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Global warming cools voters down: How climate concerns affect policy preferences

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Abstract
This study examines how regional temperature variations across OECD countries influence political behavior and support for offset policies. Our analysis reveals that exposure to higher temperatures correlates with political moderation, reduced backing for extreme and populist parties, heightened climate concerns, and increased support for environmentally conscious agendas. These effects are primarily driven by older individuals, who exhibit increased concerns about climate change and the economic costs of climate policies following temperature spikes. Moreover, they express support for policies aimed at mitigating these economic impacts. Conversely, younger individuals show less apprehension about the economic consequences of climate policies and demonstrate readiness to bear them, including through higher energy bills. These findings emphasize the necessity of accounting for age-related perspectives when formulating effective climate policies for the future.

Keywords: preference formation, environmental policies, policy support, voting
JEL Codes: D83; H23; H31; Q58

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1 Introduction

Many governments worldwide are concerned about climate change, acknowledging it as a significant threat to their nations. However, in many countries, climate action and active public support for policies to mitigate climate change lag behind (UNEP, 2023). A substantial obstacle to the implementation of ambitious climate policies lies in the lack of individual support for stringent measures. And while harnessing popular support for the implementation of green policies is perceived by many to be of paramount importance in the coming years, relatively little is known about the factors influencing the formation of such preferences.

In this paper, we ask how the rising temperatures that have been recorded in many countries in recent years, reflected in the individual-level experiences of people living in these affected regions, translate into their support for national parties on either end of the political spectrum, their concerns about the economic consequences of climate policies, and their support for economic offset policies. We present new evidence on this question by using rich and unique survey data from OECD countries in 2022 and regional data on climate and extreme weather events recorded between 1995 and 2021.

We contribute to a small, but growing literature studying the role of personal experiences of natural disasters on the formation of attitudes towards climate change (Egan and Mullin, 2012; Deryugina, 2013; Marquart-Pyatt et al., 2014; Bergquist and Warshaw, 2019; Duijndam and van Beukering, 2021; Djourelova et al., 2023), support for political green policies (Baccini and Leemann, 2021), and political support more broadly (Hazlett and Mildenberger, 2020; Coury, 2023). Much of the literature has been focused on evidence from the US,[1] showing a positive link between exposure to climate events and environmental attitudes and related

[1] With the exception of Baccini and Leemann (2021) who study the link between floods and supporting more green policies in referenda in Switzerland, and Deryugina (2013) and Duijndam and van Beukering (2021) who look at climate change concerns in Europe and, respectively, globally using Gallup data.

political support. Consequently, many of the results are specific to the US context, with both Marquart-Pyatt et al. (2014) and Djourelova et al. (2023) finding substantial polarization by political affiliation and with both Hazlett and Mildenberger (2020) and Coury (2023) finding very localized effects.

To the best of our knowledge, we are the first to look at the link between climate events and attitudes towards offset policies, political support, and actual voting outcomes within a unified framework and across a large set of OECD countries. We do so by focusing on regional variation in experienced temperatures, in line with Egan and Mullin (2012), Deryugina (2013), and Bergquist and Warshaw (2019), and by asking how it impacts both stated political support for national parties as well as, in a smaller number of countries where our data permits, actual voting trends over the past two decades.

We also analyze how these experiences relate to a range of concerns regarding the economic consequences of climate policies and to the support for a rich set of policies designed to offset those consequences. While existing research has documented that support for climate policies critically hinges on their perceived effects on households' finances (Dechezleprêtre et al., 2023), it has yet to elucidate the public's demands regarding specific offset policies.[2]

Second, we investigate how the results vary across different generations. It has been documented that older people are less concerned about climate change and less inclined to support climate policies (Ziegler, 2017; Andor et al., 2018; Hao et al., 2020), such as fossil fuel taxes (Fairbrother et al., 2019). However, they do not appear to be any more likely to deny climate change or to be skeptical of it (Poortinga et al., 2023; Andor et al., 2018; Tranter and Booth, 2015). Albalate et al. (2023) find a negative association between the

[2] There is a large literature on whether economic conditions impact concerns and attitudes towards climate change and the environment. The focus of that strand of research is on whether economic downturns cause individuals to deprioritize climate and environmental concerns compared to the economy (Scruggs and Benegal, 2012; Mildenberger and Leiserowitz, 2017; Beiser-McGrath, 2022). We instead focus on what concerns people when they hear about climate change policies.

share of the elderly population and the stringency of climate policy ambitions. None of the existing studies to date have, however, linked individual experiences of climate shocks across age groups to specific concerns regarding the economic implications of climate change policies and their support for measures designed to mitigate the negative economic impacts of regulatory policies. Older voters wield considerable influence in shaping policies aimed at mitigating risks for future generations. Thus, their support is vital in the development of climate policies, particularly those with stricter or costlier measures. By leveraging our data, we can investigate whether individuals' endorsement or opposition to climate change policies is influenced by their concerns regarding the economic costs associated with the implementation of pro-environmental measures, and whether these concerns differ across generations.

Third, we contribute to a small number of studies which examine the formation of pro-environmental preferences during early adulthood, triggered by experience of natural disasters or by increased exposure to stringent climate policies (Falco and Corbi, 2023; Ravi Vora and Zappala, 2023). Our primary contribution to this literature lies in delineating generational disparities in response to identical climate shocks. And, finally, we contribute to the broader literature concerning the relationship between generational differences, risk tolerance and the individual behaviour (Dohmen et al., 2011; Ameriks et al., 2003). While it is widely acknowledged that risk tolerance tends to decrease with age, we extend this discourse by presenting evidence within the context of perceived risks associated with climate change.

Our primary source of data is the OECD Risks That Matter Survey (2022), a representative household survey of respondents from 22 OECD countries. The survey focuses on perceived risks, with the 2022 wave featuring an extensive module dedicated to examining the threats posed by climate change. This module encompasses data on perceived associated risks, levels of support for offset policies, apprehensions regarding the economic implications of implementing climate change mitigation measures, and the electoral preferences for parties in the upcoming General Election. We complement these data with regional-level records of temperatures between 1995 and 2021 and create measures of exposure to changes in the (detrended) average regional temperature based on annual temperature figures between 1995 and 2021 across 158 regions in 22 OECD countries.

Our baseline findings indicate that experiencing abnormally high temperatures raises the likelihood of individuals supporting left-leaning parties by roughly 3.5% and increases concerns about climate change by about 6% of a standard deviation. This effect persists for 2-3 years post-experience but wanes after 5 years. Given that elections typically occur within a 4-5 year time-frame, coupled with the rising frequency and visibility of extreme weather events, our findings suggest that environmental factors will wield greater sway over political outcomes and voting behavior in the future. In line with this, we show that regional exposure to unusually high temperatures is consistent with political moderation in European elections spanning nearly two decades.

In contrast to findings by Falco and Corbi (2023), we demonstrate that encountering temperature shocks during early adulthood (between 18 and 25 years old) does not augment support for left-leaning parties nor does it heighten individuals' anxiety about climate change, partly because the effect of experienced temperature appears to fade away fairly quickly, but also because that particular sample predominantly encompass relatively younger respondents.

In our second step, we study the complex interplay between environmental factors, political orientation, and voting behavior. We find that experiencing higher temperatures increases support for parties with green manifestos, particularly among older demographics. In addition, we find that having a green manifesto increases voting for left-leaning parties, and this effect is amplified among people who have experienced temperature rises. These results suggest a two-way interaction between temperature changes and political orientation: temperature changes can shape voting behavior, but party platforms do also play role. In accordance with the issue ownership theory (Petrocik, 1996), these findings further suggest that left-leaning parties can reinforce their issue ownership of climate change by emphasizing their green manifestos and environmental policies, particularly in regions or demographics more vulnerable to temperature changes.

In a third step, we use the richness of our data to explore the underlying mechanisms shaping the connection between climate exposure and political support. On the one hand, there's a lack of expressed concern about the economic repercussions of such policies. Yet, there's a general inclination among individuals to support policies addressing the adverse economic impacts of climate policies, particularly support for labor markets in affected regions and the provision of social insurance and protection.

We show that these results mask significant diversity across age groups. Specifically, the baseline trends are predominantly driven by older demographics, who exhibit a noticeable uptick in support for left-wing political parties and heightened anxiety regarding climate change following an abnormal increase in experienced temperature. Additionally, older individuals express worries about the economic burdens associated with climate change policies, and consistently endorse offset policies targeting job-related issues, energy efficiency, affordable housing, and public transportation infrastructure. In contrast, younger respondents show little support for policies aimed at mitigating the adverse economic impacts of climate policies, possibly due to their perception that these costs are inevitable, leading to a higher willingness to bear them.

Our findings suggest that older individuals, often more conservative in their outlook, may be open to lending their support to greener parties and policies in exchange for targeted measures, particularly the provision of offsetting benefits to mitigate the perceived economic costs of green interventions. Consequently, policies that acknowledge and address the economic apprehensions of older individuals while simultaneously promoting climate action are likely to attract more electoral support. Overall, these implications underscore the importance of tailoring policies to address the diverse attitudes and needs of different age groups, while also recognizing the demographic landscape within specific regions.

The rest of the paper is organized as follows. We present our various sources of data in Section 2 and an outline of the estimation strategy in Section 3. Our main results are discussed in Section 4, and Section 5 contains our concluding remarks.

2 Data

Our primary source of data is the OECD Risks That Matter Survey (2022), a representative household survey of respondents from 22 OECD countries. The survey focuses on perceived risks, with the 2022 wave including a very detailed module on the threats from climate change, including data on perceived associated risks, support for green policies, concerns about the economic costs of implementing climate change mitigation policies, and electoral support for parties in the next General Election.

To understand the relationship between exposure to climate change and political behaviour and support, we complement the Risks That Matter Survey with data on national and sub-national climate hazards, developed by the OECD and predominantly based on figures from the Copernicus Climate Data Store (CDS) and ERA5 hourly data on single levels (ERA5). The dataset covers all OECD countries at the sub-national level and temperature figures are available at this unit of observation between 1995 and 2021.

2.1 Electoral outcomes

The OECD Risks That Matters survey collects data on the party that a respondent would vote for in the next General Election. We use the Manifesto Project Database by the Manifesto Research on Political Representation project MARPOR (MARPOR) and their developed methodology to classify parties according to their position on a right-left scale.

The Manifesto database covers 67 countries and 1373 parties between 1945 and 2022, assigning each political party a score on the right-left scale party based on their ideology on a list of items, including views on security and defence, civil rights, economic ideology, support for the welfare state, and law and order. The score is continuous, with values between -74.3 and 91.9, with higher values corresponding to a more right-leaning ideology.[3]

Our main political outcome is a dummy variable taking value one for left-leaning parties (with a score of zero or less) and value zero for right-leaning parties (with a positive score). In Appendix Table A3 we show that our results are robust to using the continuous scale instead or a constructed measure which splits the variable into deciles. Furthermore, in Section 4.3 we show how our results differ if we instead focus directly on the environmental dimension of each party, coded based on support for green policies as stated in their manifestos.

To address concerns that stated preferences for a certain political party may not necessarily translate into actual political behaviour, in Section 4.4 we complement our main analysis with data collated by Algan et al. (2017) who collect voting data for parliamentary and presidential elections using country-specific archives for a number of European countries and classify all parties as far-right, radical-left parties, populist, and Euro-sceptic. The dataset covers votes in 217 regions in 25 European countries, allowing us to merge electoral outcomes to our measures of region-level temperature fluctuations and perform a region-country level

[3]The left-right spectrum classification is conducted in line with the methodology of Budge and Laver (2016), and it has been used extensively in the literature.

panel analysis over the period 2000-2017.

2.2 Environmental preferences

Our second outcome variable is a measure of concern for the consequences of climate change, which we label as Climate Concerns. The question is asked on a 4-point scale where 1 corresponds to "Not at all concerned" and 4 corresponds to "Very concerned". In Section 4.3 we also show how our results change when we instead use a more global measure of climate concern and a measure of support for government intervention.

To explore the potential mechanisms between temperature experiences and political support and climate anxiety, we also focus on a wide set of offset policies and concerns with respect to economic consequences of climate policies. Respondents are asked about their support for various cost mitigation policies, with responses on a 5-point scale where 1 corresponds to "Strongly Disagree" and 5 corresponds to "Strongly Agree". The offset policies in question are: (1) fostering new jobs in regions impacted by climate change, (2) helping workers in industries affected by climate change to find a new job, (3) helping workers learn new skills to prepare for green jobs, (4) improving social insurance benefits, (5) providing subsidies for housing costs, (6) providing financial and technical support for energy efficiency, (7) supplying social and affordable housing, (8) providing subsidies for energy costs, (9) placing limits on energy prices, and (10) improving public transport.

We create three indexes of support for policies which sum up the support across groups of questions. Specifically, we create and index for jobs related policies (policies (1), (2), and (3)), energy-related policies (policies (6), (8) and (9)), and social policies (policies (4), (5), (7), and (10)). We also show our results for an index across all ten offset policies and in Appendix Table A5 we show support for each policy separately. When indices are used, they are standardized with a mean of zero and a standard deviation of one, to facilitate the comparison of coefficients across equations.

With respect to concerns about the impact of climate policies on economic outcomes, respondents are asked to state how worried they are on a 4-point scale, with 1 corresponding to "Not at all concerned" and 4 corresponding to "Very concerned". The economic outcomes in question are concerns with respect to the impact of green policies on (1) energy and fuel costs, (2) the costs of food and other goods, (3) loss of jobs in impacted industries, (4) not enough skilled workers being available for green jobs, (5) housing relocation costs for affected people, (6) lower economic growth, and (7) the cost of adaptation to climate change more broadly. Using the same approach as for offset policies support, we create an index of labour market-related concerns (concerns (3) and (4)), cost-related concerns (concerns (1), (2), (5), and (7)), and economic-related concerns (concern (6)). We again also show our results for an index across all seven concerns and, in the Appendix Table A6, we show results with each item separately. When indices are used, they are standardized with a mean of zero and a standard deviation of one, to simplify the comparison of coefficients.

2.3 Climate Change exposure

Our main measure of exposure to climate change relies on a measure of annual temperature change, recorded in degrees Celsius, in each region across our sample of OECD countries. We can observe annual temperature changes between 1995 and 2021 across 158 regions in 22 OECD countries. We focus on changes in average regional temperatures, net of the average trend in that region between 1995 and 2021 to account for the fact that different temperatures will be perceived as normal across areas.

Our main measure of regional temperature change is de-trended regional temperature change in the previous year. However, we explore a range of additional measures, namely weighted averages in the past 2, 3, 5, and 10 years, as well as for the whole documented period.

When weighting previous experiences we choose a set of uniform weights allowing more recent experiences to be weighted more, in a linear fashion. Additionally, we explore a measure of regional temperatures during a respondent's impressionable years, namely between 18 and 25 years of age.

In Appendix Table A8 we also show how our results change when instead we construct a binary measure of extreme temperature experiences. Specifically, we create a dummy variable which takes value 1 if a respondent's experienced a regional temperature corresponding to the top decile in that region over the entire time span of our data set. In the Appendix Table A9 we also show how our conclusions change if we instead construct our measure of extreme temperature experiences based on country-level temperatures rather than regional ones.

2.4 Control variables

We control for a rich set of individual-level characteristics, namely gender, a quadratic term in age, marital status, whether a respondent is an ethnic minority in their country, labour market status, educational attainment, the logarithm of household income, and occupational fixed effects. We also include country fixed effects in all of our specifications.[4]

3 Empirical Approach

We begin our analysis by estimating the relationship between our outcome variables and experienced temperatures. Specifically, we estimate:

[4]Since the OECD Risks That Matter Survey is a single cross-section, regional temperatures are perfectly collinear with region fixed effects, thus preventing us from including them in our set of controls. In our analysis pertaining to actual electoral outcomes we exploit the panel dimension of the data which also allows for the inclusion of regional fixed effects, although our conclusions are similar with both approaches.

$$Y_{irc} = \beta_1 TE_{irc} + \beta_2 X_{irc} + \delta_c + \omega_{oc} + \epsilon_{irc} \tag{1}$$

where Y_{ic} is the response of individual i in region r of country c, to one of our outcome variables of interest, namely (1) political support of the left-right spectrum, (2) climate concerns, (3) support for offset policies, and (4) concerns about the economic costs of climate policies. TE_{irc} captures the temperature experience of individual i in region r of country c, measured by the long-term (de-trended) temperature in that region in the year previous to the survey, namely in 2021. Our main coefficient of interest is β_1, which is estimated by exploiting within-country variation at individual level in exposure to the regional temperature changes.

We also control for a set of individual covariates X_{irc}, capturing socio-economic characteristics (gender, a quadratic term in age, marital status, ethnicity, labour market status, educational attainment, the logarithm of household income). We include occupational fixed effects (ω_{oc}) to mitigate concerns that the results are driven by occupational differences in exposure to climate change and associated policies. All regression include country-fixed effects to remove the scope for any confounds attributable to variations at the country level. And all regressions are estimated using OLS for ease of interpretation, with standard errors clustered at the country-level.

To estimate the relationship between regional temperatures and electoral outcomes, we estimate the following equation:

$$V_{rct} = \gamma TE_{rc,t-1} + \delta_c + \mu_r + \tau_t + \nu_{rct} \tag{2}$$

where V_{rct} is the share of votes in region r of country c in election year t assigned to parties classified as extreme. Specifically we look at parties that are classified as (1) extreme right, (2) extreme left, (3) populist, and (4) Euro-sceptic. $TE_{rc,t-1}$ is our measure of regional temperature in the year preceding a general election and γ is the coefficient of interest capturing the link between exposure to higher temperatures and electoral outcomes in the subsequent year. Due to the panel structure of the data, we are able to include time (τ_t), country (δ_c), and region (μ_r) fixed effects.

4 Results

We begin by discussing summary statistics pertaining to our main outcome variables, reported in Table A1 in the Appendix. On average, our sample is slightly left-leaning in their political preferences, with 58% of respondents supporting a left-leaning party. Overall, respondents are also fairly worried about climate change (with an average score of 3.21 out of 4) and appear to be overall in favor of governments implementing offset policies, with some variation across programs. The most popular policy appears to be placing limits on energy prices (with a score of 4.12 out of 5) while the least popular is an improvement in social insurance (with a score of 3.75 out of 5).

In terms of concerns about the costs of implementing climate policies, they are moderate in our sample with most respondents being somewhat concerned on average. The strongest concern relates to policies leading to higher costs for food and other goods (3.51 out of 4) and the weakest concern relates to the resulting costs of housing relocation (2.87 out of 4).

Figure A1 reports the cross-region dispersion in de-trended temperatures in OECD countries from 1995 to 2022. The figure shows that even within countries, there is significant variation across regions in (de-trended) yearly temperatures. In some countries, the dispersion is as high as one standard deviations and many of the countries in our sample regularly record variations in the region of 0.2-0.4 standard deviations. This suggests that our main source of identifying variations has significant richness across both space and time.

4.1 Baseline results

In Table 1 below we estimate equation (1), where the first column reports the results with "Voting Left" as the outcome variable and column two reports the results for our measure of "Climate Concern". We find that experiencing a higher temperature in the year preceding the survey has a positive and significant association with both outcome variables. Specifically, a one degree Celsius[5] increase in the (long-term de-trended) average temperature in a region increases the likelihood of an individual voting for left-leaning parties by approximately 3.5% and becoming more anxious about climate change by around 0.05 points on a 4-point scale, or roughly 6% of a standard deviation.

Table 1: Voting, concerns about climate change, and experienced temperature

	(1)	(2)
Dependent Variable:	Votes Left (0-1)	Concern Climate (1-4)
Regional Temperature	0.034**	0.047*
	(0.014)	(0.027)
Demographics	✓	✓
Country fixed effects	✓	✓
N	9,576	18,781
R^2	0.19	0.07

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

To address concerns that our "Voting Left" variable may be missing important variation

[5] The standard deviation of our temperature measure is 0.4 degrees Celsius is our sample.

across the left-right spectrum by transforming it into a binary measure, Table A3 in the Appendix replicates our results when employing alternative measures of political support, namely both in a continuous manner and by splitting the left-right spectrum into deciles. Our results are qualitatively robust to these alternative specifications.

To further investigate the robustness of our results to the construction of our regional temperature exposure variable, we construct alternative measures of temperature experiences that directly capture extreme regional and country level temperature events as opposed to long-term trend deviations. We define extreme regional temperature events by splitting the distribution of (de-trended) temperatures at the region level into deciles, where the top decile corresponds to the 10% highest temperatures in that region between 1995 and 2021, once the long-term trend has been removed. We then create a dummy variable which takes value one if a region experienced a top decile temperature in 2021 and zero otherwise as our measure of an extreme temperature shock.[6]

Table A8 in the Appendix replicates Table 1 using our binary measure of extreme temperature instead. In Panel A we show that our results are robust and stronger when using this alternative specification instead. In Table A9 in the Appendix we also investigate how our results differ if we define our shock based on the distribution of temperatures at the country-level instead and find weaker but qualitatively similar results.

While in Table 1 our measure of experienced temperature is based on the 2021 averages, in Table 2 we investigate the persistence of experienced temperatures. Specifically, we construct an average measure over the past 2 years, 3 years, 5 years, 10 years, and for the entire time span (1995-2021). In line with the literature in psychology (Weber et al., 1993; Hertwig et al., 2004) we assign uniformly distributed weights to each year such that more recent

[6] In our sample of respondents in the 2022 OECD survey, this corresponds to roughly 3% of individual experiences. We have also investigate how our conclusions change if we instead define our binary measure of extreme temperature in a broader manner, based on quintiles or quartiles instead. Our findings are noisier as expected, but qualitatively the same when using this specification instead. Results available upon request.

occurrences are more heavily weighted. Finally, in line with the literature on Impressionable Years (Bietenbeck et al., 2023; Carreri and Teso, 2023; Cotofan et al., 2023), we also construct a measure of temperature experiences between the ages of 18 and 25 as previous research has argued that experiences during this period may have long-lasting impacts on preferences and behaviours.[7]

The coefficient on the increased likelihood of left-leaning voting behavior and climate change concern persists for 2-3 years following the experience but diminishes after 5 years. Considering that elections typically occur within 4-5 year cycles, and with the escalating frequency and visibility of extreme climatic events, our findings imply that environmental factors will exert a stronger influence on political outcomes and voting behavior in the future.

Exposure to temperature fluctuations during early adulthood (between the ages of 18 and 25) does not seem to have a discernible impact on attitudes towards left-leaning voting or concerns about climate change. This contrasts with Falco and Corbi (2023) who found that natural disasters experienced during early adulthood can induce pro-environmental attitudes. The variation in results can be readily clarified by considering the composition of the samples. In our sample, due to the restricted time frame of the temperature data, this aspect of the analysis will predominantly encompass respondents of relatively younger ages. In contrast, in Falco and Corbi (2023), the time series spans from 1973 for the US analysis, while the cross-country analysis utilizes three waves from the World Values Survey (WVS) starting in 1995. Consequently, our findings are driven by individuals who may not have had sufficient exposure to extreme climate events over a long-term horizon, minimizing the impact of such events on their preferences.

[7]Due to the limited time-span of our temperature time series, this analysis will only include relatively younger respondents, and we interpret the results cautiously.

Table 2: Voting, concerns about climate change, and experienced temperature: various specifications

	(1)	(2)
Dependent Variable:	Votes Left (0-1)	Concern Climate (1-4)
Panel A: Last 2 years (uniform weights)		
Regional Temperature	0.040**	0.066**
	(0.017)	(0.031)
N	9,576	18,781
R^2	0.19	0.07
Panel B: Last 3 years (uniform weights)		
Regional Temperature	0.064**	0.102
	(0.029)	(0.060)
N	9,576	18,781
R^2	0.19	0.07
Panel C: Last 5 years (uniform weights)		
Regional Temperature	0.087	0.149
	(0.086)	(0.112)
N	9,576	18,781
R^2	0.19	0.07
Panel D: Last 10 years (uniform weights)		
Regional Temperature	-0.012	0.138
	(0.085)	(0.092)
N	9,576	18,781
R^2	0.19	0.07
Panel E: Full sample 1995-2021 (uniform weights)		
Regional Temperature	0.151	0.488
	(0.346)	(0.309)
N	7,753	15,009
R^2	0.20	0.07
Panel F: Experiences between 18 and 25 years		
Regional Temperature	-0.027	-0.007
	(0.032)	(0.057)
N	6,754	13,665
R^2	0.20	0.07
Demographics	✓	✓
Country fixed effects	✓	✓

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table 3 displays results regarding the association between the experience of temperature shocks and concerns regarding the economic costs of implementing climate mitigation measures, while Table 4 showcases the results concerning support for various offset policies.[8]

The results in Tables 3 and 4 show seemingly contradictory results. On the one hand, individuals do not seem to express concerns about the economic consequences of climate policies. Yet, they tend to support policies aimed at mitigating any adverse economic impacts of regulatory policies, especially concerning labor markets in affected regions and the provision of social insurance and protection against their effects. In Section 4.2 below we further investigate this and show that our results are partly explained by differences across generations.

Table 3: Experienced temperature and concerns about the economic impact of climate policies

	(1)	(2)	(3)	(4)
Dependent Variable:	Jobs	Costs	Growth	Overall
Regional Temperature	0.046	-0.010	0.033	0.015
	(0.032)	(0.034)	(0.035)	(0.035)
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓
N	16,951	17,616	18,039	15,413
R-squared	0.09	0.09	0.10	0.12

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

[8]While the outcome variables in Tablesd 3 and 4 are based on indices constructed as described in Section 2, in Panels A of Tables A5 and A6 in the Appendix we also show the results for each item individually.

Table 4: Experienced temperature and support for offset policies

Dependent Variable:	(1) Jobs	(2) Energy	(3) Social Insurance	(4) Overall
Regional Temperature	0.083***	0.045	0.087*	0.103***
	(0.023)	(0.032)	(0.044)	(0.028)
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓
N	17,787	17,927	17,557	16,637
R-squared	0.101	0.11	0.10	0.12

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

In Table A4 in the Appendix we investigate whether concerns about the cost of climate change programs and support for offset policies mediate the relationship between experienced temperature and the tendency to support more left-leaning parties, or the extent of climate concerns expressed. We find that concerns for the economic costs of climate policies and support for offset policies mediate roughly 40% of the coefficient on political support and nearly 75% of the coefficient on climate concerns, with the latter also becoming statistically insignificant at all conventional levels. While descriptive in nature, these findings suggest that a significant share of the correlation between experienced temperatures and our outcome variables is explained by individual views on the costs of implementation of climate mitigation policies and by their support for offset policies.

4.2 Results by age group

In this section we repeat our baseline analysis across age groups. Due to the relatively small sample size, we perform a median split across ages. This corresponds to a younger group aged 18 to 41 and an older group aged 42 to 64. In our sample younger respondents are more likely to be left-leaning (62% as compared to 53%, or 0.18σ more likely to support a left-leaning party) but similarly concerned about climate change (3.22 as compared to 3.20 on a 4-point scale.)

The results in Table 5 indicate that our baseline findings are predominantly driven by older demographics. When exposed to higher temperatures, older individuals are more inclined to support left-leaning political parties and to heighten their concern for climate change. Specifically, a one degree Celsius increase in the average regional temperature in the previous year results in a 6.5% higher chance of stating that they will support a left-leaning party and a 0.1 increase in Climate Concerns (on a 4-point scale), equivalent to 0.12 standard deviations. In Table A7 in the Appendix we explore alternative age splits and show that our results are qualitatively similar with these specifications. And in Panels B and C in Tables A8 and A9 we show that our findings by age group are also robust to alternative specifications of our temperature measure.

The older generation's growing concern about climate change may be attributed to the increased frequency of temperature anomalies. Individuals who have witnessed fewer occurrences of such anomalies in the past may now be noticing them more frequently, leading to heightened anxiety surrounding the issue (Poortinga et al., 2023; Moore et al., 2019).

However, older respondents being more likely to support left-wing parties and become more climate-anxious following temperature shocks does not necessarily imply a direct link between their climate attitudes and party choice. It is possible that experiencing climate shocks may heighten individuals' sensitivity to the issue and make them more receptive to political messaging and actions related to climate change. In this context, the activities of left-leaning parties advocating for climate action could resonate more strongly with those who have experienced the direct impacts of climate change, reinforcing their support for such

Table 5: Voting, concerns about climate change, and experienced temperature by age group

	(1)	(2)	(3)	(4)
Dependent Variable:	Votes Left (0-1) Younger	Concern Climate (1-4) Younger	Votes Left (0-1) Older	Concern Climate (1-4) Older
Regional Temperature	0.003	-0.006	0.065***	0.113***
	(0.018)	(0.029)	(0.015)	(0.032)
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓
N	4,724	9,579	4,852	9,202
R^2	0.19	0.8	0.19	0.07

Notes: Regressions are estimated using OLS. Younger respondents are aged below the median in our sample (18-41) while older ones are aged above the median (42-64). Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

parties.

Therefore, further explore whether increased anxiety about climate change among older demographics is associated with material considerations, reflecting increased demand from older people for welfare policies and, consequently, increased support for left-wing parties. In this section, we do so by examining individuals' specific concerns about climate policies and their policy preferences for offsetting the economic consequences of climate policies. And in Section 4.3 below we investigate if individual experiences translate into support for government intervention to address climate change and also increase support for parties which promote green policies.

Table 6 provides insights into whether and which aspects of the economic consequences of climate policies individuals are worried about by age group. Older demographics harbor concerns about the economic costs of climate policies, specifically regarding their impacts on jobs in industries affected by environmental regulations and the lack of skills needed in green jobs. They also express worries that green policies may lead to lower economic growth. As such, exposed older individuals are more likely to endorse offset policies to address job-related issues in regions and industries affected by environmental regulations, support energy efficiency, as well as policies that reduce energy costs and enhance public transportation infrastructure (Table 7).

Table 6: Experienced temperature and concerns about the economic impact of climate policies by age group

	(1)	(2)	(3)	(4)
Dependent Variable:	Jobs	Costs	Growth	Overall
Panel A: Younger respondents				
Regional Temperature	0.017	-0.074*	-0.030	-0.056
	(0.039)	(0.038)	(0.031)	(0.038)
N	8,616	8,364	9,163	7,787
R-squared	0.10	0.09	0.12	0.13
Panel B: Older respondents				
Regional Temperature	0.088**	0.067	0.097*	0.095**
	(0.041)	(0.039)	(0.048)	(0.041)
N	8,335	8,056	8,876	7,626
R-squared	0.10	0.09	0.14	0.13
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

In contrast, it seems that experiencing higher temperatures does not translate into young respondents being any more concerned about the economic consequences of green policies. If anything, young people experiencing higher temperatures are somewhat less likely to be concerned about costs, especially the costs associated with making heating and cooling systems climate-neutral. As such, younger people may be more willing to bear those costs if they perceive them as unavoidable and, as a result, do not seem to support policies aimed at mitigating the economic consequences of green initiatives.[9]

Table 7: Experienced temperature and support for offset policies by age

	(1)	(2)	(3)	(4)
Dependent Variable:	Jobs	Energy	Social Insurance	Overall
Panel A: Younger respondents				
Regional Temperature	0.039	-0.006	0.039	0.055
	(0.040)	(0.031)	(0.053)	(0.032)
N	8,970	9,010	8,841	8,290
R-squared	0.11	0.12	0.10	0.12
Panel B: Older respondents				
Regional Temperature	0.137***	0.101**	0.147***	0.158***
	(0.035)	(0.048)	(0.046)	(0.042)
N	8,817	8,917	8,716	8,347
R-squared	0.11	0.12	0.12	0.13
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

4.3 Voting "Green" and Political Support

In this section, we provide further insights into the relationship between temperature changes, political orientation, and voting behavior, and endorsement of government mitigation poli-

[9] The comprehensive compilation of results concerning support for green policies and concerns for the economic costs of climate change across different age groups for each policy is presented in Panels B and C of Table A5 and Table A6 in the Appendix.

cies.

We begin by ranking parties by their environmental commitment as codified from the individual party manifestos. Specifically, we make use of the Welfare and Quality of Life Domain of the Manifesto Project Database and focus on the Environmental Protection dimension which scores parties, on a continuous scale (values ranging between 0 and 34.8 in our sample)[10], according to their general support for policies in favour of protecting the environment, fighting climate change, and other "green" policies.

The average party in our sample scores 6 points on the scale, with a standard deviation of 4.95. The green measure also correlates well (but, as expected, not perfectly) with our binary measure for left-leaning parties, with a correlation score of roughly 0.4 and a similar figure for the continuous measure of left-right support. In Table 8 below we estimate equation (1) using the green support dimension. In column (1) we show the results for the full sample and in columns (2) and (3) we show results for young and older respondents, respectively. Consistent with our findings above, an increase in the experienced regional temperature translates in supporting a political party that scores 0.1σ higher in terms of the Environmental Protection dimension. This suggests that the shifts in political support shown in our baseline results are indeed linked to the green policies put forward by various parties. Again, these findings are predominantly driven by older respondents for whom the corresponding increase is 0.14σ.

To provide more context for these results, as a next step, we explore the extent to which the green dimension of a party mediates the effect of temperature on voting left. Results reported in Table 9 show that having a green manifesto increases voting for left-leaning parties, and this effect is amplified among people who have experienced temperature rises. Furthermore, experiences of higher regional temperatures appear to matter little once the green dimension of the manifesto is controlled for. In Table A10 in the Appendix we show

[10]A higher value corresponds to more green support.

Table 8: Voting "Green" and Experienced Temperatures

	(1)	(2)	(3)
Dependent Variable:	Green Support (Full Sample)	Green Support (Younger Respondents)	Green Support (Older Respondents)
Regional Temperature	0.099**	0.057	0.136***
	(0.047)	(0.065)	(0.037)
Demographics	✓	✓	✓
Country fixed effects	✓	✓	✓
N	9,576	4,724	4,852
R^2	0.27	0.26	0.30

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). The dependent variable is a measure of the environmental support of a political party based on their manifesto, where a higher value corresponds to stronger stated support. Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** p<.01, ** p<.05, * p<.1.

that here too, our results are predominantly driven by older individuals.

Taken together, Table 8 and Table 9 results suggest a two-way interaction between temperature changes and political orientation. Experiencing higher temperatures appears to shift voting preferences towards parties with green manifestos, especially among older voters who may be more affected by abnormally high temperatures. And because left-leaning parties skew more green in their platforms, voters exposed to higher temperatures tend to move towards the left of the political spectrum as a consequence.

These results are consistent with the theory of issue ownership, stating that certain political parties are perceived by voters as being more competent and credible on specific issues (Petrocik, 1996). In line with this, left-leaning voters may be more likely to prioritize climate change and support parties with green manifestos, as these parties are perceived to have greater credibility on environmental issues. In other words, the effect of temperature changes on voting behavior may be amplified for left-leaning parties with green manifestos if they are perceived to be better equipped to address climate-related concerns.

Table 9: Voting Left, Party's Green Dimension, and Experienced Temperatures

	(1)	(2)
Dependent Variable:	Votes Left	Votes Left
Regional Temperature	0.013	-0.040
	(0.385)	(0.040)
Green Dimension	0.208***	0.210***
	(0.043)	(0.043)
Regional Temperature * Green Dimension		0.215**
		(0.096)
Demographics	✓	✓
Country fixed effects	✓	✓
N	9,576	9,576
R^2	0.32	0.33

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). The dependent variable is voting left. Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

In addition, we also investigate how experiencing higher temperatures translates into an alternative, more global, measure of climate concerns and a measure capturing support for government intervention with respect to climate change. The first measure is based on a question asking whether they believe climate change should be a global priority, with answers on a 5-point scale ranging from " Prioritise much less" to " Prioritise much more", with higher values corresponding to a higher priority. The second measure refers to the role of government efforts in fighting climate change, on a 5 point scale ranging from "Government should do much less" to "Government should do much more", with a higher value corresponding to more support for government intervention.

The results are presented in Table 10 below. In line with our main results, we find that exposure to higher temperatures increases the belief that climate change should be treated as a global priority by 0.16σ and support for government intervention to address the impact of climate change by 0.09σ. This indicates that the experiences that we capture at the regional level have broad repercussions for a wide set of climate-related preferences and are consistent with increased support for governments introducing more measures to address these challenges. In line with previous results, our estimates here are also predominantly driven by older respondents.

In summary, our results indicate that the experience of climate shocks could be directly shaping individuals' perceptions and priorities regarding climate change, leading them to consider environmental issues when selecting political parties to support. Here too, our results are stronger for older individuals, suggesting that the impact of climate shocks on political preferences among this group can be closely tied to their environmental concerns, rather than solely being driven by broader left-wing policies or welfare considerations.

4.4 Panel Data Insights on Voting Behavior

Our main results rely on one single cross-section of stated preferences for political parties. There are two potential limitations with this approach. First, it could be that a respondent's support for a political party may not materialise in voting behaviour in General Elections, in line with concerns raised by List and Gallet (2001), although Falk et al. (2023) generally find that stated preferences are good predictors of behaviour. Second, since we rely on experienced temperatures in 2021 to predict support for political parties in 2022, our results may be missing out important time variation or be more susceptible to bias due to unobserved events in the year of the survey as we are unable to control for region-specific fixed effects.

To address both these concerns, we make use of data compiled by Algan et al. (2017) who collect voting data for parliamentary and presidential elections using country-specific archives for a number of European countries and classify all parties as far-right, radical-

Table 10: Experienced Temperatures and Support for Global Climate Priorities and Government Intervention

	(1)	(2)
Dependent Variable:	Global Climate Priority	Government Intervention
Panel A: Full Sample		
Regional Temperature	0.161***	0.087***
	(0.027)	(0.028)
Demographics	✓	✓
Country fixed effects	✓	✓
N	18,658	19,258
R^2	0.05	0.05
Panel B: Younger Respondents		
Regional Temperature	0.125***	0.070*
	(0.033)	(0.036)
Demographics	✓	✓
Country fixed effects	✓	✓
N	9,530	9,886
R^2	0.07	0.07
Panel C: Older Respondents		
Regional Temperature	0.208***	0.115***
	(0.028)	(0.029)
Demographics	✓	✓
Country fixed effects	✓	✓
N	9,128	9,372
R^2	0.06	0.06

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). The dependent variable capture concerns for climate change from a global priorities perspective and support for government intervention, where a higher value corresponds to stronger support for environmental action. Dependent variables are standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

left parties, populist, and Euro-sceptic. One advantage of this data set is that the unit of observation is the sub-national region, allowing us to merge actual electoral outcomes in any one region to a history of recorded temperatures. Their dataset covers general election results in 217 regions across 25 European countries between 2000 and 2017.

After removing countries who are not covered by the OECD survey and those where the sub-national regions do not correspond to the OECD classification, we are left with a data set of 11 European countries, and 94 sub-national regions over the 17-year period which we merge, at the regional level, to our measures of region-level temperature fluctuations. This approach allows us to both study the relationship between regional temperature fluctuations on actual voting results, as well as perform a panel analysis of this relationship while also controlling for time, region, and country fixed effects. Some descriptive statistics pertaining to this dataset are presented in Table A2 in the Appendix.

In Table 11 we estimate equation (2), where the outcome variables capture the total share of votes gained by extreme parties in that year's general election. In column (1) the dependent variable is the total share of votes going to extreme parties, while the remaining columns focus on specific types of party families. Specifically, in column (2) we look at parties on the extreme right, in column (3) the extreme left, in column (4) populist parties, and in column (5) anti-EU ones. For ease of interpretation, all dependent variables are standardised with a mean of zero and a standard deviation of one.

We focus on extreme parties as there exists a significant level of polarization concerning the response to climate change among their supporters. While some individuals endorse green policies and support parties advocating for environmental agendas, others express skepticism and apprehension regarding the associated costs. Research indicates that those with right-wing affiliations are generally less inclined to acknowledge climate change and endorse mitigation measures compared to their left-wing counterparts (McCright et al., 2016; Lookwood and Lookwood, 2022). Furthermore, populist radical right parties often oppose climate policies (Forchtner et al., 2018; Lockwood, 2018). While environmental concerns typically align more with the left side of the political spectrum (Dalton, 2009), extreme left-wing parties hold varying positions. Some prioritize environmental issues alongside social justice principles (Wang and Keith, 2020), while others adopt 'green populism,' attributing the environmental crisis to capitalism, productivism, and economic and political elites (Chazel and Dain, 2020).

We argue that such polarization poses a significant obstacle to implementing effective climate policies. But if individuals affected by temperature fluctuations become more supportive of addressing climate change, it may become increasingly difficult for anti-establishment parties to oppose mitigation and prevention policies, potentially reducing their popularity.

Our results confirm this: voters who have experienced temperature shocks tend to decrease their support for anti-establishment parties (Table 11). A one degree Celsius increase in the experienced temperature in the year preceding a General Election translates into a 0.3 standard deviations (σ) decrease in the number of votes cast for a party classified as extreme in the affected region. This finding is driven by a broad spectrum of extreme parties, with decreases corresponding to 0.34σ drops for radical left parties, 0.17σ for populist, and 0.20σ for anti EU ones. In Table A11 in the Appendix we show that our results are qualitatively the same and stronger when we also control for election month fixed effects, accounting for seasonal variation in temperature at the time of the election.

These findings further corroborate the conclusions drawn above, suggesting that exposure to extreme regional temperatures leads to actual changes in voting behavior and increases voters' inclination toward parties that have historically been more likely to support climate policies.

Table 11: Experienced temperature and extreme parties voting behaviour

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	Extreme	Extreme Right	Extreme Left	Populist	Anti EU
Regional Temperature	-0.309***	0.002	-0.338***	-0.168**	-0.196**
	(0.080)	(0.061)	(0.087)	(0.085)	(0.086)
R-squared	0.88	0.93	0.84	0.82	0.82
N	454	454	454	454	454
N Countries	11	11	11	11	11
Year fixed effects	✓	✓	✓	✓	✓
Region fixed effects	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓

Notes: Regressions are estimated using OLS, for 11 countries and 94 regions. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in the year previous to the election, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. In parentheses, heteroskedasticity robust standard errors are reported. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

5 Concluding Remarks

Using rich data from 22 OECD countries and 150 sub-national regions, we examine how regional temperature variations correlate with individual-level political leanings, climate concerns, concerns regarding the economic consequences of climate policies, and attitudes towards a range of offset policies.

Our findings reveal that a one-degree Celsius rise in regional temperature boosts the likelihood of voting for left-leaning parties by 3.4% and increases climate concerns by 6% of a standard deviation. We show that this increase in support for left-leaning parties is directly linked to the green dimension of their manifestos and using data from two decades of European elections we find that temperature fluctuations lead to more political moderation. These results remain robust across various model specifications.

We also observe that rising temperatures increase backing for parties advocating green or environmentally conscious agendas, particularly among older age groups. Furthermore, the presence of a green manifesto tends to boost support for left-leaning parties, with this effect being more pronounced among individuals who have experienced temperature escalations. These findings not only affirm the influence of temperature shifts on voting tendencies but also underscore the significance of political ideology and party agendas in shaping electoral decisions.

Furthermore, we explore how political preferences and climate concerns relate to support for different offset policies and to concerns about the economic costs of green policies. We find that individuals affected by temperature shocks do not exhibit heightened concerns about associated costs, but tend to favor offset policies. Notably, these effects are relatively short-lived, typically manifesting 2-3 years after the shocks. Contrary to existing literature emphasizing experiences in young adulthood, we find no significant impact of climate shocks during this period on political attitudes.

Our study also sheds light on generational differences in electoral support and policy preferences, with older respondents driving our results. When confronted with climate shocks, older individuals become more left-leaning but also more concerned about the economic costs of green policies. Consequently, they show stronger support for offset policies, particularly in areas like energy regulation, affordable housing, and public transportation. In contrast, younger respondents are less swayed politically by climate shocks and exhibit fewer concerns about the affordability of green policies, especially regarding fuel and climate-neutral adaptation costs.

Overall, our findings underscore the importance of temperature shocks for public perceptions of climate change and support for environmental action. Notably, political allegiance aligns closely with environmental policy stances, with left-leaning and more moderate parties benefiting from increased support in affected regions, as also confirmed in our analysis of electoral outcomes over two decades. Our research highlights the importance of temperature shocks in shaping attitudes towards climate change and green policies. Understanding the nuanced preferences of different demographic groups is crucial for effective environmental policy-making, particularly in the face of escalating climate challenges.

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Appendix

Table A1: Descriptive Statistics in Risks That Matter Survey (2022)

Variable	Mean	Standard Deviation	Sample Size
Voting Left	0.58	0.49	9,576
Concern climate change (1-4)	3.21	0.89	18,781
Offset policies			
Government Should:			
New jobs in impacted regions (1-5)	3.91	0.92	18,207
Help workers find new job (1-5)	3.98	0.86	18,505
Help workers learn new skills (1-5)	3.97	0.91	18,536
Support for energy efficiency (1-5)	4.02	0.90	18,526
Subsidies for energy costs (1-5)	3.89	1.00	18,533
Limits on energy prices (1-5)	4.12	0.94	18,510
Improve social insurance (1-5)	3.75	1.04	18,318
Subsidize housing costs (1-5)	3.81	0.99	18,357
Supply affordable housing (1-5)	3.92	0.99	18,542
Improve public transportation (1-5)	4.02	0.93	18,578
Worries economic cost			
Job losses (1-4)	2.88	0.91	17,731
Not enough skilled workers (1-4)	2.90	0.84	17,622
Energy and fuel costs (1-4)	3.50	0.72	18,673
Food and goods costs (1-4)	3.51	0.71	18,725
Cost climate-neutral adaptation (1-4)	3.10	0.81	17,863
Cost of housing relocation (1-4)	2.87	0.86	17,112

Continued on next page

Lower economic growth (1-4)	3.15	0.82	18,039
Demographics			
Female	0.51	0.50	19,258
Age	41.04	13.22	19,258
Marital Status			
Single	0.28	0.45	19,258
Married	0.50	0.50	19,258
Non-registered partnership	0.14	0.35	19,258
Separated	0.03	0.16	19,258
Divorced	0.05	0.21	19,258
Widowed	0.01	0.11	19,258
Ethnic minority	0.07	0.25	19,258
Employment status			
Full-time employed	0.55	0.50	19,258
Full-time self-employed	0.06	0.24	19,258
Part-time employed	0.09	0.28	19,258
Part-time self-employed	0.03	0.16	19,258
Apprentice	0.01	0.08	19,258
Student	0.05	0.23	19,258
Retired	0.06	0.24	19,258
Disability	0.03	0.16	19,258
Military or community service	≤ 0.01	0.06	19,258
Caring	0.03	0.17	19,258
Unemployed	0.07	0.26	19,258

Continued on next page

Other	0.02	0.15	19,258
Education			
None formal	≤ 0.01	0.06	19,258
Primary	0.01	0.11	19,258
Lower secondary	0.08	0.27	19,258
Upper secondary	0.32	0.46	19,258
Post secondary	0.19	0.39	19,258
Basic tertiary	0.25	0.43	19,258
Advanced tertiary	0.15	0.36	19,258
Log (household) income	11.32	1.85	19,258

Table A2: Descriptive Statistics in European Elections

	Mean (%)	**Standard Deviation (%)**	**Sample Size**
Extreme Votes	0.39	0.53	482
Extreme Votes Right	0.12	0.15	482
Extreme Votes Left	0.06	0.09	482
Extreme Votes Populists	0.21	0.17	482
Extreme Votes Anti-EU	0.22	0.18	482

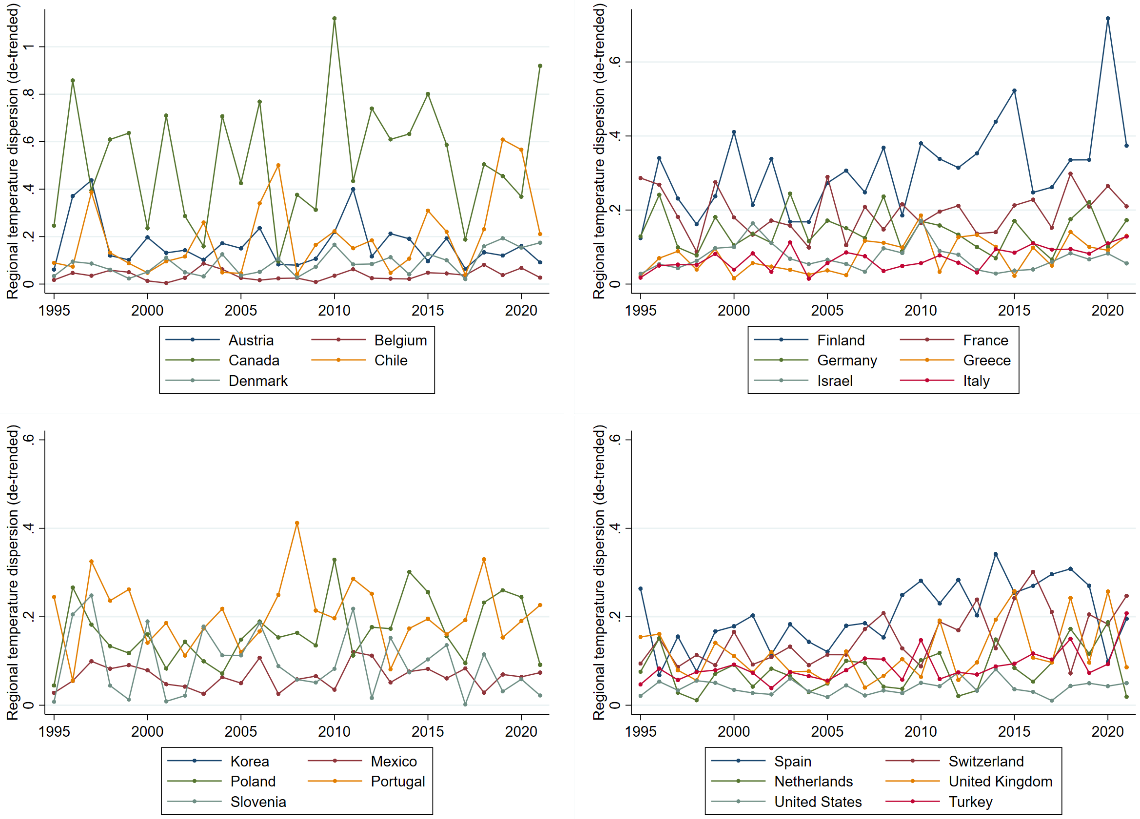

Figure A1: Standard deviation of (de-trended) temperatures across regions in OECD countries (RTM, 2022)

Table A3: Table 1 with alternative measures of political support

	(1)	(2)
Dependent Variable:	Left-Right Spectrum (continuous)	Left-Right Spectrum (deciles)
Regional Temperature	-0.075**	-0.161**
	(0.028)	(0.074)
Demographics	✓	✓
Country fixed effects	✓	✓
N	9,576	9,576
R^2	0.21	0.22

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). The left-right spectrum measure is a continuous variables in the first column, ranging between -44 and 42 points in our dataset with higher values corresponding to a more right-leaning vote. In the second column, we allow the data to be split into deciles, in line with to the distribution of the left-right spectrum variable. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** p<.01, ** p<.05, * p<.1.

Table A4: Political support and climate concerns - Mediation analysis

	(1)	(2)	(3)	(4)
Dependent Variable:	Votes Left	Votes Left	Concern Climate	Concern Climate
Regional Temperature	0.034**	0.022*	0.047*	0.013
	(0.014)	(0.013)	(0.027)	(0.018)
Support Offset Policies		✓		✓
Concerns Costs Green Policies		✓		✓
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓
N	9,576	7,523	18,781	14,315
R^2	0.19	0.25	0.07	0.21

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** p<.01, ** p<.05, * p<.1.

Table A5: Experienced temperature and support for offset policies across ages for each policy

Panel A: Full Sample	New Job	Help Job	Help Skill	Ener. Eff.	Ener. Sub.	Ener. Cap	Benefit	Housing	Afford.	Transp.
Regional Temperature	0.051*	0.066***	0.069*	0.009	-0.017	0.097**	0.039	0.010	0.092**	0.116**
	(0.026)	(0.022)	(0.038)	(0.032)	(0.032)	(0.037)	(0.041)	(0.047)	(0.036)	(0.043)
N	18,207	18,505	18,536	18,526	18,533	18,510	18,318	18,357	18,542	18,578
R-squared	0.077	0.071	0.068	0.060	0.076	0.099	0.093	0.063	0.069	0.064
Panel B: Young	New Job	Help Job	Help Skill	Ener. Eff.	Ener. Sub.	Ener. Cap	Benefit	Housing	Afford.	Transp.
Regional Temperature	0.025	0.035	0.049	0.017	-0.085**	0.056	-0.006	0.009	0.068*	0.049
	(0.046)	(0.032)	(0.043)	(0.037)	(0.036)	(0.038)	(0.050)	(0.059)	(0.039)	(0.060)
N	9,245	9,379	9,429	9,386	9,418	9,387	9,303	9,320	9,412	9,451
R-squared	0.081	0.071	0.074	0.058	0.073	0.091	0.087	0.059	0.070	0.061
Panel C: Old	New Job	Help Job	Help Skill	Ener. Eff.	Ener. Sub.	Ener. Cap	Benefit	Housing	Afford.	Transp.
Regional Temperature	0.086***	0.105***	0.098**	0.005	0.059	0.139**	0.095**	0.018	0.123**	0.191***
	(0.029)	(0.029)	(0.039)	(0.040)	(0.041)	(0.056)	(0.045)	(0.045)	(0.051)	(0.046)
N	8,962	9,126	9,107	9,140	9,115	9,123	9,015	9,037	9,130	9,127
R-squared	0.084	0.079	0.073	0.068	0.096	0.106	0.121	0.085	0.090	0.074
Demographics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are expressed in categorical terms, ranging from 1 to 5. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A6: Experienced temperature and concerns about the economic impact of climate policies for each category

Panel A: Full Sample	Job Loss	Skills	Growth	Fuel	Food	Cost Adapt	Relocation
Regional Temperature	0.014	0.057	0.027	-0.036**	-0.026	-0.060***	0.095***
	(0.025)	(0.036)	(0.029)	(0.017)	(0.031)	(0.019)	(0.023)
N	17,731	17,622	18,039	18,673	18,725	17,863	17,112
R-squared	0.100	0.041	0.099	0.071	0.082	0.047	0.066
Panel B: Young	Job Loss	Skills	Growth	Fuel	Food	Cost Adapt	Relocation
Regional Temperature	-0.006	0.035	-0.025	-0.072***	-0.043	-0.102***	0.057**
	(0.025)	(0.047)	(0.026)	(0.022)	(0.033)	(0.028)	(0.024)
N	9,049	8,982	9,163	9,509	9,548	9,079	8792
R-squared	0.093	0.048	0.095	0.074	0.089	0.045	0.063
Panel C: Old	Job Loss	Skills	Growth	Fuel	Food	Cost Adapt	Relocation
Regional Temperature	0.046	0.083**	0.080*	0.002	-0.005	-0.017	0.151***
	(0.031)	(0.037)	(0.039)	(0.021)	(0.035)	(0.017)	(0.032)
N	8,682	8,640	8,876	9,164	9,177	8,784	8,320
R-squared	0.116	0.045	0.111	0.074	0.086	0.053	0.085
Demographics	✓	✓	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are expressed in categorical terms, ranging from 1 to 4. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** p<.01, ** p<.05, * p<.1.

Table A7: Results with different age specifications

	(1)	(2)	(3)	(4)
Dependent Variable:	Votes Left	Votes Left	Concern Climate	Concern Climate
Regional Temperature	0.018	0.001	-0.010	0.008
	(0.025)	(0.037)	(0.097)	(0.144)
Aged 2nd quantile * regional temperature	0.032		0.034	
	(0.025)		(0.073)	
Aged 3rd quantile * regional temperature	-0.019		0.135	
	(0.029)		(0.120)	
Aged 4th quantile * regional temperature	0.054*		0.052	
	(0.028)		(0.149)	
Aged 26-30 * regional temperature		0.037		-0.049
		(0.044)		(0.130)
Aged 31-35 * regional temperature		0.017		0.026
		(0.043)		(0.127)
Aged 36-40 * regional temperature		0.089		-0.071
		(0.078)		(0.079)
Aged 41-45 * regional temperature		0.016		0.046
		(0.029)		(0.149)
Aged 46-50 * regional temperature		-0.051		0.130
		(0.046)		(0.218)
Aged 51-55 * regional temperature		0.074		0.153
		(0.067)		(0.136)
Aged 56-60 * regional temperature		0.096**		0.019
		(0.044)		(0.192)
Older than 60 * regional temperature		0.033		0.084
		(0.033)		(0.239)
Age in quantiles	✓		✓	
Age in 5-year intervals Demographics		✓		✓
Country fixed effects	✓	✓	✓	✓
N	9,576	9,576	18,781	18,781
R^2	0.19	0.19	0.07	0.07

Notes: Regressions are estimated using OLS. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A8: Voting, climate concerns, and experiencing regional-level extreme temperatures

	(1)	(2)
Dependent Variable:	Votes Left	Concern Climate
Panel A: Full Sample		
Extreme Temperature	0.081***	0.160***
	(0.009)	(0.036)
N	9,576	18,781
R^2	0.19	0.07
Panel B: Young Respondents		
Extreme Temperature	0.005	0.088***
	(0.017)	(0.027)
N	4,724	9,579
R^2	0.19	0.08
Panel C: Older Respondents		
Extreme Temperature	0.149***	0.247***
	(0.011)	(0.058)
N	4,852	9,202
R^2	0.19	0.07
Demographics	✓	✓
Country fixed effects	✓	✓

Notes: Regressions are estimated using OLS. Extreme temperature takes value 1 if the experienced temperature in the past year ranks in the top decile in that region between 1995 and 2021. Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A9: Voting, climate anxiety, and experiencing country-level extreme temperatures

	(1)	(2)
Dependent Variable:	Votes Left	Concern Climate
Panel A: Full Sample		
Extreme Temperature	0.032**	0.011
	(0.011)	(0.030)
N	9,576	18,781
R^2	0.19	0.07
Panel B: Young Respondents		
Extreme Temperature	-0.007	-0.033
	(0.007)	(0.029)
N	4,724	9,579
R^2	0.19	0.08
Panel C: Older Respondents		
Extreme Temperature	0.072***	0.062
	(0.020)	(0.039)
N	4,852	9,202
R^2	0.19	0.07
Demographics	✓	✓
Country fixed effects	✓	✓

Notes: Regressions are estimated using OLS. Extreme temperature takes value 1 if the experienced temperature in the past year ranks in the top decile in that country between 1995 and 2021. Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Concern for climate is coded on a 4-point scale, where larger values correspond to a higher concern. Demographics include controls for gender, a quadratic term in age, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A10: Voting Left, Party's Green Dimension, and Experienced Temperatures by Age Group

	(1)	(2)	(3)	(4)
Dependent Variable:	Votes Left (younger)	Votes Left (older)	Votes Left (younger)	Votes Left (older)
Regional Temperature	-0.009	0.036**	-0.056	-0.023
	(0.018)	(0.016)	(0.037)	(0.047)
Green Dimension	0.204***	0.213***	0.208***	0.212***
	(0.042)	(0.046)	(0.043)	(0.044)
Regional Temperature * Green Dimension			0.179	0.245**
			(0.106)	(0.087)
Demographics	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓
N	4,724	4,852	4,724	4,852
R^2	0.32	0.32	0.34	0.33

Notes: Regressions are estimated using OLS. Voting left corresponds to a dummy variable taking value one if the party supported is classified as a left-leaning party and zero otherwise. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in 2021, net of the long term average temperature trend in that region (between 1995 and 2021). The green dimension is measure of the environmental support of a political party based on their manifesto, where a higher value corresponds to stronger stated support, standardised with a mean of zero and a standard deviation of one. Demographics include controls for gender, being an ethnic minority, marital status, household size (squared), employment status, educational attainment, the logarithm of household income, and occupational dummies. In parentheses, heteroskedasticity robust standard errors are reported. Sample re-weighted using the population weights in the Risks That Matter Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A11: Experienced temperature and extreme parties voting behaviour with month fixed effects

Dependent Variable:	(1) Extreme	(2) Extreme Right	(3) Extreme Left	(4) Populist	(5) Anti EU
Regional Temperature	-0.295***	-0.130**	-0.154**	-0.312***	-0.352***
	(0.064)	(0.060)	(0.075)	(0.111)	(0.109)
R-squared	0.92	0.96	0.92	0.86	0.87
N	454	454	454	454	454
N Countries	11	11	11	11	11
Election month fixed effects	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓
Region fixed effects	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓

Notes: Regressions are estimated using OLS, for 11 countries and 94 regions. Regional temperature is expressed in degrees Celsius and corresponds to the temperature in the region of interest in the year previous to the election, net of the long term average temperature trend in that region (between 1995 and 2021). Dependent variables are standardised with a mean of zero and a standard deviation of one. In parentheses, heteroskedasticity robust standard errors are reporte Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

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