insignificant effect for the full sample.
- <sup>12</sup>Note that we always control for all the other regional characteristics in our regressions.

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## Appendix A

### Data Description and Summary Statistics

See Table A2.

**TABLE A1** | Variable description of individual-level survey data.

Variable name	Year	Range	Description/question in survey
<b>Beliefs:</b>			
Belief: share of immigrants	2020/ 2021	Numerical	"Now it is about the share of immigrants in Germany. What do you estimate, please answer spontaneously: What percentage of people living in Germany do not have German citizenship?". Hint text (clickable via question mark icon): "The percentage is understood here as the number of immigrants per 100 inhabitants in Germany."  Absolute difference between respondents answer and the true value.
Belief: unemployment rate of immigrants	2020/ 2021	Numerical	"Now it is about the unemployment rate of working-age immigrants in Germany. What do you estimate, please answer spontaneously: What percentage of these people are unemployed." Hint text (clickable via question mark icon): "The percentage is understood here as the number of unemployed persons per 100 immigrants of working age in Germany. Immigrants are considered unemployed if they are registered as unemployed with the Federal Employment Agency. Asylum seekers and tolerated persons are included in the unemployment rate if they have a work permit but no job and are registered as unemployed."  Absolute difference between respondents answer and the true value.
<b>Outcomes:</b>			
Welfare state attitudes	2020/ 2021	Numerical (0–10)	"Do you think that immigrants in Germany get more in benefits than they pay in taxes, or pay more in taxes than they get in benefits?"
Labor market attitudes	2020/ 2021	Numerical (0–10)	"Are immigrants more likely to take jobs away from workers in Germany or are they more likely to help create new jobs?"
Immigration advantage attitudes	2020/ 2021	Numerical (0–10)	"Do you think immigrants have created more disadvantages or more advantages for Germany in the last 10 years?"
Immigration Policy Preferences	2020/ 2021	Numerical (1–5)	"Do you think that the number of immigrants coming to Germany each year should be decreased a lot / decreased slightly / stay the same / increased slightly / increased a lot?"
<b>Control variables:</b>			
Concerns about immigration	2020/ 2021	Numerical (0–10)	Concerns about immigration to Germany
Concerns about economic development	2020/ 2021	Numerical (0–10)	Concerns about economic development in Germany

(Continues)

**TABLE A1** | (Continued)

Variable name	Year	Range	Description/question in survey
Concerns about COVID-19 crisis	2020/ 2021	Numerical (0–10)	Concerns due to the COVID pandemic
Attitude toward cultural diversity	2020/ 2021	Numerical (0–10)	“It is better for a country if almost everyone has the same customs and traditions.”
Political attitude	2020/ 2021	Numerical (0–10)	Measures a respondent’s generalized political attitude on an 11-point scale from 0 for “Left” to 10 for “Right”
Age group	2020/ 2021	Numerical (1–5)	Respondent’s age group according to the ranges: 16–29, 30–39, 40–49, 50–64, 65 and above
Education	2020/ 2021	Numerical (1–3)	Respondent’s education based on highest school-leaving certificate according to the ranges: low, medium, high.
Household size	2020/ 2021	Numerical	Number of persons living in a respondent’s household
Income	2020/ 2021	Numerical (1–5)	Respondent’s household net income in Euro according to the ranges: Below 1500, 1500–2500, 2500–3500, 3500–4500, 4500 and above
Female	2020/ 2021	Binary	Indicates a respondent’s gender
Employed	2020/ 2021	Binary	Indicates whether a respondent is employed
Partner	2020/ 2021	Binary	Indicates whether a respondent lives in a partnership
Migration background	2020/ 2021	Binary	Indicates whether a respondent or one of their parents was born outside of Germany
East Germany	2020/ 2021	Binary	Indicates whether a respondent lives in East Germany (excluding Berlin)
Survey wave	2020/ 2021	Binary	Indicates whether a respondent took part in the first or second wave of the survey

**TABLE A2** | Variable description of district-level data (NUTS-3).

Variable name	Year	Range	Description
Population density	2020	Numerical	Regional population per km <sup>2</sup>
AfD vote share	2021	Numerical	Regional vote share of AfD during the federal elections in Germany in 2021
GDP per capita	2020	Numerical	Regional gross domestic product in EUR 1000 per inhabitant
GDP per capita growth	2020	Numerical	Regional growth of GDP per capita with respect to 2019
Share of immigrants	2020	Numerical	Regional share of immigrants in Germany
Unemployment rate of immigrants	2020	Numerical	Regional unemployment rate of immigrants
Share of refugees in the immigrant population	2020	Numerical	Regional share of refugees in the immigrant population

Note: INKAR Database (BBSR Bonn 2023) and statistical offices of the federal and state governments (Statistical Offices of the Federal and State Governments 2024).

**TABLE A3** | Summary statistics.

	Mean	SD	Minimum	Maximum
<b>Individual</b>				
Welfare state attitudes	3.86	2.45	0.00	10.00
Labor market attitudes	5.25	2.40	0.00	10.00
Immigration advantage attitudes	4.28	2.65	0.00	10.00

(Continues)

TABLE A3 | (Continued)

	Mean	SD	Minimum	Maximum
Immigration policy preferences	2.20	1.02	1.00	5.00
Belief: share of immigrants (%)	13.45	13.73	0.00	84.00
Belief: unemployment rate of immigrants (%)	20.43	20.01	0.00	84.00
Concerns about immigration	5.88	3.23	0.00	10.00
Concerns about economic development	6.18	2.53	0.00	10.00
Concerns about COVID-19 crisis	5.58	2.89	0.00	10.00
Attitude toward cultural diversity	5.22	2.94	0.00	10.00
Political attitude	4.71	1.91	0.00	10.00
Household size	2.14	1.31	0.00	20.00
East Germany	0.15	0.36	0.00	1.00
Female	0.51	0.50	0.00	1.00
Employed	0.53	0.50	0.00	1.00
Partner	0.63	0.48	0.00	1.00
Migration background	0.23	0.42	0.00	1.00
<i>Age group</i>				
16–29	0.16	0.37	0.00	1.00
30–39	0.16	0.37	0.00	1.00
40–49	0.15	0.36	0.00	1.00
50–64	0.27	0.45	0.00	1.00
65 and above	0.25	0.43	0.00	1.00
<i>Education</i>				
Low education	0.34	0.47	0.00	1.00
Medium education	0.32	0.46	0.00	1.00
High education	0.34	0.48	0.00	1.00
<i>Income</i>				
Below 1500 EUR	0.25	0.43	0.00	1.00
1500–2500 EUR	0.29	0.45	0.00	1.00
2500–3500 EUR	0.23	0.42	0.00	1.00
3500–4500 EUR	0.14	0.35	0.00	1.00
4500 EUR and above	0.09	0.29	0.00	1.00
Survey wave	1.59	0.49	1.00	2.00
<b>Regional</b>				
Population density (residents per km <sup>2</sup> )	1087.82	1251.24	35.58	4789.84
Vote share AfD (%)	10.05	5.48	2.87	32.53
GDP per capita (1000 EUR)	41.32	16.43	16.66	167.12
GDP per capita growth (%)	–2.74	2.45	–14.70	9.16
Share of immigrants (%)	13.20	6.07	2.24	36.94
Unemployment rate of immigrants (%)	15.69	6.05	4.90	34.50
Refugees as share of immigrant population (%)	19.71	9.06	0.00	63.77
Observations	5698			

**TABLE A4** | Correlations with East-Germany dummy.

	East Germany
Population density (residents per km <sup>2</sup> )	−0.184
Vote share AfD (%)	0.814
GDP per capita (1000 EUR)	−0.254
GDP per capita growth (%)	0.182
Share of immigrants (%)	−0.505
Unemployment rate of immigrants (%)	0.243
Refugees as share of immigrant population (%)	0.493
Observations	5698

**Appendix B****Prior Beliefs****TABLE B1** | Individual and regional determinants of biases in prior beliefs.

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Population density	−0.108*** (0.027)	−0.070*** (0.021)	0.002 (0.016)	−0.008 (0.016)
AfD vote share	0.032 (0.019)	0.041* (0.023)	0.080*** (0.017)	−0.019 (0.021)
GDP per capita	0.013 (0.021)	0.024 (0.018)	0.005 (0.016)	0.005 (0.016)
GDP per capita growth	−0.010 (0.016)	−0.011 (0.013)	0.005 (0.014)	0.003 (0.013)
Share of immigrants	0.115*** (0.035)	0.117*** (0.030)	−0.077*** (0.026)	−0.048* (0.025)
Unemployment rate of immigrants	0.022 (0.024)	0.013 (0.018)	−0.005 (0.018)	−0.007 (0.017)
Share of refugees	−0.022 (0.024)	0.008 (0.018)	0.006 (0.023)	−0.001 (0.021)
Concerns about immigration		0.163*** (0.016)		0.198*** (0.018)
Concerns about economic development		0.049*** (0.015)		0.047*** (0.014)
Concerns about COVID-19 crisis		−0.010 (0.013)		−0.068*** (0.014)
Attitude toward cultural diversity		−0.021 (0.019)		0.058*** (0.018)
Political attitude		0.017 (0.017)		0.034** (0.016)
Age group		−0.130*** (0.014)		0.025* (0.015)
Education		−0.217*** (0.015)		−0.051*** (0.015)

(Continues)

**TABLE B1** | (Continued)

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Household size		0.057*** (0.017)		0.023 (0.014)
Income		−0.122*** (0.014)		−0.067*** (0.015)
Female		0.432*** (0.025)		0.196*** (0.025)
Employed		0.056** (0.027)		0.001 (0.031)
Partner		0.067** (0.029)		0.038 (0.026)
Migration background		0.144*** (0.031)		0.003 (0.029)
East Germany		−0.053 (0.067)		0.285*** (0.057)
Survey wave		0.082*** (0.023)		0.019 (0.027)
Constant	0.000 (0.016)	−0.445*** (0.044)	0.001 (0.013)	−0.197*** (0.052)
Observations	5698	5698	5698	5698
R <sup>2</sup>	0.007	0.185	0.019	0.121
Adjusted R <sup>2</sup>	0.006	0.181	0.018	0.117

Note: This table shows individual and regional determinants of biases in prior beliefs about the immigrant population. Standard errors clustered at district level.  
 \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE B2** | Determinants of biases in prior beliefs: joint overestimators.

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Population density	−0.149*** (0.037)	−0.108*** (0.028)	−0.032 (0.022)	−0.051** (0.022)
AfD vote share	0.036 (0.032)	0.045 (0.036)	0.057** (0.024)	−0.061** (0.030)
GDP per capita	0.037 (0.034)	0.062* (0.032)	0.025 (0.025)	0.018 (0.025)
GDP per capita growth	−0.017 (0.025)	−0.021 (0.021)	0.023 (0.019)	0.016 (0.018)
Share of immigrants	0.151*** (0.052)	0.149*** (0.045)	−0.069* (0.038)	−0.040 (0.036)
Unemployment rate of immigrants	0.015 (0.033)	0.011 (0.026)	−0.001 (0.026)	−0.007 (0.025)
Share of refugees	−0.000 (0.034)	0.029 (0.026)	0.015 (0.032)	0.005 (0.031)

(Continues)

TABLE B2 | (Continued)

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Concerns about immigration		0.173*** (0.027)		0.185*** (0.028)
Concerns about economic development		0.058** (0.025)		0.032 (0.021)
Concerns about COVID-19 crisis		−0.001 (0.020)		−0.078*** (0.020)
Attitude toward cultural diversity		−0.022 (0.029)		0.036 (0.027)
Political attitude		0.024 (0.025)		0.065*** (0.022)
Age group		−0.196*** (0.023)		0.043** (0.021)
Education		−0.295*** (0.024)		−0.018 (0.021)
Household size		0.057** (0.026)		0.023 (0.020)
Income		−0.156*** (0.023)		−0.078*** (0.023)
Female		0.481*** (0.039)		0.106** (0.042)
Employed		0.041 (0.043)		0.011 (0.044)
Partner		0.066 (0.047)		−0.007 (0.041)
Migration background		0.196*** (0.049)		−0.000 (0.041)
East Germany		−0.010 (0.101)		0.350*** (0.086)
Survey wave		0.101** (0.039)		−0.040 (0.037)
Constant	0.458*** (0.025)	−0.212*** (0.077)	0.470*** (0.019)	0.349*** (0.078)
Observations	2784	2784	2784	2784
R <sup>2</sup>	0.010	0.199	0.016	0.088
Adjusted R <sup>2</sup>	0.008	0.192	0.014	0.081

Note: This table shows individual and regional determinants of biases in prior beliefs about the immigrant population for respondent who jointly overestimated the share and unemployment rate of immigrants. Standard errors clustered at district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE B3** | Determinants of biases in prior beliefs: joint underestimators.

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Population density	−0.014 (0.011)	−0.008 (0.013)	−0.011 (0.010)	0.003 (0.011)
AfD vote share	0.012 (0.010)	0.023 (0.015)	0.021* (0.011)	0.039** (0.018)
GDP per capita	0.018 (0.012)	0.015 (0.012)	−0.001 (0.010)	−0.004 (0.011)
GDP per capita growth	−0.005 (0.009)	−0.007 (0.009)	−0.003 (0.008)	−0.005 (0.008)
Share of immigrants	−0.018 (0.016)	−0.019 (0.016)	0.011 (0.016)	0.016 (0.016)
Unemployment rate of immigrants	0.007 (0.010)	0.003 (0.010)	−0.006 (0.011)	−0.016 (0.010)
Share of refugees	−0.010 (0.011)	−0.004 (0.012)	−0.006 (0.014)	0.005 (0.013)
Concerns about immigration		−0.009 (0.012)		0.003 (0.010)
Concerns about economic development		−0.003 (0.009)		−0.021** (0.008)
Concerns about COVID-19 crisis		0.001 (0.009)		0.007 (0.008)
Attitude toward cultural diversity		−0.011 (0.010)		−0.009 (0.009)
Political attitude		−0.001 (0.009)		−0.016** (0.008)
Age group		0.004 (0.009)		−0.005 (0.009)
Education		−0.004 (0.009)		−0.036*** (0.008)
Household size		0.016** (0.008)		0.015** (0.006)
Income		−0.013 (0.009)		−0.026*** (0.007)
Female		−0.001 (0.016)		0.059*** (0.015)
Employed		0.017 (0.018)		0.016 (0.017)
Partner		−0.010 (0.017)		0.009 (0.015)
Migration background		0.016 (0.020)		0.028 (0.019)
East Germany		−0.035 (0.040)		−0.060 (0.045)

(Continues)

TABLE B3 | (Continued)

	Share of immigrants		Unemployment of immigrants	
	(1)	(2)	(3)	(4)
Survey wave		−0.037** (0.015)		−0.004 (0.015)
Constant	−0.628*** (0.007)	−0.577*** (0.028)	−0.678*** (0.007)	−0.705*** (0.030)
Observations	853	853	853	853
R <sup>2</sup>	0.011	0.032	0.010	0.091
Adjusted R <sup>2</sup>	0.002	0.007	0.002	0.067

Note: This table shows individual and regional determinants of biases in prior beliefs about the immigrant population for respondent who jointly underestimated the share and unemployment rate of immigrants. Standard errors clustered at district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

## Appendix C

### Attitudes Toward Immigrants—Control Group

TABLE C1 | Individual and regional determinants of welfare state and labor market attitudes - control group.

	Welfare state		Labor market	
	(1)	(2)	(3)	(4)
East Germany	0.376*** (0.144)	0.081 (0.119)	0.310** (0.148)	−0.040 (0.131)
Population density	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)	−0.000** (0.000)
AfD vote share	−0.034*** (0.010)	−0.011 (0.009)	−0.021** (0.009)	0.005 (0.008)
GDP per capita	−0.002 (0.002)	−0.000 (0.002)	−0.004** (0.002)	−0.002 (0.002)
GDP per capita growth	0.017 (0.012)	0.013 (0.011)	0.014 (0.011)	0.011 (0.009)
Share of immigrants	0.011 (0.010)	0.005 (0.009)	0.026*** (0.009)	0.021*** (0.008)
Unemployment rate of immigrants	0.011** (0.005)	0.011** (0.004)	0.006 (0.006)	0.006 (0.005)
Share of refugees	−0.009** (0.004)	−0.010*** (0.004)	0.002 (0.004)	0.000 (0.004)
Belief: share of immigrants		−0.001 (0.002)		−0.008*** (0.002)
Belief: unemployment rate of immigrants		−0.007*** (0.001)		−0.001 (0.001)
Concerns about immigration		−0.118*** (0.011)		−0.122*** (0.011)
Concerns about economic development		−0.000 (0.009)		0.016 (0.010)
Concerns about COVID-19 crisis		0.005 (0.008)		0.002 (0.008)

(Continues)



TABLE C1 | (Continued)

	Welfare state		Labor market	
	(1)	(2)	(3)	(4)
Attitude toward cultural diversity		−0.033*** (0.011)		−0.051*** (0.011)
Political attitude		−0.044*** (0.015)		−0.035** (0.016)
Age group		−0.006 (0.019)		0.020 (0.020)
Education		0.099*** (0.031)		0.131*** (0.033)
Household size		−0.021 (0.017)		−0.014 (0.019)
Income		−0.016 (0.024)		0.033 (0.021)
Female		−0.147*** (0.048)		0.066 (0.042)
Employed		−0.007 (0.054)		−0.027 (0.046)
Partner		0.075 (0.055)		0.003 (0.050)
Survey wave		−0.009 (0.041)		0.102** (0.048)
Constant	0.302* (0.175)	1.252*** (0.237)	−0.065 (0.184)	0.283 (0.230)
Observations	1437	1437	1437	1437
R <sup>2</sup>	0.018	0.357	0.014	0.372
Adjusted R <sup>2</sup>	0.012	0.346	0.008	0.362

Note: This table shows individual and regional determinants of welfare state and labor market attitudes of the control group. Standard errors clustered at district level. The sample is restricted to the control group only.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

TABLE C2 | Individual and regional determinants of immigration advantage and policy preferences - control group.

	Immigration advantage		Immigration policy	
	(1)	(2)	(3)	(4)
East Germany	0.351** (0.143)	−0.031 (0.097)	0.418*** (0.145)	0.025 (0.101)
Population density	0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
AfD vote share	−0.035*** (0.009)	−0.004 (0.006)	−0.034*** (0.010)	−0.002 (0.007)
GDP per capita	−0.002 (0.002)	−0.000 (0.002)	−0.004* (0.002)	−0.002 (0.002)
GDP per capita growth	0.017 (0.011)	0.012 (0.009)	0.016 (0.011)	0.011 (0.008)

(Continues)

TABLE C2 | (Continued)

	Immigration advantage		Immigration policy	
	(1)	(2)	(3)	(4)
Share of immigrants	−0.000 (0.009)	−0.006 (0.007)	0.011 (0.009)	0.005 (0.006)
Unemployment rate of immigrants	0.003 (0.006)	0.002 (0.003)	0.000 (0.006)	−0.001 (0.003)
Share of refugees	−0.002 (0.005)	−0.003 (0.003)	−0.002 (0.004)	−0.003 (0.003)
Belief: share of immigrants		−0.002 (0.002)		−0.003 (0.002)
Belief: unemployment rate of immigrants		−0.004*** (0.001)		−0.003*** (0.001)
Concerns about immigration		−0.158*** (0.010)		−0.167*** (0.010)
Concerns about economic development		0.006 (0.009)		−0.001 (0.008)
Concerns about COVID-19 crisis		0.021*** (0.008)		0.017*** (0.006)
Attitude toward cultural diversity		−0.054*** (0.010)		−0.043*** (0.009)
Political attitude		−0.046*** (0.015)		−0.052*** (0.012)
Age group		−0.010 (0.015)		−0.018 (0.015)
Education		0.075*** (0.027)		0.064** (0.028)
Household size		0.014 (0.013)		−0.024* (0.013)
Income		0.015 (0.019)		0.013 (0.018)
Female		−0.078** (0.037)		−0.036 (0.039)
Employed		−0.055 (0.040)		−0.021 (0.037)
Partner		−0.059 (0.046)		−0.018 (0.045)
Survey wave		0.080** (0.037)		0.140*** (0.036)
Constant	0.407** (0.176)	1.304*** (0.188)	0.365** (0.184)	1.305*** (0.179)
Observations	1437	1437	1437	1437
R <sup>2</sup>	0.015	0.536	0.013	0.549
Adjusted R <sup>2</sup>	0.010	0.528	0.008	0.541

Note: This table shows individual and regional determinants of immigration advantage and policy preferences of the control group. Standard errors clustered at district level. The sample is restricted to the control group only.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

## Appendix D

### Treatment Effects

**TABLE D1** | Average treatment effects of information provision.

	Welfare state (1)	Labor market (2)	Immig. advantage (3)	Immig. policy (4)
Info Share	0.094*** (0.029)	0.058** (0.029)	0.086*** (0.026)	0.084*** (0.024)
Info Unemployment	0.119*** (0.030)	0.030 (0.030)	0.072*** (0.023)	0.049** (0.023)
Info Bundle	0.102*** (0.031)	0.008 (0.030)	0.026 (0.026)	0.047* (0.026)
Observations	5698	5698	5698	5698
$R^2$	0.318	0.326	0.478	0.536
Adjusted $R^2$	0.314	0.323	0.475	0.534

*Note:* This table shows the average treatment effects of providing information about the share of immigrants in Germany, the unemployment rate of immigrants in Germany and a combination of both types of information on welfare state attitudes, labor market attitudes, attitudes about immigration advantages and preferences for immigration policy. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, income, gender, employment status, partner, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors are clustered at the district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE D2** | Average treatment effects of information provision with district fixed effects.

	Welfare state (1)	Labor market (2)	Immig. advantage (3)	Immig. policy (4)
Info Share	0.094** (0.031)	0.061 (0.032)	0.094*** (0.027)	0.085** (0.026)
Info Unemployment	0.131*** (0.031)	0.038 (0.032)	0.083** (0.025)	0.055* (0.025)
Info Bundle	0.115*** (0.034)	0.013 (0.033)	0.033 (0.027)	0.050 (0.029)
Observations	5698	5698	5698	5698
$R^2$	0.367	0.374	0.520	0.564
Adjusted $R^2$	0.317	0.324	0.482	0.529

*Note:* This table shows the average treatment effects of providing information about the share of immigrants in Germany, the unemployment rate of immigrants in Germany and a combination of both types of information on welfare state attitudes, labor market attitudes, attitudes about immigration advantages and preferences for immigration policy. The regression includes individual controls and district fixed effects. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, income, gender, employment status, partner, migration background, and an indicator for the survey wave.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE D3** | Treatment effect heterogeneity: share of immigrants.

	<b>Welfare state (1)</b>	<b>Labor market (2)</b>	<b>Immig. advantage (3)</b>	<b>Immig. policy (4)</b>
<i>Panel A: Districts with high share of immigrants</i>				
Info Share	0.069* (0.037)	−0.005 (0.036)	0.082** (0.033)	0.058* (0.030)
Info Unemployment	0.106*** (0.037)	0.015 (0.035)	0.074** (0.030)	0.030 (0.030)
Info Bundle	0.130*** (0.041)	0.005 (0.038)	0.045 (0.031)	0.066* (0.035)
Observations	3657	3657	3657	3657
R <sup>2</sup>	0.325	0.344	0.487	0.529
Adjusted R <sup>2</sup>	0.321	0.339	0.483	0.525
	<b>Welfare State (1)</b>	<b>Labor Market (2)</b>	<b>Immig. Advantage (3)</b>	<b>Immig. Policy (4)</b>
<i>Panel B: Districts with low share of immigrants</i>				
Info Share	0.137*** (0.050)	0.175*** (0.047)	0.080* (0.042)	0.133*** (0.044)
Info Unemployment	0.144*** (0.049)	0.060 (0.051)	0.068* (0.036)	0.086** (0.037)
Info Bundle	0.053 (0.046)	0.017 (0.049)	−0.016 (0.044)	0.016 (0.038)
Observations	2041	2041	2041	2041
R <sup>2</sup>	0.300	0.302	0.465	0.553
Adjusted R <sup>2</sup>	0.291	0.293	0.458	0.547

*Note:* This table shows the treatment effects of information provision in districts with high and low share of immigrants. The sample was split along the median. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, income, gender, employment status, partner, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors are clustered at the district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE D4** | Treatment effect heterogeneity: AfD vote share.

	<b>Welfare state (1)</b>	<b>Labor market (2)</b>	<b>Immig. advantage (3)</b>	<b>Immig. policy (4)</b>
<i>Panel A: Districts with high AfD vote shares</i>				
Info Share	0.103** (0.051)	0.045 (0.051)	0.079* (0.045)	0.058 (0.045)
Info Unemployment	0.134*** (0.049)	−0.025 (0.050)	0.061 (0.040)	0.010 (0.042)
Info Bundle	0.107** (0.046)	−0.003 (0.048)	0.019 (0.045)	−0.002 (0.040)
Observations	2066	2066	2066	2066
$R^2$	0.313	0.288	0.447	0.514
Adjusted $R^2$	0.304	0.279	0.440	0.507
	<b>Welfare state (1)</b>	<b>Labor market (2)</b>	<b>Immig. advantage (3)</b>	<b>Immig. policy (4)</b>
<i>Panel B: Districts with low AfD vote shares</i>				
Info Share	0.090** (0.035)	0.071** (0.035)	0.088*** (0.031)	0.096*** (0.028)
Info Unemployment	0.110*** (0.037)	0.062* (0.037)	0.076*** (0.028)	0.067** (0.028)
Info Bundle	0.103** (0.041)	0.017 (0.038)	0.024 (0.031)	0.074** (0.034)
Observations	3632	3632	3632	3632
$R^2$	0.318	0.348	0.494	0.549
Adjusted $R^2$	0.313	0.343	0.491	0.546

*Note:* This table shows the treatment effects of information provision in districts with high and low AfD vote shares. The sample was split along the median. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, income, gender, employment status, partner, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors are clustered at the district level.

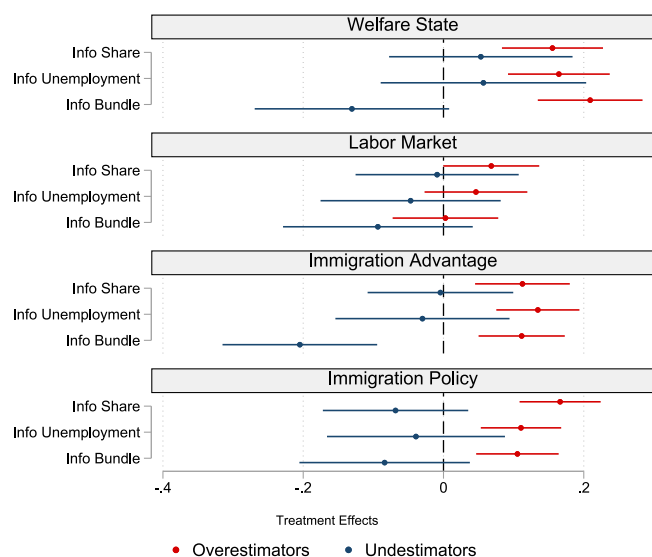
\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**TABLE D5** | Treatment effect heterogeneity: GDP per capita growth.

	Welfare state (1)	Labor market (2)	Immig. advantage (3)	Immig. policy (4)
<i>Panel A: Districts with high GDP per capita growth</i>				
Info Share	0.087** (0.042)	0.097** (0.042)	0.076* (0.039)	0.149*** (0.034)
Info Unemployment	0.166*** (0.044)	0.090** (0.042)	0.092** (0.035)	0.075** (0.035)
Info Bundle	0.071 (0.046)	0.046 (0.047)	0.029 (0.041)	0.058 (0.042)
Observations	2666	2666	2666	2666
$R^2$	0.323	0.308	0.475	0.542
Adjusted $R^2$	0.317	0.301	0.470	0.537
	Welfare state (1)	Labor market (2)	Immig. advantage (3)	Immig. policy (4)
<i>Panel B: Districts with low GDP per capita growth</i>				
Info Share	0.097** (0.041)	0.026 (0.041)	0.090** (0.035)	0.033 (0.032)
Info Unemployment	0.071* (0.040)	−0.027 (0.042)	0.054* (0.031)	0.032 (0.031)
Info Bundle	0.125*** (0.043)	−0.023 (0.041)	0.024 (0.033)	0.043 (0.035)
Observations	3032	3032	3032	3032
$R^2$	0.318	0.348	0.484	0.538
Adjusted $R^2$	0.312	0.342	0.479	0.534

*Note:* This table shows the treatment effects of information provision in districts with high and low GDP per capita growth. The sample was split along the median. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, age, education, household size, income, gender, employment status, partner, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors are clustered at the district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .



**FIGURE D1** | Treatment effects: comparison of joint overestimators and joint underestimators. The sample is split in respondents who jointly over- or jointly underestimate the share of immigrants and the unemployment rate of immigrants. For joint overestimators, the comparison is with those who at most overestimate one statistic; for joint underestimators, the comparison is those who at most underestimate one statistic. Standard errors clustered by districts. The 90% confidence intervals displayed. In total, 2784 respondents jointly overestimate both the share of immigrants and the unemployment rate of immigrants and 853 jointly underestimate both. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, gender, age, education, income, partner, household size, employment status, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees.

## Appendix E

### Robustness Checks

#### Different Regional Specifications

##### *Analysis at the NUTS 2 Level*

We also run our analysis with regional covariates at the NUTS 2 level, which roughly corresponds to *Regierungsbezirke* in Germany, to see if our results hold at a higher, i.e. less disaggregated, administrative level. Table E1 shows the results for regional heterogeneity based on variation at the NUTS 2 level in the share of immigrants, the AfD vote share, and GDP growth. There are some differences in the significance levels, for example, we do not find significant differences in labor market attitudes between regions with low and high shares of immigrants. Nevertheless, the interpretations of the overall pattern of heterogeneity across the different types of regions remain the same. Figure E1 presents the results graphically allowing for an easy comparison with our district-level results.

##### *Analysis With Federal State Fixed Effects*

Another concern might be that variations at the state level, for example, certain policies, might influence our results. We address this concern by including categorical variables for the German federal states, that is, state fixed effects, to account for changes at the state level. The results are shown in Table E2. Compared to the main specification, the results remain almost the same. We can therefore conclude that controlling for state fixed effects does not alter our results. Figure E2 presents the results graphically allowing for an easy comparison with our district-level results.

### Ordered Probit

Our outcome variables can also be seen as ordinal dependent variables, for example, welfare state attitudes ranging from 0 (receive more benefits) to 10 (pay more taxes) or immigration policy preferences ranging from 1 (decrease a lot) to 5 (increase a lot). Thus, we could also employ an ordinal regression model to evaluate treatment effects. Table E3 displays outcomes for an ordered probit regression. Given the signs of the coefficients, the interpretation of the treatment effects is comparable to the original specification. See Figure E3 for the results in comparison with our OLS results.

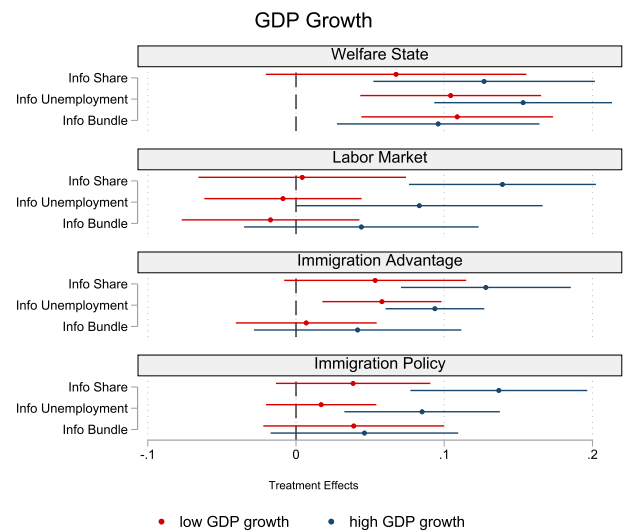
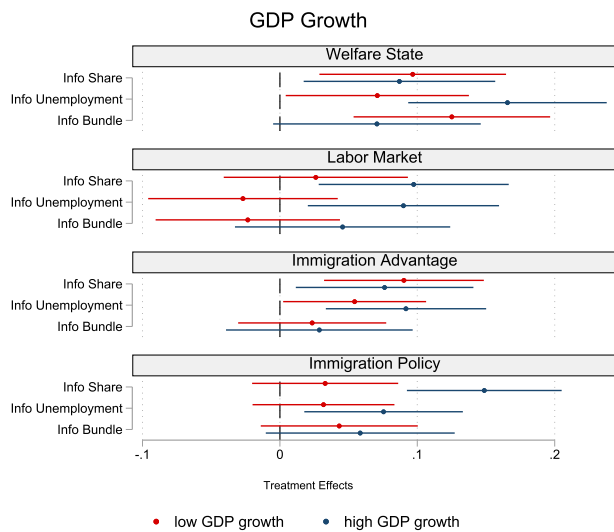
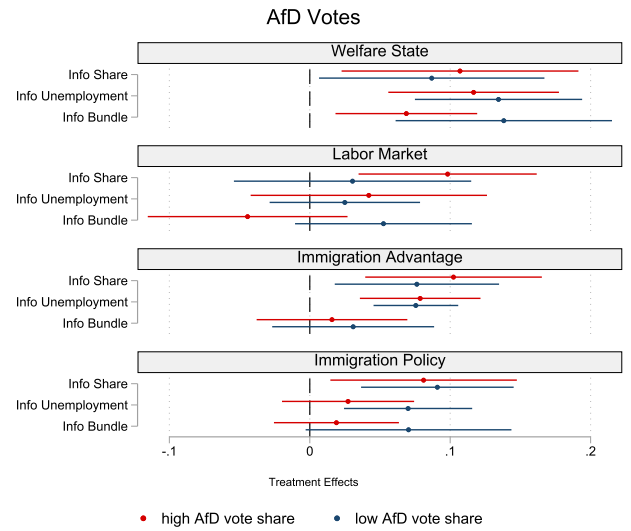
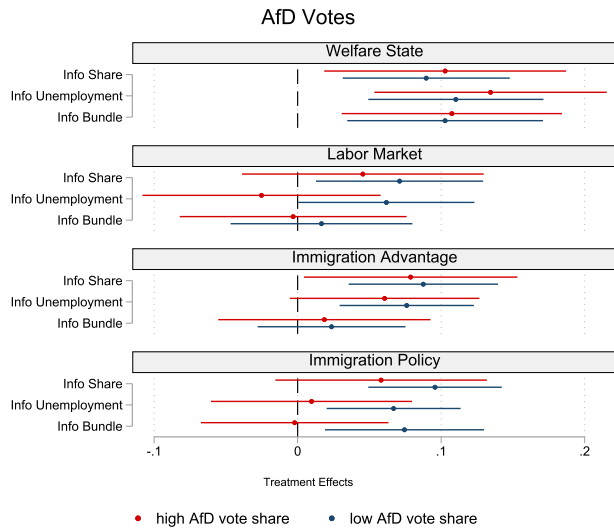
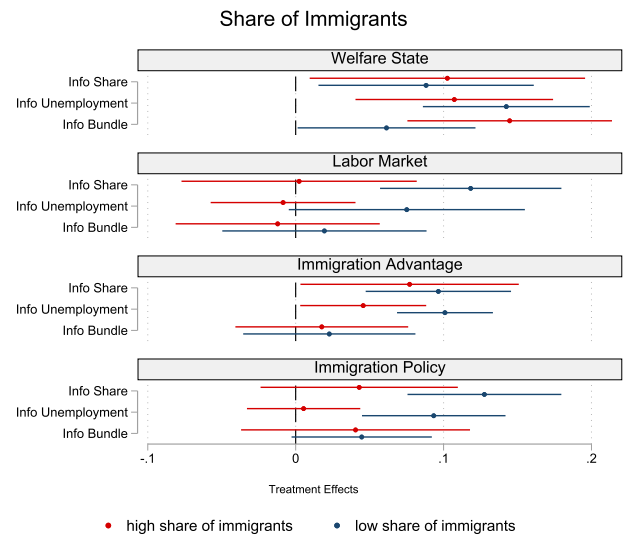
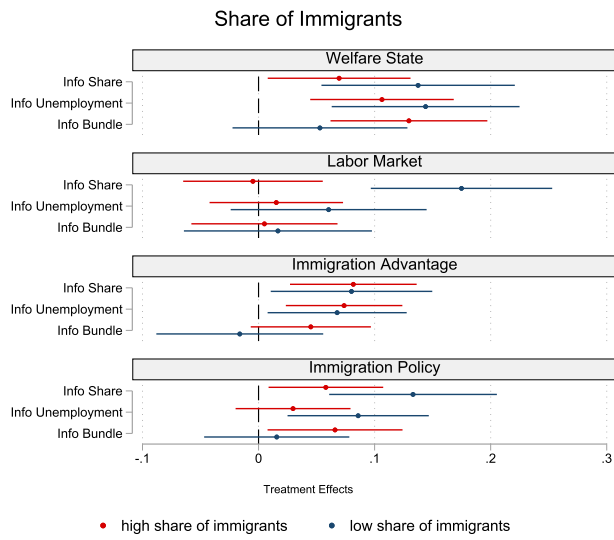
**TABLE E1** | Treatment effect heterogeneity: NUTS 2 level.

	Above median				Below median			
	Welfare state (1)	Labor market (2)	Immig. adv. (3)	Immig. policy (4)	Welfare state (5)	Labor market (6)	Immig. adv. (7)	Immig. policy (8)
<i>Panel A: Share of immigrants</i>								
Info Share	0.103*	0.002	0.077*	0.043	0.088**	0.118***	0.096***	0.128***
	(0.052)	(0.045)	(0.041)	(0.037)	(0.043)	(0.036)	(0.029)	(0.030)
Info Unemployment	0.107**	−0.009	0.046*	0.005	0.142***	0.075	0.101***	0.093***
	(0.037)	(0.027)	(0.024)	(0.021)	(0.033)	(0.047)	(0.019)	(0.028)
Info Bundle	0.145***	−0.012	0.018	0.040	0.061*	0.019	0.023	0.045
	(0.039)	(0.039)	(0.033)	(0.043)	(0.035)	(0.040)	(0.034)	(0.028)
Observations	2860	2860	2860	2860	2843	2843	2843	2843
R <sup>2</sup>	0.318	0.349	0.491	0.535	0.320	0.311	0.466	0.541
<i>Panel B: AfD vote share</i>								
Info Share	0.107**	0.098**	0.102**	0.081**	0.087*	0.030	0.076**	0.091**
	(0.049)	(0.037)	(0.037)	(0.039)	(0.046)	(0.048)	(0.033)	(0.031)
Info Unemployment	0.117***	0.042	0.079***	0.027	0.134***	0.025	0.076***	0.070**
	(0.035)	(0.049)	(0.025)	(0.027)	(0.034)	(0.030)	(0.017)	(0.026)
Info Bundle	0.069**	−0.044	0.016	0.019	0.138***	0.052	0.031	0.070
	(0.029)	(0.041)	(0.031)	(0.026)	(0.044)	(0.036)	(0.033)	(0.042)
Observations	2702	2702	2702	2702	3001	3001	3001	3001
R <sup>2</sup>	0.331	0.308	0.459	0.525	0.308	0.344	0.493	0.546
<i>Panel C: GDP growth</i>								
Info Share	0.127***	0.139***	0.128***	0.137***	0.068	0.004	0.053	0.039
	(0.043)	(0.037)	(0.033)	(0.035)	(0.050)	(0.040)	(0.035)	(0.030)
Info Unemployment	0.153***	0.083	0.094***	0.085**	0.104***	−0.009	0.058**	0.017
	(0.035)	(0.048)	(0.019)	(0.030)	(0.035)	(0.030)	(0.023)	(0.021)
Info Bundle	0.096**	0.044	0.042	0.046	0.109***	−0.017	0.007	0.039
	(0.040)	(0.046)	(0.041)	(0.037)	(0.037)	(0.034)	(0.027)	(0.035)
Observations	2585	2585	2585	2585	3118	3118	3118	3118
R <sup>2</sup>	0.329	0.317	0.473	0.540	0.318	0.340	0.485	0.539

*Note:* This table shows results at the NUTS 2 level. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, gender, age, education, income, partner, household size, employment status, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors clustered at the NUTS 2 level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .





(a) District level

(b) NUTS 2 level

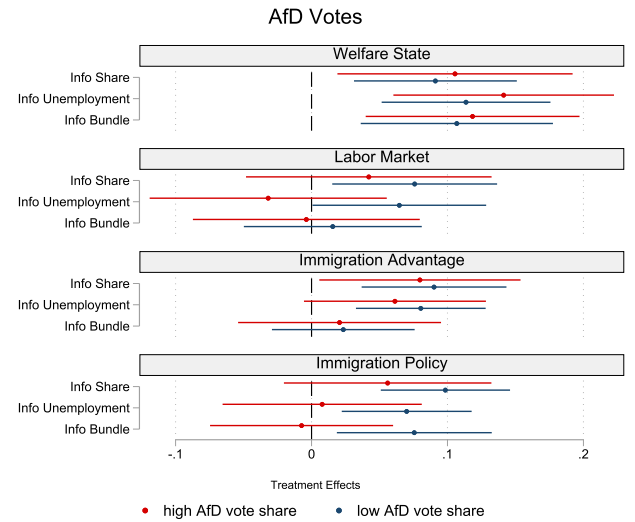
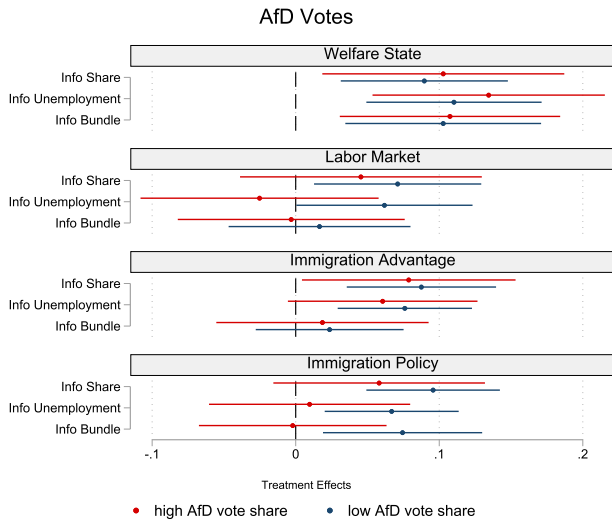
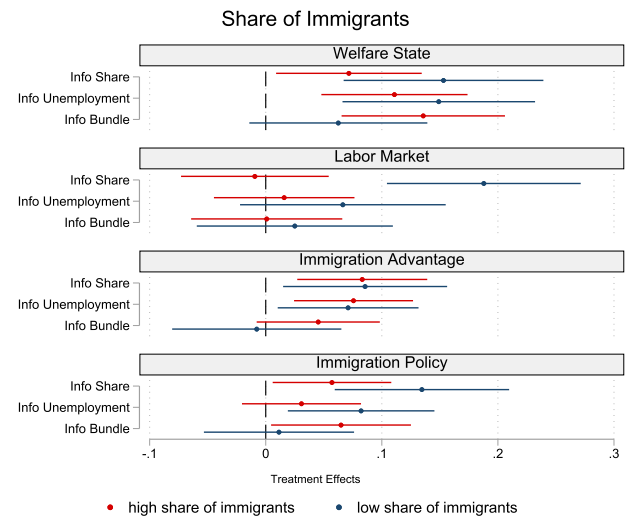
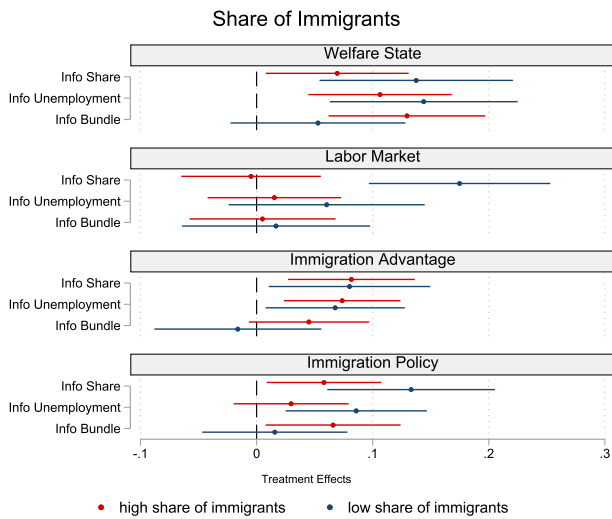
**FIGURE E1** | Robustness check: NUTS- 2 level results compared to district- level results. This figure graphically compares the estimation results from Table E1 for NUTS- 2 (panel b) with the original results on the district- level (panel a).

**TABLE E2** | Treatment effect heterogeneity: state fixed effects.

	Above median				Below median			
	Welfare state (1)	Labor market (2)	Immig. adv. (3)	Immig. policy (4)	Welfare state (5)	Labor market (6)	Immig. adv. (7)	Immig. policy (8)
<i>Panel A: Share of immigrants</i>								
Info Share	0.071*	−0.009	0.083**	0.057*	0.153***	0.189***	0.086**	0.134***
	(0.038)	(0.039)	(0.034)	(0.031)	(0.052)	(0.051)	(0.043)	(0.046)
Info Unemployment	0.110***	0.016	0.075**	0.031	0.148***	0.066	0.070*	0.083**
	(0.038)	(0.037)	(0.031)	(0.031)	(0.050)	(0.054)	(0.037)	(0.038)
Info Bundle	0.134***	0.001	0.045	0.065*	0.064	0.028	−0.007	0.015
	(0.042)	(0.039)	(0.032)	(0.036)	(0.046)	(0.051)	(0.044)	(0.039)
Observations	3657	3657	3657	3657	2041	2041	2041	2041
R <sup>2</sup>	0.327	0.348	0.488	0.530	0.310	0.307	0.469	0.557
<i>Panel B: AfD vote share</i>								
Info Share	0.104**	0.041	0.081*	0.055	0.090**	0.076**	0.090***	0.098***
	(0.052)	(0.055)	(0.045)	(0.046)	(0.036)	(0.037)	(0.032)	(0.029)
Info Unemployment	0.137***	−0.032	0.061	0.009	0.113***	0.064*	0.080***	0.070**
	(0.049)	(0.053)	(0.041)	(0.044)	(0.038)	(0.039)	(0.029)	(0.029)
Info Bundle	0.116**	−0.002	0.023	−0.004	0.106**	0.016	0.023	0.075**
	(0.048)	(0.050)	(0.045)	(0.041)	(0.043)	(0.040)	(0.032)	(0.034)
Observations	2066	2066	2066	2066	3632	3632	3632	3632
R <sup>2</sup>	0.322	0.295	0.451	0.518	0.319	0.352	0.497	0.550
<i>Panel C: GDP growth</i>								
Info Share	0.082*	0.103**	0.074*	0.151***	0.104**	0.027	0.094***	0.032
	(0.044)	(0.044)	(0.040)	(0.035)	(0.042)	(0.043)	(0.035)	(0.033)
Info Unemployment	0.166***	0.093**	0.095***	0.075**	0.073*	−0.021	0.054*	0.036
	(0.045)	(0.045)	(0.036)	(0.036)	(0.042)	(0.043)	(0.032)	(0.033)
Info Bundle	0.073	0.050	0.033	0.061	0.133***	−0.022	0.023	0.044
	(0.047)	(0.049)	(0.042)	(0.043)	(0.045)	(0.042)	(0.033)	(0.036)
Observations	2666	2666	2666	2666	3032	3032	3032	3032
R <sup>2</sup>	0.328	0.312	0.479	0.544	0.323	0.353	0.488	0.542

*Note:* The regression includes federal state fixed effects. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, gender, age, education, income, partner, household size, employment status, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors clustered at the district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .



(a) District level without state fixed effects

(b) District level with state fixed effects

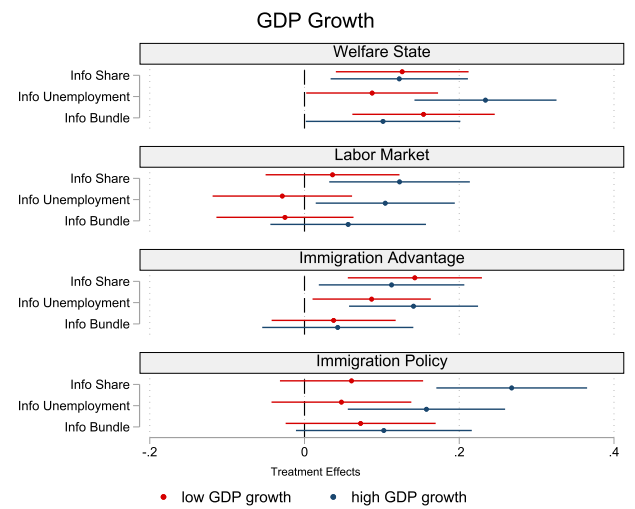
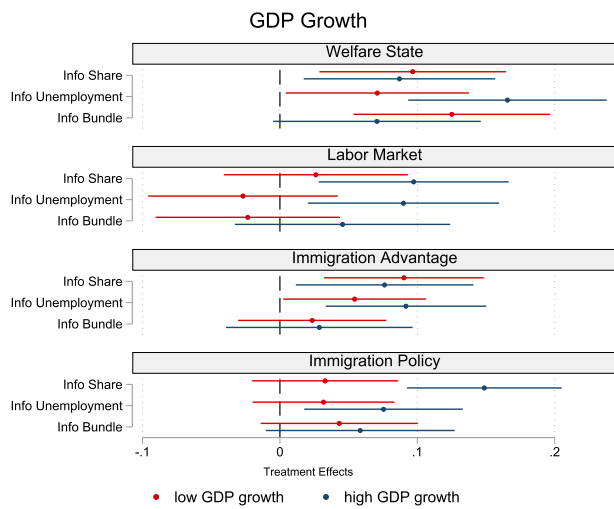
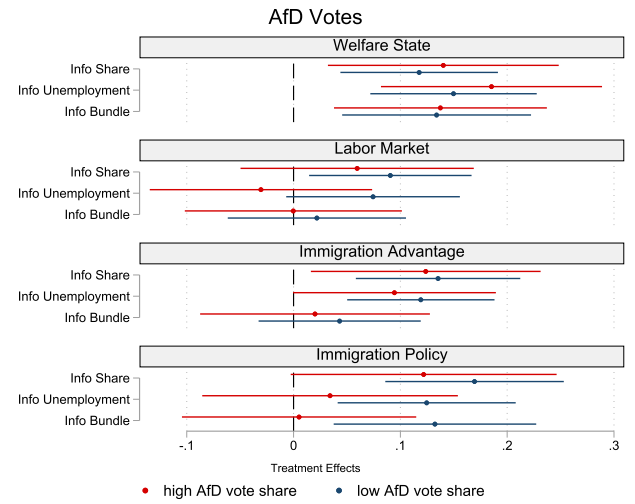
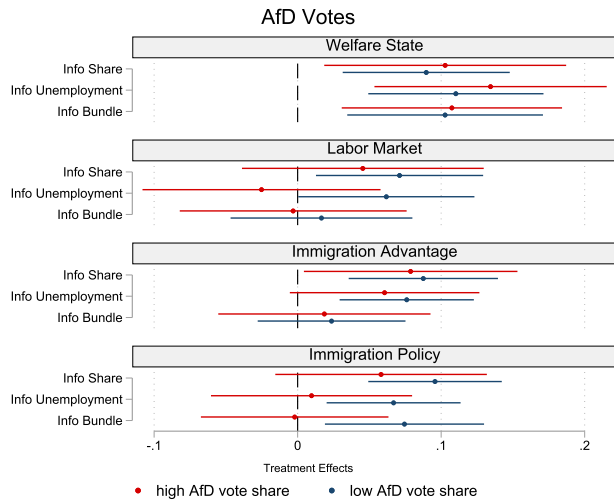
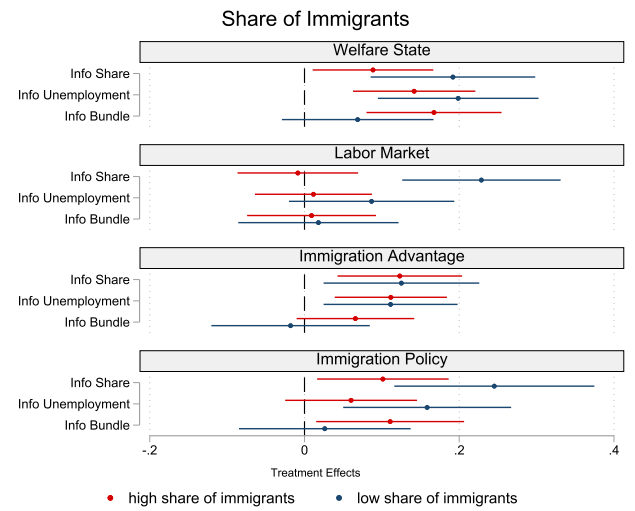
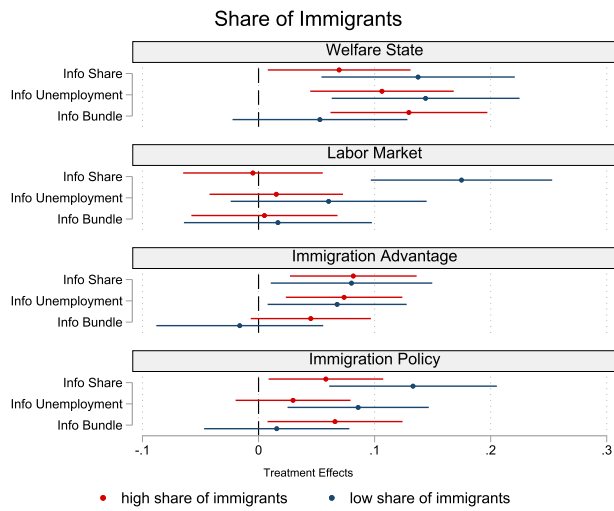
**FIGURE E2** | Robustness check: district-level results without and with state fixed effects. This figure graphically compares the estimation results with state fixed effects from Table E2 (panel b) with the original results without state fixed effects (panel a).

**TABLE E3** | Treatment effect heterogeneity: ordered probit regression.

	Above median				Below median			
	Welfare state (1)	Labor market (2)	Immig. adv. (3)	Immig. policy (4)	Welfare state (5)	Labor market (6)	Immig. adv. (7)	Immig. policy (8)
<i>Panel A: Share of immigrants</i>								
Info Share	0.088*	−0.009	0.123**	0.101**	0.192***	0.228***	0.127**	0.246***
	(0.048)	(0.047)	(0.049)	(0.052)	(0.065)	(0.062)	(0.062)	(0.079)
Info Unemployment	0.141***	0.011	0.111**	0.060	0.199***	0.085	0.111**	0.162**
	(0.048)	(0.046)	(0.044)	(0.052)	(0.063)	(0.065)	(0.053)	(0.066)
Info Bundle	0.165***	0.009	0.066	0.110*	0.070	0.020	−0.016	0.035
	(0.053)	(0.051)	(0.046)	(0.058)	(0.060)	(0.063)	(0.063)	(0.067)
Observations	3657	3657	3657	3657	2041	2041	2041	2041
Pseudo $R^2$	0.092	0.100	0.146	0.268	0.085	0.087	0.138	0.292
<i>Panel B: AfD vote share</i>								
Info Share	0.139**	0.058	0.124*	0.122	0.117***	0.091**	0.135***	0.170***
	(0.066)	(0.066)	(0.066)	(0.076)	(0.045)	(0.046)	(0.047)	(0.051)
Info Unemployment	0.184***	−0.032	0.095*	0.033	0.148***	0.074	0.118***	0.124**
	(0.063)	(0.063)	(0.058)	(0.072)	(0.047)	(0.049)	(0.042)	(0.051)
Info Bundle	0.138**	0.001	0.023	0.008	0.133**	0.022	0.042	0.132**
	(0.061)	(0.062)	(0.065)	(0.066)	(0.054)	(0.051)	(0.046)	(0.057)
Observations	2066	2066	2066	2066	3632	3632	3632	3632
Pseudo $R^2$	0.089	0.084	0.133	0.263	0.089	0.101	0.148	0.283
<i>Panel C: GDP growth</i>								
Info Share	0.122**	0.121**	0.114**	0.268***	0.124**	0.036	0.141***	0.060
	(0.054)	(0.055)	(0.057)	(0.059)	(0.052)	(0.053)	(0.052)	(0.057)
Info Unemployment	0.233***	0.103*	0.141***	0.158**	0.086*	−0.030	0.086*	0.047
	(0.056)	(0.055)	(0.051)	(0.062)	(0.052)	(0.055)	(0.047)	(0.055)
Info Bundle	0.103*	0.057	0.045	0.108	0.153***	−0.026	0.037	0.072
	(0.061)	(0.061)	(0.059)	(0.069)	(0.056)	(0.054)	(0.049)	(0.059)
Observations	2666	2666	2666	2666	3032	3032	3032	3032
Pseudo $R^2$	0.092	0.089	0.141	0.280	0.090	0.102	0.145	0.276

*Note:* This table shows results for treatment effect heterogeneity estimated with an ordered probit regression. The regression includes individual and regional control variables. Individual controls include beliefs about the share of immigrants in Germany, beliefs about the unemployment rate of immigrants in Germany, concerns about immigration, concerns about economic development, concerns about the COVID-19 crisis, attitudes toward cultural diversity, political attitudes, gender, age, education, income, partner, household size, employment status, migration background, and an indicator for the survey wave. Regional controls include living in East Germany, population density, AfD vote share, GDP per capita, GDP per capita growth, share of immigrants, unemployment rate of immigrants, and share of refugees. Standard errors clustered at the district level.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .



(a) District level - OLS

(b) District level - ordered probit

**FIGURE E3** | Robustness check: Ordered probit results compared to OLS results. This figure compares the ordered probit estimation results from Table E3 to the original OLS results.