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HOW TO AVOID ANOTHER YELLOW VESTS MOVEMENT? ASSESSING PUBLIC PREFERENCE FOR A CARBON TAX WITH A DISCRETE CHOICE EXPERIMENT[•]

Jakub Sokołowski[♦]

Piotr Lewandowski[♣]

Jan Frankowski[♥]

Abstract

Climate policy can trigger tensions in divided societies with low trust. We examine public preferences for policies to achieve energy security and climate change mitigation goals in the context of the energy crisis caused by Russia's invasion of Ukraine. We conducted a discrete choice experiment with 10,000 people in Poland, a country heavily reliant on fossil fuels. Using a willingness-to-pay approach, we find a strong aversion to carbon tax, only slightly mitigated by redistribution. Income, trust, and age shape preferences for climate and energy policies, and for redistribution mechanisms. People with low incomes value climate change mitigation (15%) and energy security (10%) less than the average (17% and 14%, respectively). People aged 55 or more value climate mitigation less than those aged 18-34 (12% vs 28%) but are willing to sacrifice more to reduce Russian fuel imports (16% vs 11%). Quantifying the preferences for redistribution measures, we find that households with low income prefer cash transfers while high-income households prefer green investment subsidies. Addressing redistribution accordingly could increase support for climate policy more than providing either transfers or subsidies for all.

Keywords: carbon tax, redistribution, climate change, discrete choice experiment, willingness to pay
JEL: H23, Q41, Q54

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[♦] Institute for Structural Research, University of Warsaw. jakub.sokolowski@ibs.org.pl. Irysowa 18C, 02-660 Warsaw, Poland.

[♣] Institute for Structural Research, IZA, Bonn, and RWI, Essen. piotr.lewandowski@ibs.org.pl. Irysowa 18C, 02-660 Warsaw, Poland.

[♥] Institute for Structural Research, Institute of Philosophy and Sociology, Polish Academy of Sciences. jan.frankowski@ibs.org.pl. Irysowa 18C, 02-660 Warsaw, Poland.

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1. Introduction

Climate policy can spark social conflicts in countries with high social distrust, scepticism towards climate change, and a lack of political representation. Instruments such as carbon taxes, often perceived as the most efficient climate policies, can destabilise mitigation efforts (McCright et al., 2016) as they directly affect household budgets. This tension is embodied by the "end of the month" versus "end of the world" dilemma (Martin and Islar, 2021), whereby the elites prioritise climate change mitigation over the needs of financially struggling social groups. Reinforced by class divisions, it can fuel radical political movements, anti-elitist, and anti-climate discourse.

Carbon taxes remain politically controversial and considerable shares of developed countries' populations oppose them more strongly than other climate policies (Carattini et al., 2018). Low political trust amplifies this opposition (Levi, 2021), discouraging decision-makers from carbon taxes (Umit and Schaffer, 2020). Their acceptance is higher among well-educated or more affluent people and lower among those with high energy costs (Sommer et al., 2022). In this context, it is important to understand how carbon taxes impact social groups prioritising short-term financial stability over concerns about global warming in politically risky institutional settings. To this aim, we answer two questions: (1) What is the value attached to energy and climate policy goals? (2) Which redistributive measures can mitigate carbon tax aversion among groups most exposed to energy price spikes?

This paper aims to answer these questions by assessing individuals' willingness to support climate change mitigation and energy security measures. We also estimate the threshold of aversion and acceptance of two compensation policies: unconditional cash transfers and subsidies for green investments. We address these questions in the context of the energy crisis caused by the ongoing war in Ukraine, which may fuel public reluctance to new policies or taxes. We conducted a discrete choice experiment to estimate preferences for climate change mitigation and improved energy security in Poland. Such conjoint experiments allow for simultaneously estimating the causal effects of multiple treatment components, specifically policy dimensions (Hainmueller et al., 2014).[1] The context of our experiment supports the salience of policy choices we study – Poland is an emblematic Central and Eastern European country with relatively high income inequality, rather low trust, deep social divisions, and strongly reliant on fossil fuels which exposed to the effects of new carbon taxes due it strong reliance on fossil fuels in transport and heating.[2] Introducing the Emission Trading System for residential buildings and individual transport (ETS-II) in the late 2020s may lead to widespread social discontent as it will directly impact households through higher energy prices.

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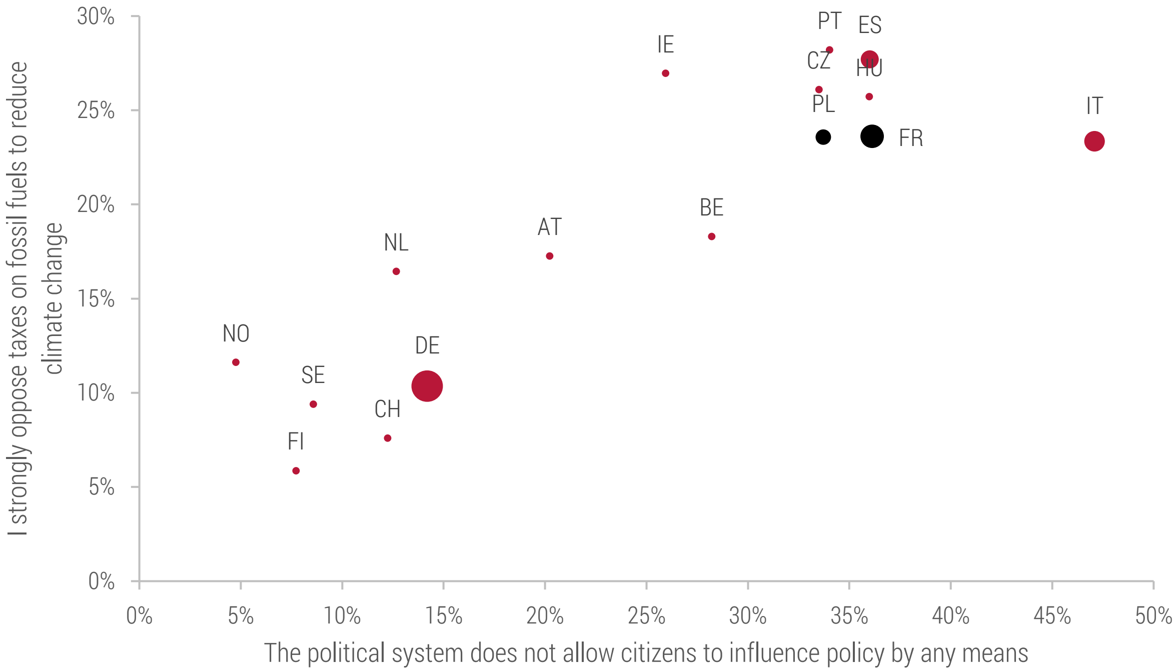
[1] Since Hainmueller et al. (2014) work on using conjoint experiments to estimate policy preferences and attitudes, such experiments have been applied to understand public support for climate policy (Dechezleprêtre et al., 2022; Devine et al., 2024; Montfort et al., 2023) or attitudes to migration and integration policy (Bansak et al., 2023). This method has also been used to evaluate redistribution preferences and the acceptability of carbon taxes, demonstrating its applicability to assess fairness and policy effectiveness in different contexts (Bachler et al., 2024; Hvidberg et al., 2023; Maestre-Andrés et al., 2021).

[2] Households in Poland are highly exposed to the effects of a new carbon tax (Antosiewicz et al., 2022a) as most people (56%) live in detached or semi-detached houses, rely on fossil fuels for household heating, and drive outdated cars. In 2018, 45% of households in Poland used coal to heat their homes. Almost two-thirds of Polish households own cars, with the average vehicle being 12 years old (GUS, 2019), making Poland one of Europe's largest and most obsolete car fleets.

The Yellow Vests[3] are one of the most well-known social movements triggered by climate policies. They believed the French government's proposed tax disproportionately affected low-income individuals or those struggling financially (Mehleb et al., 2021). The Yellow Vests' strikes and riots led to the French government withdrawing a diesel tax, illustrating the agency against top-down carbon tax adoption even in societies supportive of climate policy (Douenne and Fabre, 2020). Social structures in Poland and France share several similarities; both are politically divided, less trustful (both socially and politically), and more sceptical about climate change than the EU average (Fairbrother et al., 2019). Similarly to France, people in Poland and other Central and Eastern European countries strongly oppose carbon taxes and declare a widespread sense of political underrepresentation (Figure 1). In this regard, the example of Poland is essential for studying preferences regarding climate change, energy security, and the risks of social tensions caused by introducing a carbon tax.

Figure 1. Opposition to a carbon tax and feelings of political underrepresentation by nation (%)



Note: bubbles are proportional to countries' population size.
Source: own elaboration based on European Social Survey 8, 2018.

Our paper makes three key contributions. First, we unveil preferences regarding climate change mitigation and energy security in the context of the Russian invasion of Ukraine. We evaluated the choices of more than 10,000 individuals regarding hypothetical carbon taxes that differed in redistribution mechanism (direct unconditional cash transfers vs. subsidies for green technologies) and their effects on the climate, health, energy security, and income. We identified a strong public aversion to carbon taxes, barely affected by redistribution policies – when offered the same income with or without a climate policy, most participants preferred no climate policy, regardless of the redistribution mechanism. A penalty considerably reduced preference for a carbon tax for each level of income difference, while an equivalent premium did not increase it. Our results augment existing knowledge

[3] As a bottom-up, anti-establishment movement, protests by the Yellow Vests sprouted up across France in 2018, constituted by growing sentiments of social injustice and demands for stronger citizen agency in political decisions (Grossman, 2019). The Yellow Vests protested the disrespect by the "ruling class" towards the "common people" (Kipfer, 2019; Lianos, 2019).

concerning the design (Carattini et al., 2018), perceptions (Drews et al., 2022), and preferences for revenue recycling schemes (Klenert et al., 2018) of a carbon tax. However, our study is the first exploring public preferences in the context of an ongoing war that has heavily impacted Europe's energy market (Antosiewicz et al., 2022b) before the implementation of the EU's carbon pricing mechanism taxing households' transport and energy consumption.

Second, we demonstrate an important heterogeneity in climate change mitigation and energy security preferences. Generally, people value climate change mitigation and air quality improvements more than energy security. On average, they are willing to forego 17-18% of their incomes towards mitigating climate change and improving air quality and 11% to reduce reliance on Russian fuels. However, they would also require compensation equal to 14% of their incomes if their energy access and commuting options were limited. Income and age shape these preferences. Lower-income individuals attach lower value to climate change mitigation and energy security than the general population (a WTP lower by 2-4 pp, on average) and high earners. Younger respondents are willing to sacrifice a substantially higher share of income to mitigate climate change than older respondents (28% compared to 12%), but a noticeably lower share to reduce Russian fossil fuel imports (11% vs. 16%). While our results align with the previous valuation of climate change mitigation in European countries (Ščasný et al., 2017) and air quality (Viscusi et al., 2008), we provide new knowledge by making respondents trade-off between climate and energy-security-related attributes. We also show the potential of security arguments to convince older people, usually less concerned about the climate change impacts, of carbon taxes' benefits.

Third, our study suggests viable redistribution measures based on the results of a discrete choice experiment. We find that lower-income groups prefer cash transfers while higher-income groups prefer green investment subsidies. Addressing compensation mechanisms accordingly could help alleviate tensions arising from climate policies (Köppl and Schratzenstaller, 2022). Using preferences for the effects of carbon taxes (i.e. climate change mitigation, secure access to energy), we suggest implementing redistribution strateies aimed at reducing the income-related burdens of the carbon tax. We show that it increases its public acceptance as compared to only transfers or only subsidies. Allocating carbon tax revenues toward environmental initiatives can enhance public acceptance by improving environmental awareness and behaviour (Gevrek and Uyduranoglu, 2015; Kallbekken et al., 2011). However, climate rebates affect carbon pricing popularity only weakly (Levi, 2021; Mildenberger et al., 2022). Combining transfers to low-income households with income tax reductions for high-income households can muster support for carbon tax (van der Ploeg et al., 2022) but it can hurt climate goals (Antosiewicz et al., 2022a). Our contribution takes a different approach by using experimental methods to provide recommendations for addressing compensation mechanisms that facilitate both redistribution (transfers) and emission reduction (green investment subsidies).

The remainder of this paper is structured as follows. Section two presents the experimental framework, data, and descriptive statistics. Section three introduces our econometric methodology, while section four presents the results. Section five concludes the paper.

2. Data and descriptive statistics

2.1. Experimental framework

In order to elicit the preferences toward climate and energy policies, we conducted a discrete choice survey experiment using vignettes based on four distinct attributes: (1) climate change mitigation; (2) improvements in air quality; (3) a limit on Russian fuel imports; (4) uninterrupted supply of electricity and transportation fuels (Table 1). Additionally, respondents decided if a new carbon tax should be introduced (status quo option) and how it should be redistributed. Two standard revenue recycling schemes were offered: (i) a monthly cash benefit for all families and (ii) a subsidy to finance green investments in environmentally friendly technologies.[4]

The participants viewed five screens with vignettes,[5] each with two policy options and four attributes (i.e., climate change, air quality, fuel imports, energy supply) with randomly drawn levels. One of the options (at random) was the "status quo", meaning it did not include a new policy and redistribution scheme. The options differed between their "gains and losses", a monetary attribute representing changes in respondents' incomes due to introducing a new climate policy. The gains/losses were randomly drawn from a uniform distribution of -0.24 to 0.24. We used emojis (pictograms), a universal and widespread mode of communication, to better visualise the choices on the vignettes.

Our sample size (n = 10,281) was sufficient to investigate the main effect size among various subgroups. The projected sample size required to estimate the effect size of around 2 pp in the binary outcome (choosing a particular policy) was approximately 1,800 participants per subgroup (9,000 choices), with standard parameters of alpha (the significance level) equal to 0.05 and power equal to 0.8.

The experiment received ethical approval from the Rector's Committee for Ethics of Research with Human Participants at the University of Warsaw (Decision 156/2022). We also registered the experiment with the American Economic Association's registry for randomised controlled trials (RCT IDs: AEARCTR-0009482).

[4] These two categories were previously applied in policy reviews to assess the distributional effects of climate policies (Vona, 2023), in energy-economy modelling (Bourgeois et al., 2021), and other experimental studies (Dechezleprêtre et al., 2022).
[5] Before seeing the vignettes, each participant received information on interpreting each attribute (Table A1, Appendix A). A sample vignette is in Table A3, Appendix A.

Table 1. The attributes used in the experiment

Attribute	Level		
	1	2	3
Climate change impacts	Major A major decline in crop yields, a significant threat to life due to catastrophic heatwaves, flooding, and droughts	Limited A moderate decline in crop yields, a moderate threat to life from catastrophic heatwaves, flooding, and droughts	Minimal No changes in crop yields, low risk to life from catastrophic climate events
Diseases caused by poor air quality	No change 50,000 deaths annually	Limited by half 25,000 deaths annually	Limited to minimum less than 5,000 deaths annually
Purchases of Russian fuels	No change imports of 10 billion m^3 of gas and 16 million tons of oil annually	Limited by half imports of 5 billion m^3 of gas and 8 million tons of oil annually	Limited to zero
Access to electricity and individual transport	No change	Interrupted access no electricity once a week for 1 hour and 2 Sundays a month without a car	Energy rationing no electricity every day for 1 hour and all Sundays of the year without a car
Policy options	No change	Carbon tax and new cash benefit Tax on coal, gas and oil consumption at home and a monthly cash benefit from the state budget for all families in Poland	Carbon tax and full investment subsidy Tax on coal, gas and oil consumption at home and one-off, full co-financing from the state budget for heat pumps, photovoltaic panels, thermal retrofitting, or an electric car
Net monthly income of your household in a given option	$\{-24\%, -20\%, -16\%, \ldots, 0, \ldots, 16\%, 20\%, 24\%\}$		
Monthly benefit/loss for your household			

Source: own elaboration.

2.2. Data collection

The survey was conducted in August 2022 using a Computer-Assisted Web Interviewing (CAWI) technique and a nationwide research panel, "Ariadna", comprising 150,000 registered, active, and validated respondents.[6] It is an established research tool in Poland, widely used for various research studies, including on energy policy preferences (Aruga et al., 2021), prejudice and hate speech (Bilewicz and Soral, 2022), or labour market amenities and hiring

[6] The panel's users are unique and real participants as they are verified by a postal address. Their socio-demographic structure is representative of Polish Internet users. The panel is certified by a valid Interviewer Quality Control Program certificate and audited annually by an independent auditor (Polish Association of Public Opinion and Marketing Research Firms). The company follows the international Code of Marketing and Social Research Practice (the International Chamber of Commerce/ESOMAR).

decisions (Lewandowski et al., 2024). Participants were compensated with non-cash rewards, such as supermarket coupons. To ensure a representative sample, we set quotas for key socio-demographic (gender, age, educational level) and geographical (municipality size and region) variables.

The survey consisted of three parts. In the first part, we collected information on a participant's socio-demographic characteristics, energy consumption, individual transportation patterns, and opinions on climate change and energy security. In part two, we introduced the discrete choice experiment. In the third part, we asked about their political preferences and levels of trust (social and political) using standard questions and cafeterias from the European Social Survey (including the ESS8 with climate-related variables) to control the precision of our results.

Preferences over policies or amenities elicited in discrete choice experiments predict well real-life voter behaviour (Hainmueller et al., 2015) or labour market behaviour (Lewandowski et al., 2024; Mas and Pallais, 2017). Nevertheless, we accounted for two critical sources of bias in the discrete choice experiment: (i) inattention and (ii) hypothetical bias. To check for inattention, participants were asked about their favourite colour at a random moment during the survey but were told to select a predetermined one regardless of their preference. An incorrect answer would result in the survey's termination. We also addressed hypothetical bias (Ladenburg and Olsen, 2014) by emphasising the study's real-life importance, informing participants that their answers would be presented to Polish policymakers later. We also included a follow-up question after each vignette, asking participants to indicate their confidence about the choices on a scale of 0-100. Overall, participants were confident in their decisions; the median confidence level was 71, and the bottom quartile was 56 (see Table A2 in Appendix 1). To limit inattention, we provided a time lock for carefully reading the vignette instructions and filling in the answers, making our experiment a good approximation of real-life choices.

Before conducting the experiment on the total sample (n=10,281), we arranged quantitative (n=200) and qualitative (n=16) pilot studies in June 2022. The feedback we received helped us simplify the vignettes, improve the readability of instructions, and provide precise answers. We collected our data in August 2022, encompassing three important events: (i) the Russian invasion of Ukraine, which impacted trade between the EU and Russia and led to hikes in fossil fuel prices, (ii) the inflation rate in Poland, which reached 16% (Statistics Poland, 2022), and (iii) a coal supply shortage caused by the embargo on Russian coal, which led to anxiety among Poles reliant on this fuel for domestic heating (almost half of all households in Poland (Statistics Poland, 2018) as many were concerned about the availability of coal before the heating season. These impactful developments made our respondents' choices particularly salient, as they were navigating the immediate, real-world implications of these socio-economic and geopolitical shifts on their personal and financial well-being.

2.3. Sample characteristics

Our experiment involved 10,281 respondents, with a slight underrepresentation of men (45% in the sample vs. 48% in the general population). Additionally, our sample had a lower share of individuals above 55 years of age, with primary education, from small cities, living in old buildings (built before 1980), as well as a slightly smaller share of households that use coal stoves for heat and are located in rural areas. We applied weights to ensure the sample's representativeness. We rebalanced the data by matching the distribution of key variables, such as gender, age, and education, to the relevant population structure. We derived the weights using data from the 2020 Polish Household Budget Survey. Table 2 illustrates the weighted structure of our sample.

Table 2. Sample characteristics

	Sample structure			Population structure
	N	%	% (weighted)	%
Gender				
Men	4,653	45.3	48.0	48.0
Women	5,628	54.7	52.0	52.0
Age group[7]				
18-24	1,027	10.0	7.6	6.8
25-34	2,328	22.6	16.1	13.2
35-44	1,897	18.5	15.3	16.5
45-54	2,061	20.0	21.5	13.4
55 or more	2,968	28.9	39.5	43.9
Education				
Primary	914	8.9	16.3	17.9
Secondary	5,867	57.1	61.8	57.7
Tertiary	3,500	34.0	21.9	24.4
Main heating source[8]				
District heating	4,082	39.7	38.8	40.0
Coal	2,456	23.9	26.2	49.0
Biomass	815	7.9	7.7	
Gas	2,365	23.0	22.0	5.0
Heat pump	234	2.3	1.8	3.0
Electric stove	329	3.2	3.5	3.0

Note: the sample structure is weighted with our survey weights, and the population structure is weighted with Household Budget Survey weights.

Source: own calculations using data gathered for the experiment and annual data for 2020 from Poland's Household Budget Survey.

2.4. Descriptive results

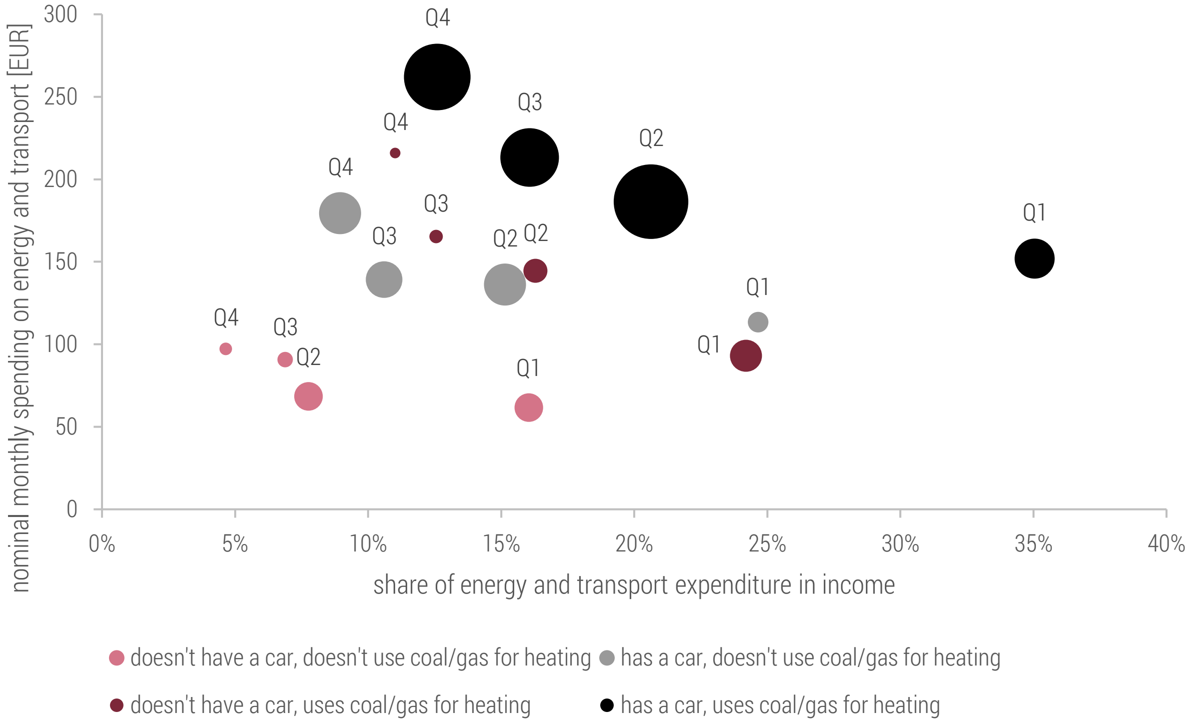
In this subsection, we present the descriptive patterns across three dimensions: (1) income and spending, (2) energy and commuting patterns, and (3) levels of social and political trust and awareness of climate change, as these were the defining characteristics of people who identified with the Yellow Vest movement in France.

In our sample, respondents with the highest incomes pay the most for energy and individual transport in nominal terms, while the low-income population pays the most in relative terms (Figure 2). Moreover, households that either own a car or heat their homes with coal or gas spend the most on energy and individual transport in nominal (260 EUR per month) and relative terms (35% of their incomes) and constitute the highest share of the total population (45%). This pattern forms a key context for introducing a carbon tax as it underscores the disproportionate exposure the energy and transportation costs can have on low-income citizens, as they are the most vulnerable to increases in energy prices.

[7] Population structure based on Local Data Bank, Statistics Poland, 2021.

[8] Population structure based on Polish Household Budget Survey data, 2020.

Figure 2. Energy and individual transport expenditures in Polish households by income quartile (%)



Note: "Q1-Q4" are income quartiles. Plot size represents the relative size of a given group in the total population.
Source: own calculations using data gathered for the experiment (2022).

We found that almost 70% of people in our sample are highly aware of the adverse effects of climate change and that differences between particular groups were not particularly pronounced. Our results are consistent with other studies on social attitudes towards climate change and energy security.[9] It aligns with the study's findings on the Yellow Vest movement in France, which showed that Yellow Vest supporters were not anti-ecological but representatives of groups that demanded a more egalitarian approach and effective climate action (Kipfer, 2019). The knowledge that climate change is anthropogenic was widespread, and the share of people who do not believe in climate change was marginal (Douenne and Fabre, 2020).

Below, we present the descriptive results of the five attributes outlined in Table 1: (1) a carbon tax with a revenue recycling mechanism; (2) climate change impacts; (3) air quality impacts; (4) Russian fuel imports; and (5) access to energy and private transport. All proposed policies were largely rejected by respondents, with approximately 60% preferring the status quo regardless of the redistribution measure (Table 3). There were minor differences in preferences between socio-demographic groups, such as men being more likely than women to choose carbon tax and older individuals being slightly more inclined than younger ones. We also observed slight variations in preferences between education groups, with a higher share of respondents with tertiary education choosing attributes related to climate change mitigation, air quality improvement and reducing imports from Russia.

[9] For example, ESS8 identified 11% of climate change denialists in Poland (Poortinga et al., 2018), which is similar to the results of our sample (12%).

Table 3. Shares of respondents' choices of vignettes with particular attributes (%)

	Climate change impacts		Diseases caused by poor air quality		Purchases of Russian fuels		Access to electricity and individual transport	
Attribute level	Limited	Minimal	Limited by half	Limited to minimum	Limited by half	Limited to zero	Interrupted	Energy rationing
				Total sample				
%	34.9	35.3	33.9	36.0	33.7	35.4	33.6	30.8
N	5,500	5,575	5,355	5,681	5,318	5,581	5,294	4,864
				Women				
%	35.0	35.7	33.7	36.4	34.2	35.4	33.7	30.7
N	3,035	3,098	2,926	3,160	2,971	3,068	2,927	2,664
				Men				
%	34.7	35.0	34.2	35.5	33.1	35.4	33.3	31.0
N	2,466	2,478	2,430	2,522	2,348	2,513	2,367	2,200
				Secondary or lower				
%	34.9	34.9	34.2	35.5	33.5	35.0	33.4	30.8
N	3,636	3,627	3,559	3,698	3,490	3,636	3,479	3,200
				Tertiary				
%	34.7	36.3	33.4	36.9	34.0	36.2	33.8	31.0
N	1,865	1,949	1,796	1,984	1,828	1,945	1,815	1,665
				18-34				
%	35.3	36.4	34.2	35.2	33.2	35.1	34.5	30.0
N	1,828	1,881	1,769	1,821	1,715	1,814	1,786	1,551
				35-54				
%	34.8	35.4	33.7	36.2	34.0	35.1	32.7	31.1
N	2,131	2,167	2,062	2,218	2,086	2,153	2,001	1,902
				55 or more				
%	34.4	34.1	34.0	36.7	33.9	36.0	33.6	31.5
N	1,542	1,528	1,525	1,644	1,518	1,614	1,507	1,411

Note: participants chose between introducing a carbon tax and a status quo. Among the vignettes with a carbon tax, 50% contained a carbon tax paired with an unconditional cash transfer, while the other 50% were paired with a full subsidy for investments in a new heating source, a PV installation, or an electric car. Sample sizes refer to the total number of vignettes presented.
Source: own calculations using data gathered for the experiment.

3. Methodology

3.1. Stated preferences regarding energy and climate policies

We use logistic regression to estimate the probability that an individual prefers a given alternative for energy and climate policies. The logistic model is specified as follows:

$$\Pr(a_j = 1) = F(\beta_0 + \beta_1\tau_i + \beta_2 c_i + \beta_3 s_i + \beta_4 r_i + \beta_5 u_i + \beta_6 D_i + \beta_7 Q_i + \beta_8 \lambda_j + \varepsilon_{ijv}) \quad (1)$$

where $F(Z) = \frac{e^Z}{1+e^Z}$, i stands for the individual, j for a choice, and v for the vignette number. The five attributes described in Table 1 are represented by: τ_i for carbon tax, c_i for climate change impacts; s_i for air quality, r_i for Russian fuel imports, u_i for access to energy and individual commuting. D_i is a vector of personal characteristics (a set of indicator variables for gender, age, education, employment status, and income), while Q_i is a set of indicator variables that represent urbanisation (location), building type, year of construction, and main heating source; λ_j is a set of indicator variables that reflects attitudes towards climate change and levels of political and social trust. The error term, ε_{ijv} is clustered at the level of an individual respondent.

To estimate the conditional logistic regression, we assessed the probability of choosing a particular distributional policy (the preferred policy) against the "status quo" option. The model we used is specified as:

$$\Pr\,(\mathrm{p}_j = 1) = F(\beta_0 + \beta_1 c_i + \beta_2 s_i + \beta_3 r_i + \beta_3 u_i + \beta_5 D_i + \beta_6 Q_i + \beta_7 \lambda_j + \varepsilon_{ijv}) \tag{2}$$

In contrast to model (1), the variable of interest here is the choice of a different policy option rather than choosing a particular alternative.

Next, we adapt the logistic regression model into a mixed multinomial logit model while maintaining its general structure. The mixed multinomial logit model allows us to account for unobserved heterogeneity among individuals:

$$\Pr(a_{ij} = 1) = \frac{\exp\,(\beta_0 + \beta_1 \tau_i + \beta_2 c_i + \beta_3 s_i + \beta_4 r_i + \beta_5 u_i + \beta_6 D_i + \beta_7 Q_i + \beta_8 \lambda_j + \varepsilon_{ijv})}{\sum_{k=1}^{J} \exp\,(\beta_0 + \beta_1 \tau_i + \beta_2 c_i + \beta_3 s_i + \beta_4 r_i + \beta_5 u_i + \beta_6 D_i + \beta_7 Q_i + \beta_8 \lambda_k + \varepsilon_{ikv})} \tag{3}$$

This model has a similar formulation to model (1), with the addition of k, a variable used to iterate over all possible choices in the choice set. The model allows us to estimate the probability of choosing each available alternative, taking into account individual-specific random effects.

3.2. Willingness to pay

Next, we estimate the willingness to pay for specific climate change or energy security attributes to better understand the monetary valuation of each attribute. We model participant utility as:

$$U_{ijv} = \alpha_0 + \alpha_1 X_i + \alpha_2 \theta_j + \alpha_3 W_j + \epsilon_{jiv} \tag{4}$$

Where i stands for the individual, j is the alternative, and v is the vignette number. X_i stands for the individual characteristics of a participant i, θ_j represents particular attributes related to climate and energy security, W_j is the relative income difference after introducing detailed policy j compared to the status quo.[10]

Policy j is chosen if it provides a higher expected utility than the status quo k presented in the same vignette v, $U_{jiv} > U_{kiv}$. The indicator variable Y_{ijv} is equal to one if participant i selected policy j presented in a vignette v:

$$Pr\,(Y_{ijv} = 1) = \Pr\,(U_{ijv} > U_{ikv}) \tag{5}$$

We estimate the parameters using logit models, where $F(U) = \frac{e^U}{1+e^U}$. Standard errors ε_{jiv} are clustered at the level of an individual respondent. We estimate the willingness to pay for a particular attribute as the ratio of point

[10] Treating the income difference between the status quo a carbon tax with redistribution as a continuous variable yields comparable results to treating these differences as a set of indicator variables. Results available upon request.

estimates of parameters $WTP(O_j) = -(\frac{\alpha_2}{\alpha_3})$. We then compute the confidence intervals using the Stata *wtp* command with the default delta method (Hole, 2007).

To quantify the heterogeneity in WTP, we re-estimate our regressions on subsamples based on demographic variables, socio-economic characteristics, energy consumption patterns, and attitudes.

3.3. Minimising carbon tax aversion

Finally, we focus on the heterogeneity of preferences for redistribution measures in different income groups. We assume that although the lower a participant's income after introducing the tax, the lower the predicted probability that they would choose the climate policy, premiums and penalties showed differing impacts. Hereby, redistribution measures do not substantially increase the acceptance of a carbon tax. They can be used to minimise carbon tax aversion, which was only made worse by income penalties. If a particular group has a substantially higher carbon tax aversion than the average, redistribution measures may help close this gap and diffuse tensions among this particular category. We use the estimated probability of accepting a carbon tax (equation 1) paired with a redistribution measure and willingness-to-pay data to identify which groups are more likely to lose from the tax's introduction and how the negative income loss can be eased by adopting redistribution measures.

Our procedure was based on three steps. First, we established the carbon tax rate within a range of $0 \leq t \leq \overline{WTP}$. We determine this rate based on participants' average willingness to pay for various attributes associated with the tax. These attributes include climate change mitigation, improved air quality, uninterrupted energy access, and impacts on individual commuting. These collectively represent the intended outcomes of implementing the carbon tax. Second, we calculated the likelihood that respondents would accept a carbon tax rate within the $t = [0, \overline{WTP}]$ range using the formula described in the model (3). This step involved assessing public receptivity to the tax at various levels within the specified range of t. Finally, we compared the probability of accepting the carbon tax across different groups. For example, we measured the difference in acceptance rates between low-income respondents (those in the lowest 25% of the income distribution), the overall average acceptance rate in the population, and high-income respondents (those in the highest 25% of the income distribution).

4. Results

First, we study preferences for carbon tax and its effects (climate change mitigation and other attributes). Second, we identify carbon tax compensation mechanisms preferred by various subgroups. Third, we present alternative mechanisms and robustness checks.

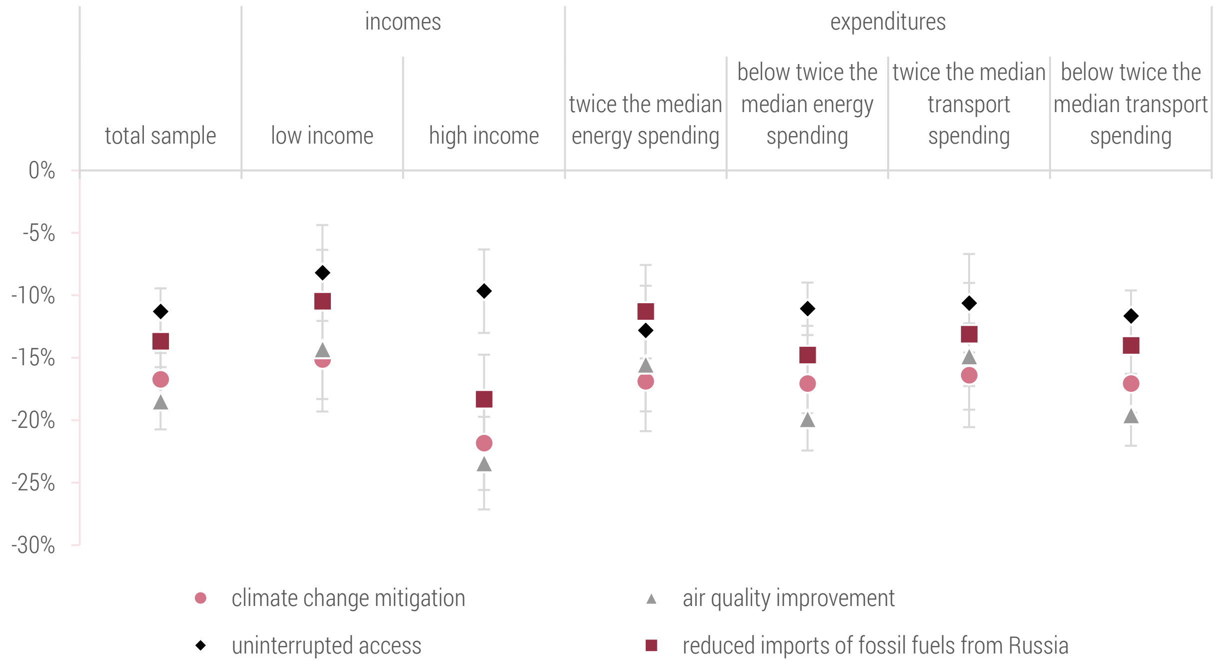
4.1. Willingness to pay for climate change mitigation and improved energy security

We consider the following dimensions of heterogeneity when analysing people's willingness to pay for climate change mitigation and energy security: (1) incomes and expenditures, (2) energy consumption patterns, (3) levels of trust and awareness of the effects of climate change, and (4) age. Income and expenditure inform the capacity to afford higher costs due to climate policies. Energy use patterns reveal the potential for consumption reductions. Climate change awareness shapes willingness to contribute to mitigation efforts, while trust influences policy fairness and efficiency perceptions. Age is consistently related to attitudes towards climate change (Syropoulos and Markowitz, 2022). To this end, we estimate how the model specified in equation (5) interacted with respondents' characteristics. We tallied the results for each attribute and variable in Appendix B.

Overall, people prefer climate change-related attributes over energy security attributes. On average, respondents are willing to forego 17-18% of their incomes to mitigate the negative impacts of climate change or achieve better air quality (95% CI: 14.6-18.9% in the case of climate change and 16.2-20.7% for air quality) and 11% to reduce imports of Russian fuel (95% CI: 9.4-13.2%). They would also require compensation of 14% of their incomes if their access to energy and individual car use is limited (Figure 4; 95% CI: 11.6-15.7%).

Evaluating specific attributes, we find that income disparities matter more than differences in energy and transportation expenditures.[11] A carbon tax would disproportionately impact low-income households, aggravate economic hardship, and potentially exacerbate existing inequalities. Individuals with low incomes place a lower value on reducing climate change impacts and energy security than the general population (by about 2-4 pp). In contrast, those with high incomes value climate change mitigation, air quality improvements, and reducing Russia fuel imports by 4-5 pp more than the average respondent. Our findings are consistent with previous studies examining the differences in carbon tax aversion between low- and high-income households (Sommer et al., 2022).

Figure 4. Willingness to pay for climate and energy security attributes in the total sample and groups defined by income and energy spending (%)



Note: the Y-axis represents the share of income an average respondent is willing to forego for a specific attribute. Attribute levels: Climate change impacts: (1) Major; (2) Limited; (3) Minimal; Diseases caused by poor air quality: (1) No change; (2) Limited by half; (3) Limited to a minimum. Participants chose between introducing a carbon tax and the status quo. 50% of carbon tax vignettes paired it with an unconditional cash transfer, the other 50% paired it with a subsidy for investments in a new heating source, a PV installation, or an electric car.
Source: own estimations using data gathered for the experiment.

[11] Two variables related to income also differentiate the valuation of attributes: (i) education (ii) occupation type. Respondents with tertiary education and those in white-collar occupations demonstrated higher valuations across all attributes included in the experiment. Results are available upon request.

Additionally, people who spend a large share of their income on energy or individual transportation value most attributes less than the general population (Figure 4). First, those who spend a high share of their income on energy value reducing Russian fuel imports by 3 pp less than the average. Secondly, those who spend a high share of income on transportation value better air quality by 3 pp less than the average.

Next, we discuss differences related to characteristics that are difficult to observe but play a critical role in defining attitudes, such as levels of trust and climate change awareness (Mayer and Smith, 2019).[12] People who express low trust and low awareness of the climate change adverse impacts demonstrate a substantially lower willingness to pay for climate change mitigation (Figure 5). Individuals with low trust value improved air quality and reduced Russian fuel imports by 4 pp less than the average, and they would also require a 3pp higher compensation for interrupted access to energy and transportation. Conversely, people with high trust are willing to pay 3 pp more than the average for improved air quality and 2 pp more than the average for reduced Russian imports. Finally, respondents with low levels of climate change awareness value all attributes substantially less (nearly 9 pp for Russian fuel imports, 6 pp for climate change mitigation and air quality improvement).

Figure 5. Willingness to pay for climate and energy security attributes in the total sample and groups defined by levels of trust and climate change awareness (%)

Note: the Y-axis represents the share of income an average respondent is willing to forego for a specific attribute. Attribute levels: Climate change impacts: (1) Major; (2) Limited; (3) Minimal; Diseases caused by poor air quality: (1) No change; (2) Limited by half; (3) Limited to a minimum. Participants chose between introducing a carbon tax and the status quo. 50% of carbon tax vignettes paired it with an unconditional cash transfer, the other 50% paired it with a subsidy for investments in a new heating source, a PV installation, or an electric car.
Source: own estimations using data gathered for the experiment.

[12] Political orientation is also an important factor that consistently shapes attitudes towards carbon taxes (Levi, 2021). We find that right-leaning individuals are generally less willing to pay to mitigate climate change impacts and improve air quality (by 5 pp and 3 pp, respectively) than the average. In contrast, left-leaning individuals have a higher willingness to pay (by 4 pp and 7 pp, respectively). Interestingly, people who consider themselves centrist are less willing to pay to reduce Russian fuel imports than both left- and right-leaning respondents (11%, compared to 17% and 16%, respectively).

Additionally, we explore the interactions between two sets of variables: (i) trust and income and (ii) awareness of climate change effects and income (Table 4).[13] Examining them allows for separating the relationship between income, trust, climate change awareness, and the valuation of particular attributes. These results highlight the importance of attitudes to climate change and trust. The differences between groups with high and low levels of these characteristics are present within particular income groups. They are particularly pronounced for the WTP for mitigating climate change in the case of climate awareness and for the WTP for reducing Russian fuel imports in the case of trust. However, the variations related to trust and climate awareness are generally higher in high-income than low-income populations. This suggests that while trust and climate change awareness are important factors, their relation to policy acceptance and attribute valuation may be amplified or moderated by an individual's economic status.[14]

Table 4. Willingness to pay climate and energy security attributes in subpopulations defined by income, trust, and climate awareness

Interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
Low income x low trust	-17.3 (-23.7; -10.8)	-11.9 (-17.9; -5.8)	-12.6 (-6.5; -18.7)	-4.8 (-11.6; 2.0)
Low income x high trust	-13.6 (-18.9; -8.3)	-15.9 (-21.0; -10.7)	-5.5 (-0.5; -10.4)	-14.1 (-19.3; -9.0)
High income x low trust	-16.7 (-22.6; -10.9)	-18.2 (-23.8; -12.7)	-13.6 (-7.5; -19.6)	-15.3 (-21.1; -9.5)
High income x high trust	-24.6 (-29.1; -20.1)	-26.3 (-30.8; -21.8)	-7.8 (-3.9; -11.7)	-19.9 (-24.2; -15.6)
Low income x low awareness of climate change	-9.6 (-15.9; -3.4)	-6.3 (-12.3; -0.4)	-8.0 (-2.0; -14.1)	-2.0 (-8.7; 4.7)
Low income x high awareness of climate change	-18.3 (-23.7; -12.9)	-18.9 (-24.1; -13.6)	-8.6 (-3.7; -13.6)	-15.1 (-20.4; -9.9)
High income x low awareness of climate change	-17.2 (-23.8; -10.7)	-19.8 (-25.8; -13.8)	-8.2 (-1.9; -14.5)	-7.2 (-13.5; -1.0)
High income x high awareness of climate change	-23.6 (-27.8; -19.3)	-24.6 (-28.9; -20.4)	-10.3 (-6.5; -14.2)	-22.2 (-26.4; -18.0)

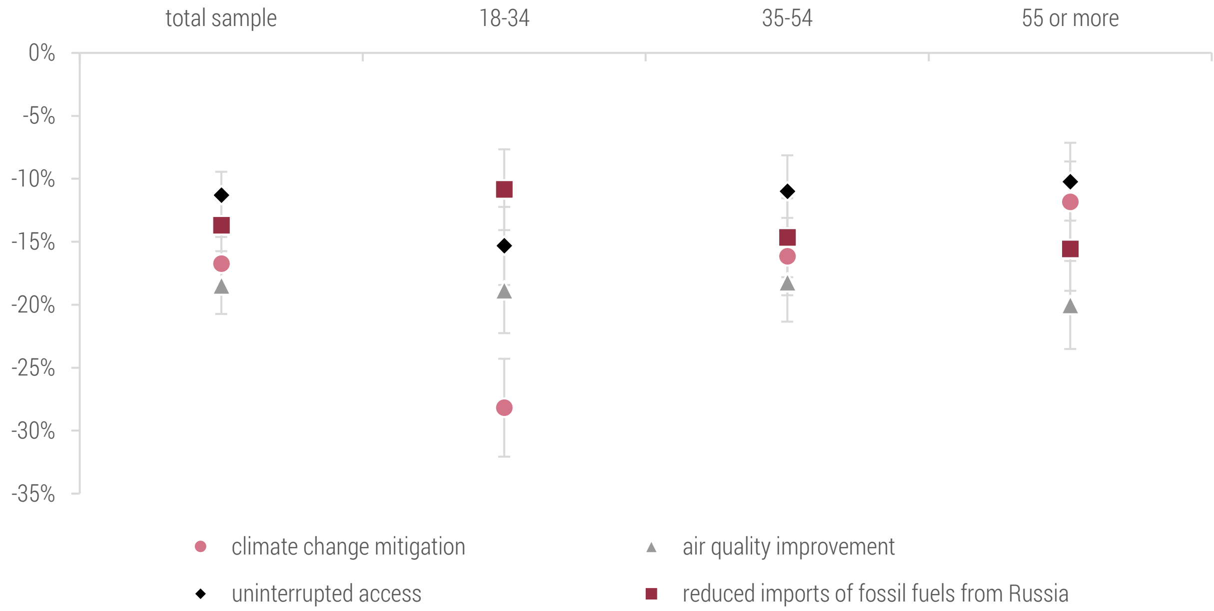
Note: Continued in Appendix B, Table B3.
Source: own estimations using data gathered for the experiment.

[13] Descriptively, the share of respondents who declared low trust and low climate change awareness is similar in all income groups. We further examine the interrelatedness of low trust and low awareness of climate change effects across income groups by running logistic regressions (see Appendix B, Table B1) in which low trust and low climate change were dependent variables. We find that both characteristics are correlated with low incomes, and the higher the income, the lower the probability that respondents have low trust or low awareness of climate change effects. For example, the probability of declaring low trust among respondents from the first income quartile is 27 pp higher compared to the fourth quartile.

[14] We also examined the results of interactions separated into dummy variables representing each attribute level, Table B4 in Appendix. In all cases, our results remained robust and reliable, helping to understand the willingness to pay for particular policy objectives (e.g. limiting Russian fuel imports by half or completely).

Finally, age shapes preferences for climate and energy policies, with a key distinction in the willingness to pay for reducing Russian fuel imports (Figure 6). Younger people report a lower WTP (10.9%, 95% CI: 7.7-14.1%) than older individuals (15.6%, 95% CI: 12.3-18.9%), potentially reflecting generational differences in experiences with Russian influence on Central Eastern European politics and energy shortages. Older people may feel stronger solidarity with Ukraine and are more willing to weaken Russia's financial capacity for war. This contrasts with older individuals' lower willingness to pay for climate change mitigation (12%, 95% CI: 8.6-15.1% among people aged 55+, vs 28%, 95% CI: 24.3-32.1% among people aged 18-34), which is consistent with prior research identifying age as a key predictor of climate change attitudes (Douenne and Fabre, 2020). Our findings suggest that geopolitical consideration may help to increase support for climate and energy policies among older people.

Figure 6. Willingness to pay for attributes in the total sample and selected subgroups (%)

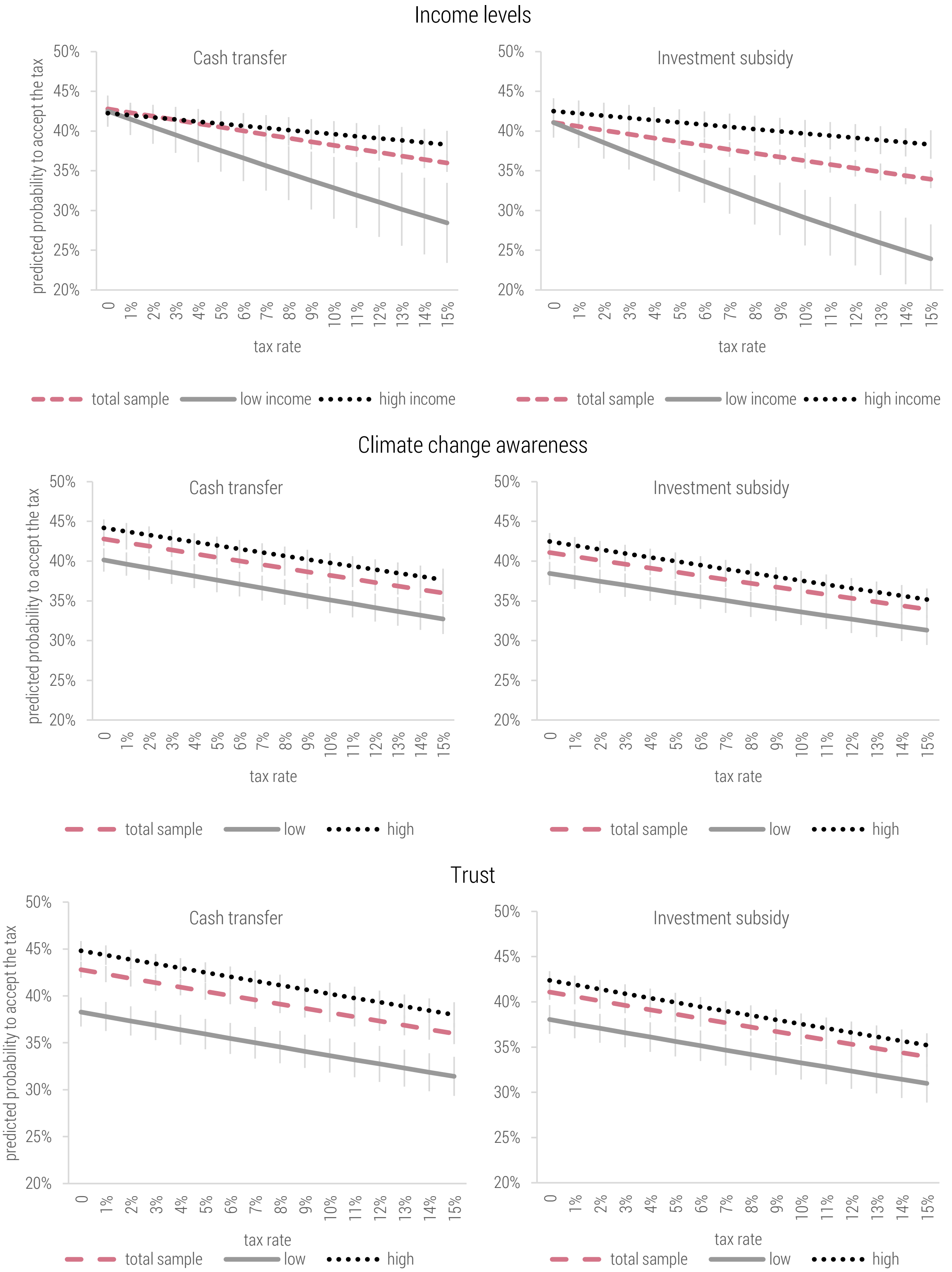


Note: the Y-axis represents the share of income an average respondent is willing to forego for a specific attribute. Attribute levels: Climate change impacts: (1) Major; (2) Limited; (3) Minimal; Diseases caused by poor air quality: (1) No change; (2) Limited by half; (3) Limited to a minimum. Participants chose between introducing a carbon tax and the status quo. 50% of carbon tax vignettes paired it with an unconditional cash transfer, the other 50% paired it with a subsidy for investments in a new heating source, a PV installation, or an electric car.
Source: own estimations using data gathered for the experiment.

4.2. Minimising carbon tax aversion with redistribution measures

Our findings have important implications for understanding preferences for climate change mitigation and energy security improvement. Firstly, income penalties decrease the probability of accepting a carbon tax, while premiums do not bolster policy acceptance. Secondly, income-related differences in attribute valuation can be addressed through targeted transfers to low-income groups that improve their economic position and cushion inequalities resulting from energy policies that increase living costs. Thirdly, individuals who do not believe in the adverse effects of climate change express substantially lower valuations than those with a higher awareness of climate change concerns. Knowing these differences in preferences is essential for understanding how various groups may react to introducing a carbon tax. Consequently, it allows for identifying if and which redistribution measures could effectively alleviate their aversion to carbon tax.

Figure 7. Predicted probabilities of choosing a carbon tax paired with a cash transfer or subsidy, conditional on differences in income after introducing the policy measure, trust, climate awareness (%)

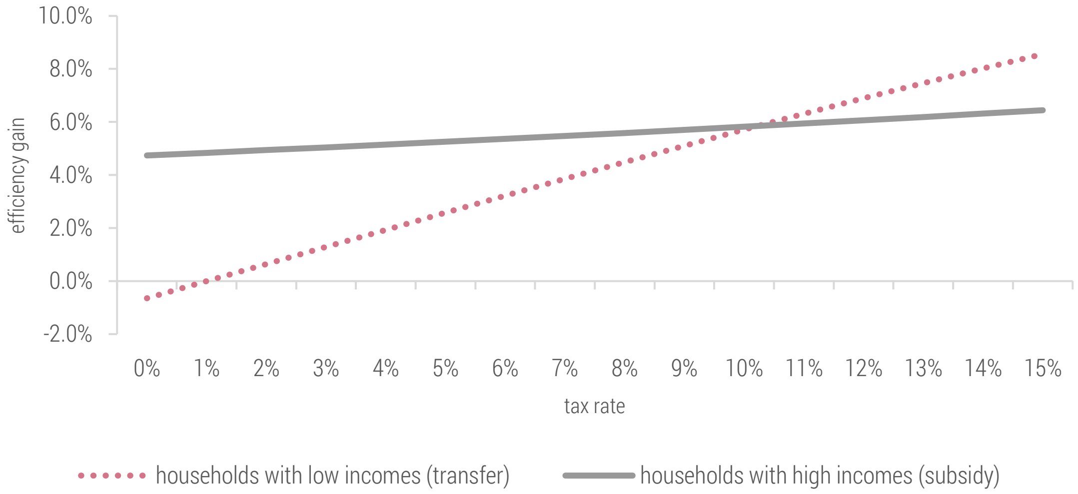


Note: the figure shows the predicted acceptance probabilities for a carbon tax coupled with a cash benefit (left) and a carbon tax coupled with a green investment subsidy (right).
Source: own calculations using data gathered for the experiment.

Consequently, we concentrate on income disparities between groups of households and consider two redistribution measures – transfers and green investment subsidies. Predicting policy support conditional on these measures, we provide suggestive evidence that preferences for redistribution measures differ between low- and high-income households. Households with low incomes are more likely to accept climate policy if cash transfers are used as a redistribution measure. In contrast, high-income households prefer subsidies for green technology investments (Figure 7, top panel). Low-income households also display a greater aversion to carbon taxes, even at low rates such as 5% (when paired with a subsidy) and 8% (when paired with a cash transfer). Therefore, a carbon tax paired with a cash transfer reduces tax aversion among people with low incomes more effectively than redistributing revenues through subsidies. Our results align with macro-microeconomic modelling for Poland, which shows lump-sum transfers as the progressive revenue recycling scheme for a carbon tax (Antosiewicz et al., 2022a). At the same time, high-income households are less averse to carbon tax than the general populace and are more likely to accept it if green investment subsidies are offered (Figure 7, top panel). Hence, preferences for compensation mechanisms appear to differ between high- and low-income respondents.[15]

The importance of these differences is further underscored by evaluating the efficiency of redistribution strategies through the relative acceptance gain of a targeted strategy—households with low incomes receive cash transfers and high-income households receive subsidies. We measure it with a ratio of the expected acceptance rate under a targeted strategy over the average acceptance rate of uniform redistribution strategies (i.e., all households receive either transfers or subsidies), see Appendix A4 for details. Targeted redistribution consistently outperforms uniform redistribution strategies, especially as carbon tax rate increases. For instance, at a 15% carbon tax, the acceptance gain for targeted redistribution measures reaches 9% compared to subsidies for all households and 6% compared to transfers for all households (Figure 8).

Figure 8. Estimated acceptance rate gains when applying targeted redistribution measures



Note: The figure illustrates the efficiency gain in acceptance probabilities for a carbon tax coupled with cash transfers or subsidies, showing the relative effectiveness of these redistribution strategies across different tax rates.
Source: own calculations using data gathered for the experiment.

[15] Additionally, car owners and people who heat their homes with coal or gas have a similar aversion to a carbon tax to the general population (figures B1-B2 in Appendix B). Hence, a means-tested approach may be more effective than policies targeted at owners of particular heating technologies or vehicles.

Finally, we quantify the acceptance of a carbon tax paired with various redistribution measures among groups defined by two latent characteristics that shape preferences for a carbon tax: awareness of the adverse effects of climate change and trust. Generally, people unaware of climate change's adverse effects and those who do not trust others follow a similar pattern as people with low incomes. Their acceptance of a carbon tax paired with a given redistribution measure is significantly lower compared to individuals with high knowledge of the adverse effects of climate change and high trust, respectively (Figure 7, bottom panel). However, the differences between these groups in acceptance of climate policy conditional on cash transfer or an equivalent green investment subsidy are much less pronounced than the differences between low- and high-income individuals. This suggests that while enhancing trust and climate awareness could improve support for climate and energy policy, income levels are critical for addressing compensation mechanisms that may sway people's positions on these policies.

4.3. Alternative specifications and robustness

Here, we present an alternative specifications and several robustness tests.

First, we tested alternative specifications and estimated the model outlined in equation (2) for specific subpopulations instead of incorporating interactions with the variables of interest (Table 5).[16] The disparities we identified in these estimations validated the robustness of our chosen approach, which prioritises using interactions in a pooled model. Notably, we observe two differences in attribute valuation between respondents with low and high incomes when focusing on subpopulations rather than interactions (for the air quality and limiting imports from Russia attributes). These differences can be due to unaccounted-for heterogeneity within the subpopulation. Therefore, the model estimated on subpopulations might not fully capture the complexities inherent in the diverse characteristics of these subgroups. However, in other instances, our results prove consistent across all subgroups, affirming the reliability of our findings.

Table 5. Willingness to pay in selected subpopulations (continued in Appendix B, Table B2)

subpopulation	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high income	-19.2 (-25.6; -12.8)	-18.3 (-24.8; -11.9)	-9.6 (-4.4; -14.7)	-12.7 (-18.4; -7)
low income	-18.2 (-21.7; -14.7)	-19.5 (-23.1; -15.9)	-8.0 (-5.1; -10.9)	-15.5 (-18.9; -12.1)
high awareness of climate change	-18.6 (-21.1; -16.1)	-20.7 (-23.4; -18)	-11.4 (-9.2; -13.5)	-16.6 (-19.1; -14.1)
low awareness of climate change	-11.5 (-15.3; -7.7)	-12.5 (-16.4; -8.7)	-11.2 (-7.4; -15)	-5.5 (-9.1; -1.9)
Aged 18-34	-23.7 (-27.4; -19.9)	-15.8 (-18.9; -12.7)	-12.9 (-10.1; -15.7)	-9.1 (-11.9; -6.3)
Aged 35-54	-14.3 (-17.3; -11.4)	-16.3 (-19.3; -13.2)	-9.7 (-7.1; -12.4)	-13.1 (-16.2; -10.1)
Aged 55 or more	-13.8 (-18; -9.7)	-23.3 (-28.7; -17.8)	-12.0 (-8; -16)	-18.2 (-22.9; -13.5)

Source: own calculations using data gathered for the experiment.

[16] The mean marginal effects are reported in Appendix B, Table B1.

Next, we performed robustness checks to validate the reliability and consistency of our findings. We estimated our models on the entire dataset. It included individuals we excluded for accuracy (e.g. those who always chose the left/right panel) and those who completed the survey relatively quickly (the 5% of the respondents who took the least time to complete the experiment). By including these subgroups, we aimed to ensure our results were not driven by selective sampling. This robustness check affirmed that our results remained consistent and robust (Table 6).[17]

Table 6. Willingness to pay estimated on a total sample (including respondents previously excluded for accuracy)

interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high income	-23.8 (-27.8; -19.7)	-24.9 (-28.8; -20.9)	-10.1 (-6.5; 13.6)	-20.9 (-24.8; -17.0)
low income	-16.1 (-20.1; -12.2)	-15.5 (-19.3; -11.7)	-9.0 (-5.4; 12.5)	-9.7 (-13.5; -6.0)
high awareness of climate change	-20.6 (-23.3; -17.8)	-23.2 (-26.0; -20.3)	-12.6 (-10.3; -14.9)	-18.6 (-21.3; -16.0)
low awareness of climate change	-12.2 (-15.5; -8.8)	-11.3 (-14.5; -8.0)	-10.6 (-7.3; 13.8)	-6.1 (-9.4; -2.9)
high trust	-18.8 (-21.5; -16.1)	-21.7 (-24.5; -18.8)	-10.7 (-8.4; -13.0)	-16.5 (-19.1; -13.9)
low trust	-16.6 (-20.0; -13.3)	-15.4 (-18.6; -12.3)	-14.4 (-11.3; -17.6)	-11.6 (-14.8; -8.4)
Aged 18-34	-29.8 (-33.9; -25.7)	-19.5 (-23.1; -16.0)	-15.8 (-12.6; -19.1)	-9.7 (-12.9; -6.4)
Aged 35-54	-17.2 (-20.4; -13.9)	-18.9 (-22.1; -15.7)	-12.4 (-9.4; -15.4)	-15.5 (-18.8; -12.3)
Aged 55 or more	-12.6 (-15.9; -9.2)	-20.8 (-24.4; -17.1)	-9.9 (-6.7; -13.0)	-17.9 (-21.3; -14.4)

Source: own calculations using data gathered for the experiment.

Additionally, we conducted analyses on an unweighted sample to assess the impact of our weighting methodology on the results and ensure that the findings were not artefacts of the weighting process. The outcomes remained consistent across both weighted and unweighted samples, reinforcing the robustness of our findings (Table 7).

Table 7. Willingness to pay estimated on an unweighted sample

interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high income	-23.6 (-26.8; -20.5)	-21.5 (-24.5; -18.5)	-9.5 (-6.7; -12.3)	-17.6 (-20.6; -14.6)
low income	-14.1 (-17.7; -10.6)	-13.1 (-16.4; -9.7)	-8.9 (-5.6; -12.2)	-9.7 (-13.2; -6.3)
high awareness of climate change	-21.2 (-23.5; -19.0)	-20.1 (-22.2; -18.0)	-11.1 (-9.3; -12.8)	-16.9 (-18.9; -14.9)
low awareness of climate change	-12.2 (-14.9; -9.4)	-11.1 (-13.8; -8.4)	-10.0 (-7.3; -12.7)	-4.9 (-7.6; -2.1)

[17] We focus on the heterogeneities presented earlier, the additional robustness checks are available at a request.

Table 7. Willingness to pay estimated on an unweighted sample (continued)

interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high trust	-19.3 (-21.5; -17.1)	-19.4 (-21.6; -17.2)	-9.5 (-7.7; -11.3)	-15.3 (-17.4; -13.2)
low trust	-17.9 (-20.6; -15.1)	-14.4 (-16.9; -11.9)	-13.4 (10.8; 15.9)	-10.3 (-12.9; -7.7)
Aged 18-34	-26.9 (-30.1; -23.6)	-18.4 (-21.2; -15.6)	-13.9 (-11.3; -16.6)	-11.0 (-13.7; -8.3)
Aged 35-54	-17.3 (-20.0; -14.7)	-17.0 (-19.6; -14.5)	-9.4 (-7.0; -11.8)	-15.0 (-17.6; -12.4)
Aged 55 or more	-12.5 (-15.3; -9.7)	-18.6 (-21.6; -15.7)	-10.0 (-7.3; -12.7)	-15.3 (-18.3; -12.4)

Source: own calculations using data gathered for the experiment.

Finally, we combine these two approaches for a robustness check as we re-estimate the model on a sample including all observations without weights (Table 8). Overall, the consistent results across different sample types and analytical methods demonstrate the resilience of our findings to various testing conditions. Our findings, therefore, hold significant relevance and can be considered robust for policy formulation and further academic exploration in similar socio-economic contexts.

Table 8. Willingness to pay estimated on the total and unweighted sample

interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high income	-25.4 (-28.8; -22.0)	-22.9 (-26.1; -19.7)	-10.1 (-7.1; -13.0)	-19.5 (-22.7; -16.3)
low income	-15.3 (-18.6; -12.0)	-13.9 (-17.0; -10.8)	-9.8 (-6.8; -12.9)	-8.9 (-12.0; -5.8)
high awareness of climate change	-22.4 (-24.8; 20.1)	-21.5 (-23.8; -19.3)	-12.0 (-10.1; -13.9)	-18.1 (-20.3; -16.0)
low awareness of climate change	-12.9 (-15.7; -10.1)	-10.8 (-13.5; -8.2)	-10.0 (-7.4; -12.7)	-5.0 (-7.7; -2.2)
high trust	-20.3 (-22.6; -18.0)	-19.9 (-22.2; -17.7)	-9.9 (-8.0; -11.7)	-16.0 (-18.1; -13.8)
low trust	-18.6 (-21.4; -15.7)	-15.4 (-18.0; -12.8)	-14.2 (-11.6; -16.9)	-11.0 (-13.7; -8.4)
Aged 18-34	-28.4 (-31.8; -25.0)	-19.2 (-22.1; -16.3)	-14.8 (-12.0; -17.5)	-10.2 (-12.9; -7.4)
Aged 35-54	-18.0 (-20.8; -15.3)	-17.7 (-20.4; -15.1)	-10.5 (-8.0; -12.9)	-16.0 (-18.7; -13.4)
Aged 55 or more	-12.9 (-15.9; -10.0)	-19.0 (-22.0; -16.0)	-9.5 (-6.8; -12.3)	-17.1 (-20.1; -14.1)

Source: own calculations using data gathered for the experiment.

5. Discussion and conclusions

We examined the preferences toward a carbon tax in Poland, a high-inequality, politically divided country that relies heavily on fossil fuels. Revealing a strong aversion to carbon tax, we found that income, trust, and climate change awareness are crucial in shaping preferences for climate and energy policies. Specifically, groups with low income, low trust, and low levels of climate change awareness are willing to forego a substantially lower share of income for reaching climate change mitigation and energy security goals. While financial compensation barely affects people's reluctance to carbon tax on average, we find some evidence that low- and high-income groups differ in their preferred compensation mechanisms. Low-income individuals are more likely to accept carbon tax if offered a transfer, while high-income individuals are more likely to accept it if offered a green transfer subsidy. Our study is the first to identify the preferences for climate change mitigation and energy security improvement in the context of the Russian invasion of Ukraine and the following energy market shocks. We find that older people are the most willing to forego income in exchange for reducing Russian fuel imports. As older people value mitigating climate change the least, the energy security argument may help to sway this group toward higher acceptance of carbon taxes than would be the case if only future-oriented and environmental arguments were used.

Implementing carbon taxes in a country with low political trust, deep social divisions, and low climate policy priority may exacerbate social tensions, triggering anti-establishment movements and, in turn, effectively opposing carbon tax adoption and deflecting climate policy goals. Our study demonstrates that redistributive policies may help mitigate these risks, responding to the demand for designing revenue recycling paths for a specific country (Lamb et al., 2020). However, in a studied country context, these policies are unlikely to increase the acceptance of new taxes. Policymakers should, therefore, focus on introducing targeted measures to alleviate the burden of an additional tax on low-income households, as these can improve public acceptability and support of climate policies (Baranzini et al., 2017). Importantly, using carbon tax revenues to compensate lower-income households may not be the preferred option (Büchs et al., 2011), and households with higher incomes may be the primary driver of using carbon tax revenues as green investment subsidies. Therefore, policymakers should consider public preferences and distributional effects when designing carbon pricing policies (Bureau, 2011) and include compensation mechanisms in the design of climate policies (Jagers et al., 2019).

Our study also highlights the importance of difficult-to-observe factors, such as attitudes and trust, in shaping preferences for climate change mitigation and energy security. Increasing social capital and climate change awareness may improve the acceptance of policy measures and resilience to possible social tensions. Involving social NGOs in climate actions and promoting more socially-oriented initiatives within climate NGOs may help to achieve this (Adger, 2003; Dombrowski, 2010). Additionally, we identified the heterogeneity of preferences between respondents of different ages – climate change mitigation was more important for younger respondents. In comparison, older respondents preferred improvements in air quality and energy security. Efforts to foster intergenerational solidarity in the environmental domain would be advisable. Based on these principles, policymakers could frame the carbon tax effects (Köppl and Schratzenstaller, 2022).

Our study improves an understanding of social preferences for mitigating climate change and improving energy security, but we acknowledge its limitations. First, its generalisability is the best for countries that share similar features with Poland – reliance on fossil fuels, especially in transport and heating, relatively high pre-existing inequality, and deep social divisions with low trust. Still, several European countries resemble Poland. Second, our study relied on a survey-based approach, which may be prone to biases. Aware of this fact, we used a representative sample and applied rigorous survey methods to mitigate these limitations. Third, our study is limited in capturing the complexity of social tensions and their impacts on climate policy adoption. While we refer to the Yellow Vest movement in France as an illustrative example, we did not fully capture the complexity of the social and political dynamics that could lead to new anti-systemic and anti-elitist movements. Finally, our study did not explore the potential trade-offs between climate change mitigation and other policy objectives such as economic growth, employment and social welfare. Future research could explore these trade-offs to inform policy design better and help strike a balance between multiple policy goals.

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Appendix A: Methodological details

Table A1. Information on interpreting each attribute (translated)

Attribute	Definition
Climate change impacts	Permanent changes and climate properties that affect the intensity and frequency of weather events such as droughts 🔥, floods, heavy and intense rainfall ⛈, storms, heatwaves 🥵 and changes in the scale and structure of agricultural crops 🌱 🌽
Air quality	Air quality assessed by analysing the presence and concentration of substances harmful to health 💀 🏭 😟
Purchases of Russian fuels	Natural gas and oil imported to Poland from Russia ⛽⛽ This gas and oil is used by households (heating, cooking, refuelling cars) and industry
Access to electricity and individual transport	Access to electricity and car usage ⚡ 🚙 Interruptions in access: a power outage once a week for 1 hour and a ban on using cars on two Sundays a month ⚡ 🚫 Energy rationing means no electricity for 1 hour a day and a ban on using cars on Sundays ⚡ ⛔
Climate and energy policy	Government actions designed to limit climate change by reducing the use of coal, oil and gas for energy production. As part of the climate and energy policy, the government may, for example, introduce environmental fees 🪙, i.e. a tax on the use of coal, oil and gas. Tax revenues to the state budget can then finance: 1. cash transfers 💶 – a monthly amount paid unconditionally by the government to all households in Poland, 2. full subsidies for green investments 🔋 – (heat pumps, photovoltaic panels), building insulation, electric car.

Source: own elaboration.

Table A2. Confidence among study participants regarding their choices

	Mean	SD	Min	Max	Q1	Median	Q3
Confidence level (points on a scale from 0-100)	69.0	21.0	0.0	100.0	56.0	71.0	85.0

Source: own calculations using data gathered for the experiment.

Appendix A3. A sample vignette

Climate change impacts	Major A major decline in crops, a significant threat to life due to catastrophic heat, floods and droughts	Limited The average decline in crops, a moderate threat to life from catastrophic heat, floods and droughts
Diseases caused by poor air quality	No change 50,000 deaths annually	No change 50,000 deaths annually
Purchases of Russian fuels	No change imports of 10 billion m^3 of gas and 16 million tons of oil annually	Limited to zero
Access to electricity and fuel	Interrupted access no electricity once a week for 1 hour and 2 Sundays a month without a car	Energy rationing no electricity every day for 1 hour and all Sundays of the year without a car
Policy options	No change	Carbon tax and new cash benefit Tax on coal, gas and oil consumption at home and monthly cash benefit for all families in Poland from the state budget
Net monthly income change	0	1176 EUR
Monthly benefit / loss	0	-176 EUR

Source: own calculations using data gathered for the experiment.

Appendix A4. Methodology for evaluating the efficiency of redistribution strategies

To assess the efficiency of redistribution measures in increasing acceptance of a carbon tax, we compare the relative effectiveness of cash transfers and subsidies for different income groups. For presentation purposes, and to allow both strategies to be shown on the same graph without arbitrarily favoring one strategy over the other (which could result in negative values for the less effective strategy), our methodology incorporates a switching pattern. This reflects the experimental findings that cash transfers are generally more effective for low-income households, while subsidies are more effective for high-income households.

The evaluation process for efficiency ΔE_l (for households with low incomes) and ΔE_h (high income households) involves the following calculations:

1. Households with low incomes

For cash transfers:

$$E_{l,t} = \frac{A_{l,t}}{\bar{A}_t}$$

For subsidies:

$$E_{l,s} = \frac{A_{l,s}}{\bar{A}_s}$$

Acceptance efficiency gain:

$$\Delta E_l = E_{l,t} - E_{l,s}$$

2. High-Income Households

For subsidies:

$$E_{h,s} = \frac{A_{h,s}}{\bar{A}_s}$$

For cash transfers:

$$E_{s,t} = \frac{A_{h,t}}{\bar{A}_t}$$

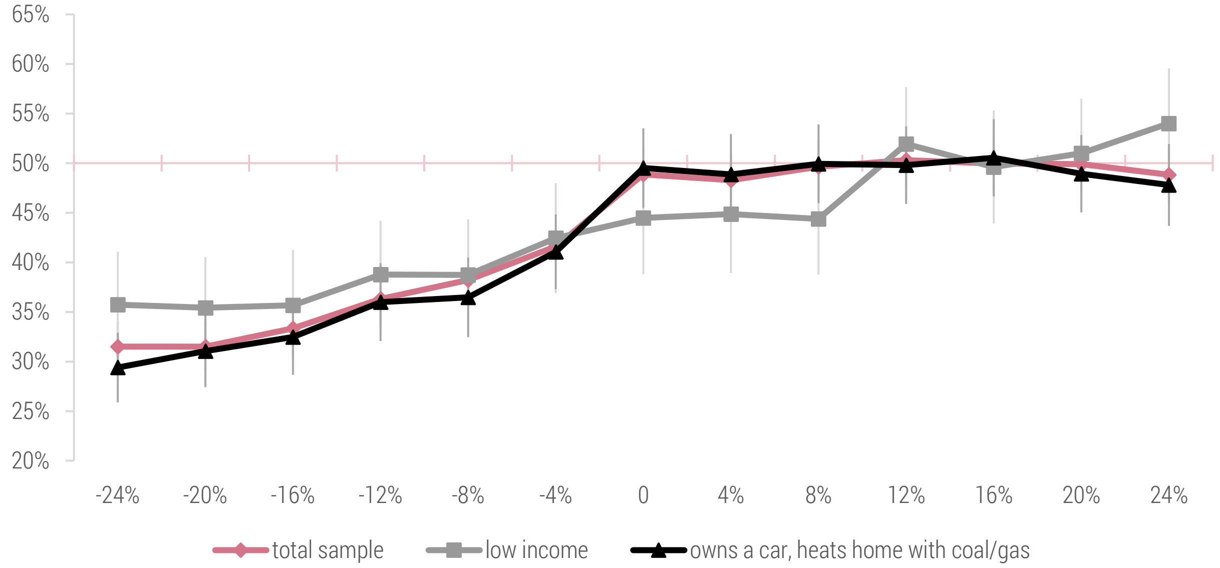
Acceptance efficiency gain:

$$\Delta E_h = E_{h,s} - E_{h,t}$$

where: $A_{l,t}$: Acceptance rate of low-income households under the cash transfer policy; $A_{l,s}$: Acceptance rate of low-income households under the subsidy policy; $A_{h,s}$: Acceptance rate of high-income households under the cash transfer policy; $A_{h,t}$: Acceptance rate of high-income households under the subsidy policy; $\bar{A}_t$: Average acceptance rate for cash transfer measures across all households; $\bar{A}_s$: Average acceptance rate for subsidy measures across all households.

Appendix B: Additional results

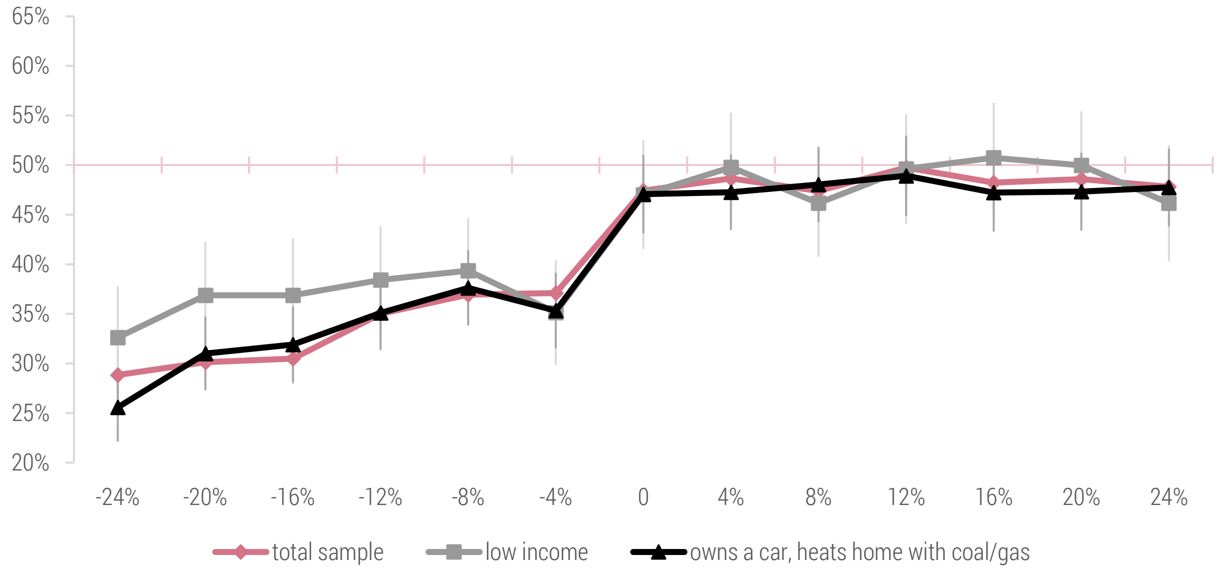
Figure B1. Predicted probabilities of respondents choosing a carbon tax paired with a cash transfer, conditional on differences in income after introducing the policy measure (%)



Note: participants had to choose between introducing a carbon tax and a status quo. Among the vignettes with a carbon tax, 50% contained a carbon tax paired with an unconditional cash transfer, while the other 50% were paired with a full subsidy for investments in a new heating source, a PV installation, or an electric car. Sample sizes refer to the total number of vignettes presented.

Source: own calculations using data gathered for the experiment.

Figure B2. Predicted probabilities of respondents choosing a carbon tax paired with an investment subsidy, conditional on differences in income after introducing the policy measure (%)



Note: participants had to choose between introducing a carbon tax and a status quo. Among the vignettes with a carbon tax, 50% contained a carbon tax paired with an unconditional cash transfer, while the other 50% were paired with a full subsidy for investments in a new heating source, a PV installation, or an electric car. Sample sizes refer to the total number of vignettes presented.

Source: own calculations using data gathered for the experiment.

Table B1. Marginal effects from logistic regressions

	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels	Climate change impacts
high income	0.441*** (0.034)	0.473*** (0.033)	-0.195*** (0.033)	0.370*** (0.033)	2.020*** (0.088)
low income	0.304*** (0.041)	0.287*** (0.039)	-0.165*** (0.039)	0.210*** (0.041)	2.005*** (0.087)
Above double the median energy spending[18]	0.340*** (0.039)	0.313*** (0.036)	-0.258*** (0.035)	0.228*** (0.037)	2.016*** (0.088)
Above double the median transport spending	0.329*** (0.040)	0.298*** (0.042)	-0.213*** (0.039)	0.263*** (0.041)	2.005*** (0.087)
Below double the median energy spending	0.352*** (0.021)	0.410*** (0.021)	-0.228*** (0.020)	0.305*** (0.021)	2.060*** (0.089)
Below double the median transport spending	0.354*** (0.021)	0.406*** (0.020)	-0.242*** (0.020)	0.290*** (0.020)	2.072*** (0.089)
car owners	0.359*** (0.034)	0.372*** (0.033)	-0.264*** (0.035)	0.336*** (0.035)	2.011*** (0.087)
coal/gas heating	0.361*** (0.052)	0.421*** (0.050)	-0.221*** (0.048)	0.298*** (0.051)	2.014*** (0.087)
without a car or coal/gas heating	0.336*** (0.051)	0.406*** (0.050)	-0.188*** (0.046)	0.258*** (0.048)	2.002*** (0.087)
low trust	0.325*** (0.031)	0.285*** (0.028)	-0.285*** (0.029)	0.214*** (0.031)	2.017*** (0.087)
high trust	0.361*** (0.023)	0.438*** (0.023)	-0.209*** (0.022)	0.321*** (0.022)	2.064*** (0.089)
high awareness of climate change	0.406*** (0.022)	0.452*** (0.022)	-0.248*** (0.021)	0.361*** (0.022)	2.090*** (0.090)
low awareness of climate change	0.218*** (0.033)	0.234*** (0.031)	-0.212*** (0.031)	0.109*** (0.033)	1.998*** (0.087)
18-34	0.572*** (0.033)	0.382*** (0.032)	-0.311*** (0.029)	0.220*** (0.032)	2.028*** (0.088)
34-54	0.326*** (0.029)	0.367*** (0.028)	-0.222*** (0.028)	0.296*** (0.029)	2.016*** (0.088)
55 or more	0.240*** (0.032)	0.406*** (0.032)	-0.207*** (0.031)	0.316*** (0.032)	2.028*** (0.088)

[18] The share of actual energy expenditures is higher than twice the median of this value in the sample.

left	0.435***	0.508***	-0.184***	0.344***	2.035***
	(0.034)	(0.033)	(0.032)	(0.034)	(0.088)
centre	0.347***	0.347***	-0.239***	0.221***	2.018***
	(0.028)	(0.027)	(0.026)	(0.027)	(0.088)
right	0.252***	0.313***	-0.292***	0.326***	2.018***
	(0.037)	(0.034)	(0.035)	(0.036)	(0.087)
social	0.327***	0.379***	-0.192***	0.331***	2.020***
	(0.035)	(0.034)	(0.033)	(0.034)	(0.088)
central	0.304***	0.336***	-0.262***	0.180***	2.014***
	(0.032)	(0.031)	(0.030)	(0.031)	(0.088)
liberal	0.404***	0.431***	-0.248***	0.337***	2.032***
	(0.030)	(0.029)	(0.029)	(0.030)	(0.088)
N			87,736		

Source: own calculations using data gathered for the experiment.

Table B2. Willingness to pay interacted with particular socio-economic characteristics (continued from Table 5)

interaction	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
left	-20.8 (-24.9; -16.6)	-24 (-28.6; -19.5)	-8.5 (-5.4; -11.7)	-16.4 (-20.3; -12.5)
centre	-16.4 (-19.4; -13.3)	-16.2 (-19.3; -13.1)	-11.1 (-8.4; -13.9)	-10.4 (-13.2; -7.6)
right	-13 (-17.2; -8.8)	-16.5 (-21; -12)	-14.9 (-10.7; -19.2)	-16.7 (-21.3; -12.1)
social	-16 (-20.1; -11.9)	-18.9 (-23.3; -14.4)	-9.6 (-6.1; -13.1)	-16.3 (-20.5; -12.1)
central	-16.2 (-20.2; -12.2)	-18.2 (-22.6; -13.9)	-14.3 (-10.5; -18.1)	-9.9 (-13.6; -6.2)
liberal	-17.4 (-20.5; -14.3)	-18.5 (-21.7; -15.3)	-10.4 (-7.8; -13)	-14.5 (-17.5; -11.6)
women	-19.4 (-22.2 ; -16.6)	-19.7 (-22.5 ; -16.9)	-12.0 (-9.5 ; -14.4)	-13.0 (-15.5 ; -10.4)
men	-14.4 (-17.3 ; -11.6)	-17.9 (-20.9 ; -14.9)	-11.1 (-8.4 ; -13.8)	-15.1 (-18.1 ; -12.2)
rural	-18.0 (-21.5 ; -14.6)	-19.1 (-22.5 ; -15.7)	-9.8 (-6.8 ; -12.9)	-12.4 (-15.7 ; -9.1)
urban	-16.6 (-19 ; -14.1)	-18.7 (-21.2 ; -16.1)	-12.3 (-10.1 ; -14.5)	-14.6 (-17 ; -12.2)
Multifamily	-18.1 (-21 ; -15.1)	-19.0 (-22 ; -16)	-11.9 (-9.1 ; -14.6)	-12.0 (-14.9 ; -9.2)
Detached	-16.4 (-19.1 ; -13.7)	-18.8 (-21.5 ; -16)	-11.3 (-8.9 ; -13.7)	-15.4 (-18 ; -12.7)
Buildings built until 1980	-17.4 (-20.2 ; -14.6)	-18.9 (-21.9 ; -16)	-11.4 (-8.8 ; -13.9)	-13.5 (-16.2 ; -10.8)
Buildings built after 1981	-16.7 (-19.4 ; -14)	-18.8 (-21.5 ; -16.1)	-11.8 (-9.4 ; -14.2)	-14.7 (-17.3 ; -12.1)
employed	-20.1 (-22.7 ; -17.5)	-18.4 (-21 ; -15.8)	-12.5 (-10.1 ; -14.8)	-13.7 (-16.1 ; -11.2)
Unemployed	-12.6 (-15.8 ; -9.4)	-19.6 (-22.9 ; -16.2)	-10.2 (-7.3 ; -13.1)	-14.5 (-17.7 ; -11.3)
Primary, secondary education	-18.2 (-20.5 ; -15.9)	-18.3 (-20.6 ; -16.1)	-11.2 (-9.3 ; -13.2)	-15.0 (-17.1 ; -12.8)
Tertiary education	-24.3 (-27.8 ; -20.8)	-21.2 (-24.6 ; -17.8)	-10.0 (-7.1 ; -13)	-20.6 (-24 ; -17.2)
Blue-collar occupations	-13.3 (-18.1 ; -8.5)	-15.1 (-20 ; -10.3)	-13.9 (-8.9 ; -18.9)	-8.7 (-13.6 ; -3.9)
White-collar occupations	-22.5 (-26.3 ; -18.7)	-21.6 (-25.3 ; -17.9)	-10.7 (-7.2 ; -14.1)	-19.0 (-22.8 ; -15.2)

Source: own calculations using data gathered for the experiment.

Table B3. Willingness to pay for attributes of selected subgroups (continued from Table 6)

subpopulation	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
Above 2M energy spending	-20.1 (-26.1; -14.2)	-19.1 (-24.9; -13.2)	-15.3 (-10; -20.6)	-13.4 (-18.6; -8.2)
Above 2M transport spending	-20.2 (-26.7; -13.6)	-18.4 (-24.8; -12.1)	-13.4 (-7.8; -18.9)	-16.5 (-22.5; -10.5)
Below 2M energy spending	-15.8 (-18; -13.6)	-18.4 (-20.8; -16)	-10.3 (-8.3; -12.3)	-13.7 (-15.9; -11.5)
Below 2M transport spending	-16.1 (-18.3; -13.9)	-18.4 (-20.8; -16)	-11.1 (-9.1; -13)	-13.3 (-15.5; -11.1)
car owners	-16.2 (-19.9; -12.6)	-16.6 (-20.4; -12.8)	-11.7 (-8.3; -15.1)	-15.3 (-19.1; -11.5)
coal/gas heating	-20 (-27.9; -12.1)	-24.6 (-33.1; -16)	-12.4 (-6.1; -18.6)	-17.5 (-25.1; -9.8)
without a car or coal/gas heating	-16.7 (-22.6; -10.9)	-19.9 (-26.3; -13.4)	-9.2 (-4.4; -14)	-13.3 (-18.7; -7.8)
low trust	-15.3 (-18.7; -11.9)	-13.6 (-16.8; -10.4)	-13.7 (-10.5; -17)	-10.1 (-13.2; -6.9)
high trust	-17.4 (-20; -14.7)	-21.2 (-24.2; -18.2)	-10 (-7.8; -12.3)	-15.4 (-18.1; -12.8)

Source: own calculations using data gathered for the experiment.

Table B4. Willingness to pay interacted with particular attribute levels (continued from Table 7)

Interaction	level	Climate change impacts	Diseases caused by poor air quality	Access to electricity and individual transport	Purchases of Russian fuels
high income	1	-8.2 (-11.3; -5.1)	-4 (-6.9; -1.1)	3.4 (6.4; 0.4)	-1.4 (-4.5; 1.7)
	2	-13.8 (-17.1; -10.4)	-18.8 (-22.3; -15.2)	-12.9 (-9.6; -16.3)	-16.5 (-20; -12.9)
low income	1	-6.6 (-10.3; -2.9)	0.2 (-3.4; 3.9)	-1.1 (2.6; -4.8)	-1.1 (-5; 2.8)
	2	-8.9 (-12.8; -5)	-14.3 (-18.4; -10.2)	-7.3 (-3.3; -11.3)	-9.2 (-13.3; -5.2)
high awareness of climate change	1	-7.1 (-9.1; -5.1)	-2.6 (-4.5; -0.7)	1.3 (3.2; -0.6)	-1.1 (-3.1; 0.9)
	2	-12.9 (-15.2; -10.7)	-18.9 (-21.5; -16.4)	-13 (-10.7; -15.2)	-16.4 (-18.8; -14)
low awareness of climate change	1	-5.5 (-8.6; -2.3)	-1 (-4; 2)	-0.2 (2.8; -3.2)	-1.3 (-4.5; 1.8)
	2	-5.7 (-8.7; -2.6)	-10.8 (-14.1; -7.5)	-10.8 (-7.5; -14)	-3.8 (-7.2; -0.5)
18-34	1	-10.6 (-13.5; -7.6)	-4.4 (-7.2; -1.6)	3 (5.8; 0.3)	-1.4 (-4.3; 1.4)
	2	-16.9 (-20.2; -13.6)	-14.2 (-17.4; -11)	-18.4 (-15; -21.7)	-9 (-12.1; -5.9)
35-54	1	-4.9 (-7.5; -2.3)	-0.6 (-3.2; 2.1)	-1.6 (1; -4.3)	-2.2 (-4.9; 0.5)

	2	-11.7 (-14.5; -8.9)	-17.5 (-20.6; -14.5)	-9.2 (-6.4; -12)	-12.4 (-15.4; -9.5)
55 or more	1	-5.9 (-8.9; -2.9)	-2.2 (-5.1; 0.6)	1.8 (4.6; -1)	-0.2 (-3.1; 2.8)
	2	-6.5 (-9.6; -3.4)	-17.6 (-21.1; -14.1)	-11.9 (-8.7; -15.1)	-15.6 (-19; -12.2)
Above 2M energy spending	1	-4 (-7.5; -0.5)	0.2 (-3.1; 3.6)	-0.6 (2.8; -4)	-1.3 (-4.8; 2.3)
	2	-13.5 (-17.3; -9.8)	-16.3 (-20.1; -12.5)	-12.8 (-9.1; -16.6)	-10.1 (-13.7; -6.4)
Above 2M transport spending	1	-6.2 (-10; -2.4)	-0.2 (-3.8; 3.4)	1.1 (4.8; -2.5)	0.1 (-3.7; 3.9)
	2	-10.9 (-14.9; -6.8)	-14.9 (-19; -10.9)	-12.3 (-8.2; -16.4)	-12.9 (-17; -8.8)
Below 2M energy spending	1	-7.5 (-9.5; -5.5)	-2.9 (-4.8; -1.1)	1.3 (3.1; -0.6)	-1.2 (-3; 0.7)
	2	-9.9 (-12; -7.9)	-16.7 (-19.1; -14.3)	-12.2 (-10.1; -14.4)	-13.6 (-15.9; -11.3)
Below 2M transport spending	1	-6.7 (-8.6; -4.8)	-2.6 (-4.4; -0.8)	0.8 (2.6; -1.1)	-1.5 (-3.3; 0.4)
	2	-10.8 (-12.8; -8.7)	-16.9 (-19.3; -14.6)	-12.3 (-10.2; -14.4)	-12.7 (-14.9; -10.5)
car owners	1	-6.9 (-10; -3.8)	-1.9 (-5; 1.3)	-0.1 (3; -3.1)	-1.4 (-4.6; 1.8)
	2	-10.6 (-14; -7.1)	-16 (-19.6; -12.4)	-12.7 (-9.2; -16.2)	-15.4 (-19; -11.8)
coal/gas heating	1	-6.7 (-11.3; -2)	-2.3 (-6.8; 2.2)	1.7 (6.5; -3.2)	-2.8 (-7.5; 1.9)
	2	-11.7 (-16.6; -6.9)	-18.8 (-23.8; -13.7)	-12.3 (-7.4; -17.2)	-12.5 (-17.7; -7.4)
without a car or coal/gas heating	1	-6.4 (-10.8; -2.1)	-2.7 (-7.1; 1.6)	0.8 (5.1; -3.5)	0.4 (-3.8; 4.7)
	2	-10.8 (-15.5; -6.1)	-17.1 (-21.9; -12.2)	-10.6 (-6; -15.1)	-12.8 (-17.4; -8.2)
low trust	1	-4.3 (-7.1; -1.5)	-1 (-3.7; 1.8)	-0.8 (2; -3.6)	-1.4 (-4.2; 1.5)
	2	-12 (-15.1; -9)	-13.2 (-16.3; -10.2)	-13.3 (-10.2; -16.4)	-9 (-12.3; -5.8)
high trust	1	-7.8 (-10; -5.7)	-2.8 (-4.8; -0.7)	1.7 (3.7; -0.3)	-1.1 (-3.1; 1)
	2	-10.1 (-12.3; -7.9)	-18.3 (-20.9; -15.7)	-11.9 (-9.6; -14.2)	-14.6 (-17; -12.2)
left	1	-9.4 (-12.6; -6.3)	-3.9 (-6.9; -0.8)	0.9 (3.8; -2.1)	-1.5 (-4.6; 1.5)
	2	-12.5 (-15.7; -9.2)	-20.7 (-24.2; -17.2)	-9.8 (-6.6; -12.9)	-15.2 (-18.6; -11.7)
centre	1	-5.7 (-8.1; -3.2)	0 (-2.4; 2.5)	2 (4.5; -0.4)	-0.3 (-2.8; 2.2)
	2	-11.6 (-14.3; -8.9)	-17 (-20; -14)	-14.2 (-11.3; -17)	-10.9 (-13.6; -8.1)
right	1	-4.9 (-8.3; -1.4)	-3.8 (-7; -0.7)	-1.5 (1.8; -4.7)	-2.4 (-5.7; 0.9)

	2	-7.9 (-11.3; -4.4)	-11.6 (-15.1; -8.1)	-12.8 (-9.2; -16.4)	-13.6 (-17.3; -9.9)
social	1	-6.1 (-9.3; -2.9)	-3 (-6; 0)	1.4 (4.4; -1.6)	-0.1 (-3.2; 3.1)
	2	-10.8 (-14.1; -7.5)	-15.2 (-18.6; -11.7)	-10.9 (-7.6; -14.2)	-16.5 (-20.1; -12.9)
central	1	-5.3 (-8.2; -2.4)	-1 (-3.8; 1.9)	-1.2 (1.7; -4)	0.3 (-2.6; 3.3)
	2	-9.7 (-12.7; -6.7)	-15.7 (-19; -12.4)	-12 (-8.7; -15.3)	-9.2 (-12.3; -6)
liberal	1	-8.2 (-10.9; -5.4)	-2.5 (-5.1; 0.1)	2.2 (4.9; -0.4)	-3.4 (-6.1; -0.7)
	2	-12 (-14.9; -9.1)	-18.9 (-22.1; -15.7)	-14.1 (-11.2; -17)	-13.2 (-16.2; -10.1)

Source: own calculations using data gathered for the experiment.

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