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Diverging beliefs on climate change and climate policy in Germany: The role of political orientations

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Stephan Sommer

**Diverging Beliefs on Climate Change and
Climate Policy in Germany – The Role of
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Leonard Knollenborg and Stephan Sommer¹

Diverging Beliefs on Climate Change and Climate Policy in Germany – The Role of Political Orientations

Abstract

Using longitudinal data from two household surveys in 2017 and 2019, we analyze the determinants of climate skepticism in Germany. We find that nearly 20% of respondents state that they do not believe in climate change and more than 30% are doubtful that climate change is mainly caused by human action. Both percentages have increased over time. Moreover, we detect that political orientation is a crucial determinant for climate skepticism, as respondents inclined to Germany's right-wing populist party AfD are substantially more climate-skeptical and object to climate policies more frequently. One reason for the deviating beliefs may be rooted in the different trust in science, even if we can rule out that the lack of knowledge is a major factor. Consequently, our findings indicate a clear division in society on climate-related issues, one that would widen if the measures taken to combat climate change involved distributional consequences for AfD voters, as they already feel particularly burdened by energy costs.

JEL-Code: H41, Q50, Q58

Keywords: Climate change mitigation; support; environmental policy; attitudes; survey data

June 2021

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1) Introduction

With the Paris Agreement, the United Nations has agreed to the goal of limiting the rise in global average temperature compared to pre-industrial levels to well below 2°C, preferably 1.5°C (Hulme 2016). To comply with this goal and to aim for a climate-neutral economy, EU member states have agreed on reducing greenhouse gas emissions until 2030 by at least 55% compared to 1990. However, many European countries have struggled to reduce emissions and only the Covid pandemic triggered a substantial temporary decline (Le Quéré et al. 2021). In most European countries, including Germany, additional measures will be necessary to reach the goals of the Paris Agreement (see Rogelj et al. 2016). This includes higher carbon prices like the newly introduced carbon price in Germany, which will increase the price of CO₂ emissions in the transport and heating sector to 55 euros per ton by 2025 (Edenhofer et al. 2020).

Policies that impose an additional burden on citizens are often cumbersome to enforce owing to public opposition (Hammar et al. 2004). There is an extensive literature that quantifies the distributive burden of environmental policies (e.g., Cronin et al. 2019, Fullerton and Muehlegger 2019). In France, for example, the government's plan to increase taxes on fossil fuels led to the rise of the Yellow Vest movement and heavy protests (Douenne and Fabre 2020). In Germany, higher carbon prices have met with majority opposition, with perceived fairness in the redistribution of revenues appearing to be an important aspect (Sommer et al. 2020).

There are multiple reasons why people oppose climate protection policies, and one reason is skepticism about or denial of climate change and the need for climate protection.³ According to an international study by YouGov (2019), the belief that climate is changing, and that human activity is mainly responsible for climate change is not as uncontroversial within the European population as one might expect. Agreement with this belief ranges from 35% in Norway to 69% in Spain, while in Germany, the rate is 49%. Understanding the determinants of why many people remain skeptical towards climate change – despite broad agreement within the scientific community (e.g., Anderegg et al. 2010) – is crucial to fashioning and enforcing climate protection measures.

Using longitudinal data of roughly 6,000 individuals for Germany, this paper analyzes the attitudes toward climate change as well as pro-environmental behavior. We concentrate on the role of political orientation, in particular populism (see Guriev and Papaioannou, 2020 for a synthesis on populism). For our analysis, we build upon extensive survey data that was

³ We use the terms climate skepticism and climate denial interchangeably as they are both used in the literature. However, there is a debate whether climate skepticism is an accurate term (see Björnberg et al. 2017).

collected in 2017 and 2019, comprising a wide range of socio-economic characteristics as well as a large suite of attitudes, policy choices, and environmental values to account for the fact that attitudes are shaped by several factors. While in general climate skepticism, attitudes toward climate policy, and pro-environmental behavior are well-researched individually (see Hornsey et al. 2016), we provide a comprehensive analysis of the three aspects together using a large-scale, longitudinal data set and link it with a rich set of explanatory variables. Moreover, there is limited research on the intersection between political orientation and climate policy in Germany. Yet, Germany presents itself as an interesting case study given its longstanding implementation of a large-scale transition of the energy system and its recent introduction of a carbon tax.

Using German data, Engels et al. (2013) find climate change skepticism to be little diffused, also because of the lack of a strong political outlet for public climate change skepticism. However, a lot has changed in this period since their study: The right-wing populist party Alternative für Deutschland (AfD) was founded in 2012 and initially exhibited strong opinions against the common currency in the EU (for a summary of the development of the AfD, see for example Dilling 2018 and Tomberg et al. 2020).⁴ AfD has changed quite a lot since then. In parallel with the shift in public debates (see Figures A3 and A4 in the appendix for an illustration of Google search queries), the AfD focused first on the Euro crisis, then on migration, and for a few years, their political manifesto has also included climate denial views. For instance, the 2016 platform states that climate has always been changing since the earth exists and it rejects the results of IPCC computer models, which show that anthropogenic CO₂ emissions lead to global warming with serious consequences for humanity (AfD 2016). AfD leaders have even declared fighting climate policy to be the party's new main task (Sturm 2020).

We build upon a large literature that has analyzed the denial of climate change and “discourses of delay” (Lamb et al. 2020). Rahmstorf (2004) distinguishes three kinds of denials: (i) *trend denialists* contest that any climate change is taking place, (ii) *attribution denialists*, cast doubt on the anthropogenic nature of climate change, and (iii) *impact denialists* deny that climate change will have a negative bearing on humans or the environment. Our analysis focuses on trend denial, as the three facets of climate change denial are strongly correlated (Poortinga et al. 2011). Regarding the determinants of belief in climate change and the support for climate policy, van der Linden (2015) identifies four kinds of determinants for climate change denial, namely socio-economic, cognitive, socio-cultural, and experiential aspects (see also Myers et al. 2013). Among socio-economic characteristics, higher age, lower education, lower income, and being male are associated with a higher tendency to be skeptical about climate change.

⁴ We refer to the AfD as a right-wing populist party, as this is the common formulation and is considered appropriate, even if the term is not clearly defined (Jesse and Panreck 2017). See also Häusler (2018) for a debate on the political classification of the AfD.

Moreover, a common finding is that political orientation matters (see Hornsey et al. 2016 for a meta-analysis and Tranter and Booth 2015 for a cross-country analysis): individuals with conservative values tend to be more climate skeptical (e.g., McCright and Dunlap, 2011; Poortinga et al., 2011; Whitmarsh, 2011). For instance, using US data McCright and Dunlap (2011) demonstrate that conservative white males are more likely to report denialist views and state that media coverage of climate change is exaggerated. Poortinga et al. (2011), Poortinga et al. (2019) and Whitmarsh (2011) uniformly detect that climate change skepticism mainly hinges on values and environmental attitudes rather than knowledge. This corresponds to the finding of Hobson and Niemeyer (2013) who show that people do not abandon their climate skepticism after receiving scientific information. Consequently, climate skepticism may be rooted in people's core values and identities (Bliuc et al. 2015), implying a coherent and encompassing skeptical outlook on climate change. Moreover, Cherry et al. (2017) as well as Campbell and Kay (2014) detect that the opposition to environmental policies is explained by cultural worldviews and ideology.

Recently, the direct link between right-wing populism and climate skepticism has received more attention from researchers. Lockwood (2018) presents two different explanations for this link: an ideological explanation and a structural explanation. The ideological explanation assumes that right-wing populist voters might regard climate change as a typical elite issue and therefore reject it. The opposing structural explanation assumes that there are structural, especially economic, reasons for the rejection of climate protection among right-wing populist voters. For the US, Huber et al. (2020) have quantitatively investigated these two explanatory patterns and their results strengthen the ideological explanation. In general, they find that the effects of populism on climate change attitudes are smaller and less relevant than expected. However, along party lines, they find that right-wing populism significantly corresponds with lower concerns about climate change and lower support for climate policies, whereas left-wing populism has the opposite association. In a very different approach, merging web tracking data with survey data from six countries, including Germany, Yan et al. (2021) show that supporters of right-wing populist parties are significantly more critical towards climate policy than supporters of other parties. Using data from the European Social Survey, Kulin et al. (2021) show that people who hold nationalist attitudes and are associated with right-wing populist parties are more skeptical about climate change and mitigation policies, such as carbon taxes.

The question of how different attitudes towards climate change relate to actual behavior is less clear though. Hornsey et al. (2016) find that attitudes towards climate change have only a moderate effect on climate-friendly behavior. In contrast, according to Kotchen, Boyle and Leiserowitz (2013), the willingness to support the reduction of greenhouse-gas emissions in the US differs significantly across individuals with different characteristics, for example

Republican party affiliation. After controlling for the belief in climate change, the effect disappears, stressing the relevance of climate skepticism in this regard.

In our analysis, we find climate-change skepticism to be quite common in Germany (as opposed to Engels et al. 2013). Almost a fifth of our participants state that they do not believe that the world's climate is changing ("trend denials"). Of those who do believe in climate change, only about two thirds believe that it is mainly caused by human action, one third can therefore at least partly be viewed as "attribution denials" who doubt the (predominantly) anthropogenic nature of climate change. Among the main drivers for skepticism but also for the opposition to climate policies, such as the promotion of renewable energy or the coal phase-out, are age, education, income, and location, as also found by Whitmarsh (2011) and Andor et al (2018), for instance.

Moreover, we find empirical evidence that political orientation matters for climate skepticism in Germany. Most strikingly, while controlling for a range of socioeconomic variables and environmental attitudes, voters of the German right-wing populist party AfD deviate significantly from voters of all other parties in their beliefs about climate change and their attitudes toward climate policy. While between 85 and 92% of voters inclined to any other party currently represented in German parliament agree with the statement that global climate is changing, the portion among AfD voters is as low as 60%. Likewise, among those who generally believe in a changing climate, the share of respondents who think that humans are mainly responsible for climate change is substantially lower among AfD voters compared to voters of any other party. AfD voters also have a substantially higher likelihood to think that job protection must have priority over climate protection than voters of other parties and are more likely to reject carbon taxes. All in all, we show that since the rise of AfD, climate-change skepticism has a strong political outlet in Germany.

Exploiting the longitudinal character of our data, we find that climate change skepticism has generally increased over time. We observe this pattern across the entire political spectrum, not just among AfD voters. Hence, the climate skepticism of AfD voters did not increase over time relative to other voters, i.e., not even after the topic became an extremely topical issue in the media due to the school strike of Greta Thunberg beginning in August 2018, the Fridays for Future movement, and the accompanying political debate in Germany, which eventually culminated in the stipulation of the climate package (Edenhofer et al. 2020).

In terms of climate-friendly behavior in everyday life, however, differences between AfD voters and others are much less pronounced. AfD voters are just as likely to be a frequent driver as other voters and are equally likely to fly more than once per year. This might be because such decisions are subject to certain constraints, such as the job or place of residence. By contrast, differences in eco-friendly behavior exist regarding decisions that are not taken on a regular

basis. For example, AfD voters are substantially and significantly less likely to purchase green electricity.

Beside analyzing differences in attitudes towards climate change between right-wing and other voters, we aim to shed light on the reasons for those deviations. In line with previous findings in the literature (see e.g., Kahan et al. 2012), our results indicate that knowledge about emission-related questions is not a relevant factor for climate change attitudes. Our analysis rather points towards differences regarding the trust in science and the government. Coupled with the opposition to pro-environmental movements, i.e., Fridays for Future, our findings point towards an ideological explanation for climate change skepticism of right-wing populist voters, in line with e.g., Huber (2020) and Huber et al. (2020). However, we also find some evidence for the opposing structural interpretation as right-wing populist voters in Germany are significantly more concerned about rising energy prices.

Rising populism and associated climate change denial may result in a lower support for climate policy. Hence, populist parties may shape climate policy even when not formally part of a government. Moreover, fear of further polarization and “Yellow Vest” protests like in France could make politicians shy away from tougher climate protection measures. This is especially true for the Christian Democratic Union (CDU) and its sister party Christian Social Union (CSU), which have been in the federal government for four legislative terms consecutively and which have recently faced competition on the right fringe from the AfD (Nestler and Rohgalf 2014, Tomberg et al. 2020).

Convincing populist voters of the urgency of climate change mitigation or at least is thus key to stipulate more ambitious policies. As the lack of knowledge is not the driver between divergent attitudes of AfD and non-AfD voters, the communication needs to be of a different sort. For example, emphasizing non-climate benefits of climate policy (e.g., job creation or reduction of air pollution) might be one way to overcome the division in climate-related issues (Partnership for Market Readiness 2018). The strong prediction of pro-environmental attitudes and political orientation may illustrate motivated reasoning (see, for instance, Epley and Gilovich 2016 and Druckman and McGrath 2019). Zimmermann (2020) shows that the effect of contrary feedback on beliefs abates over time. Therefore, lecturing populist voters to reassess their skepticism is unlikely to work in the long run. Instead, Zimmermann (2020) highlights the role of high monetary incentives to overcome motivated reasoning. For climate change deniers this could be the threat of high costs due to more frequent and more severe weather events or the gain of training for pro-environmental jobs. Undoubtedly, communication of climate change needs to address the urgency of stringent action and the impacts on key stakeholders, such as politically mobilized groups (Goulder 2020).

2) Data and Methods

To analyze the relationship between political orientation and environmental attitudes, we designed a large nation-wide survey. We collected the data in collaboration with the German market research institute *forsa*, which maintains a household panel that consists of approximately 80,000 individuals and is representative for the German population aged 14 and above. The questionnaire concentrated on the elicitation of attitudes toward the environment and the so-called “Energiewende”, i.e., the transition toward more sustainable energy generation. It was pre-tested among 150 respondents. The survey was subsequently conducted between June 7, 2017 and July 23, 2017.

The questionnaire was sent out to 12,941 members of the *forsa* panel, 7,843 of whom participated, yielding a response rate of 61%. At some point, 1,332 subjects quit the survey, leading to a drop-out rate of 17%. The median duration of participants who finalized the survey was 37 minutes. The questions were asked to the household heads who are defined as the person who is responsible for the financial decisions within the household. The participants are usually familiar with surveys. Most households participated via an online questionnaire, while the households without an internet connection received a device by *forsa* to take part via a mobile network. The participants gained bonus points which can be traded in for prizes.

Along with environmental attitudes, we gathered a plethora of socio-economic characteristics and political attitudes. Close to 4,000 participants picked a party when asked if they were inclined to a certain party, around 3% of whom indicated that they are inclined to AfD (Table 1). Note that the share increases to 5% when non-party sympathizers are excluded. Despite not being directly comparable, the answers to this question resemble polling results at the time the survey took place (Table A1 in the appendix). While the poll conducted by *forsa* (so-called “Sonntagsfrage”) aims at getting a more contemporaneous picture of political orientation, we elicit long-term inclination toward a specific party.

Table 1 displays that the mean household size is about two, 43% are female, and 25% reside in East Germany. These figures are roughly in line with official statistics (see Table A2). Moreover, 13% of the households earn incomes of at least 4,200 EUR, which we define as high incomes. Around a quarter of the households has graduated from college, and the mean age is about 53 years. Compared to official statistics, these numbers are somewhat higher. Slightly more than a third of the sample lives in urban areas, which are defined as regions with a minimum population density of 50 citizens per km². Following Myers et al. (2013), we also control for the mean temperature at the day of the interview, which in our survey period amounts to roughly 19°C.

Table 1: Summary statistics of 2017 survey

	All	Non-AfD	AfD	Difference	t-Statistic
Household size	2.112	2.092	2.310	-0.218	-3.158**
Homeowner	0.538	0.532	0.594	-0.062	-1.717
College	0.259	0.259	0.218	0.041	1.291
Unemployed	0.023	0.025	0.005	0.020	1.766
High income	0.125	0.126	0.103	0.023	0.915
East Germany	0.246	0.243	0.330	-0.087	-2.799**
Female	0.432	0.431	0.223	0.208	5.815**
Urban	0.373	0.379	0.305	0.074	2.113**
Semi-urban	0.424	0.417	0.533	-0.116	-3.240**
Rural	0.203	0.204	0.162	0.042	1.430
Temperature	19.1	19.1	18.9	0.203	1.012
Age	53.483	53.558	53.030	0.527	0.447
Pro-environmental attitudes	0.749	0.752	0.669	0.083	7.167**
AfD	0.032				
Observations:	6,252	6,055	197		

Note: ** denotes statistical significance at the 1% level.

Pro-environmental attitudes are elicited via a short version of the Diekmann-Preisendörfer (1998) scale. Using a subset of four questions from the original scale, we cover its three spheres – affective, cognitive, and conative – yielding a Cronbach’s (1951) Alpha of $\alpha=0.785$, which is very similar to the mean Alpha for measuring attitudes in the meta-analysis conducted by Peterson (1994). Each question was answered on a five-point Likert scale. The score in Table 1 shows the sum of the answers divided by the maximum score of 20. For the estimations, we normalize the scores on this scale by subtracting the mean and dividing by the standard deviation.

Table 1 also shows the difference in socio-economic characteristics and attitudes between AfD voters and others. We find some notable differences: Most importantly, AfD voters exhibit substantially lower scores on the scale for pro-environmental attitudes. In addition, AfD voters are less likely to be female and to live in urban areas. Moreover, they reside particularly often in East Germany.

To test whether the attitudes of different voter groups change differently over time and to concentrate on a larger set of climate-related questions, we make use of a second data set. This was conducted about two years after the survey just described (between October 9, 2019 and November 6, 2019) and followed the same subjects who participated in the 2017 survey. We successfully re-interviewed 3,967 respondents and included around 3,000 additional subjects. Table A3 displays the summary statistics of this sample. Over time, the share of AfD voters increased to 7%.

For all questions in the following section, we estimate linear probability models (LPM). To check robustness, we also estimate standard probit models that are designed to better capture

the binary character of the dependent variable. The results are virtually unchanged and thus we present the LPM models because of easier interpretation.

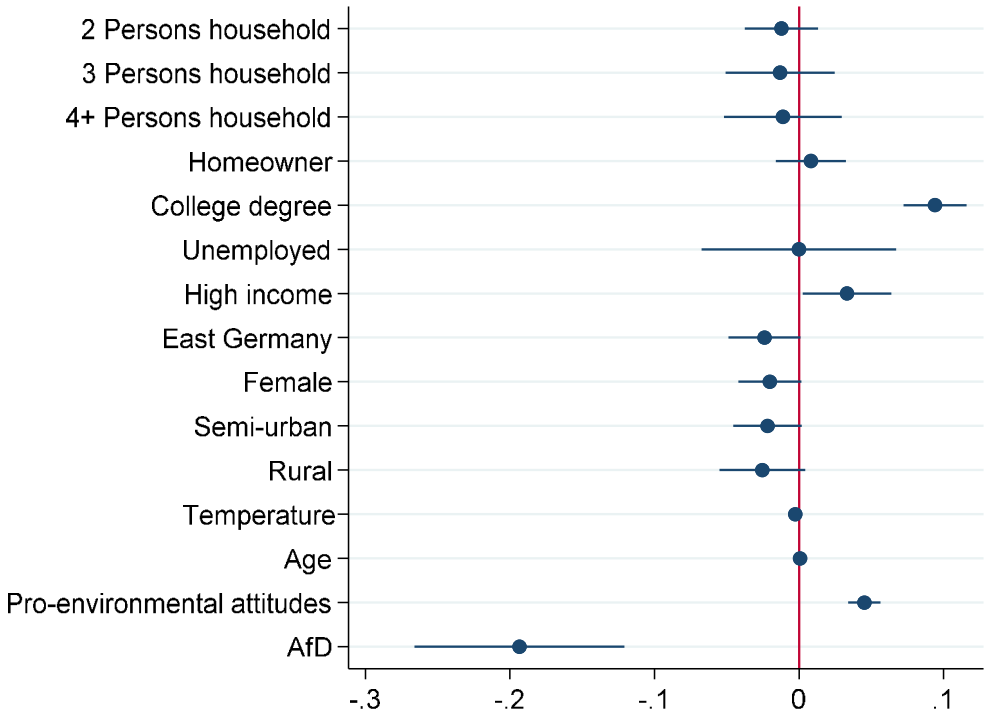
3) Results

We start our analysis by analyzing the question whether respondents “believe that the world’s climate is changing”. Overall, 82% confirm the statement that climate change is happening. Comparing this figure to other surveys is delicate, as wording of the question changes across surveys. For instance, in the 8th wave of the European Social Survey, around 90% of all respondents and of the German subsample state that climate “is definitively or probably changing” (ESS 2018). According to the Special Eurobarometer 490 (EC 2019), around 80% of the sample states that climate change is a “very serious problem”. Our findings are roughly in line with Leiserowitz et al. (2020), who conducted a representative study of the US where 73% of the respondents state that “global warming is happening”.

Figure 1 shows that among the main drivers of climate change skepticism are education and income. For instance, having a college degree reduces the propensity to be skeptical about climate change by about 10 percentage points, while the effect of high incomes amounts to about five percentage points. These effects of declining skepticism with income are in line with, for instance, Whitmarsh (2011) and Hornsey et al. (2016). In addition, pro-environmental attitudes are a strong predictor of climate change skepticism. Hence, beliefs about the existence of climate change are fundamentally linked to existing values. This may illustrate motivated reasoning (Druckman and McGrath 2019). Contrasting with Myers et al. (2013), the temperature at the day of the interview does not seem to bear on climate change beliefs.

Being inclined to Germany’s right-wing populist party, AfD, strikingly increases climate change skepticism. Compared to the average voter of all other parties, political orientation toward AfD decreases the likelihood of stating that climate is changing by almost 20 percentage points (to roughly 60%). Hence, the AfD effect is quite substantial compared to other variables, e.g., college education or age. This contrasts with the findings of Engels et al. (2013), who do not find an effect of political orientation. Yet, their study was conducted in 2012, just before the establishment of AfD, i.e., a period where climate change skepticism was not a partisan issue. In turn, our finding that political orientation matters is in line with a survey by the Pew Research Center (2020), which shows that around 90% of Democrats say that “global warming is a major threat to the well-being of the US”, while only 30% of Republicans agree with this statement.

Figure 1: Agreement with the statement that climate change is happening



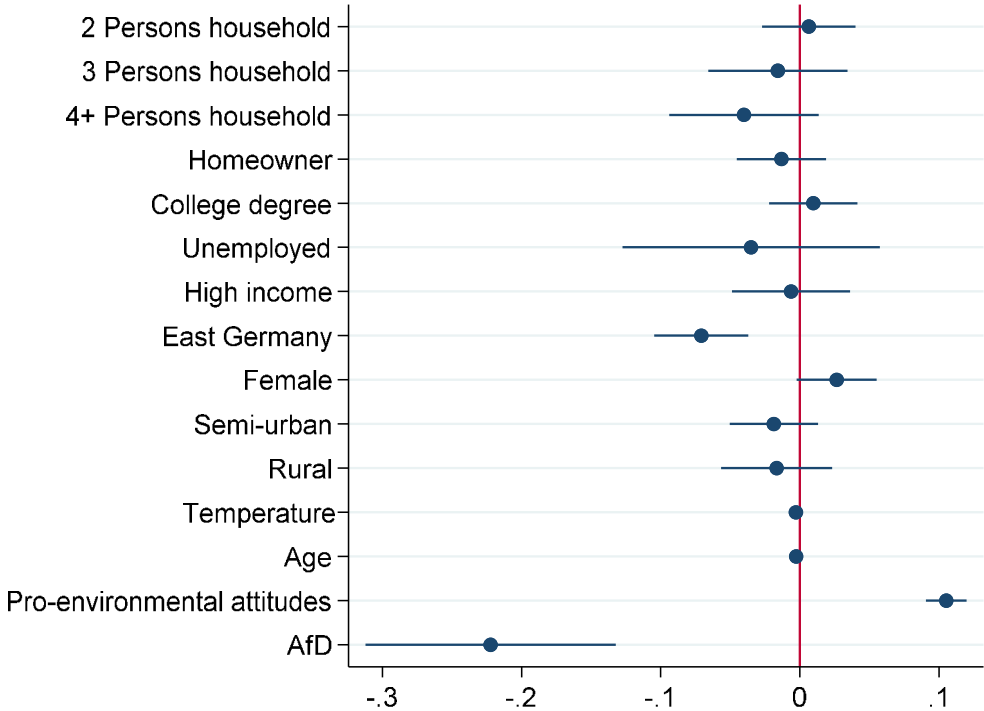
Note: The dots represent the coefficient estimate and the lines are the 95% confidence interval. On average, 82% of the respondents with the statement that climate is changing. Thus, the coefficients are interpreted as a deviation to this average.

Next, we analyze the perceived drivers of climate change among people who believe in climate change, i.e., responded to the previous question affirmatively. Only 69% of the respondents agree with the statement that “human action predominantly causes climate change”, while 5% ascribe it mainly to natural causes and the remainder of 26% think that both causes contribute equally to climate change. This is in line with ESS (2018), which shows that 95% of the German sample thinks that “climate change is at least partly caused by human action”. Moreover, our findings align with Leiserowitz et al. (2020), who detect that 62% of Americans believe that “global warming is mostly human-caused”.

Focusing on the drivers for this question shows that again education, income, and pro-environmental attitudes increase the probability to state that climate change is anthropogenic (Figure 2). Beside these drivers, one crucial variable for the perception of causes of climate change is political orientation: Among respondents who are inclined toward Germany’s right-wing populist party, the agreement with the statement that climate change is mainly human caused is about 22 percentage points lower compared to the average voter of other parties. This finding also aligns with US results from Pew Research Center (2020), which indicate that 84% of Democrats state that “human activity contributes a great deal to climate change”, while this holds true for just 14% of Republicans.

Yet, not only does the perception of AfD voters about issues related to climate change differ compared to the average voter. Figures A1 and A2 show that AfD voters are least likely to both believe that climate change is happening and that it is human caused. Moreover, in both cases, agreement rates of AfD voters are about 20 percentage points lower even than the average voter of the respective party, with the second lowest agreement rates represented in German parliament. Even though small differences can also be observed across voters of other parties, with voters of Germany’s Green party at the top of the agreement rate scale, these differences are small compared to the strong contrast between AfD voters and voters with a different political orientation: With at least 80%, respondents who are inclined to any other party agree with the statement that climate is changing and at least 60% agree that it is anthropogenic. These results highlight the ambiguity and polarization with climate-related issues.

Figure 2: Agreement with the statement that climate change is mostly human caused



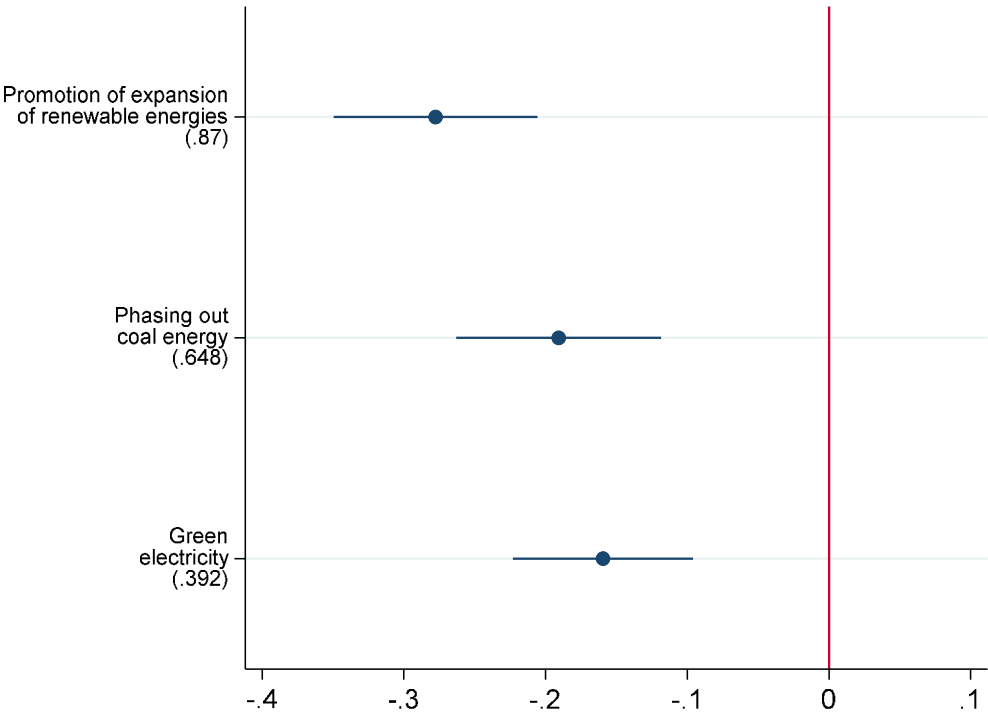
Note: The dots represent the coefficient estimate and the lines are the 95% confidence interval. On average, 69% of the respondents with the statement that climate change is mostly human based. Thus, the coefficients are interpreted as a deviation to this average.

Regarding the relevance of different determinants of climate change skepticism, our study generally confirms the results of Hornsey et al. (2016), as political affiliation and values overshadow sociodemographic variables such as gender, age, and education, which are statistically imprecise in our analysis.

One consequence of climate change skepticism is that climate mitigation policies are more difficult to pass for policymakers. Hence, the conviction that climate is changing necessarily shapes support for climate policies, especially since the policies submitted in the aftermath of

the Paris Agreement are not sufficient to successfully mitigate climate change (see Rogelj et al. 2016). To investigate this nexus, we scrutinize the support for some specific energy and climate policies that were discussed at the time the survey took place as well as voluntary action to reduce the individual carbon footprint and their relation to political orientation (Figure 3). Overall, 87% of the non-AfD voters are in favor of promoting green electricity and 65% support the coal phase-out. Yet, among supporters of the AfD, the respective percentages decrease by about 25 points. Regarding individual behavior, the purchase of green electricity is about 10 percentage points lower among AfD voters.

Figure 3: Deviation of AfD voters from the average regarding climate policies in the 2017 survey



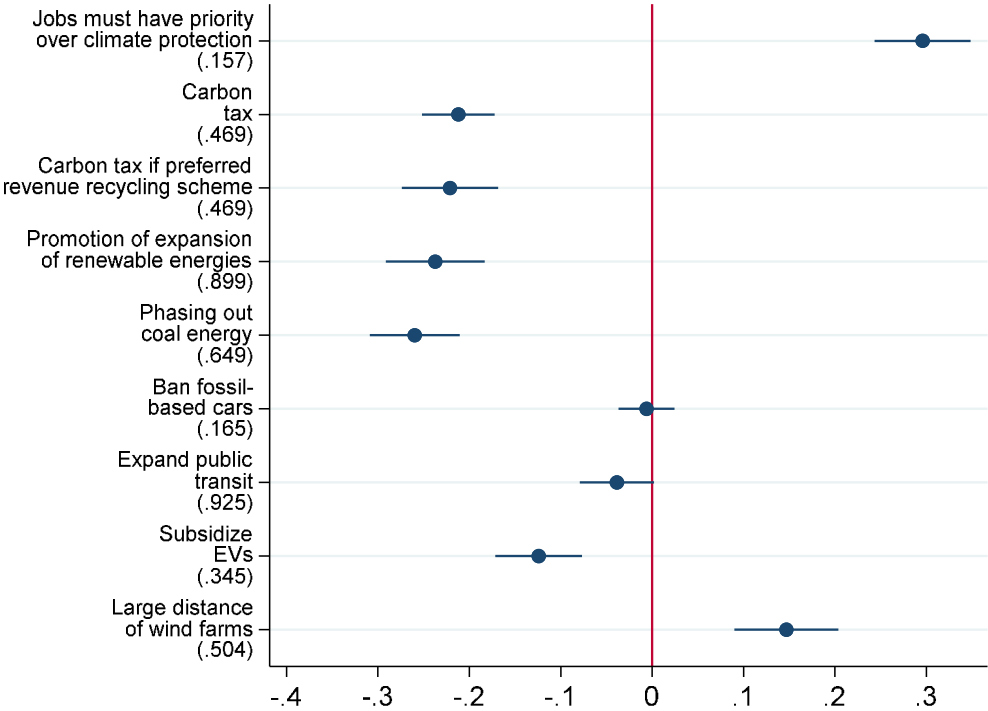
Note: The dots represent the coefficient estimate on the AfD dummy and the lines are the 95% confidence interval. The mean values of non-AfD voters are reported in parentheses. Thus, the coefficients are interpreted as a deviation to this average.

The 2019 battery of questions was expanded to allow us to delve deeper into this question. On a very general note, only 16% of the non-AfD supporters agree with the statement that jobs must have priority over climate change. The agreement with this statement is about 30 percentage points higher among AfD supporters. While the majority of non-AfD voters support the introduction of a carbon tax (see Sommer et al. 2020 for a more detailed analysis), the support among AfD voters drops by about 25 percentage points. Figure A5 shows respondents inclined to AfD are by far the least supportive group of voters. The gap in support compared to the next party is notable, while respondents inclined to the green party are by far the biggest supporters of a carbon tax. Hence, carbon taxes are a highly political issue, as also demonstrated by Douenne and Fabre (2020). The rejection of the carbon tax is also strongly

increased among AfD supporters under the condition that the respective tax revenues would be rechanneled to the population according to their preference. In this context, respondents previously received information about CO₂ emissions in Germany and different revenue uses for the carbon tax. First, this finding corroborates the perception that providing information does not have a bearing on climate skepticism. Second, it supports the ideological explanation suggested by Lockwood (2018) as structural, particularly financial, concerns for rejecting the carbon tax should be absent if one can choose the mechanism by which revenues are redistributed.⁵

In addition, AfD voters tend to be in favor of very large distances regarding the construction of wind farms in the proximity of settlements. The only policy where we do not detect significant deviations between AfD voters and voters of other parties is the ban of fossil-based cars by 2030. Yet, this seems to be a policy that enjoys particularly low public support in the population (16.5%).

Figure 4: Deviation of AfD voters from the average regarding climate policies in the 2019 survey

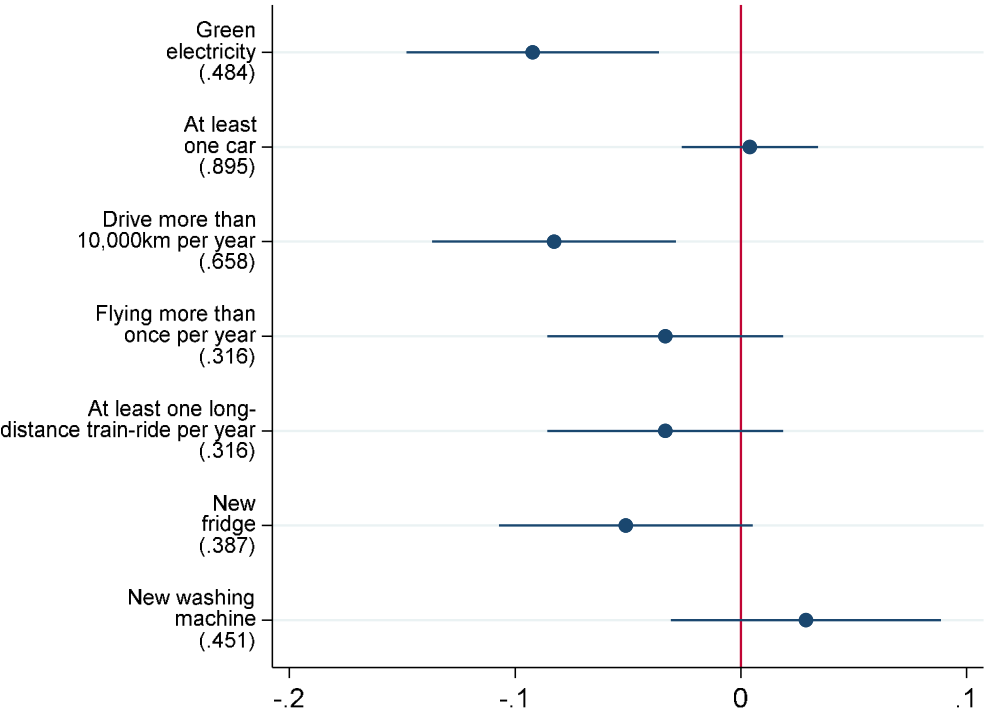


Note: The dots represent the coefficient estimate on the AfD dummy and the lines are the 95% confidence interval. The mean values of non-AfD voters are reported in parentheses. Thus, the coefficients are interpreted as a deviation to this average.

⁵ Beside political orientation the residence seems to play a major role for the support of carbon taxes. Respondents in rural areas are about 10 percentage points less likely to support a carbon tax compared to respondents who reside in urban areas. This finding emphasizes difficulties for the implementation of a carbon tax owed to a rural-urban divide, as also documented by Douenne and Fabre (2020). Similarly, rural respondents are less likely support the promotion of green electricity and the coal phase-out, but the differences are more modest.

We also look at voluntary climate-friendly behavior and their relation to political orientation (Figure 5). In terms of climate-friendly behavior in everyday life, differences between AfD voters and others are very limited. AfD voters are not more likely to have cars and are even less likely to drive large distances than other voters. Likewise, their flying and train-riding behavior does not deviate from the average non-AfD voter. This might be because those decisions are subject to certain constraints, e.g., job or place of residence. The only significant deviation we find regards the purchase of green electricity, confirming our findings from the 2017 survey.

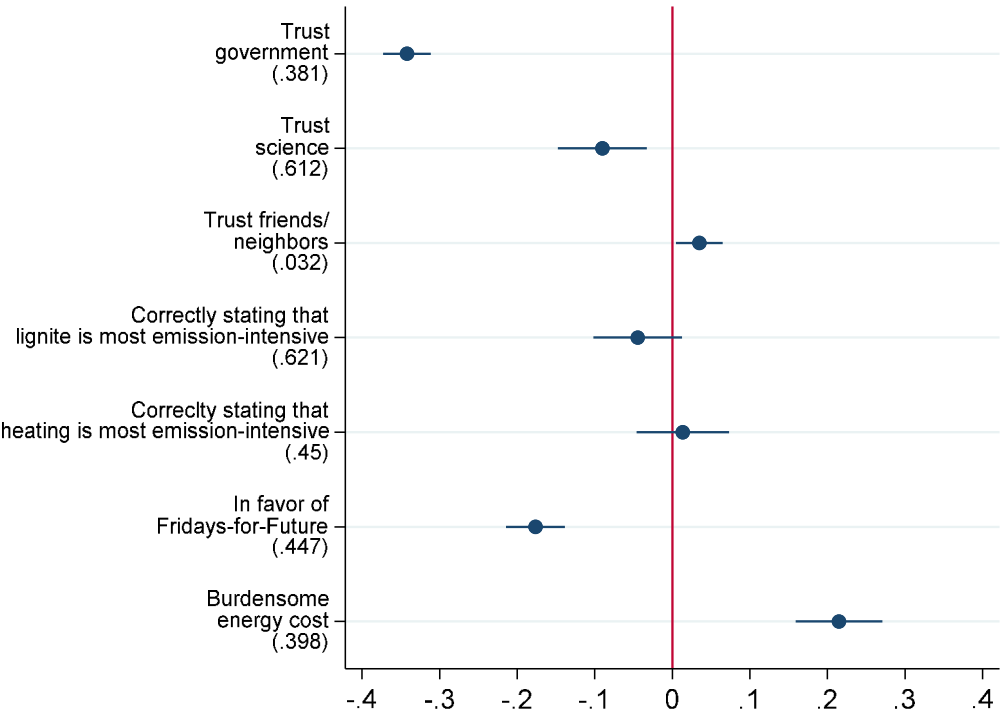
Figure 5: Deviation of AfD voters from the average regarding climate-friendly behavior



Note: The dots represent the coefficient estimate on the AfD dummy and the lines are the 95% confidence interval. The mean values of non-AfD voters are reported in parentheses. Thus, the coefficients are interpreted as a deviation to this average.

Besides focusing on partisan differences, using the 2019 survey we also shed light on the reasons for those deviations (Figure 6). One reason for the deviating beliefs on climate related questions may be rooted in different levels of trust in the government and in science. While 38% of non-AfD voters trust the German government very much or at least somewhat, this percentage drops to almost zero among AfD-voters. Moreover, less than 50% of AfD voters think that science is among the most credible sources of information on the German “Energiewende”, while a clear majority of voters of all other parties think so. In contrast, respondents inclined to voting in AfD are somewhat more likely to report that their friends and neighbors are credible sources.

Figure 6: Reasons for deviations of AfD voters from average voter



Note: The dots represent the coefficient estimate on the AfD dummy and the lines are the 95% confidence interval. The mean values of non-AfD voters are reported in parentheses. Thus, the coefficients are interpreted as a deviation to this average.

Another reason for a higher climate skepticism among AfD voters could be the lack of knowledge. However, as our data shows, the level of information of AfD voters regarding CO₂ emissions of energy sources and household areas does not deviate significantly from the rest. This corresponds to the finding of Hobson and Niemeyer (2013), who detect that people do not stop being skeptical with respect to climate change after being provided with scientific information. Moreover, it aligns with the results from Whitmarsh (2011). Lastly, we find that AfD supporters are substantially less favorable toward the Fridays-for-Future movement.

The low level of trust in government and science, the rejection of Fridays-for-Future, and the high rate of climate change skepticism despite an average level of information might indicate that attitudes of AfD voters towards climate change are at least in part of ideological nature as described by Lockwood (2018). In this case, the rejection of climate policy, representative of an elite topic, would reflect the aversion to the liberal, cosmopolitan elite. If this is correct, climate skepticism of voters of right-wing populist parties will even increase the more attention is paid to the issue and the more it is thus perceived as an elite issue.

A different explanation for the division proposed by Lockwood (2018) would be structural, linking attitudes towards climate policy of right-wing populist voters to the economic costs imposed on groups that belong to the core electorate of right-wing populist parties. One hint that this explanation could also play a role in our study is the finding that around 60% of AfD

voters perceive energy cost as burdensome, whereas this holds for about 40% of the non-AfD voters.

To further investigate different hypotheses, we check whether attitudes of voters have changed differently over time. To this end, we use both surveys, from 2017 and 2019, and run regressions on the questions asked in both surveys among the subsample of participants that took part in both surveys. Table A4 reports the results of the subset of questions that were asked in both surveys. It illustrates very clearly that the share of respondents who agree with the statements that the world's climate is changing and that it is mostly human caused has declined over time. Between 2017 and 2019, the shares drop by about four percentage points. This result seems quite surprising because reporting on climate change and climate policy has increased substantially between both surveys, rendering the topic more salient (see also Figures A3 and A4). Although AfD voters deviate notably from the average in both surveys, we do not detect different response patterns over time across political orientation. One exception is that the share of respondents who purchase green electricity has further diverged between AfD voters and non-AfD voters.

As an alternative approach, we convert the two surveys into a panel format and apply the standard fixed effects estimator, exploiting within-variation. In this set up, the identification of the effects is driven by individuals who participated in both surveys but changed their political orientation toward AfD. The advantage of this estimator is that by using individual fixed effects it controls for all time-invariant individual characteristics. Table A5 shows that changing the inclination toward AfD is not related with changes in climate change skepticism. Thus, orientating toward AfD does not change attitudes toward climate change, but rather AfD tends to attract people who are climate-skeptical in the first place.

4) Conclusion

Using data from two household surveys conducted in 2017 and 2019, we have analyzed different determinants for climate skepticism in Germany. In general, we find climate skepticism to be surprisingly widespread in Germany. Close to 20 per cent of participants state that they do not believe that global climate is changing. Of those who believe in climate change, more than 30 per cent express doubts that climate change is mainly caused by human action. Surprisingly, both percentages slightly increase over time.

In line with previous findings from the literature (e.g., McCright and Dunlap 2011, Hornsey et al. 2016), we find that environmental attitudes and especially political orientation are important determinants for climate skepticism, while socio-economic characteristics are less important. People who vote for Germany's right-wing populist party AfD are substantially more likely to doubt that the world climate is changing or that climate change is human caused than voters

of any other party represented in German parliament. Hence, since its foundation in 2012, German voters have found a political outlet to express their climate change skepticism, especially since AfD leaders have made criticizing climate policy the party's new main task (Sturm 2020). In contrast, sociodemographic factors like gender, age, income, education, and geographic location play a much more modest role in that regard. We observe similar patterns with respect to a wide range of questions on climate and energy-related questions.

Our analysis also sheds light on the reasons for partisan differences. One reason for the deviating beliefs on climate related questions may be rooted in the lack of trust in science and the government. Moreover, our results are unrelated to differences in the level of energy and climate-related knowledge. Hence, repeated presentation of information may not be sufficient to increase the acceptance of climate protection measures.

Although some of the results point towards an ideological link between voting for right-wing populist parties like AfD and opposing climate policy as an elite topic, we do not find that climate skepticism of AfD voters increases relative to others after the debate gained momentum with the start of the Fridays for Future movement. Nonetheless, our results indicate a clear division in society on issues related to climate and energy policy, which has been also established by Anderson et al. (2019) for the US. This division could widen if the measures taken to combat climate change raise the burden on households, especially because our study indicates that AfD voters already feel particularly burdened by energy costs.

The recent decline in emissions triggered by the Covid pandemic (Le Quéré et al. 2021) demonstrates that behavioral changes are a powerful means to mitigate climate change. Obviously, the restrictive policies are neither sustainable nor desirable for climate policy. Instead, rising carbon prices are an efficient way to mitigate climate change in the long term. However, the fear of polarization and protests could prevent governments from increasing carbon prices to sufficient levels. The rejection of climate protection policy by AfD supporters, which emerges from our study could make the established political parties wary of taking tougher climate protection measures since the AfD represents a competition on the right edge for the current political incumbent (Nestler and Rohgalf 2014).

Hence, there seem to be two options for policymakers, if they are serious about pursuing climate goals: First, they could try to convince skeptics through changed communication. Of course, converting skeptics to believe in climate change seems implausible, but emphasizing non-climate benefits of climate policy (e.g., job creation or reduction of air pollution) might be one way to overcome the division in climate-related issues (Partnership for Market Readiness 2018). Another way to convince skeptics lies in a more responsive, empathetic and less technical communication, expressing understanding of the needs of climate skeptics as suggested by Huber et al. (2020) and Feygina et al. (2010). Moreover, an effective

communication requires addressing the impacts on key stakeholders, such as politically mobilized groups as well as the urgency of stringent action (Goulder 2020), involving social norms (Druckman and McGrath 2019), and appealing to multiple aspects of human behavior (van der Linden 2015).

Second, policymakers could decide to ignore the minority of climate skeptics. It is questionable, for example, whether the government would benefit from moving closer to AfD positions (Dilling 2018), especially since our study shows that attitudes of their voters are largely in line with the average. However, it is still a largely open research question how high the willingness to protest would be among climate protection opponents in Germany and at what point climate protection measures could also meet with rejection in the middle of society.

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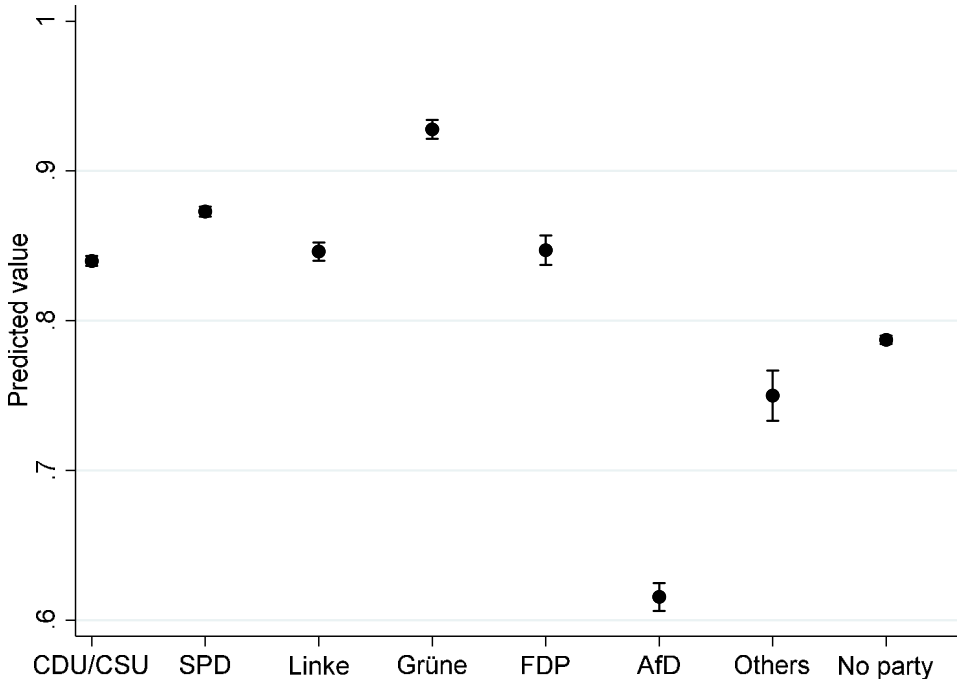
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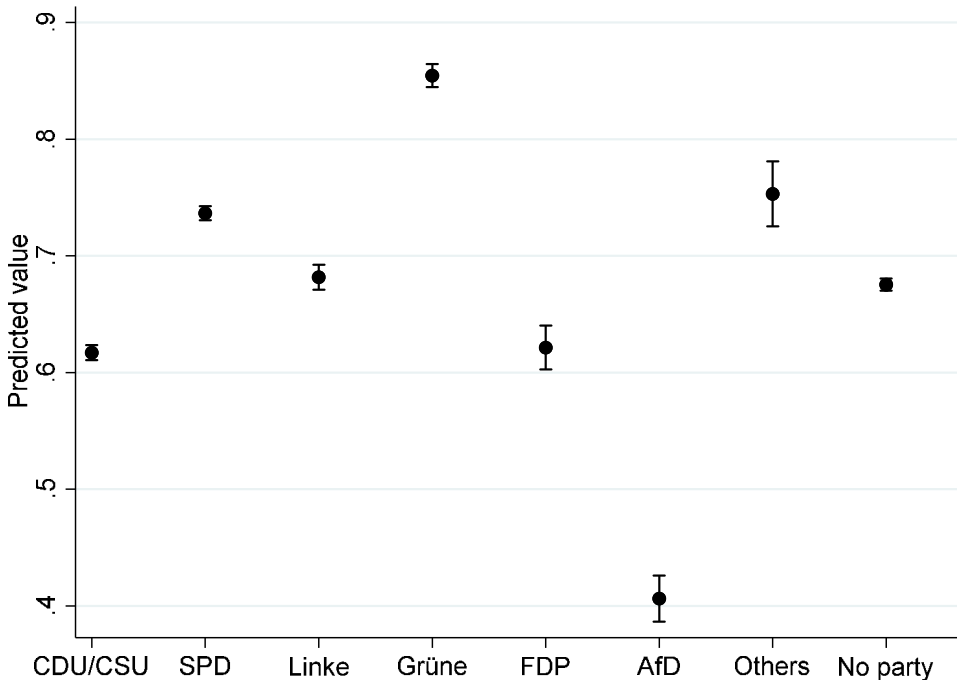
Appendix

Figure A1: Climate change is happening by party



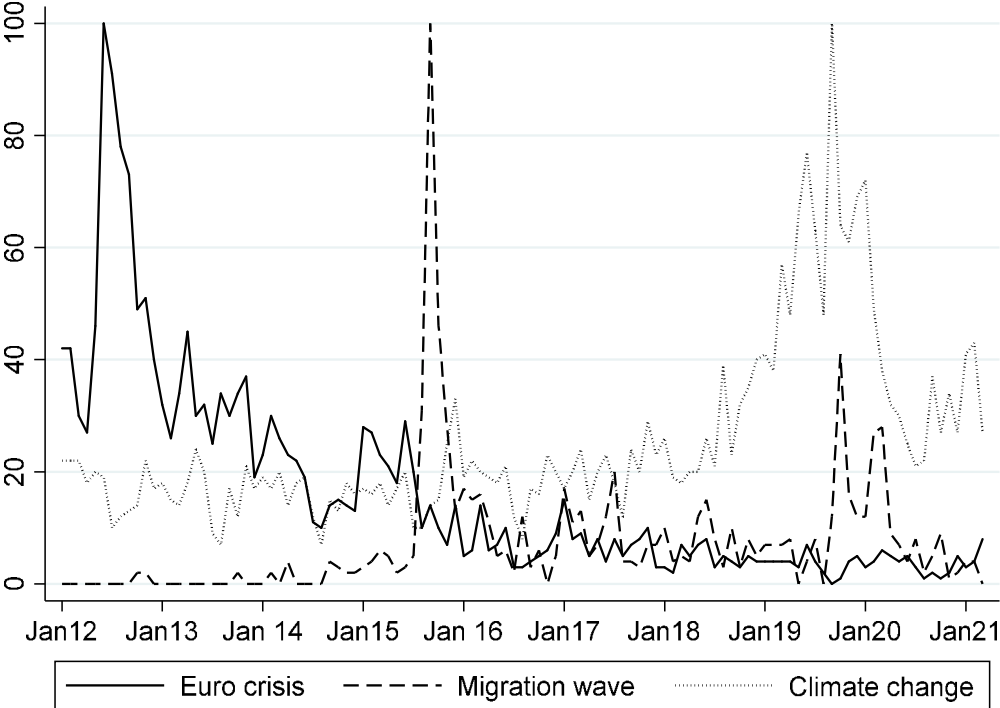
Note: The dots represent the predicted values for the dependent variable and the whiskers are the 95% confidence interval.

Figure A2: Anthropologic climate change by party



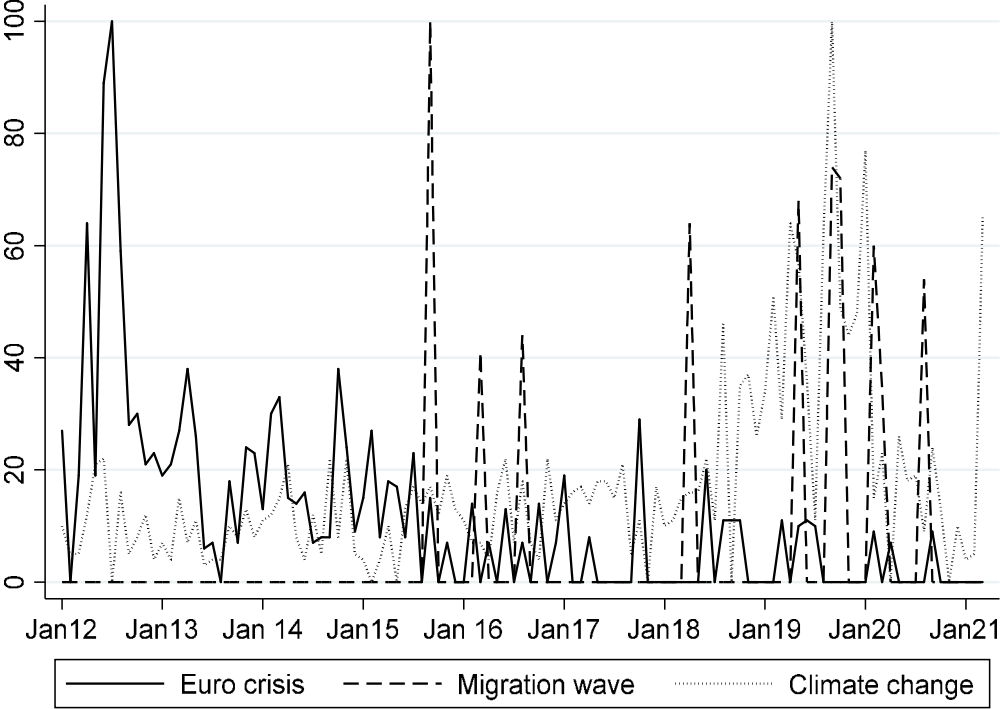
Note: The dots represent the predicted values for the dependent variable and the whiskers are the 95% confidence interval.

Figure A3: Google trends (news search)



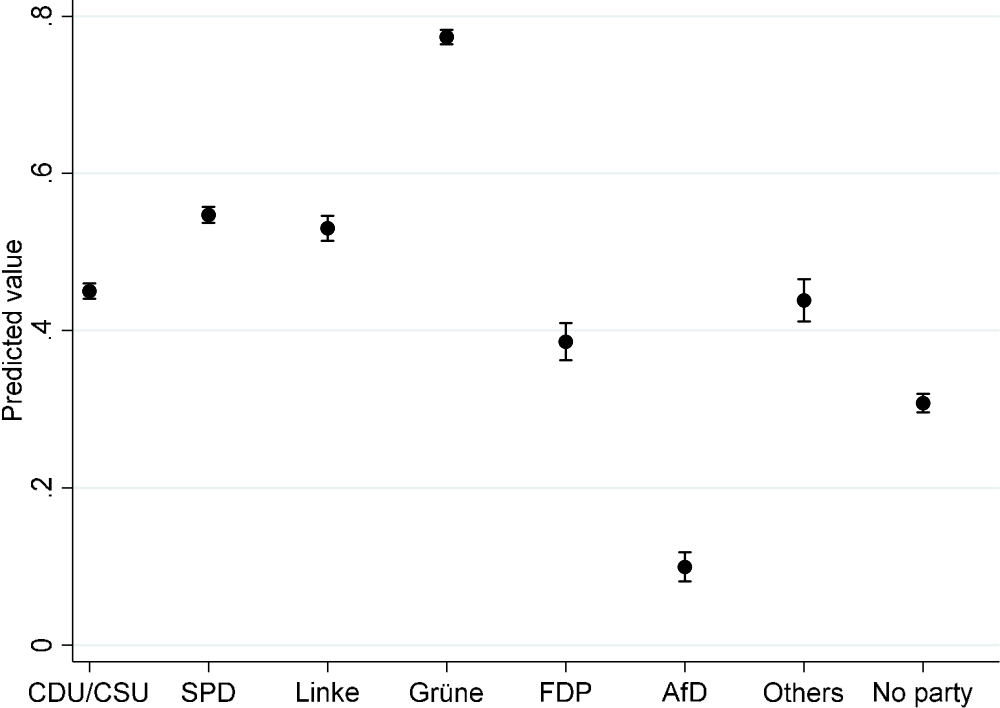
Note: Google trends news search from 2021-03-05 for the keywords euro crisis, migration wave, and climate change (Eurokrise, Flüchtlingswelle, and Klimawandel in German)

Figure A4: Google trends (news search)



Note: Google trends web search from 2021-03-05 for the keywords euro crisis, migration wave, and climate change (Eurokrise, Flüchtlingswelle, and Klimawandel in German)

Figure A5: Support of carbon tax



Note: The dots represent the predicted values for the dependent variable and the whiskers are the 95% confidence interval.

Table A1: Comparison of voter behavior in our sample with poll numbers (“Sonntagsfrage”)

Party	Our sample	Sonntagsfrage
CDU/ CSU	35.44	40
SPD	30.55	22
Die Linke	10.36	9
Bündnis 90/ Die Grünen	11.46	8
FDP	5.29	8
AfD	4.94	7
Others	1.96	6

Note: About 19% of the respondents did not pick any party and are thus excluded from the table. Source: RTL (2017).

Table A2: Comparison of sample characteristics (2019 survey) with official data

Party	Our sample	Destatis (2020)
1 person household	0.423	0.274
2-person household	0.332	0.473
3-person household	0.119	0.135
4+ person household	0.164	0.119
Age < 35 years	0.196	0.108
Age 35-65 years	0.524	0.537
Age >65 years	0.279	0.355
Income < 1,200 EUR	0.184	0.079
Income 1,200 – 2,200 EUR	0.209	0.228
Income 2,200 – 4,700 EUR	0.445	0.539
Income > 4,700 EUR	0.163	0.154
College degree	0.224	0.256
East Germany	0.206	0.235
Female	0.359	0.417

Note: We ask the household head, while Destatis (2020) asks the main income earner. Moreover, the income categories are not directly comparable.

Table A3: Summary statistics of 2019 survey

	All	Non-AfD	AfD	Difference	t-Statistic
Household size	2.107	2.094	2.159	-0.065	-1.394
Homeowner	0.570	0.573	0.566	0.007	0.285
College degree	0.256	0.265	0.139	0.126	5.728**
Unemployed	0.016	0.015	0.028	-0.013	-2.050*
High income	0.160	0.163	0.130	0.033	1.640
East Germany	0.235	0.226	0.351	-0.126	-5.921**
Female	0.417	0.432	0.214	0.219	8.890**
Urban	0.359	0.360	0.307	0.053	2.206*
Semi-urban	0.429	0.427	0.474	-0.047	-1.883
Rural	0.213	0.213	0.219	-0.006	-0.302
Temperature	12.1	12.2	12.5	-0.331	2.260*
Age	56.677	56.690	56.500	0.190	0.243
Pro-environmental attitudes	0.726	0.739	0.563	0.176	19.860**
AfD	0.070				
Observations	6,119	5,692	427		

Note: ** and * represent statistical significance at the 1% and 5% level, respectively.

Table A4: AfD rejection of climate-related issues by year

	CC	Anthropogenic CC	Promote green	Coal phase out	Green tariff
AfD	-0.195** (0.037)	-0.212** (0.046)	-0.280** (0.036)	-0.180** (0.037)	-0.152** (0.032)
2019	-0.044** (0.013)	-0.064** (0.017)	0.044** (0.010)	-0.005 (0.015)	0.089** (0.017)
AfD # 2019	0.064 (0.046)	-0.007 (0.055)	0.043 (0.045)	-0.107* (0.043)	0.041 (0.042)
Constant	0.865** (0.033)	0.914** (0.043)	0.936** (0.026)	0.806** (0.038)	0.418** (0.044)
Further variables	Yes	Yes	Yes	Yes	Yes
Observations	9359	7569	9288	9433	8824

Note: Robust standard errors are reported in parentheses. ** and * represent statistical significance at the 1% and 5% level, respectively.

Table A5: Fixed effects estimation results for AfD rejection of climate-related issues

	CC	Anthropogenic CC	Promote green	Coal phase out	Green tariff
AfD	0.079 (0.053)	-0.031 (0.069)	-0.066 (0.043)	-0.132** (0.050)	-0.031 (0.045)
2019	-0.066** (0.024)	-0.072** (0.025)	0.041** (0.014)	0.021 (0.024)	0.126** (0.023)
Constant	1.255** (0.274)	0.463 (0.285)	0.824** (0.070)	0.713** (0.157)	0.351 (0.288)
Further variables	Yes	Yes	Yes	Yes	Yes
Observations	9359	7569	9288	9433	8824

Note: Robust standard errors are reported in parentheses. ** and * represent statistical significance at the 1% and 5% level, respectively.