Preferences And Willingness To Pay For Climate Policy Mixes

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Abstract

In the discussion surrounding mitigation policies, subsidy programs are often met with high public support, whereas carbon pricing is stagnating at low price levels due to the fear of public backlash. We conduct a survey experiment where respondents can select the shares of carbon pricing and subsidies in the climate policy mix to achieve a given abatement target in the building sector. Our findings show that the gap between public preferences and efficient climate policy making is at least partly driven by the asymmetric salience of costs and benefits of both instruments. Our information treatment reveals the individual cost of financing subsidies. The less respondents are directly affected by carbon pricing, the stronger they react to this information, reducing the share of subsidies in their preferred policy mix. The more costly subsidy programs are compared to carbon pricing, the stronger the effect. However, our study also shows that there is an inherent preference for subsidy programs that can be diminished but does not disappear when costs and benefits are made salient. Given the higher cost of subsidy schemes to achieve the same abatement effect as a carbon price, respondents on average prefer to pay EUR 4 to fund subsidy schemes rather than to pay an additional EUR 1 for carbon pricing.

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1 Introduction

Although introduced in several countries around the globe, carbon pricing ekes out a shadowy existence at very low price levels (IMF 2022). This is in stark contrast to the role as a central pillar of efficient climate policy that economists envisioned for the pricing measure. Low public acceptance of carbon pricing in high income countries (Sommer, Mattauch, et al. 2022; Douenne and Fabre 2022; Dechezleprêtre et al. 2024), in particular in times of high energy costs (Sommer, Konc, et al. 2023), is considered as one of the main reasons for stagnating price. Even though potential benefits and welfare enhancements from the reduction of negative externalities have been shown to be substantial (Amberg et al. 2022), pricing instruments meet large skepticism before and after their implementation even if they are combined with rebates and compensation measures (Mildenberger et al. 2022).

From the perspective of welfare maximization, Pigouvian pricing (i.e., a carbon price equal to the marginal damages of emitting an additional ton of carbon) is the first-best instrument to remove an externality (Baumol and Oates 1971; Dales 1968) as it triggers an efficient market response because emissions are abated where they can be reduced at least cost. In contrast, subsidies are distributed according to pre-defined rules. If these rules do not exactly address the sources of carbon emissions that have the lowest mitigation cost, they are less effective and, thus, more than costly carbon pricing. Further, to finance the subsidy payouts, distortionary taxes on, e.g., income or value-added taxes (VAT) must be increased which leads to additional efficiency losses. From this cost perspective, the public should prefer carbon pricing over subsidies and decide how to allocate the revenues. However, the real preferences are the other way round (Cherry et al. 2012; Heres et al. 2017; Huber et al. 2020; Eriksson et al. 2008). There is a pivotal information asymmetry between subsidies and the carbon price: while the benefits of the former are immediately visible, the later makes the costs directly salient. The costs of subsidies are financed via the general public budget and are therefore not directly linked to a type of tax or levy. On the other hand, revenue rebating from carbon pricing is often not visible (Schwegler et al. 2015; Mildenberger et al. 2022) or not even yet in place. Thus, public preferences observed in surveys and polls are subject to, and potentially strongly driven, by incomplete information. The acceptance for the two instruments is only comparable if symmetry in cost and benefit attributes is ensured (Andreassen et al. 2024).

We present an experiment that will provide evidence on the gap between public preferences and economically optimal policy making. The aim is to (1) provide evidence that and to which extent the preference of subsidies over carbon pricing diminishes as costs and benefits of both instruments are made fully salient and (2) develop a rough estimate of the public's additional willingness to pay for subsidies compared to carbon pricing. The experimental design consists of a control group and two treatment groups. The control group only receives basic information about how carbon prices and subsidies on green technologies can induce an emission abatement. The treatment groups additionally learn that carbon pricing generates revenues which can either be recycled or rebated to the population, while subsidies require a higher public budget. Subsequently, all respondents choose their preferred mix of carbon pricing and green subsidies to achieve a predefined climate policy target. When deciding about their preferred mix, respondents in the treatment groups receive real-time feedback on how their current choice affects the average household in terms of additional costs for fossil fuels, a per-capita rebate of carbon pricing revenues and higher VAT costs to fund the subsidy. The treatment groups differ only with regard to the efficiency of the subsidy at achieving the climate target. In the first treatment, a hypothetical subsidy is just as efficient as carbon pricing, whereas the second treatment group faces an inefficient, more costly subsidy option.

We follow the salience description by Chetty et al. 2009 and Gabaix and Laibson 2006 as "shrouded" attributes: although it is clear from a fiscal perspective that subsidies need to be financed by taxes, government debt or a cut in other spending categories, subsidies become primarily salient to the general public as instruments associated with benefits that increases electoral support (Slattery 2023).

Our experiment is connected to the literature on policy packaging. It often deals with the question how perception and acceptance of a policy measure changes, if it is combined with other more or less popular instruments. It is shown, that more complex policy designs can increase the perceived effectiveness of a policy but also cause respondents to feel more affected in their daily life (Fesenfeld 2022). Further, combining push- and pull-measures can increase policy acceptance (Eriksson et al. 2008). Wicki et al. 2020 shows that "ancillary measures" (i.e., communication measures or R&D support) make climate policy instrument more popular. However, the results on the acceptance effect of a tax-subsidy combination are not univocal. Andreassen et al. 2024 find no evidence that carbon taxes benefits from an acceptance spill-over when combined with subsidies.

Our paper contributes to the existing literature as it is less concerned about how policy bundling affects support for its individual components. Instead, we focus on how salience about costs and benefits affects the preferred share of each instrument in the mix and the support for climate policy mixes. We find that, when no additional information about cost and benefits of the policy instruments is provided, respondents in the control group choose a share of subsidies in the mix of more than 60%. The salience effect becomes statistically relevant only when subsidies are less effective than carbon pricing. While the share of subsidies decreases by 9 percentages points, respondents still prefer about 50% of the climate target to be achieved via subsidies even if they are more than six times as expensive as carbon pricing. This outcome is not consistent with individually rational cost minimization, indicating that subsidies may be associated with additional, unobserved effects on utility, e.g., via behavioral channels such as a status-quo bias. We use this preference stickiness to compute the willingness-to-pay for subsidies. Compared to the preferred mix under hypothetical, perfectly efficient subsidies, respondents in the treatment with inefficient subsidies are willing to pay EUR 4 in form of additional VAT expenditures funding subsidies to avoid additional EUR 1 in fossil expenditures due to higher carbon prices. Furthermore we find that, while less efficient subsidies increase the share of carbon pricing in the policy mix, the overall support for the chosen mix decreases slightly, yet, remaining at a comparatively high rate of 75%.

The remainder of this paper is structured as follows. Section 2 describes the experimental design and the main hypotheses. Section 3 gives an overview of the sample of the German population whose answers are used in the following. In Section 4, we analyze in how far people are unaware of the inherent costs that come along with subsidies and how this changes their willingness to pay for policy packages. Since parts of our experiment are cognitively demanding, we check in Section 5 whether respondents understood the task assigned to them. Section 6 concludes with a discussion of our results.

2 Experimental design

The structure of our experiment is illustrated in Figure 1. Respondents are assigned to one control and two treatment groups of equal sizes. After being supplied an introductory information frame and description of the task, respondents chose their preferred policy mix, consisting of carbon pricing and green subsidies, on a slider. Subsequently, respondents answer whether they would vote in favor of or against their chosen policy mix in a hypothetical referendum followed by a block of heterogeneity items.

To ensure that our treatment effect is driven by the salience of policy costs instead of more generic knowledge about climate policy instruments, we provide the control group with an information text about the mechanisms underlying carbon pricing and subsidies (see Section F.2). This active control group design (Haaland et al. 2023) allows studying the effect of providing information about the budget gap caused by subsidies and the resulting need for additional financing only, without being confounded by the effect of drawing respondents' attention to the topic of public finances and taxes. The text explains that Germany has to reduce its carbon emissions in order to meet international climate agreements. The framing of our experiment focuses on climate policy instruments in the building sector, stating that mitigation efforts by private households and firms can be induced via increasing prices for heating oil and natural gas as well as subsidies on renewable heating systems or energy efficiency investments. The treatment groups receive the same information texts about the mechanisms as the control group supplemented with the information that revenues from carbon pricing can be rebated to households and firms and that subsidies require public funds which, e.g., may be generated via tax increases (see blue-colored text in the questionnaire presented in Section F.2).

Subsequent to the introduction, all respondents are asked to imagine that they can advise the German government on the policy mix employed to reach the climate targets for 2030. Treated respondents are reminded that carbon pricing generates revenues which are earmarked to fund green subsidies, mimicking the current funding structure in Germany, with any excess revenues being rebated on a per-capita basis, while any budget deficit caused by paying subsidies – net revenues from carbon pricing – has to be covered via increasing the value-added tax (VAT).

The core task of our experiment, choosing the preferred policy mix, is administered via a slider where respondents can choose on a continuum of policy mixes to achieve the climate target, ranging from 'only via subsides' to 'only via carbon pricing'. In line with Andreassen et al. (2024), we ensure comparability between the two instruments by calibrating each possible mix on the interval such that the same emission reduction target (-42 Mt of CO_2 compared to 2022) is achieved. Consequently, policy mixes vary with regard to their cost attributes, while the overall ambition level of climate policy remains predetermined. The control group sees the slider only without any information on the cost of the policy mix (see Figure F1). The treatment groups receive an additional badge displaying the monetary impact of their decision on the average household (see Figure F2 and Figure F3). These include (1) the additional monthly expenditures for heating oil and natural gas due to carbon pricing, (2) the VAT increase required to fund the share of subsidies in the chosen policy mix, (both in percentages and monthly costs for the average consumer) as well as (3) whether a per-capita rebate is payed and if so, to how much it amounts. To avoid ordering effects, we randomize the order in which these there blocks are displayed. As a central feature of our experimental design, these monetary effects are updated in real time as respondents move the slider between the two policy options.[1]

The two treatments only differ with regard to the efficiency or, analogously, cost of subsidies but otherwise receive the same information. Mitigating a ton of carbon via carbon pricing always costs EUR 207.[2] In a policy mix consisting of equal shares carbon pricing and subsidies, carbon prices only has to mitigate 'half' of each ton of carbon, such that the target-consistent price reduces to EUR 103.50. In the 'low-cost' treatment, subsidies are just as efficient as carbon pricing, i.e., the price of mitigating a ton of carbon via subsidies is just as expensive as the carbon price. This treatment essentially serves as a benchmark, where subsidies are able to incentivize investments with the lowest marginal abatement costs and do not incur other costs such as administrative burden. In the corresponding 'high-cost' treatment, the cost of mitigation is 6.5 times higher when mitigating via a subsidy rather than the carbon price. This value is consistent with cost estimates for various green subsidy schemes in Germany.[3] The difference between cost effectiveness levels in both treatments becomes best apparent when comparing the required increase in the VAT to fund an 'only subsidies' policy: in the low-cost treatment, the VAT has to increase from its current 19% level to 20.1%, whereas an increase to 26.6% is necessary in the high-cost treatment (compare Figure A5). Importantly, respondents neither learn the per-ton level of the carbon price or the efficiency of the subsidy, they only see monthly cost changes for the average consumer and the updated VAT rate.

In principle, we could conceive a wide range of different instruments to fund the subsidies whenever their cost exceeds the revenues from carbon pricing, e.g., (income) tax adjustments, higher public debt or cuts to other public expenditures. We chose a VAT increase for two reasons. First, a carbon price and VAT increase share some distributional and tax-incidence related properties. Both instruments impose similar absolute mean burdens on all households along the income distribution, i.e., are regressive relative to income or total consumption (Bohmann and Küçük 2024). In addition, the majority of households in Germany still relies on fossil fuels for heating (75 % either use oil or natural gas, Statistisches Bundesamt

[1] A detailed description of the underlying calculations can be found in C.

[2] The carbon price level is derived as the difference (in real levels) between the German carbon price in 2024 (EUR 45 per ton) and the estimated price in 2030 for a joint, EU-wide ETS on housing and road transport as resulting from the integrated assessment model 'REMIND-EU' .

[3] The results by Kalkuhl et al. (2013) served as motivation of this approach and is, on average, in line with observed subsidy costs in Germany (Prognos/ ifeu/ FIW/ ITG 2024). See Section C.2 in the Appendix for more details.

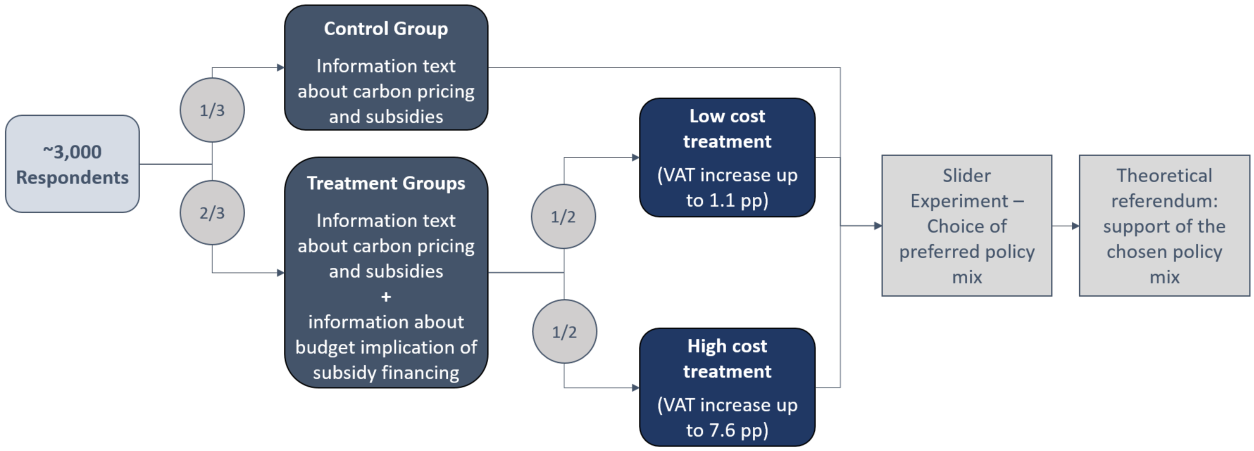

Figure 1: Treatment Design

(2024i)).[4] While, especially wealthier, households can 'opt out' of carbon pricing over time by adopting renewable heating systems, we argue that most households would be affected by either carbon prices or higher VAT rates in the short run. Second, as simple VAT increase allows for comparably simple calculation of its impact on the average consumer and does not require comprehensive explanation in order for respondents to understands the mechanism. While, for instance, income tax funding might be preferred from a welfare perspective, the income tax schedule can be adjusted in a variety of (non-self-explanatory) ways. Similar reasoning applies to deficit funding.

Our experiment tests two main hypotheses:[5]

Hypothesis 1: Making the cost of subsidies and the revenue-recycling potential of carbon pricing salient, results in respondents choosing a higher share of carbon pricing in the policy mix.

Hypothesis 2: The less cost effective subsidies are, i.e., the more the VAT has to be increased to provide sufficient funds for reaching the climate target, the stronger respondents veer towards carbon pricing in their preferred policy mix.

These are in line with the expectation that citizens are not aware of the inherent costs of subsidy programs while the costs of carbon pricing may be overestimated.

[4] 15 % of households are connected to district heating which is still mainly dependent on fossil resources (Becker et al. 2023). The remaining heating systems are based on wood (4 %), heat pumps (3 %) (Statistisches Bundesamt 2024i).

[5] The hypothesis are pre-registered as AEARCTR-0013909 on AEA RCT Registry in July 2024 (`https://www.socialscienceregistry.org/trials/13909`). We changed the wording slightly as cost effectiveness is a more suitable term to describe the differences between our treatment arms.

3 Data

The survey was conducted via the online platform Bilendi from 24 June to 19 July 2024. In total, 6,659 respondents started the survey and we collected 3,284 full responses which are reduced to 3,034 relevant observations after accounting for quotas with regards to age, gender, income and regional state. Around 75% of the original sample, i.e., 2,472 observations, remain after dropping respondents who rushed through the experiment ($<$ 10 seconds on the information or the slider pages) or through the survey (lower 5 % of time distribution, i.e. less than 4.63 minutes)[6], who reported wrong zip codes (we compared whether zip code is consistent with the federal state provided by the respondent), who showed suspicious answering patterns (gave the same answer on the 11-point likert scale across 22 consecutive questions) as well as those who do not pass the second attention check or started the survey more than once. Table B1 provides an overview of the sample and Section D shows the number of excluded observations.

Our sample is somewhat older than the population average in Germany. Since the sample quotas did not include the heating system, the shares deviate from the overall distribution in Germany as well. The share of gas heating lies 10 pp below the population average and the share of oil heating lies 2 pp above. A surprisingly high share of respondents states to use a heat pump or solar heating system (9 %) compared to the population average of 3 %. The average net equivalent income is below the German average of EUR 3,650. Households are slightly larger than the population average of 2.03 persons per household and hold more often a university degree.

4 Results

4.1 Changes in policy mix preferences

The main outcome variable of our experiment is the choice of the climate policy mix on the slider. The control group primarily relies on subsidies (carbon pricing has a share of 37.3% in the policy mix) to achieve the climate target, in line with our prior assumptions about how hidden and salient cost of policies affect the preferred policy package. Table B2 summarizes the OLS results for regressing the preferred share of carbon pricing in the policy mix on the treatment factors as well as on a set of socio-demographic control variables. While both treatment indicators have a positive coefficient, i.e., treated respondents choose a higher share of carbon pricing than the control group, only the high-cost treatment has a significant effect at the 5 % level. The low-cost treatment (T1) is significant at a 10 % level. Additionally, confronting the respondents with a less efficient (i.e., more costly) subsidies option as in T2 also has quantitatively larger effect on the shift towards carbon pricing. The low-cost treatment increases the share of carbon pricing by 2.6pp and the high-cost treatment increases the share by 9pp over the 37.3% chosen by the control group (compare Figure A1). These increases imply that the preferred carbon price rises by EUR 4 (T1) and EUR 15 (T2) in the respective treatments. Thus, making the costs of both instruments

[6]The distribution of answer times is shown in Figure D1.

salient when subsidies are just as efficient as carbon pricing, only has a minor effect on the predominance of subsidy programs if we accept a higher alpha error. However, in Section 5, we show that that the effect of T1 becomes larger and significant when we further restrict our sample to highly attentive or more financially literate respondents.

Economic efficiency does not prescribe that respondents should prefer carbon pricing to subsidies in the low-cost treatment. While individual households may still benefit more from either carbon pricing or subsidies (in particular, depending on their heating source and heating consumption), the marginal cost of abating a ton of carbon is the same between both options. If respondents take a more abstract, aggregate view at their task to advise the government on climate policy (and do not strategically minimize individual costs), making similar costs salient would even account for indifference between the instruments. Depending on the underlying welfare considerations, carbon pricing might sill be identified as the 'superior' alternative even in this case due to the potential negative distributional impacts of funding subsidies via a VAT increase.

In contrast, when subsidies are less efficient, i.e., more expensive as in the (realistic) high-cost treatment, we actually observe that salient information leads to a shift in preferences towards carbon pricing. In sum, these findings confirm Hypothesis 1. Making the cost and benefits of subsidies and carbon pricing salient reduces respondents' reliance on subsidies to achieve the climate targets whereby the salience effect is in particular driven by the cost of subsidies. We argue that this result indicates that respondents in the control group are, in fact, not aware of the cost associated with subsidies, or over-estimate the cost of carbon pricing relative to subsidies. Comparing the point estimates for the effects of the low and high-cost treatment further suggests that the latter induces a stronger shift towards carbon pricing. This is corroborated by a test for statistical difference (compare F-Test in Table B2). Therefore, we also confirm Hypothesis 2, i.e., the higher the cost of the subsidy, the more willing respondents become to implement carbon pricing as a means of climate policy. As a caveat, we cannot use the comparison between the two treatments to infer a monotonous effect of the cost of subsidizing on respondents' decisions, i.e., the selected share of carbon pricing in the policy mix may be bounded above at a value smaller than 1 even if the cost of subsidies increases further. This aspect is also relevant for the subsequent analysis.

Most socio-demographic variables are insignificant. The positive effect for net income may stem from the fact that richer households are less depended on subsidies to finance investments. Although we do not provide information about distributional implication of subsidy financing and payouts, subsidies may be associated with payments to lower income groups so that richer respondents do not expect to profit from them. Since we do not include information about the effect of carbon pricing on transportation means in our treatments, the negative effect for respondents in rural areas is surprising. This may be driven by the higher share of home owners in rural areas in Germany than in cities (Herwegen et al. 2024). As a consequence, this group may be more in favor of subsidy programs as they have to carry the investment costs directly. Further, respondents may be aware that the carbon price is applied to both, heating and motor fuels (85 % have heard of the national carbon price before the survey). Thus, the experiment may suffer spillover effects here.

The experiment includes a second outcome question which asks whether respondents would support the chosen policy mix in a referendum. This question is important to ask, as we do not offer an outside option during the slider experiment but enforce an answer. Hence, respondents, who disagree with climate policy in general or prefer command-and-control approaches over subsidies and pricing instruments, may have to choose a policy mix which they do not agree with, potentially resulting in arbitrary responses. The last two columns of Table B2 refer to those respondents who stated that they would vote in favor of the proposed policy mix in a hypothetical referendum. The treatment effects become even stronger in this subsample. This shows that results are robust to the exclusion of respondents who do not support the chosen policy mix. However, the composition of respondents who support the policy mix is itself endogenous to the treatment as analyzed in the following.

In Table B3, we estimate the effect of our information treatments on the support for the chosen policy mix. Both treatments significantly reduce the support in a hypothetical referendum compared to the control group (-7.5pp for the low cost and -11.3pp for the high cost treatment, respectively). Despite the substantially higher cost of the policy mix chosen by respondents in T2 and an increase in the absolute size of the coefficient measuring the 'High cost treatment' effect on support for the policy mix, we find no statistically significant difference between the two treatments. From this we derive that, there is a negative salience effect on support for the policy mix which, however, does not increase (locally) with the cost of the policy package.

Underlying this result, we find remarkably high rates of support for the chosen policy mix across the sample, with a baseline of 87% approval in the control group (see Figure A1). This effect may, in part, be driven by the fact that respondents have to decide whether or not to support a policy mix they selected themselves, arguably increasing the satisfaction with the survey (Kühne and Kroh 2018), associated with a higher willingness to bear the costs and trade-offs associated with climate policy. On the other hand, Heres et al. (2017) find comparably high support levels for policy mixes, when people are provided with budgetary information and are incentivize by actual payouts in a lab experiment.

Among the control variables, the positive and significant coefficients of higher education (university and (technical) high school degree as compared to no or the lowest educational attainment in Germany as the baseline) on the probability to support the policy mix stands out. This may indicate that higher education enables respondents to comprehend the slider and process the interacting effects of choosing a specific policy mix. In Section 5, we further investigate in how far education and financial literacy influence the results of the experiment.

4.2 Effect of heating system on choice outcome

While we are able to partly confirm our two main hypotheses across the full sample as predicted, an exploratory analysis of the underlying effects reveals additional insight. If treated respondents behave rationally, they employ the information on costs and benefits provided in the decision frame (see Figure F2 and F3). A rational individual would then choose the point on the slider that is optimal from their point of view to minimize

$$\text{Policy cost} = \begin{cases} P^{T_i}_{gas}(s_i) + \Delta VAT^{T_i}(s_i) - R^{T_i}(s_i) + \theta & \text{with gas heating (1)} \\ P^{T_i}_{oil}(s_i) + \Delta VAT^{T_i}(s_i) - R^{T_i}(s_i) + \theta & \text{with oil heating (2)} \\ \Delta VAT^{T_i}(s_i) - R^{T_i}(s_i) + \theta & \text{without fossil heating (3)} \end{cases} \tag{1}$$

$P^{T_i}_{gas}$ ($P^{T_i}_{oil}$)represents the increase in fossil fuel prices induced by carbon pricing and ΔVAT^{T_i} represents the additional cost for an average household due to the change of the VAT rate. R^{T_i} denotes the per-capita rebate paid out to every household if a sufficiently high carbon pricing share is chosen (otherwise the value is equal to 0). All three variables have the treatment T_i as superscript as they are endogenous to the respective treatment (compare Figure A5 and Figure A6).[7] Further, they are endogenous to the policy mix chosen by the respondent, here represented as the share of subsidies s_i (the carbon pricing share results from 100-s_i). P and R are decreasing in s_i and ΔVAT is increasing in s_i. The monetized value of any other reason apart from monetary incentives that respondents may consider during the decision problem is captured by θ, with $\theta < 0$ if non-market characteristics of the policy mix reduce the perceived cost. Figure 2 illustrates equation 1. Depending on the treatment, respondents can either decide along the respective supply curve for low cost (blue line) or high cost subsidies (red line). The three cases for the supply curve in equation 1 are represented by the dashed (1), continuous (2) and dotted lines (3) relating to the respective heating systems.

Decomposing the sample by heating system reveals that not only respondents in the high-cost treatment receive a stronger incentive to reduce the share of subsidies in the policy mix, but that the incentives also vary within treatment groups depending on which heating system is installed. Households relying on technologies which are not subject to carbon pricing ('non-fossil') are always better off when increasing the share of carbon pricing as they bear no burden from it, whereas subsidies have to be funded via higher VAT rates indiscriminately by all consumers. In contrast, the average household relying on natural gas should be indifferent between all possible combinations of carbon pricing and subsidies in the low-cost treatment.[8] The high carbon intensity of heating oil implies that the rational, cost-minimizing average oil user should always opt for achieving climate targets via subsidies only in the low-cost treatment. As subsidies become relatively more expensive in the 'High cost treatment', it becomes cost optimal for all households, irrespective of their heating fuel, to opt for the maximum share of carbon pricing.

Figure A2 indicates that the chosen policy mix is contingent on the heating system installed in the respective households. In particular households without a fossil fuel based heating system choose on average across all treatments higher carbon shares than households with

[7] P also depends on the treatment because the VAT, which is added to the carbon price, is on average higher in T2.

[8] The different slopes in between the heating systems are driven by different counteracting sources such as a higher carbon intensity for oil which makes oil prices more sensitive to the carbon price. Theoretically, a carbon price is just as efficient as a subsidy in T1 so that the blue line should be flat. However, the carbon intensity of oil is so high that increasing the subsidy share in the policy mix makes it in total cheaper for oil households. This leads to a falling cost curve for oil households in the 'Low cost treatment'.

oil or gas heating. Along with equation 1, this motivates the analysis of treatment effect heterogeneity with respect to heating systems. Column 1 in Table B4 shows that – qualitatively – respondents behave in line with the cost curves presented in Figure 2. In the low-cost treatment, oil users reduce the share of carbon pricing in the policy mix compared to the control group and a gas heating system,[9] while households without a fossil fuel based heating system increase the respective share. Given that the slope of the cost curve is the steepest for households without a fossil-based heating system (one additional percentage point of subsidies is the costliest for this group), it is not surprising that we find the highest coefficients for this subgroup: people who do not benefit from subsidies should react more sensitive to both, the salience effect as well as increasing costs of subsidies. In the high cost treatment, all subgroups increase their share of carbon pricing whereby, again the interaction effect is negative for households with oil heating showing a reluctance to increase the carbon price to high levels even if subsidies become expensive. However, none of these interaction effects are statistically significant. Column 2 confirms that that also supporters of the chosen policy mix barely react differently to the treatment contingent on their heating system. However, the negative effects for oil households increase in size and become partly statistical significant for the 'High cost treatment'.

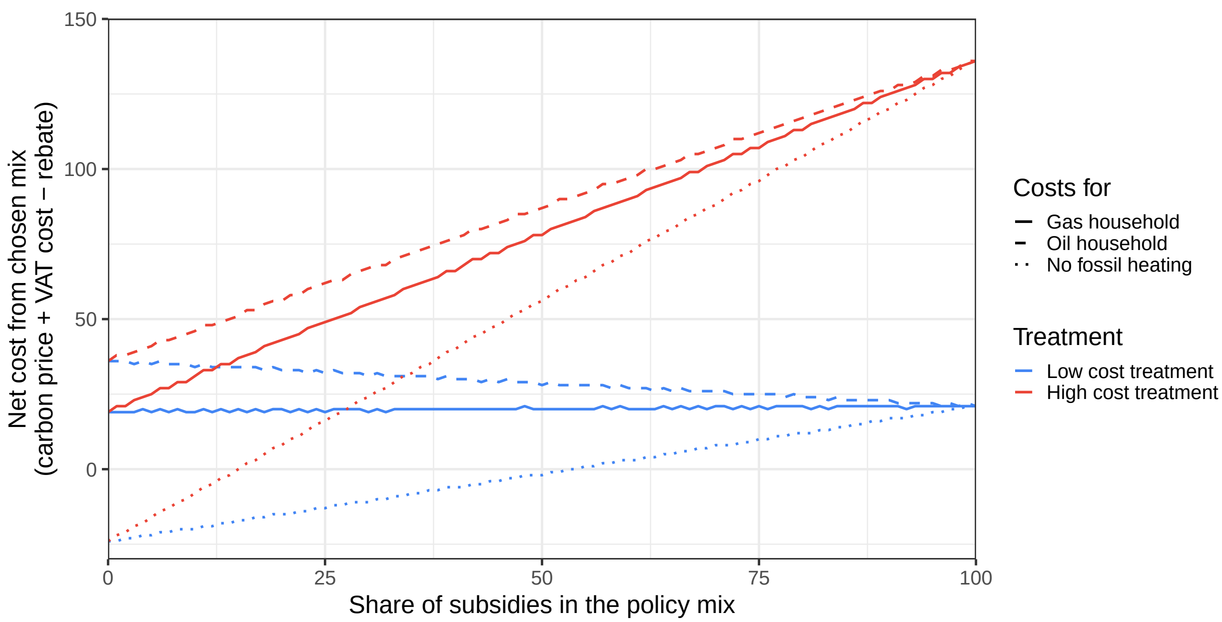

Figure 2: Total policy costs that result from different slider positions.

Considering that the control groups for all subsets choose a share of carbon pricing well below 0.4 (see Figure A2), Table B4 also reveals that respondents do indeed not act as pure cost minimizers. Otherwise, the salience effect of the treatments should produce larger and more significant coefficients, especially with respect to the heating systems. In fact, people without a fossil-based heating system could even 'earn' money by moving the slider to 100

[9]Since a gas heating system is used as the point of comparison for heating systems, interaction effects must be calculated on the basis of the control group (for the treatment variable) and gas heating (for the heating system variable).

% carbon pricing as every household receives a rebate if there are free revenues. Instead, we find only weak interaction effects between either treatment and the heating type. Thus, non-fossil users' preference for a higher carbon pricing as shown in Figure A2 is not driven only by our treatments, but also an underlying effect which is also present in the control group. Hence, while the preference for subsidies and carbon pricing is indeed contingent on the respective heating system, we observe no manipulation effect as the reaction to the treatment (incl. the different cost slopes in Figure 2) does not differ between heating types. As we will see in the next section, this lack of reaction with respect to heating systems entails a heterogeneous willingness to pay by these groups.

4.3 Willingness to pay for subsidies

The analysis above indicates that respondents have a positive valuation for subsidies which exceeds the monetary cost of the instrument. Otherwise respondents' reactions to the treatments are not strong enough. We can exploit this setup to determine respondents willingness-to-pay for the share of subsidies in their preferred policy mix.

Given the level of subsidy cost effectiveness, the budget required to mitigate a set quantity of emissions via subsidies is exogenously fixed and the government can only vary the instruments with which it raises the respective funds (e.g., different taxes or increase in government debt). Thus, we define equation 1 in the following as the supply function of subsidies under different degrees of cost efficiency. Figure 3 shows the inverse demand and the supply curves for different policy mixes. We depict the curves separately for households using heating oil, natural gas and non-fossil technologies. The share of subsidies preferred by the average household differs depending on the heating system in the low-cost treatment (64.8 % for oil, 61.6 % for gas and 56.2 % for non-fossil households). The share of subsidies decreases for all heating types in the 'High cost treatment' (-6.2 % for oil, - 7.5% for gas and -5.6 % for non-fossil households).

Our experimental setting to elicit differences in willingness to pay follows the principle of the contingent valuation (CV) method. By asking respondents to choose a preferred policy mix (given the respective costs shown to them in the badge below the slider) and to vote in favor or against it, we indirectly ask about their WTP. Comparing the different results for the two treatments T1 and T2, we can identify how much the respondents are willing to pay additionally if subsidies become less effective. i.e., they have to allocate more funds to the policy mix to "buy" a certain share of subsidies.To illustrate this, we fit a linear inverse demand curve between the two observed demand levels for the share of subsidies in either treatment in Figure 3. Following Kotchen et al. (2013) and Krosnick et al. (2002) we start with an analysis of the full sample, including also respondents who would oppose the chosen policy mix in a referendum. Based on the results by Carson et al. (1998) we did not include a "Don't know" category in the answer section of the referendum question as it is shown that this is just an additional option to capture "No" answers. In a conservative robustness check, we set the willingness to pay of all respondents who do not support the policy mix in T1 or T2 to 0. This is a conservative estimation since particularly respondents in T2 may have a WTP above 0 which cannot be captured by the two discrete measurement points.

While the demand function may not be linear or even not monotonously decreasing in reality, the functional form is of no further importance as we can observe the demand only at two points (choices under T1 and T2). The curvature between these two points would be relevant to determine the exact Dead Weight Loss (DWL) associated with less-efficient subsidy programs which is linearly approximated in our specification. Alternatively, an estimate for the demand curve would be required to predict the intersections with other, hypothetical supply functions which is beyond the scope of our study. Only the willingness-to-pay for a certain "supply" of subsidies is of interest to us. We run the following equation

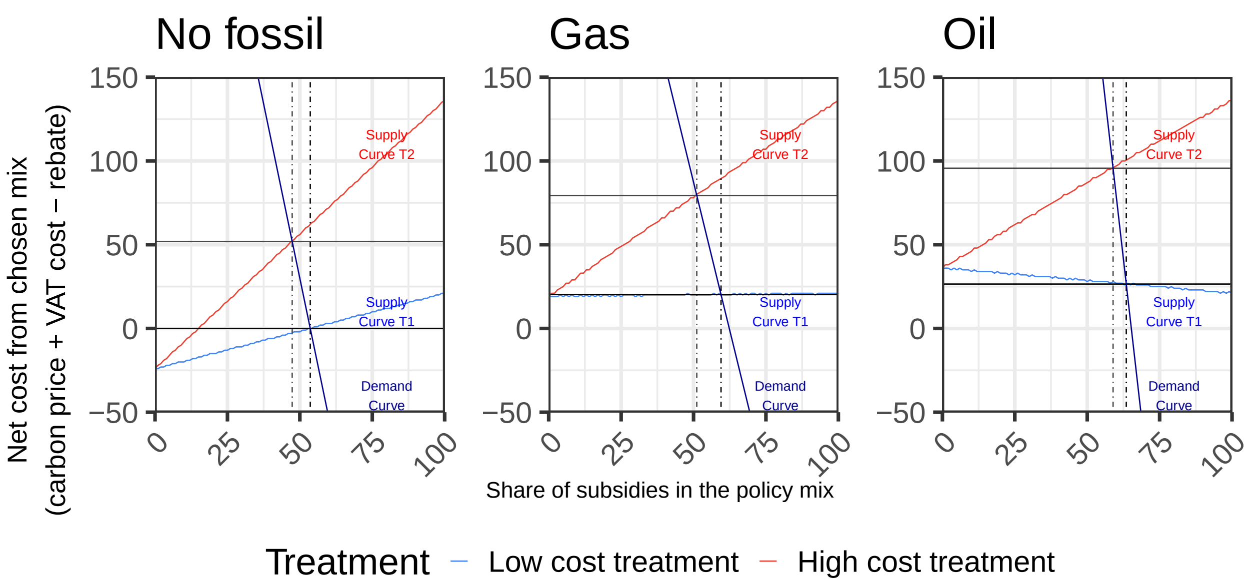

Figure 3: Mean choices of respondents on the policy mix in T1 and T2 given the marginal costs in each experimental setting. The blue (red) line shows the supply function for subsidies in T1 (T2). The (light) dark gray line shows the demanded shares of subsidies under T1 (T2). The shift of supply curves (different slope of the red and the blue curve) is due to the shift in cost efficiency. The supply curves have the exact same y intercept as a policy mix consisting of 0 % subsidies (i.e., 100 % carbon pricing) is independent of the targeting accuracy of subsidies.

to estimate the WTP:

$$WTP_i = \beta_0 + \beta_1 \cdot T_i + \beta_2 \cdot H_i + \beta_3 \cdot T_i \cdot H_i + \beta_4 \cdot X_i, \tag{2}$$

where T_i now is a dummy variable discerning between high and low-cost treatment (T1 and T2) as the control group did not receive any information about policy costs. H_i indicates the respective heating system whereby gas heating is the reference point. The dependent variable WTP_i reflects the aggregated cost for the average household as shown in Equation (1) for the respective policy mix s_i chosen by the respondent. Table B5 summarizes the results depicted in Figure 3 where we interact the treatments with the respective heating system and use the additional costs implied in the chosen policy mix as dependent variable. Since respondents who do not support the policy mix in a theoretical referendum would also not be willing to pay for the inherent cost of the mix, we focus in the following on column 2 of B5. The baseline effect for the treatment variable in column 2 indicates the average increase in the willingness to pay for the policy mix by a gas household in T2 compared to the choice in T1.

On average, this increase amounts to EUR 59. This translates into an average willingness to pay of EUR 708 per year for a gas household as the costs provided to the respondents are reported in monthly terms. We can observe partially positive interaction effects between treatment and heating system. The willingness to pay increases to EUR 75 per month for respondents with oil heating, and falls to EUR 31 per month for respondents without a fossil fuel based heating system. This additional willingness to pay is mainly due to a shift of the supply function for subsidies in the 'High cost treatment'. Respondents react inelastically to this increase in the relative prices for carbon pricing and subsidies such that the high-cost treatment results in higher net costs of the policy package. Column 1 proves that the observed effects hold qualitatively if we include all respondents in the analysis, although significance is partly lost. However, in contrast to Section 4.2, the heating system has a statistically and economically significant effect on the willingness to pay for the respective heating system. In column 3 we test whether our results remain valid if we use a lower bound of WTP and set the additional cost for all respondents who voted "No" in the referendum question to 0. We can see that the baseline WTP for gas households decreases strongly to 43 EUR per month. However, the difference to the low cost treatment remains economically and statistically highly significant. The difference between oil and gas heating system loses significance, indicating that at the lower bound, only people who do not have a fossil fuel heating system decrease their WTP for the policy mix compared to gas households.

In a next step, we can translate this willingness to pay into a quota of how much people are willing to pay in form of general taxes to not pay the same amount in form of a carbon price. To derive this trade-off, we have to determine first which carbon pricing share would have to be chosen in the 'High cost treatment' to be cost equivalent with the average choice made in the 'Low cost treatment'. This difference is the amount of carbon pricing, that respondents want to avoid and for which they are willing to pay a price premium. Figure A8 illustrates this decision. Dividing the willingness to pay (blue bracket) by the avoided share of carbon prices (pink bracket) gives the rate that respondents would be willing to pay additionally for subsidies in order to avoid paying one euro in the form of carbon pricing. Table B10 illustrates these results. Since households without a fossil-fuel heating system do not pay a carbon price at all, they have a (locally) "infinite" willingness to pay for subsidies.[10] This means that respondents are highly reluctant to give up on a certain minimum share of subsidies. Both, oil and gas households are willing to accept price increases of a policy mix by up to EUR 3 to avoid a shift of EUR 1 from subsidies to carbon pricing in the policy mix. In other words, respondents prefer that an average household pays EUR 4 in form of subsidies in order to avoid paying EUR 1 in form of carbon pricing.

We exploit this setup of demand and supply and the WTP derived from it, to examine the following hypothesis.

Hypothesis 3: The higher the aversion against carbon pricing, the higher the willingness to pay for subsidies will be.

Our survey includes one central item that measures attitudes towards carbon pricing and two additional questions that can measure the attitude towards carbon pricing in a broader

[10]This result holds only in the cost ranges that are tested in our experiment.

sense. We consider the first measure individually but also construct an index along with the other two questions concerning carbon pricing as explained in Section D.2. Since we ask the questions that measure attitudes towards carbon pricing after the treatment, there is the risk that our results are endogenous to the treatment effect. As shown in Figure A3, we cannot find significant differences between the high and low-cost treatments after correcting for multiple testing neither for the three separate questions nor in the cumulated index. Therefore, we disregard the risk of endogeneity in this case. Table B6 summarizes the results from the OLS regression. We find that attitudes towards carbon pricing strongly affect the willingness-to-pay. Given a respondent who is assigned to the 'High cost treatment' (T2), column 5 and 6 show that the WTP for subsidies falls on average by EUR 20 (22) when the support for carbon pricing (the index of attitudes towards carbon pricing) increases by one standard deviation. This decrease is somewhat smaller but still robust if we include respondents who do not support the policy mix in column 1 and 2. When we assign a WTP of 0 to non-supporters (column 3 and 4, the variables that measure support for carbon pricing become irrelevant, probably because of a correlation between support for carbon pricing and support of the policy mix.

5 Do respondents understand the experiment?

The treatment groups face during the experimental phase an extensive decision problem. They must compare different costs (price increases for fossil fuels vs. higher general living expenses due to a VAT increase), understand the interaction between the two end points of the slider (when subsidy costs go down, carbon prices increase and vice versa) and draw conclusions under consideration of their own living situation (e.g., people who do not own a fossil heating system are not affected by carbon prices but only by increased VAT rates). Although the results in Section 4 provide confidence that respondents do not decide randomly, we investigate further the sensitivity of our results when we in- or exclude certain respondent groups.

In the following, we check the understanding of respondents with two approaches. First, we will focus on statement questions where respondents had to prove that they understood the problem at hand by checking respondents knowledge about the carbon pricing design and signs of non-attentive behavior. Further, we check whether people can report the VAT rate that would result from their policy mix decision right after the experiment has ended (compare Question 8 in Section F). The distance between the stated and the true VAT rate (true means here the VAT rate that was shown in the table below the sliders) indicates the attention that the respondent spent at the experiment. The VAT check is only feasible for the treatment groups as the control group did not receive VAT rate information. Second, we focus on respondents who show a very high financial literacy or have a high educational attainment.

Table B8 summarizes the check on knowledge and non-attentive behavior. The dummy variable in column 1 controls whether the respondent chose the middle point (50 %) on the slider. Although we cannot exclude that this is the truly preferred policy mix by the respective respondent, it may be the position respondents choose who feel unable or who not willing to decide.[11] It becomes visible, that this group drives especially the treatment effect of the 'High cost treatment' down. Excluding these respondents leads to higher and more significant treatment effects, also for the 'Low cost treatment'. The dummy variable 'Do not understand carbon price mechanism' in column 2 controls for whether the respondent incorrectly answered that a household that switched to a heat pump would still have to pay the carbon price. The interaction term does not indicate that respondents who did not answer this question correctly reacted significantly differently to the treatment. However, excluding these respondents drives again the significance of the 'Low cost treatment' up, indicating that our main results are watered down by respondents not fully comprehending the climate policy instruments presented to them. The last column tests whether treatment effects in our main sample are driven by the exclusion of respondents who showed strong behavior of non-attention and were therefore not included in the main dataset (see section D for an overview of excluded data points). In the full data set the share of carbon pricing increases but the size and effect of the treatments is not significantly affected.

Table B9 summarizes the results of the attention checks by the reported VAT rate. Since we can apply these VAT checks only on respondents from the treatment groups, the reference point for the 'High cost treatment' is T1. We see that in both specifications the interaction between the treatment and the attention check becomes very large and highly significant. The dummies indicate whether the respondent stated the VAT rate shown in the treatment badge correctly. 'Large VAT difference' in column 1 is the wider attention criterion that flags respondents only as inattentive when their answer falls outside the upper or lower 12.5 % of the distribution of VAT differences.[12] The large, highly significant negative coefficient shows that this group even decreases the share of carbon pricing under the 'High cost treatment'. Given that these people can barely report the information provided to them shortly after the experiment, this results indicates again that treatment effects are driven down by respondents who spent little attention. Column 2 defines a stricter attention check by flagging all respondent as inattentive who stated a wrong VAT rate (zero deviation). 54.4 % of the respondents in T1 and 74.3 % of the respondents in T2 do not report the correct VAT rate. Thus, although the treatment effect of T2 is exceptionally large among respondents who stated the correct VAT rate, this is strongly reduced by the other respondents as indicated by the large negative interaction effect in column 2. As a caveat, it should be noted that this panel may be biased by the fact that estimation of a correct VAT (and hence inclusion in the sample) is more likely if very high carbon pricing shares are chosen (the VAT rate rises above 19 % if a carbon pricing share below 46 % is chosen in T1 whereas the VAT remains at 19 % until the carbon pricing share falls below 85 % in T2). Thus, by design, the dummy also includes respondents who cannot remember the VAT rate from the experiment and instead only provide the current VAT rate of 19 % in Germany.

Table B7 tests whether treatment effects differ with respect to the education or financial literacy of the respondent. Adding up the costs components as suggested in equation 1 requires some arithmetic skills. In column 1 we test whether high financial literacy leads to different experimental results. The 'Low financial literacy' dummy in column 1 becomes one if the respondent answered more than one of the three financial literacy questions incorrectly

[11] For a discussion of this assumption see Section D.3

[12] See section D.1 for a description of the VAT rate distribution

(see Section D.2). Whereas we find again under stricter sample definition a significant effect of the 'Low cost treatment, we find no significant effect for the interaction term. However, respondents with low financial literacy react less strongly to the 'High cost treatment'. Thus, the treatment becomes only statistical and economical significant if respondents have a certain level of financial literacy. Education, on the other hand, plays less a role as visible in column 2 where the results barely deviate from the main specification in Table B2. Among highly educated respondents (n = 1,079) the effect of T1 becomes insignificant. We can summarize that our treatments work (non surprisingly) better if respondents are financial literate and spend attention to the survey.

6 Discussion

We conduct a survey experiment with respondents in Germany to analyze the effect of salience about costs and benefits on the preferences for carbon pricing and subsidies on green technologies as alternative means of climate policy. Our design ensures that we can identify via the control group whether the salience of subsidy costs is the driving force of acceptance. We find that this salience effect exists – even in a setting where hypothetical subsidies are just as effective as carbon pricing – if we focus on respondents who show high attention during the experiment. Otherwise, respondents treated with (realistic) high-cost subsidies react to the salience effect and choose a higher share of carbon pricing in the policy mix. Further, we cannot say whether the information text about carbon pricing and subsidies shifts policy views in general as all groups see this basic information. An uninformed control group might choose a different baseline level of carbon pricing in the policy mix. We deliberately opt for this approach as there is already ample evidence in the literature, suggesting that the aversion to carbon pricing is barely driven by misconceptions about how it works and its emission abating effect. It is of high interest to single out the effect of cost salience. If this salience does not change peoples behavior, we can deduct that respondents are subject to behavioral biases favoring subsidies or that there is an intrinsic preference for subsidies which is not driven by a lack of awareness of subsidy costs. We observe that cost salience decreases the support for subsidies. Still, the subsidy share remains at a high level across the treatment. Hence, although people do not seem to be fully aware of the inherent costs, they have other reasons for favoring subsidies that we cannot account for in our experiment.

We do not make explicit to the respondents how effective the subsidy (or carbon pricing, respectively) is in their treatment group. Respondents are also not confronted with the alternative subsidy setting (each respondent makes the slider decision only once). Their response behavior may change if they are informed that they face a highly (in)effective policy. Again, we chose this approach on purpose. We argue that this design replicates a real world scenario where citizens cannot assess the efficiency of a subsidy scheme ex-ante but, in fact, learn about the fiscal costs and monetary implications on the average household. Thus, clearly stating how effective subsidies are compared to carbon pricing in the respective treatment could add an unrealistic bias to our experiment. Second, the low cost subsidy is actually a non-implementable instrument. We only consider this option as a hypothetical benchmark, where from a welfare economic perspective, a decision maker would be indifferent between carbon pricing and subsidies. A subsidy will only in very rare cases (which cannot be implemented at scale) be as cost-effective as a carbon price. However, it would be still of interest how the decision behavior of respondents changes if they are informed about the policies' varying effectiveness.

By comparing respondents choices in the treatments with efficient and costly subsidy options, we compute an average willingness-to-pay for subsidies of EUR 63 (when accounting for all respondents). This estimate is not based on a continuum of policy options but two discrete points. Thus, we expect that the willingness-to-pay is a lower bound: If preferences for subsidies are indeed sticky, further increasing the cost of subsidies (case studies suggest that substantially higher inefficiency factors are possible) in the policy mix, should also increase the willingness-to-pay as long as support for the policy mix does not break down entirely.

Our experiment indicates that the fiscal effects of subsidy payments are "shrouded" attributes that suffer a lack of attention in the public discourse. Making them salient to respondents influences their policy preferences. However, we also document that the demand for subsidies is to some extent resilient to information provision. Even people who bear no direct burden of carbon pricing and cannot expect to benefit from subsidy payments (e.g., because they already run a heat pump), support policy mixes consisting to a substantial degree of subsidies. Identifying the underlying causal effects is beyond the scope of our paper. Future research might address this question to determine whether social concerns, effectiveness concerns, behavioral biases or other mechanisms play a pivotal role that increases people's willingness-to-pay for climate policy. From a welfare economic approach it is imperative to understand whether inefficiency costs of subsidies are justified by other benefits.

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Appendix

A Figures

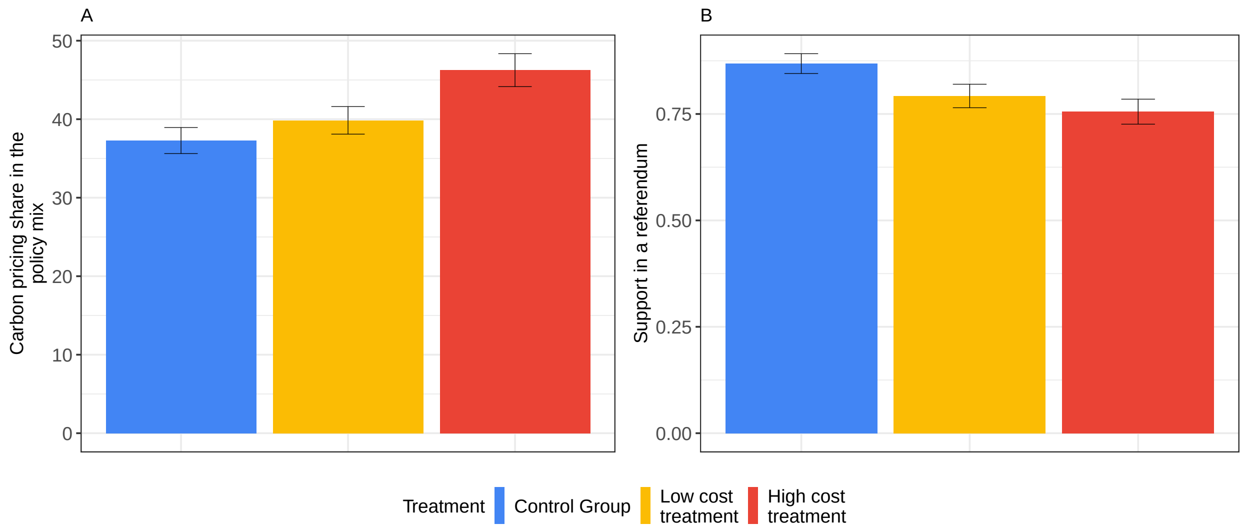

Figure A1: (A): Mean share of carbon pricing in the policy mix with respect to treatment group. (B): Mean support for the chosen policy mix with respect to treatment group. Support rate is measured as theoretical support if the chosen policy mix is up for vote in a referendum

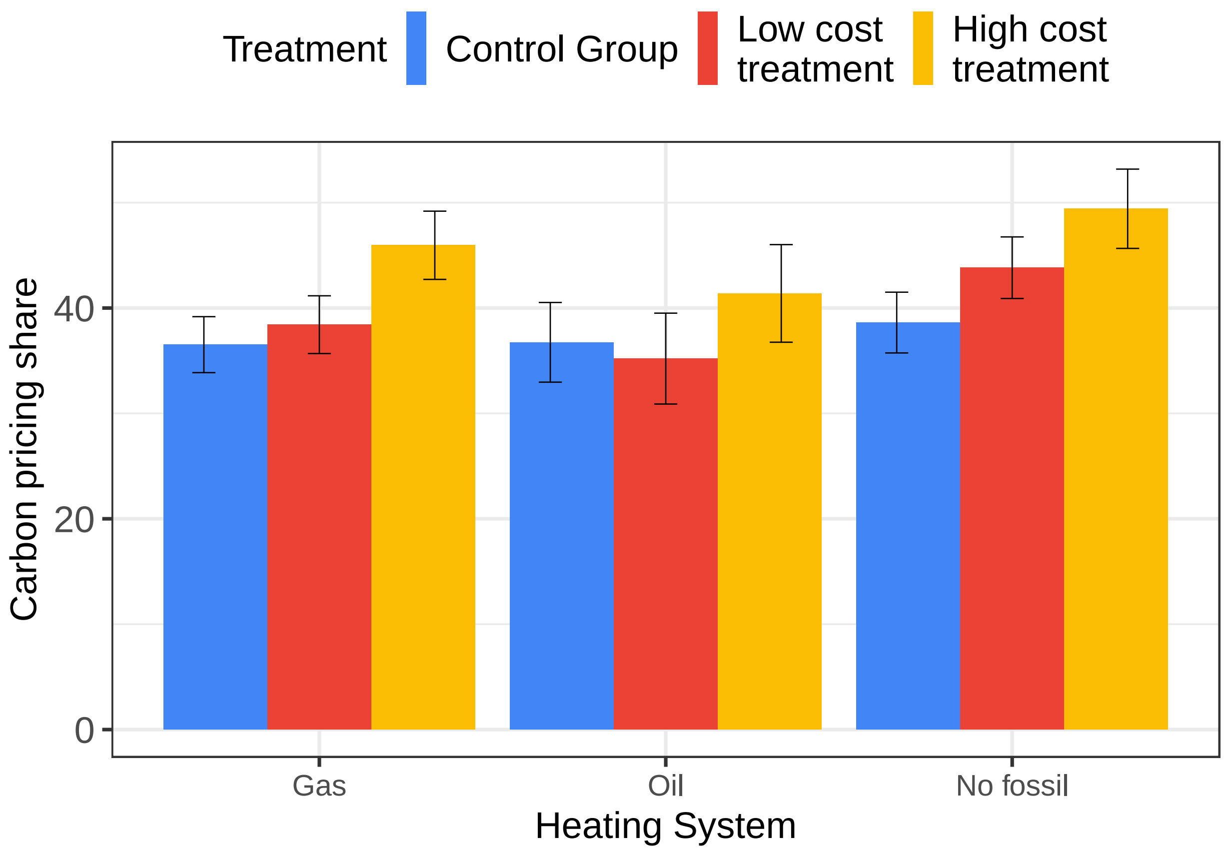

Figure A2: Mean share of carbon pricing in the chosen policy mix with respect to heating system and group. 148 respondents do not know their heating system and are therefore not included.

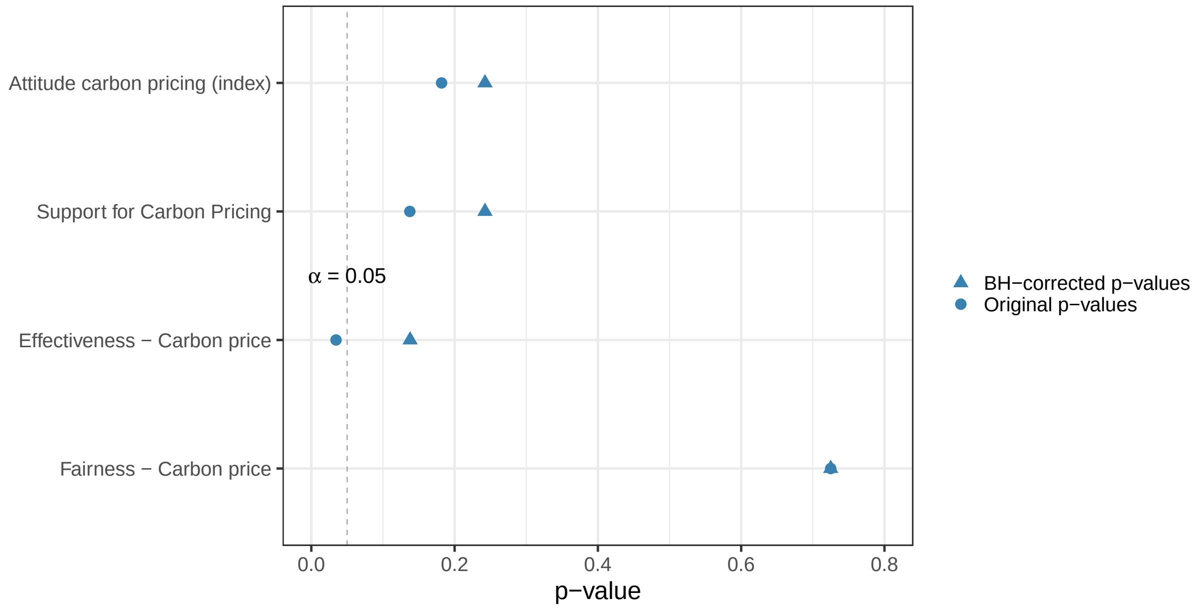

Figure A3: The results shown refer to the treatment effect of T2 compared to T1 on the variables that measure attitudes towards carbon pricing in Table B6. Support for carbon pricing is the single core measure for carbon pricing support. Effectiveness and Fairness are supplementary measures that are included in the composite index that captures attitudes towards carbon pricing. The p-values are FDR (BH-) corrected to account for multiple testing. None of the corrected p-values falls below the critical threshold of $\alpha = 0.05$. The coefficient with the respective confidence intervals (without p-value correction) are shown in Figure A4.

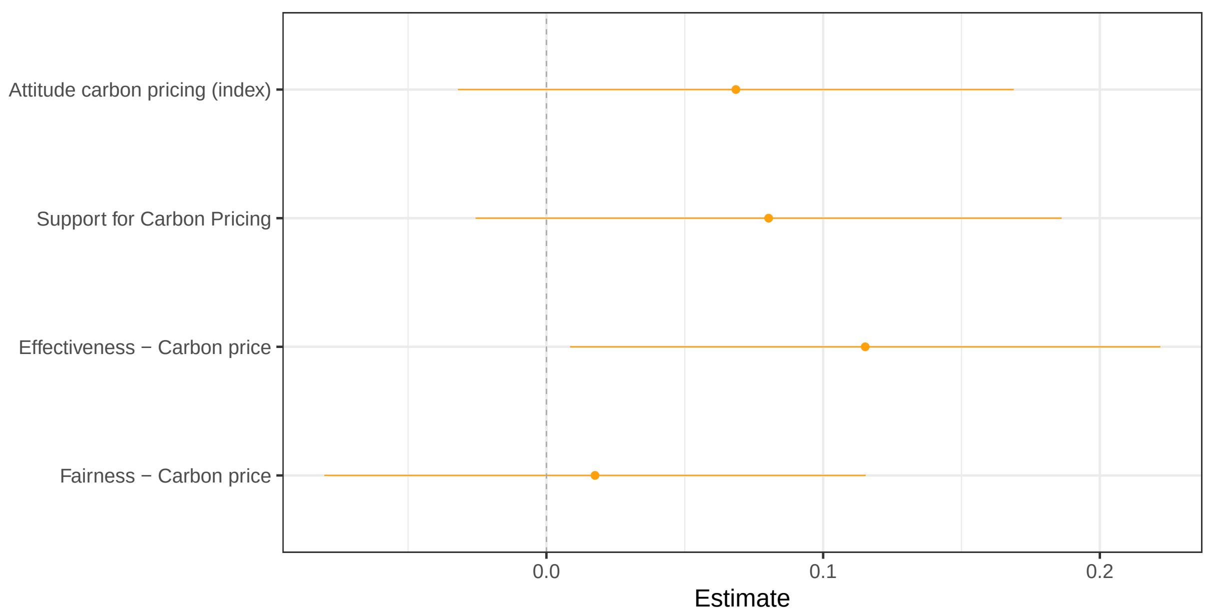

Figure A4: The results shown refer to the treatment effect on the variables that measure attitudes towards carbon pricing in Equation B6.

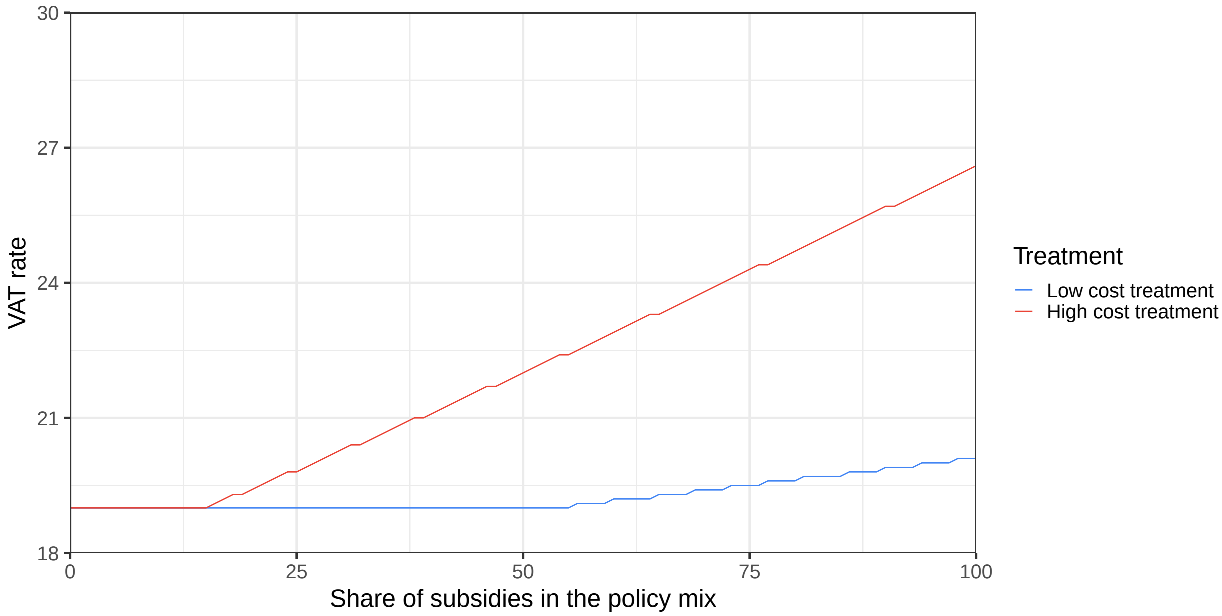

Figure A5: VAT rate that is shown to respondents in T1 and T2 during their choice on the slider. If the share of subsidies is very small, respondents are informed that the VAT rate remains unchanged at 19 % (VAT level in Germany in 2024). If they increase the share of subsidies and the VAT increases beyond 19 %, respondents are informed that the rate increases to the respective level and about the resulting additional cost for an average household. The VAT rate does not increase at very low subsidy levels because the subsidies are first financed from the carbon pricing revenues. Since subsidies are costlier in T2, the VAT rate rises earlier.

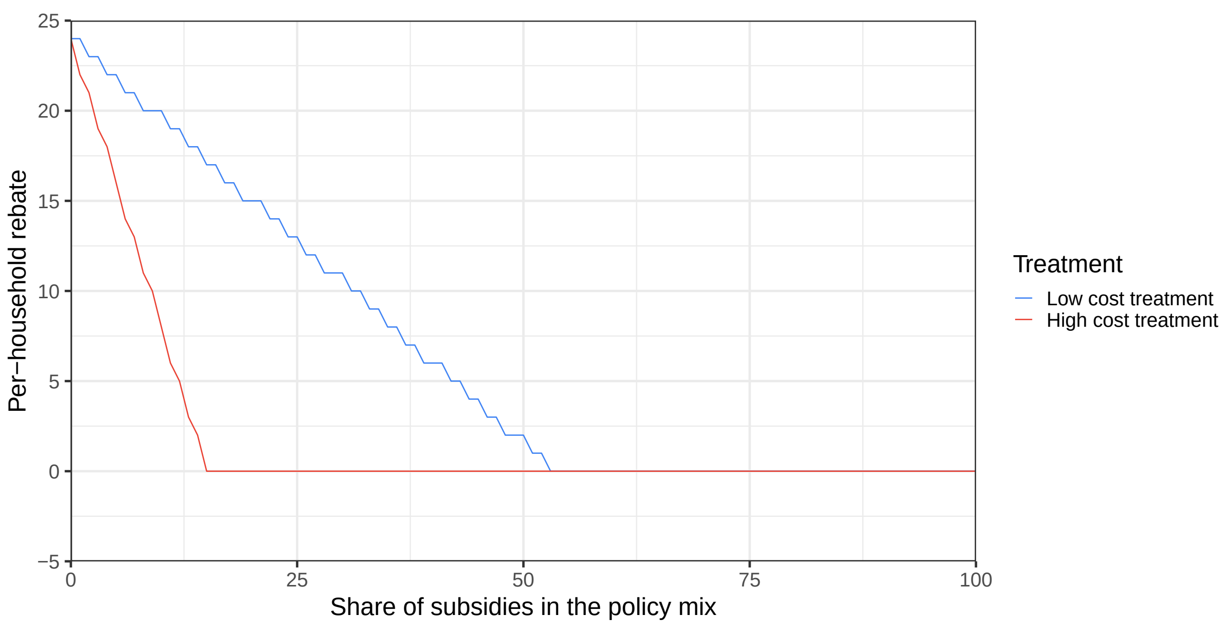

Figure A6: Per household redistribution from carbon revenues that is shown to respondents in T1 and T2 during their choice on the slider. If the share of subsidies is very low (i.e., the share of carbon pricing is very high) the 'free revenues' are divided by the number of households in Germany and paid back directly. Since subsidies are costlier in the 'High cost treatment', the revenues are consumed faster at low levels of subsidy payment and the redistribution reaches 0 earlier.

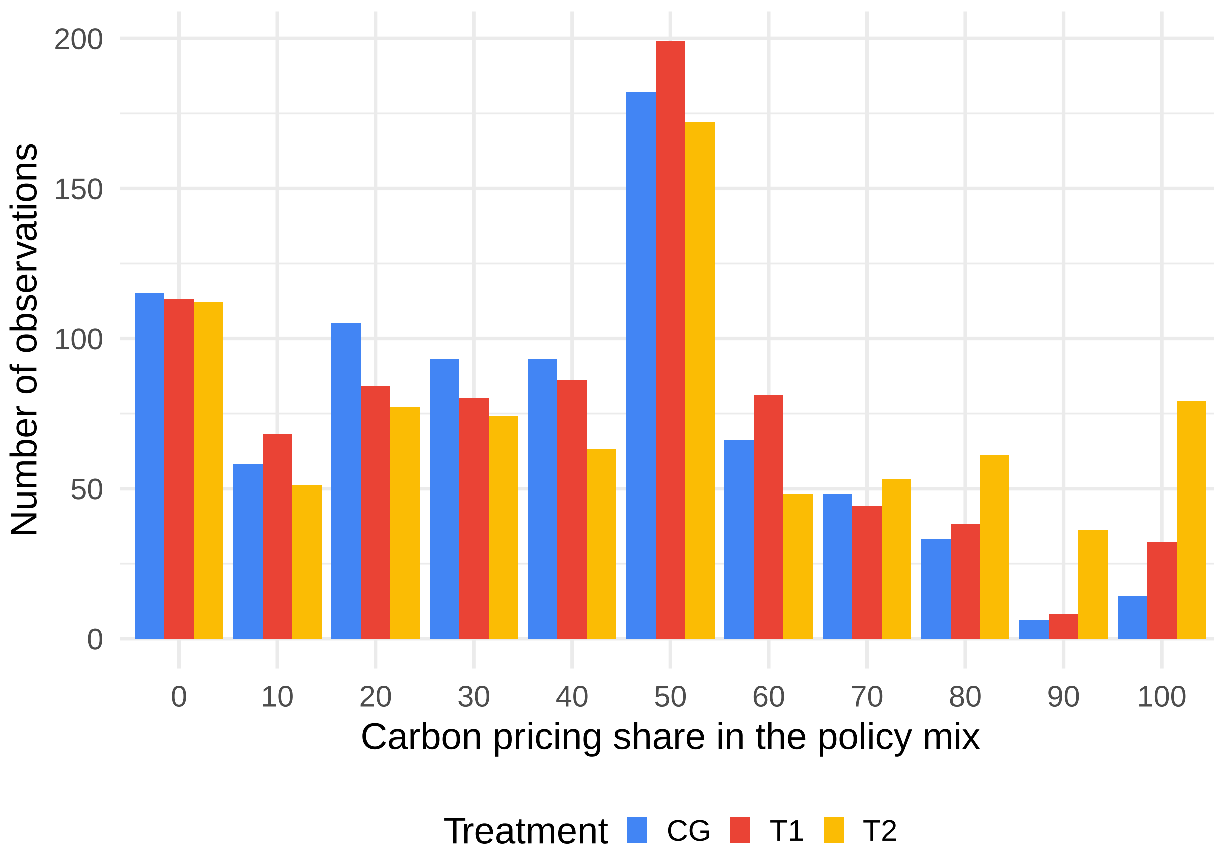

Figure A7: Change in distribution of choices due to treatments. Particularly under T2, the distribution of answers is moved in the direction of high carbon pricing shares (70-100%)

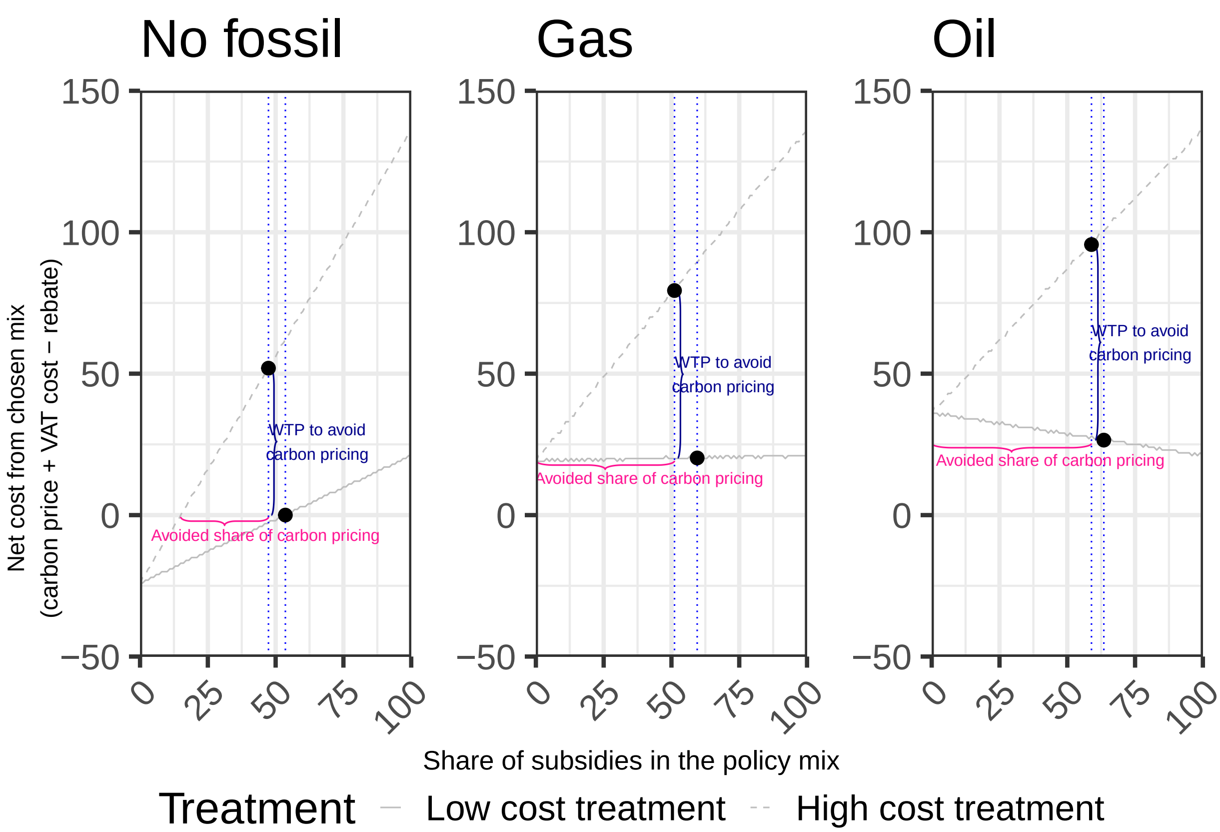

Figure A8: Relationship between "avoided" carbon pricing and additional costs in T2. Point of reference on the x-Axis is the chosen share of subsidies in T1 and the corresponding cost on the y-axis. The pink bracket shows, how much more carbon pricing a respondent would have had to accept in T2 to reach the same policy costs as in T1. The blue bracket shows what this additional share of subsidies (i.e., not carbon pricing) is worth to the respondent.

B Tables

Table B1: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Median	Pctl. 75	Max	NA	Population Mean
Age[1]	2472	49	15	18	35	51	61	75	0	47
Male [2]	2472	0.5	0.5	0	0	1	1	1	0	49 %
Net income [3]	2472	3495	2221	1000	2500	3500	4500	15163	0	3650
East Germany [4]	2472	19%	39%	0	0	0	0	1	0	19 %
Household Size [5]	2472	2.2	1.1	1	1	2	3	12	0	2.03
Education [6]	2472									
Basic school certificate or less	243	10%								36 %
Secondary school certificate	836	34%								30 %
University entrance qualification	1,393	56%								34%
Employed [10]	2472	63%	48%	0	0	1	1	1	0	77.2 %
City (>100.000 inhabitant)	2472	34%	48%	0	0	0	1	1	0	
Family Status	2472									
Partnership	1529	62%								42.5 %
Single	943	38%								56.6 %
Heating system	2324								148	
Gas	1069	46%								56 %
Oil	481	21%								19 %
Heat Pump/ Solar energy	225	9 %								3 %
District Heat	386	17%								15%
Other	163	7%								7 %
Living space [7]	2472	107	186	0	65	90	125	8000	0	94.4
Climate policy mix support	2472	81%	40%	0%	100%	100%	100%	100%	0%	
Carbon pricing share	2472	41%	27%	0%	20%	45%	56%	100%	0	
Support climate policy in general	2472	4.5	2.7	0	3	5	6	10	0	
Financial literacy (correct answers out of 3)	2472	2.2	0.86	0	2	2	3	3	0	

[1] Population mean of people aged 18 to 74 as of 2023 (Statistisches Bundesamt 2024a).
[2] Population mean of gender as of 2024 (Statistisches Bundesamt 2024d).
[3] Population mean of net income as of 2023 (Statistisches Bundesamt 2024f).
[4] Share of population living in east Germany as of 2022 (Statistisches Bundesamt 2024c).
[5] Household size as of 2023 (Statistisches Bundesamt 2024g).
[6] Educational attainment of population 15 years and older as of 2019 (Statistisches Bundesamt 2024b).
[7] Heating system shares and living in 2022 (Statistisches Bundesamt 2024i).
[8] Housing situation in 2023 (Statistisches Bundesamt 2024j).
[9] Housing situation in 2023 Family status in 2022 (Statistisches Bundesamt 2024h).
[1]0 Labor force participation rate between 15 and 65 in 2023 (Statistisches Bundesamt 2024e).

Table B2: Treatment effects on the chosen share of carbon pricing in the policy mix

	(1)	(2)	(3)	(4)
Low cost treatment	2.574+	2.592+	3.713**	3.671**
	(1.333)	(1.330)	(1.425)	(1.420)
High cost treatment	8.968***	8.889***	10.226***	10.109***
	(1.336)	(1.334)	(1.446)	(1.443)
Age		-0.025		-0.024
		(0.038)		(0.042)
Male		-1.557		-2.850*
		(1.103)		(1.199)
Net income (equivalent, logged)		3.483***		3.858***
		(1.013)		(1.123)
East		-1.874		-2.337
		(1.425)		(1.559)
Household size		0.598		0.268
		(0.506)		(0.554)
Technical degree		-0.124		1.061
		(2.001)		(2.244)
(Technical) high school degree		2.137		3.323
		(2.101)		(2.328)
University degree		1.699		2.093
		(2.139)		(2.357)
Small city		1.550		2.059
		(1.861)		(2.000)
Suburbs		-0.347		-0.709
		(2.320)		(2.459)
Town close to city		-0.040		1.224
		(2.008)		(2.172)
Town		-1.812		-0.840
		(2.135)		(2.335)
Rural area		-3.685*		-3.812*
		(1.648)		(1.777)
Num.Obs.	2472	2472	1990	1990
R2	0.019	0.035	0.025	0.045
R2 Adj.	0.018	0.029	0.024	0.038
Sample	All	All	Supporters only	Supporters only
Diff T1 vs. T2 F-Test, p-val.	0	0	0	0

Treatment effect on the chosen share of carbon pricing in the policy mix. Point of reference for the treatment variable is the Control Group. Reference point for education is the lowest education level in Germany (basic school leaving certificate) and living area is compared to respondents living in a city. 'Sample' indicates whether all repsondents or only those who would support the chosen policy mix in a referendum are included.
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B3: Treatment effects on referendum support

	(1)	(2)
Low cost treatment	-0.076***	-0.075***
	(0.019)	(0.019)
High cost treatment	-0.113***	-0.111***
	(0.019)	(0.019)
Age		0.000
		(0.001)
Male		0.020
		(0.016)
Net income (equivalent, logged)		0.032*
		(0.015)
East		-0.038+
		(0.021)
Household size		0.003
		(0.007)
Technical degree		0.024
		(0.029)
(Technical) high school degree		0.083**
		(0.031)
University degree		0.102**
		(0.031)
Small city		0.000
		(0.027)
Suburbs		0.022
		(0.034)
Town close to city		-0.026
		(0.029)
Town		-0.042
		(0.031)
Rural area		-0.017
		(0.024)
Num.Obs.	2472	2472
Sample	All	
R2	0.014	0.032
R2 Adj.	0.013	0.026
Diff T1 vs. T2 F-Test, p-val.	0.0566	0.0605

Treatment effect on the chosen share of carbon pricing in the policy mix. Point of reference for the treatment variable is the Control Group. Reference point for education is the lowest education level in Germany (basic school leaving certificate) and living area is compared to respondents living in a city.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table B4: Treatment effects on the chosen share of carbon pricing in the policy mix: differences between heating systems

	(1)	(2)
Low cost treatment	1.903	2.833
	(2.046)	(2.183)
High cost treatment	9.203***	11.070***
	(2.029)	(2.204)
Oil heating	0.707	1.082
	(2.599)	(2.721)
No fossil heating	2.300	2.040
	(2.262)	(2.345)
Low cost treatment:Oil heating	-3.410	-4.587
	(3.684)	(3.980)
High cost treatment:Oil heating	-4.503	-8.338*
	(3.626)	(3.909)
Low cost treatment:No fossil heating	3.427	4.287
	(3.142)	(3.316)
High cost treatment:No fossil heating	1.584	1.958
	(3.161)	(3.401)
Num.Obs.	2324	1880
R2	0.043	0.058
R2 Adj.	0.034	0.048
Sample	All	Support referendum

Treatment effect on the chosen share of carbon pricing in the policy mix. Point of reference for the treatment variable is the Control Group. All estimates are calculated under the inclusion of socio-demographic controls.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B5: Willingness to pay for subsidies in the policy mix

	(1)	(2)	(3)
High Cost Treatment (Ref: Low cost treatment)	62.755***	59.250***	42.713***
	(2.146)	(2.340)	(2.532)
Oil heating	5.583*	6.103*	4.058
	(2.795)	(3.054)	(3.298)
No fossil heating	-19.967***	-21.264***	-16.397***
	(2.346)	(2.488)	(2.768)
High Cost Treatment (Ref: Low cost treatment):Oil heating	6.090	9.319*	12.375**
	(3.873)	(4.218)	(4.570)
High Cost Treatment (Ref: Low cost treatment):No fossil heating	-6.471+	-6.909+	-2.432
	(3.300)	(3.560)	(3.894)
Num.Obs.	1561	1216	1561
R2	0.585	0.601	0.359
R2 Adj.	0.581	0.595	0.351
Sample	All	Supporters only	All

Point of reference for the treatment variable is the ‘Low cost treatment’ and gas heating for the heating systems. All estimations include the full set of control variables. In column (3), the dependent variable is set equal to zero for people who oppose the policy mix.
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B6: Willingness to pay for subsidies in the policy mix: role of attitudes

	(1)	(2)	(3)	(4)	(5)	(6)
High Cost Treatment (Ref: Low cost treatment)	61.916***	62.079***	43.674***	44.024***	66.248***	66.548***
	(1.569)	(1.619)	(1.853)	(1.924)	(1.746)	(1.825)
Support for Carbon Pricing	-2.173*		-0.006		-2.723*	
	(1.068)		(1.262)		(1.135)	
High Cost Treatment (Ref: Low cost treatment): Support for Carbon Pricing	-14.792***		-2.951+		-17.246***	
	(1.498)		(1.770)		(1.641)	
Attitude carbon pricing (index)		-2.982*		-0.578		-3.538**
		(1.195)		(1.421)		(1.290)
High Cost Treatment (Ref: Low cost treatment): Attitude carbon pricing (index)		-16.735***		-2.387		-18.665***
		(1.685)		(2.003)		(1.878)
Num.Obs.	1478	1381	1478	1381	1112	1050
R2	0.546	0.551	0.286	0.288	0.593	0.589
R2 Adj.	0.541	0.545	0.278	0.279	0.587	0.582
Sample	All	All	All	All	Supporters only	Supporters only

Effect of carbon pricing support on the willigness to pay for subsidies. Explanatory variables are z-scored. For a description of the index calculation see Section D.2. In column (3) and (4), the dependent variable is set equal to zero for people who oppose the policy mix.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B7: Heterogeneity of treatment effects: Education

	(7)	(8)
Low cost treatment	3.301*	2.676
	(1.484)	(1.765)
High cost treatment	10.267***	10.347***
	(1.481)	(1.770)
Low fin. literacy	1.446	
	(2.311)	
Low cost treatment:Low fin. literacy	-3.591	
	(3.328)	
High cost treatment:Low fin. literacy	-7.975*	
	(3.426)	
Low education		-0.527
		(2.637)
Low cost treatment:Basic education		-0.271
		(2.688)
High cost treatment:Basic education		-3.340
		(2.690)
Num.Obs.	2472	2472
R2	0.038	0.035
R2 Adj.	0.031	0.029
Sample:	All	All

Interaction between treatments and indicators of attention and understanding. All p-values are Benjamini-Hochberg corrected. The full set of control variables is included. (1): 'Low fin. literacy' (n = 462) indicates respondents with who answered more than one financial literacy question wrong, (2): 'Basic education' (n = 1079) indicates respondents with a technical degree or less

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B8: Heterogeneity of treatment effects: Attention measured by answer behaviour

	(1)	(2)	(3)
Low cost treatment	3.223*	4.433*	2.538+
	(1.419)	(1.950)	(1.311)
High cost treatment	10.522***	9.649***	8.871***
	(1.422)	(1.939)	(1.315)
50pp	15.080***		
	(2.634)		
Low cost treatment:50pp	-3.163		
	(3.795)		
High cost treatment:50pp	-10.490**		
	(3.846)		
Do not understand carbon price mechanism		-2.112	
		(1.898)	
Low cost treatment:Do not understand carbon price mechanism		-3.654	
		(2.662)	
High cost treatment:Do not understand carbon price mechanism		-1.670	
		(2.660)	
Full sample			6.086*
			(2.126)
Low cost treatment:Full sample			-5.803
			(3.258)
High cost treatment:Full sample			-5.932
			(3.184)
Num.Obs.	2472	2472	2948
R2	0.056	0.040	0.032
R2 Adj.	0.049	0.033	0.026
Sample:	All	All	All

Interaction between treatments and indicators of attention and understanding. All p-values are Benjamini-Hochberg corrected. The full set of control variables is included. (1): '50pp' (n = 334) indicates that respondent chose 50 pp as carbon pricing share in the policy mix, (2): 'Do not understand carbon price mechanism' (n = 1303) indicates respondent answered Question 10 wrongly or with 'Don't know', (3): 'Full sample' (n = 476) indicates that respondent is dropped during data cleaning

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B9: Heterogeneity of treatment effects: Attention measured by reported VAT rate

	(1)	(2)
High Cost Treatment (Ref: Low cost treatment)	9.302***	27.250***
	(1.610)	(2.124)
Large VAT difference	0.808	
	(2.180)	
High Cost Treatment (Ref: Low cost treatment):Large VAT difference	-11.807***	
	(3.133)	
VAT false		-16.806***
		(1.720)
High Cost Treatment (Ref: Low cost treatment):VAT false		-23.702***
		(2.622)
Num.Obs.	1659	1659
R2	0.045	0.261
R2 Adj.	0.036	0.253
Sample:	Treatment Groups	Treatment Groups

Interaction between treatments and indicators of attention and understanding. All p-values are Benjamini-Hochberg corrected. The full set of control variables is included. (1): 'Large VAT difference' ($n = 440$) indicates VAT rates that fall in the outer 25pp of the distribution, (2): 'VAT correct' ($n = 1067$) indicates that the respondent reported the correct VAT rate
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	No fossil	Gas	Oil
Avoided share of carbon pricing in pp	15.00	51.12	58.92
Avoided carbon price	24.30	82.82	95.46
Avoided expenditures for carbon pricing for an avg. household	0.00	240.00	288.00
Willingness to pay	623.23	710.14	829.59
Trade off: Expenditures for carbon price vs. subsidies	Inf	2.96	2.88

Table B10: Willingness to pay for avoidance of carbon pricing

C Policy mix calculation

C.1 Carbon price

The *carbon price* of 207 EUR per ton CO2e is based on the REMIND-EU prices for a combined ETS/ESR emission trading system. The gap in ambition (the EU aspires carbon neutrality in 2050 whereas the German target is 2045) is neglected in further calculation. For simplicity, we assume that the emission gap with respect to the German Emission goals caused by a carbon price < 207 EUR in 2030 increases linearly with a decreasing price level. Although Pietzcker et al. (2021) show that a lower ambition level does not lead to a proportionally lower emission path, calculating the emission path for a continuously decreasing price level, as simulated in the slider experiment, is computationally not feasible with the REMIND model.

The emissions in the housing sector are taken from the German Climate Protection Law.[13] It prescribes a reduction to 66 Mt CO2e in the housing sector until 2030. This implies a delta of 46 Mt CO2e between the emissions in 2022 and the aspired level in the housing sector. However, not all buildings are private buildings so that only a share of these emissions must be saved by private households. According to Becker et al. (2023, p.7), 91 % of buildings are private residential buildings. Thus, we end up with an emission gap E_h of 41.7 Mt CO2e that must be mitigated by private individuals. We assume that the KSG targets will be achieved if the carbon price is set at EUR 207 in 2030. Any carbon price below the REMIND-EU optimal level leads to residual emissions. These must be reduced by subsidies, the only alternative emission reduction instrument in our experiment. At a carbon price of 0 EUR, all emission reductions are financed through subsidy programs.

Respondents in the treatment group receive information of the *fossil fuel price increases* driven by carbon pricing as one element of the policy mix. The price increases vary with the choice of carbon pricing share. The price increase is calculated as delta between the German carbon price as of 2024 (45 EUR per ton of CO2e) and the level chosen by the respondent. This means that if the respondent chooses a policy mix that is solely based on subsidies, it still includes a carbon price of 45 EUR. The price changes include the VAT which is recursively adapted (i.e., if the policy mix includes a VAT increase, the fossil fuel prices are adapted to the new tax level). However, the revenues generated stay constant.[14]

C.2 Calculation of VAT rate increase

The budget required to finance the *subsidies* depends on the cost factor γ which equals the ratio between the cost of a ton of CO2e mitigated by the carbon price and the cost of mitigation through a subsidy payment, i.e.

$$\gamma = \frac{\text{cost of subsidy per ton CO2e}}{\text{carbon price per ton CO2e}} \tag{3}$$

The low cost subsidy ($\gamma = 1$) assumes a subsidy program that is just as effective as a carbon price (first best instrument). This means that the program is aimed at exactly the same type of emission sources as the Pigouvian tax would address. Although it is impossible to implement such an instrument in reality, this part of the study will examine whether respondents are steered towards one of the two instruments when the costs of subsidies are salient but not overly high. The high cost subsidy level is equal to $\gamma = 6.5$ resulting in an implicit price of 1,345.5 EUR per ton CO2e mitigated through the subsidy which is motivated by the results of Kalkuhl et al. (2013).[15] These higher costs come along with massive increases of VAT levels (up to almost 8 pp).

[13] Updated numbers from Umweltbundesamt (2023) are used.

[14] A change in VAT is not taken into account when calculating the subsidy budget, as this would lead to an endogenous relationship between R and VAT. Although this is mathematically solvable, we consider a constant VAT as sufficient for our approximation of changes in the government budget.

[15] A review of the current subsidy programs in the German residential building sector show costs between EUR 596 and EUR 3,548 with an average of EUR 1,392 (Prognos/ ifeu/ FIW/ ITG 2024, p.72)).

The *VAT increase* to finance the subsidy budget is calculated based on the price elasticities in Ploeg et al. (2022). The authors report the own- and cross-price elasticities for the first and fourth quartile. We approximate the reaction to a VAT increase by taking the mean values of the two respective tables and multiply them with the expenditures reported in the EVS 2018.The change in VAT revenue is calculated as the sum of weighted differences between the share of VAT in the expenditures before the VAT increase and the new consumption expenditures times the new VAT rate. With this approach, we also take the change in the tax base due to price elasticities into account (Laffer effect). Potential decreases in emissions due to changes in consumption patterns are as second order effects neglected.Table C11 provides an overview of example budgets and the corresponding tax rates.

Table C11: VAT increases and generated government budget

VAT	Revenue in bln. EUR
0.01	9.43
0.02	18.66
0.03	27.69
0.04	36.51
0.05	45.14
0.06	53.57
0.07	61.79
0.08	69.81
0.09	77.63
0.1	85.25

Note:

Since an exact calculation of continuous VAT changes is computational highly intensive, we approximate the relationship between the budget and VAT changes with the formula

$$\Delta\text{VAT in pp} = \frac{R}{11.19702} * 0.01 * 1,01^{\frac{R}{11.19702}} \tag{4}$$

whereby 11.19702 is the exactly calculated change in government budget in billion EUR for an VAT increase of 1 pp and R is the revenue gap that needs to be financed by the VAT. Figure C1 shows that the delta between the real and approximated values remains small.

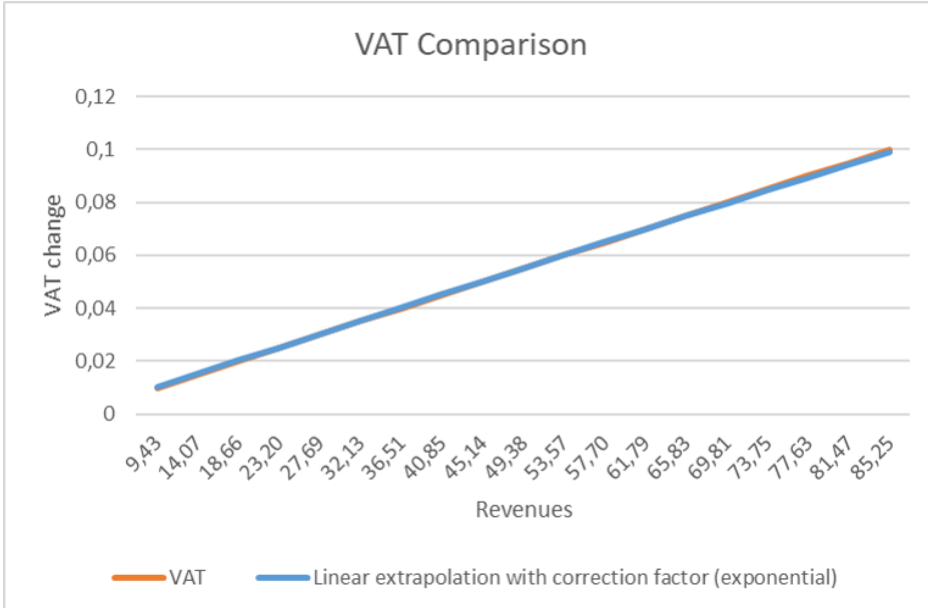

Figure C1

The exact budget R that must be financed via the VAT depends on two factors: the level of the subsidy cost parameter γ and the share π of climate mitigation efforts that is exerted via the carbon tax. Thus, R results as

$$R = E_h * (1 - \pi_i) * \gamma * 207 * 1.19 - rev^{cprice_i} \tag{5}$$

whereby $\pi_i = \frac{cprice_i}{207}$ is the policy mix chosen by individual i. The total revenue from the respective implicitly chosen price level ($rev^{price_{ij}}$) is calculated with the distribution calculator developed by Roolfs et al. (2021). They amount to a total of 21.8 bln. EUR in 2030 if the carbon price is set at its optimal level whereby we deduct 45 EUR per ton CO2 that are already implemented as carbon price level in 2024 (net carbon price equals to 162 EUR per ton CO2). Since these current revenues are already allocated to other projects (which is probably known to most of the respondents) we would deceive the respondents when claiming that this money is free for subsidy projects.

Based on the emission calculations by Roolfs et al. (ibid.), we scale emissions down to 2030 target levels (according to KSG, Appendix 2). We calculate the private emissions in the EVS 2018 first (102 Mt CO2 in the housing, 95 Mt CO2 in the transport sector). Afterwards, we multiply the emissions by the respective sectoral emission reduction goals (-41 % in the housing sector, -45 % in the transport sector compared to 2018).[16] We assume here that private and non-private emissions are mitigated proportionally (the KSG goals capture both). Only 53.96 % of the revenues from the carbon pricing mechanism in 2030 is redistributed, as the remaining revenues will stem from the transport sector in 2030. Since we do not decrease emissions linearly in the housing sector, this share deviates from the allocation in 2018. We consider only the emissions that are priced in 2030. If a carbon price of 207 EUR is implemented, emissions will decrease to the target emissions in 2030. Thus, we can only put a price on these remaining emissions.

To avoid negative VAT changes (i.e., VAT would decrease below it current level), we define a corner solution for $R < 0$. The corner solution is reached if the share of carbon pricing in the policy mix (π) surpasses the financing need for the respective subsidy (high or low cost). In this case, a per-household redistribution is paid out. All remaining revenues are distributed equally among all German households.

[16] 60/102 for the housing and 52/95 in the transport sector

D Data quality

The median (mean) response time for completing the survey was 12 (24) minutes.We can show that over 90% of the respondents consider the information provided as rather trustworthy or very trustworthy and over three quarter consider the survey as politically balanced. One has to consider that we deal with a heavily surveyed population as over 85% fill out a survey once a week or even more. Although this makes the results less generalizable, there is no evidence to our knowledge that customers of survey platforms have skewed views on climate policy. Table D12 describes how many observations were dropped due to technical reasons. Since one observations can be dropped due to several reasons, the total numbers dropped adds up to 336. Table D12 describes how this table was further cleaned with respect to attention checks. 476 respondents were dropped in this step.

Table D12: Cleaning due to technical errors (random)

Condition	Number of observations dropped
Error in Slider programming	120
Double ID Cases	4
Quota application	240

Table D13: Cleaning due to inattention

Condition	Number of observations dropped
Slowest 5 pp of the overall sample	22
Wrong ZIP code	36
2nd attention check	164
Spent than 10 seconds on slider and info treatment	306

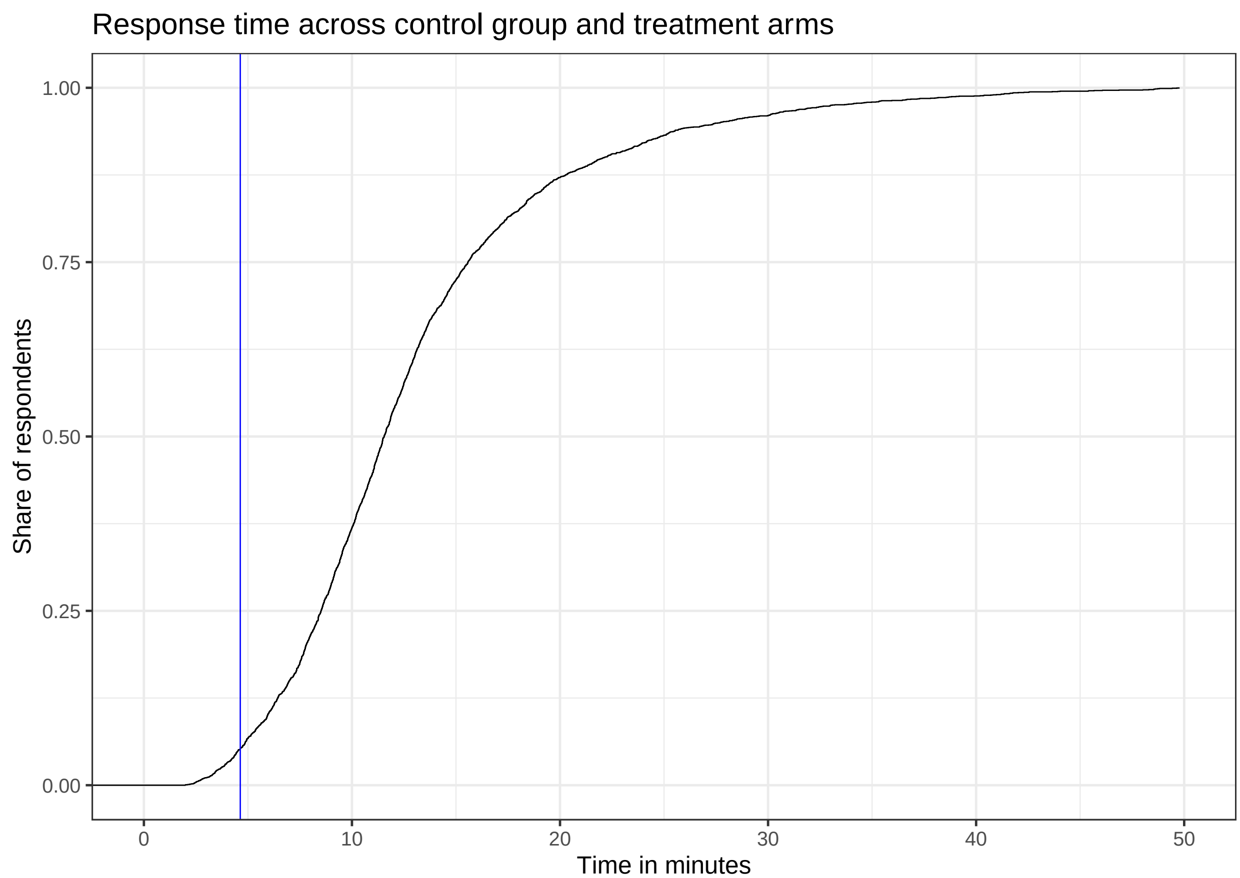

Figure D1: Share of respondents who completed the survey in a certain time. The black line shows the distribution across all respondents who completed the dataset. The blue line shows the minimum response time of respondents who are included in the final dataset.

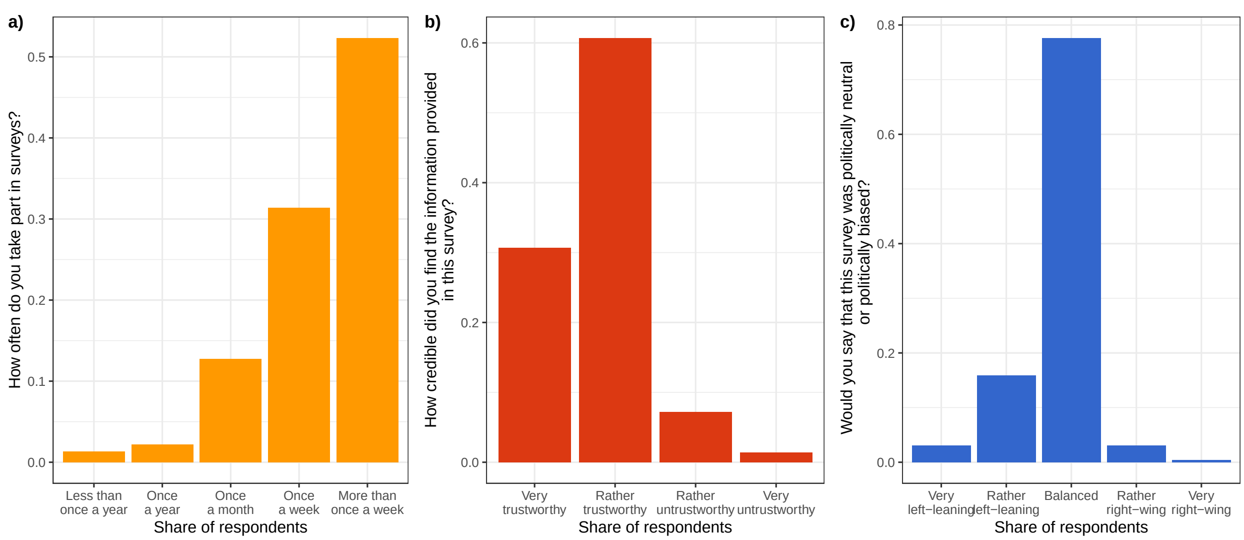

Figure D2: Type of respondents and their perception of the survey. Shares refer to the full dataset with 2,948 respondents.

D.1 VAT rate differences

After the experiment, we ask all respondents in the treatment groups to report the VAT rate that was implied in their decision. With this, we want to single out respondents who did not pay attention to or did not understand the full set of consequences implied in their decision. Figure D3 presents the distribution of the actual VAT and the stated rate in Question 8 (only shown to the treatment groups). The dotted lines represent the cut-off points for the upper and lower 12.5 % of the distribution that were applied in Table B9. They are calculated separately for T1 (red) and T2 (blue) as the range where the VAT remains unchanged is larger in T1 than in T2. In T1, the VAT rate remains at 19 % for a policy mix with a carbon pricing share of 46% or more, whereas this point goes up to 85 % or higher in T2. Respondents in T1 are therefore much more likely to pass the attention check if they enter the current VAT rate which makes separate scaling necessary.

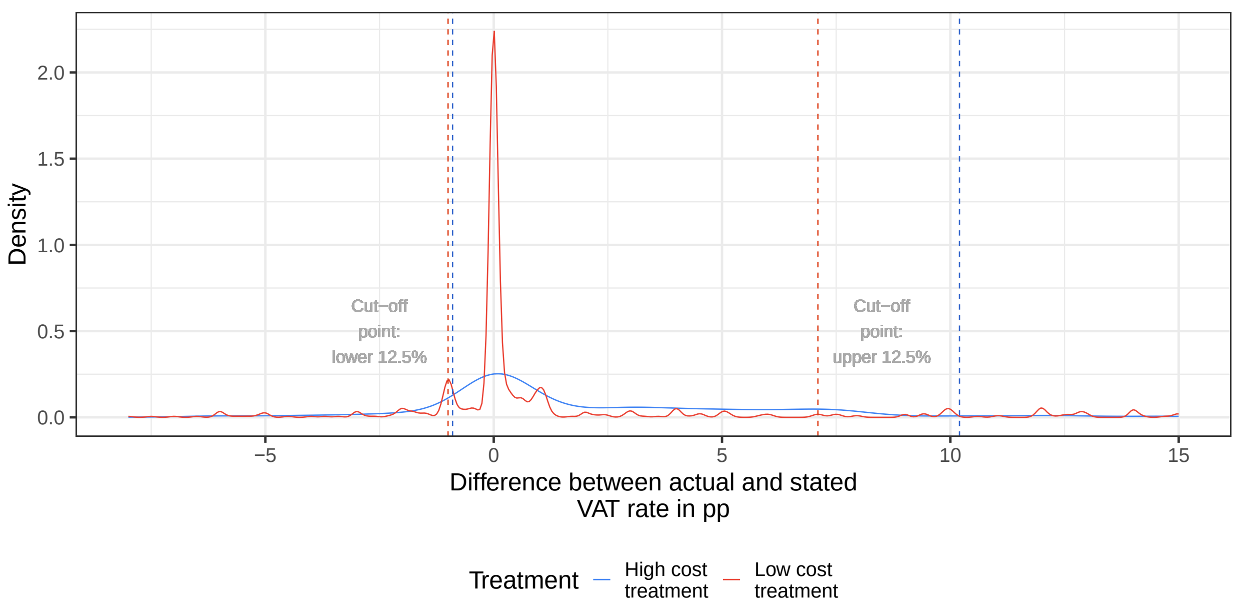

Figure D3: Distribution of the difference between the actual VAT rate shown to the respondents in the badge below the slider and their reported VAT rate in the attention checks after the experiment. The upper and lower 25 % of the distribution are calculated for T1 (red) and T2 (blue) separately.

D.2 Variable definition

Whenever an index is built, we follow Dechezleprêtre et al. (2024) and use the equally weighted average of the z-scored answers to the questions.

Financial Literacy: Score derived from the three literacy questions in Block 10 (see F, question 41-44) based on Davoli and Rodríguez-Planas (2021). Each correct question is counted as 1 point so that scale ranges from 0 to 3 points. We do not consider the risk diversification question of the original S&P index as we are only interested in the respondents ability to calculate with interest rates.

Attitudes towards carbon pricing:

- Core measure of attitudes towards carbon pricing are the z-scored answers to the question *"Do you tend to oppose or support a carbon price?"*
- Composite measure of attitudes towards carbon pricing (in addition to the core question):

Table D14: Correlation of 50pp choice on slider and NA in the following questions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Low cost treatment	0.004	0.001	-0.008	-0.011	-0.026	-0.007	-0.010
	(0.012)	(0.020)	(0.015)	(0.016)	(0.018)	(0.014)	(0.015)
High cost treatment	0.001	-0.008	0.002	0.003	-0.030+	0.020	0.001
	(0.013)	(0.020)	(0.015)	(0.016)	(0.018)	(0.014)	(0.016)
50pp chosen	0.037*	0.066**	0.046*	0.022	0.020	0.048**	0.040
	(0.015)	(0.024)	(0.018)	(0.019)	(0.022)	(0.017)	(0.018)
Num.Obs.	2472	2472	2472	2472	2472	2472	2472
R2	0.026	0.049	0.034	0.019	0.022	0.021	0.019
R2 Adj.	0.020	0.043	0.028	0.013	0.016	0.014	0.013
Sample:	All	All	All	All	All	All	All

Check whether respondents who choose 50 pp for the first outcome question are more likely to choose NA in the following. The dependent variables are defined as follows: Respondent choses 'Don't know' when being asked (1) about the estiamted proximity to the average household, (2) about the workings of the carbon price mechanism, (3) about the effectiveness of the carbon price to reduce carbon emissions, (4) about the effectiveness of the carbon price to reduce carbon emissions, about support for (5) rebates, (6) subsidies and (7) carbon pricing. All p-values are Benjamini-Hochberg corrected.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

"How effective do you think a carbon price would be in reducing carbon emissions?"
"How fair or unfair do you think a carbon price on heating oil and natural gas would be?"

D.3 Who are the respondents who chose 50 %/ 50 % as preferred policy mix?

Figure D4 shows that round shares of carbon pricing are chosen much more often on the slider. The spikes at zero, 50 and 100 % stand out as well. This accumulation of answers at the borders of our scale mitigates concerns around biased usage of the scale due to end aversion (Choi and Pak 2005). In column 1 of Table B8 we exclude respondents who choose 50 % as preferred policy mix (middle of the slider). Based on the literature (Masuda et al. 2017; Kulas et al. 2008; Sturgis et al. 2014) we suspect that these respondents are either insecure about their answer or do not cognitively engage with the problem provided. However, these results are debated (Kulas et al. 2008) and refer to discrete answer options. Therefore, we tested in our setting of a continuous slider whether choosing 50 % in the first outcome question comes along with indecisiveness in the further run of the study. We can show in Table D14 that respondents who choose the middle point on the slider are significantly more likely to choose NA when they are asked about their relationship to the average household (column 1) and the working of the carbon price (column 2) as well as the assessment of the effectiveness of carbon pricing (column 3) and their support for subsidies. However, this result is not univocal across Table D14.[17]

[17] We test only questions where perceptions are asked and a 'Dont't know' option was provided. We exclude questions that ask about the respondents' individual life (e.g., heating expenditures) or financial literacy as these are facts that may be truly unknown to the respondent.

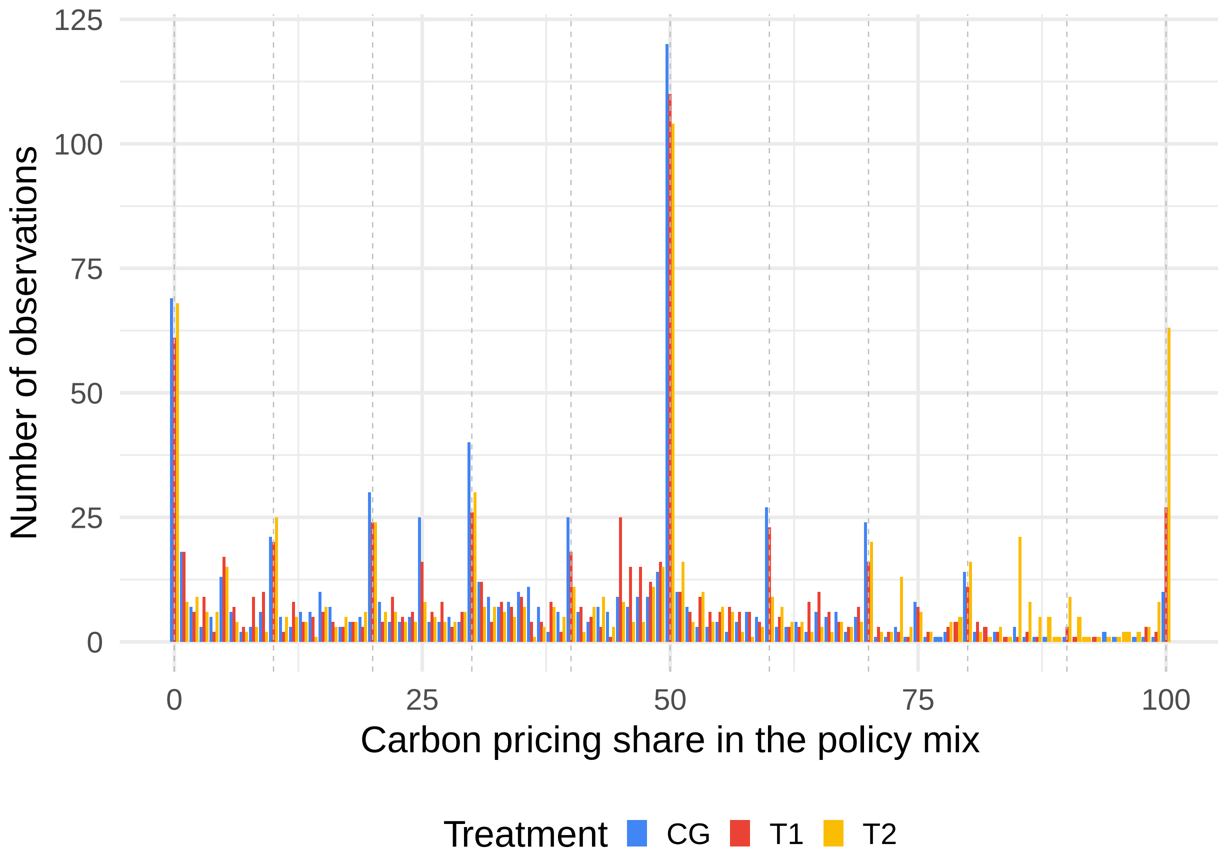

Figure D4: Distribution of respondents choices on the slider scale across the treatment groups. The dashed grey lines indicate rounded choice, i.e., 10 %, 20 % etc. It becomes visible that respondents show a tendency to choose rounded numbers. An aggregation of the answers across scales can be found in Figure A7.

E Attrition Analysis

The full dataset (incl. respondents who dropped out or were dropped because of the quota sample) amounts to 6,659 respondents. 3,034 were considered as complete cases. For 459 respondents, the survey was terminated because they did not answer or incorrectly answered the first attention check (see Question 5 in Section F) which was a prerequisite to participate in the rest of the survey. Since only the four quota characteristics age, gender, regional state and income were collected at the beginning of the questionnaire, the drop outs can only be analyzed with respect to these four attributes.

Table E15 shows how the probability of dropping out of the questionnaire is distributed across socio-demographic variables. We find in column 1 that respondents who were dropped because of not passing the attention check did not differ significantly from the remaining survey respondents in terms of age, gender and regional state (Saxony is an exception here). Poorer respondents where less likely to pass the attention check. Column 2 shows that respondents who could not continue with survey because of the quotation (e.g., because they were younger (older) than 18 (75) years or because their socio-demographic characteristics were already fulfilled by previous respondents) of the sample were concentrated across certain socio-demographic characteristics. Women were significantly more often dropped than men, poor households more often than rich households and also some regions (e.g., Saarland) are significantly more often excluded. Since these respondents do not self-select into leaving the survey, but are systematically rejected, this exclusion is not considered a potential source of biased results. 1,665 persons were excluded due to this reason. Sorting out took place right after the quota questions (before the first attention check) so that none of these respondents saw the outcome questions. Finally, there are 1,501 respondents that dropped out during the course of the survey although they were not rejected by the system. This implies an attrition rate of 31 % accounting for the fact that the drop outs above were not steered by the respondents but by the survey system (4,535 respondents are left). Column 3 of Table E15 shows that women were more likely to leave the survey voluntarily. All other socio-demographic attributes play no significant role. 30 % of these 1,501 respondents leave the survey already at the first question where the scientific purpose of the study as well as the two conducting institutes (ifo institute and MCC Berlin) are named. The topic of the survey is not mentioned at this stage so that a drop out due aversion against climate policy and climate protection can largely be excluded.[18] Until the beginning of the treatment, only 945 out of the 1,501 respondents are left that drop out either at the treatment or a later stage. For the actual attrition analysis, we focus on these observations as we lack even the most basic socio-demographic information to analyse attrition at an earlier stage

61 % of these 945 respondents drop out during the information treatment, i.e., they do not answer the first outcome question. In this part of the survey, respondents are confronted with the topic of the survey (climate change and climate protection), face a rather complex information text about subsidies and carbon pricing and are asked to make a hypothetical decision. Although it is possible that respondents drop out at this point due to ideological worldviews (e.g., do not believe in climate change or are against any climate protection measures), we can only identify whether drop outs take place along certain socio-demographic characteristics as all other variables are collected only after the treatment. As can be seen from column (1) Table E16, women and older people are more likely to drop out of the survey during the information texts (n = 579). Another 262 respondents drop out during the outcome questions (column 2). The socio-demographics are again similarly distributed, although age is of lower importance in columnn 2. Since we can control in this setting also for the treatment variables, it is visible that the treatment conditions lead to significantly higher dropouts.

After the treatment and outcome questions, there are 104 respondents left that drop out at a later point of the survey. These are not analyzed further.

[18]As the full name of the MCC institute is "Mercator Research Institute on Global Commons and Climate Change", there is the risk that people who are familiar with the acronym connect the survey directly to climate related topics.

Table E15: Attrition analysis

	Failed 1st attention check	Quota	Dropped-out
Age	0.000	0.002***	0.000
	(0.000)	(0.000)	(0.000)
Regional state			
Hamburg	0.034	0.085*	-0.023
	(0.032)	(0.037)	(0.048)
Lower Saxony	0.025	-0.013	-0.018
	(0.023)	(0.026)	(0.034)
Bremen	0.002	0.068	-0.054
	(0.045)	(0.052)	(0.068)
North Rhine-Westphalia	0.010	0.037	-0.007
	(0.021)	(0.024)	(0.031)
Hesse	0.019	0.031	-0.014
	(0.024)	(0.027)	(0.035)
Rhineland-Palatinate	0.049+	-0.008	-0.018
	(0.026)	(0.029)	(0.038)
Baden-Württemberg	0.024	0.002	-0.023
	(0.022)	(0.025)	(0.033)
Bavaria	0.028	0.059*	-0.033
	(0.021)	(0.024)	(0.032)
Saarland	0.028	0.160***	-0.063
	(0.039)	(0.045)	(0.058)
Berlin	-0.021	0.001	-0.058
	(0.028)	(0.032)	(0.042)
Brandenburg	0.042	-0.028	0.017
	(0.029)	(0.033)	(0.043)
Mecklenburg-Vorpommern	0.062+	-0.029	0.005
	(0.033)	(0.037)	(0.049)
Saxony	0.064**	0.128***	-0.077*
	(0.024)	(0.028)	(0.037)
Saxony-Anhalt	0.009	-0.017	-0.046
	(0.034)	(0.039)	(0.051)
Thuringia	0.014	-0.016	-0.059
	(0.030)	(0.034)	(0.045)
Gender			
Male	0.003	-0.029***	-0.084***
	(0.008)	(0.009)	(0.012)
Diverse	0.070	0.049	0.014
	(0.059)	(0.068)	(0.089)
Net income (log)	-0.039***	-0.030***	-0.012
	(0.006)	(0.007)	(0.009)
Num.Obs.	4876	4876	4876
R2	0.015	0.035	0.015
R2 Adj.	0.011	0.031	0.011

'Dropped-out' refers to all respondents that dropped out of the sample voluntarily and not due to failing the attention check. The dependent variable takes the value 1 if the respondent drops out and 0 otherwise.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table E16: Attrition analysis

Drop out during...	treatment texts	outcome questions
Low cost treatment	0.061***	0.025**
	(0.013)	(0.009)
High cost treatment	0.075***	0.021*
	(0.013)	(0.009)
Age	0.002***	0.000+
	(0.000)	(0.000)
Regional state		
Hamburg	-0.042	0.073*
	(0.045)	(0.032)
Lower Saxony	0.019	-0.020
	(0.030)	(0.022)
Bremen	-0.018	-0.064
	(0.060)	(0.043)
North Rhine-Westphalia	0.019	0.003
	(0.028)	(0.020)
Hesse	0.008	-0.005
	(0.032)	(0.023)
Rhineland-Palatinate	-0.015	0.012
	(0.035)	(0.024)
Baden-Württemberg	0.010	-0.018
	(0.029)	(0.021)
Bavaria	-0.003	-0.013
	(0.029)	(0.020)
Saarland	-0.061	0.107*
	(0.059)	(0.042)
Berlin	0.015	-0.049+
	(0.037)	(0.026)
Brandenburg	0.005	0.021
	(0.039)	(0.028)
Mecklenburg-Vorpommern	-0.014	0.034
	(0.045)	(0.031)
Saxony	-0.006	-0.003
	(0.035)	(0.025)
Saxony-Anhalt	-0.022	-0.017
	(0.046)	(0.032)
Thuringia	-0.035	-0.010
	(0.040)	(0.028)
Gender		
Male	-0.086***	-0.017*
	(0.011)	(0.007)
Diverse	0.063	-0.013
	(0.083)	(0.059)
Net income (log)	-0.012	-0.013*
	(0.008)	(0.006)
Num.Obs.	4227	4237
R2	0.035	0.014
R2 Adj.	0.030	0.009

The dependent variable takes the value 1 if the respondent drops out and 0 otherwise.
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

F Questionnaire

F.1 Screening

Welcome to the survey! This survey was compiled by a group of independent researchers from the ifo Institute and the MCC Berlin and is purely for scientific purposes. It is important for the quality of the study that you read the questions very carefully and answer them honestly. It is also important for the quality of the study that you complete the entire questionnaire after you have started the survey. This survey should take about 15 minutes to complete. Please note: Your participation in this study is completely voluntary. We will only receive your answers in anonymised form. This anonymised data will be stored securely and used for scientific purposes only. If you have any questions, please contact us at *contact mail*.
Yes, I would like to take part in this survey; No, I do not wish to take part in this survey.

1. Please state your age.
   Open field; screen out if below 18 or above 75
2. Please select your gender.
   Female; Male; Diverse; No answer
3. Which federal state do you live in?
   Schleswig-Holstein; Hamburg; Lower Saxony; Bremen; North Rhine-Westphalia; Hesse; Rhineland-Palatinate; Baden-Württemberg; Bavaria; Saarland; Berlin, Brandenburg; Mecklenburg-Vorpommern; Saxony; Saxony-Anhalt; Thuringia
4. What is the approximate monthly net income of your household? This is the income available to your household each month after deduction of taxes and social security contributions. Please consider the total income of all household members from wages/salaries, pensions/pensions, social and family benefits, regular transfers from persons who do not belong to your household and from other sources.
   Up to less than 2.000 euros per month; 2.000 euros to under 3.000 euros per month; 3.000 euros to less than 4.000 euros per month; 4.000 euros to less than 5.000 euros per month; 5.000 euros to less than 6.000 euros per month; 6.000 euros to less than 7.000 euros per month; 7.000 euros to less than 8.000 euros per month; 8.000 euros to under 9.000 euros per month; 9.000 euros to less than 10.000 euros per month; 10.000 euros and more per month
5. Attention: The following input field is only for checking your attention. Please enter the number '5' regardless of your answer.
   Open field; screen out if answer is not equal to 5

F.2 Treatment texts

Below you will be asked for your opinion on various possible climate policy measures in the building sector.

Text printed in blue in the following is shown to the treatment groups T1 and T2 only.

Page 1
Germany is obliged by the Climate Protection Act to significantly reduce its emissions. The state can provide various incentives to encourage households and companies to emit less carbon. Two options are often discussed for this: Either higher prices for fossil fuels such as heating oil and natural gas, for example through a carbon price, or state subsidy programmes in which the state covers part of the cost of climate-friendly products.

If the state levies a carbon price on natural gas and heating oil, this creates an incentive to use more climate-friendly alternatives. These include, for example, heating systems that run on renewable energies. The revenue that the state generates from the carbon price can be channelled back to households and companies through various measures.

Government subsidy programmes also create an incentive to use more climate-friendly alternatives. These include, for example, subsidising building renovations or heating systems that run on renewable energies. In order to finance such programmes, the state needs additional money, which can be raised through tax increases, for example.

Page 2
Now imagine that you can recommend to politicians how they should achieve the climate targets by 2030. Use a slider to determine the proportion of climate policy that should consist of higher prices for fossil fuels, for example in the form of a carbon price, or of support programmes for climate-friendly alternatives.

The further you move the slider on the next page towards 'Climate policy only via a carbon price', the more the state increases the prices for heating oil and natural gas. The revenue generated is first used to finance subsidy programmes. If further revenue remains afterwards, this is paid out to each person as an equal amount ('per capita refund' or 'climate money').

The further you move the slider on the next page towards 'Climate policy only via subsidy programmes', the more extensively the state subsidizes investment in climate-friendly residential buildings. This incurs costs for the state. If the revenue from the carbon price is not sufficient, VAT will rise. This makes all products more expensive for end customers.

F.3 Slider experiment and outcome questions

Please indicate to what extent climate policy should be achieved via a carbon price on fossil fuels or subsidies for climate protection measures.
Options: Climate policy only trough subsidies, Climate policy only through a carbon price **View: Control Group**

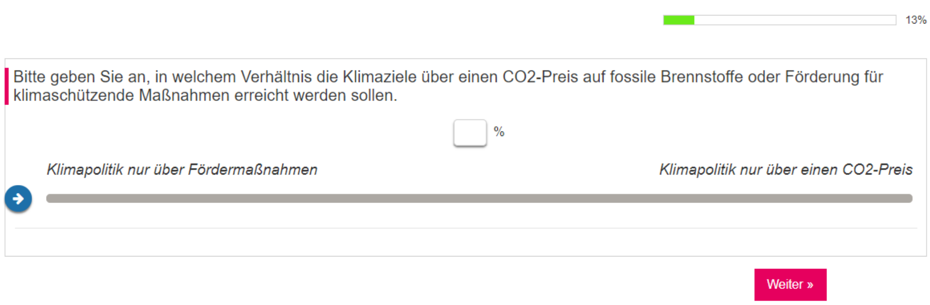

Figure F1: Screenshot of the slider that the Control Group sees,

View: Treatment Group 1

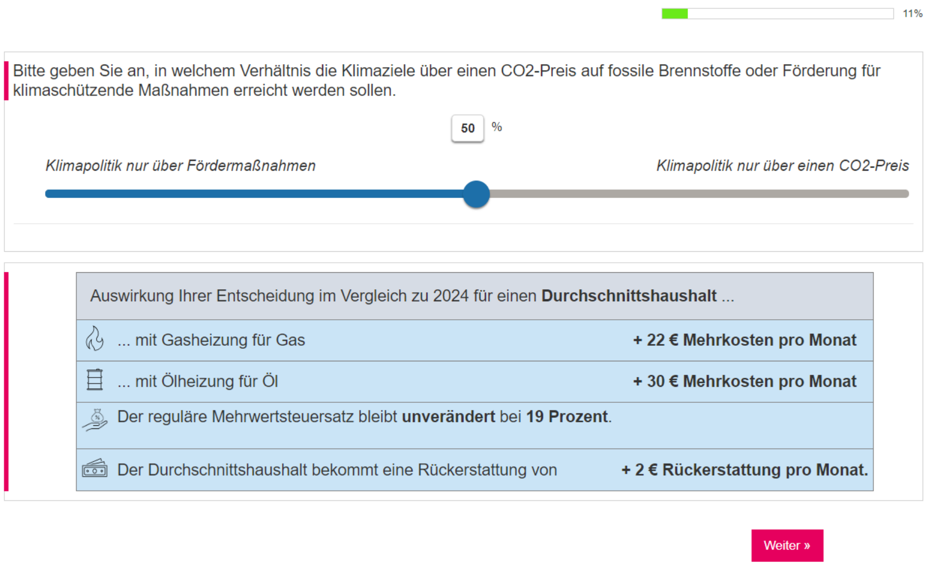

Figure F2: Screenshot of the slider that the Treatment Group 1 sees.

View: Treatment Group 2

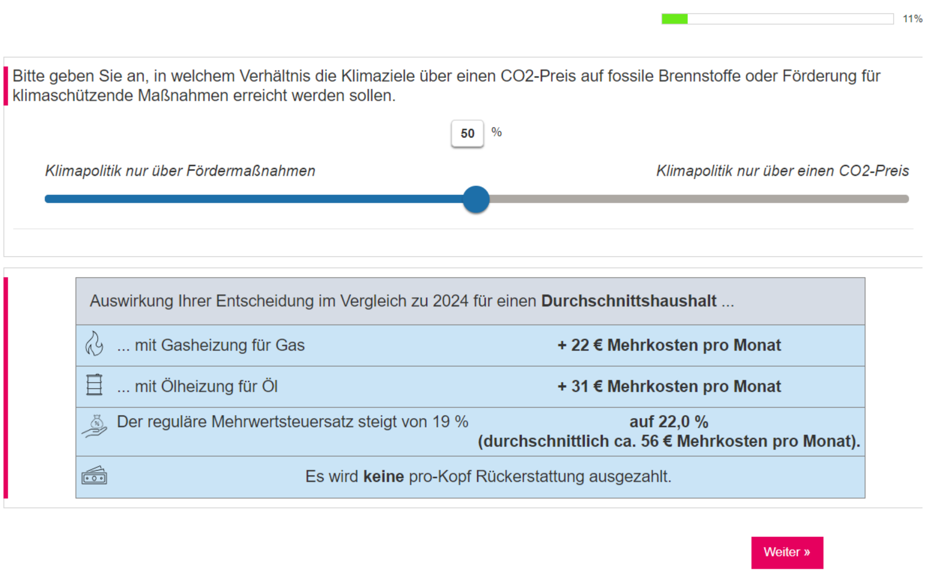

Figure F3: Screenshot of the slider that the Treatment Group 2 sees.

Second outcome question

6. On the previous page, you were asked for your preferred mix of carbon price and subsidies. If this policy measure was put to a referendum, would you support the mix you have chosen?
Yes, No

F.4 Heterogeneity questions

7. If you would like to explain or justify your decision regarding the selected policy mix, please use the following field: *Open text field*
8. How high is the new VAT in the policy mix you have chosen?
   Open text field
9. Do you think you spend more or less on heating oil or natural gas than the average household?
   Much more; More; Just as much; Less; Much less
10. Imagine a household switches to a heat pump because of the carbon price induced price increases. Will this household still be affected by rising prices for heating oil and natural gas?
    Yes, No, Don't know
11. To what extent do you agree or disagree with the following statement on climate protection?
    If we do not provide sufficient financial resources for climate protection today, the consequences of climate change will cost us even more.
    Disagree strongly; Disagree somewhat; Partly/partly; Agree somewhat; Agree strongly; Don't know

    In the following, the order of question blocks are randomized for each respondent. The questions in each block were randomized as well.

    Block 1

12. Do you think climate change is real?
    Yes, No
13. Do you generally tend to oppose or support German climate policy?
    Likert scale from 'I strongly oppose' to 'I strongly support'

    Block 2

14. How much do you spend on heating and hot water in a typical month?
    Under EUR 50; EUR 50 to EUR 99; EUR 100 to EUR 149; EUR 150 to EUR 199; EUR 200 to EUR 249; EUR 250 to EUR 299; EUR 300 to EUR 349; 350 to EUR 399; EUR 400 and over; Don't know
15. Please tick which living arrangement applies to you. Are you:
    Tenant; Owner; Occupant of a rent-free property
16. Which of the following energies do you use to heat your house/apartment? (multiple answers possible)
    Heating oil; Natural gas; Solar thermal energy; District heating; Heat pump; Other; Don't know
17. What is the approximate size of your living space?
    Open text field (in m^2)
18. How would you rate the energy efficiency of your home?
    Very poor; Poor; Average; Good; Very good
19. Have you ever taken advantage of a state subsidy for building refurbishment or heating system replacement? (multiple answers possible)
    Yes; No; I applied but was rejected; Don't know
20. Do you rent out a property?
    Yes; No; Don't know
    (a) *If answer is yes:* How many residential units do you rent out?
        Open field answer

    Block 3

21. How much do you trust politicians in general?
    Likert scale from 'No trust' to 'Full trust'

22. How much do you trust the current federal government?
Likert scale from 'No trust' to 'Full trust'

23. How much do you trust scientific experts?
Likert scale from 'No trust' to 'Full trust'

Block 4

24. We will now ask you about your willingness to behave in a certain way. Again, please use a scale from 0 to 10. 0 means 'not at all willing to do this' and 10 means 'very willing to do this'.
    (a) How much would you be prepared to give up something that benefits you today in order to benefit more in the future?
    (b) How much would you be prepared to give up something that is useful to you today in order to have more of it in the future?

Block 5

25. Some people think that the government wants to do too many things that are better left to individuals and companies. Others think that the government should do more to solve our country's problems. Which is closer to your own view?
Likert scale from 'The government is doing too little' to 'The government is doing too much'

26. In politics, people sometimes talk about 'left' and 'right'. Where would you place yourself on the following scale, where 0 means 'very left' and 10 means 'very right'?
Likert scale from 'Very left' to 'Very right'

27. There are different ideas about how the government should act in terms of environmental policy. What is your personal opinion on this? Please indicate your assessment on a scale from 0 (strongly disagree) to 10 (strongly agree).
    (a) The government should set concrete regulations and standards for environmental problems that companies must follow.
    Likert scale from 'Strongly disagree' to 'Strongly agree'
    (b) The government should set market-based price incentives for environmental problems and then let companies decide on measures themselves.
    Likert scale from 'Strongly disagree' to 'Strongly agree'

Block 6

28. There are different ideas about when a society is fair. What is your personal opinion on this? Please give your assessment on a scale from 0 (strongly disagree) to 10 (strongly agree).
    (a) It is fair if those who emit more carbon pay more for climate protection.
    Likert scale from 'Strongly disagree' to 'Strongly agree'
    (b) It is fair for richer people to pay more for climate protection.
    Likert scale from 'Strongly disagree' to 'Strongly agree'
    (c) It is fair if those who are severely affected by climate change contribute more to climate protection.
    Likert scale from 'Strongly disagree' to 'Strongly agree'
    (d) It is fair if everyone pays the same amount for climate protection.
    Likert scale from 'Strongly disagree' to 'Strongly agree'

Block 7

29. How fair or unfair do you think a carbon price on heating oil and natural gas would be?
Likert scale from 'Very unfair' to 'Very fair'

30. How fair or unfair do you think an increase in VAT would be?
Likert scale from 'Very unfair' to 'Very fair'

31. How fair or unfair do you think an increase in income tax would be?
Likert scale from 'Very unfair' to 'Very fair'

Block 8

32. How effective do you think a carbon price would be in reducing carbon emissions?
Likert scale from 'Very ineffective' to 'Very effective'; Outside option: Don't know

33. How effective do you think subsidies would be in reducing carbon emissions?
Likert scale from 'Very ineffective' to 'Very effective'; Outside option: Don't know

34. Do you tend to oppose or support a flat-rate per capita reimbursement (also known as 'climate money') of the revenue from a carbon price?
Likert scale from 'I strongly oppose' to 'I strongly support'; Outside option: Don't know

35. Do you tend to oppose or support state support programs for private household investments?
Likert scale from 'I strongly oppose' to 'I strongly support'; Outside option: Don't know

36. Do you tend to oppose or support a carbon price?
Likert scale from 'I strongly oppose' to 'I strongly support'; Outside option: Don't know

37. Some households cannot buy climate-neutral heating without subsidy programs because they do not have enough income or assets. Other households receive subsidies even though they don't necessarily need them. Out of 100 households that receive state subsidies for climate-neutral heating: How many do you think actually need the subsidy because they would otherwise not be able to afford the switch?
Open field answer households

38. Do you think that you and your household will be financially burdened or relieved by future climate protection measures?
Likert scale from 'Very heavily burdened' to 'Very heavily relieved' The randomization of question blocks end here. The following questions always appear at the end of the survey.

39. The following input field is only for checking your attention. Please enter '33' regardless of your answer.
In how many German federal states have you already lived?
Open field; screen out if answer is not equal to 33

Block 9

40. The state can finance climate protection measures from various sources. Please select the option that you most favor as the main source of funding.
Increase in national debt; Increase in income tax; Increase in VAT; Increase in carbon price; Increase in top tax rate; Cuts in other government spending; No money should be spent on climate protection measures in general

41. In your opinion, who would be most affected by the following financing instruments? (multiple answers possible)

	High-income households	Households with medium income	Low-income households	Future generations	Companies/ Industry
Increase in government debt					
Increase in income tax					
Increase in the VAT					
Increase in the carbon price					
Increase in the top tax rate					
Cuts in other government expenditures					

Table F17: Respondents were asked to choose one or more category per line.

Block 10

42. Suppose the prices of the things you buy double in the next 10 years. If your income also doubles, will you be able to buy less than today, just as much as today or more than today?
Less; Just as much; More; Don't know

43. Suppose you invest your money with the bank for two years and the bank agrees to add 15 percent to your account each year. Will the bank pay more money into your account in the second year than in the first year, or will it pay the same amount in both years?
More; The same; Don't know

44. Suppose you have to borrow EUR 100. Which is the lower amount that you have to pay back: EUR 105 or EUR 100 plus three per cent?
EUR 105; EUR 100 plus three percent; Don't know

Block 11

45. Please enter the zip code of your main place of residence.
Open text field

46. Please state how many people (including yourself) live in your household:
Adults (18 years and older): *Open text field*
Children and adolescents (0 - 17 years old): *Open text field*

47. What is your highest level of education?
No (or not yet) school-leaving certificate / qualification after no more than 7 years of school; Secondary school leaving certificate; Completed polytechnic secondary school in the GDR (8th to 10th grade); Secondary school leaving certificate (intermediate school leaving certificate) or equivalent qualification; Advanced technical college entrance qualification; High school diploma (general or subject-restricted higher education entrance qualification); Completed (specialised) university degree

48. Please indicate your current professional situation. If you have more than one occupation, please answer the following questions for your current main occupation.
I am self-employed; I am employed; I am unemployed (but looking for work); I am retired; I am at school, studying or in training; Other (maternity leave, parental leave, carer's leave, househusband/wife, ...)

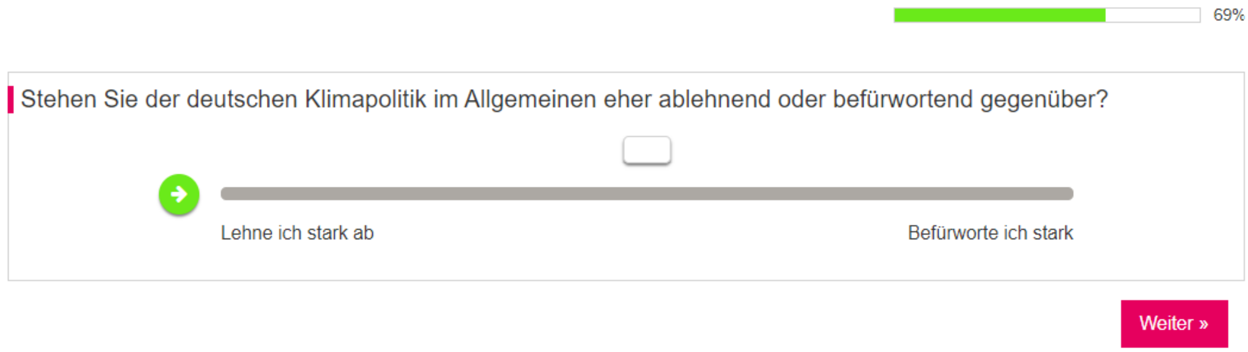

Figure F4: Example view: Selection on the likert scale for question 13.

49. How would you decribe your current place of residence?
A large city with more than 500,000 inhabitants; A smaller large city (between 100,000 and 500,000 inhabitants); A suburb/town/community in the suburbs of a large city; A medium-sized town (less than 100,000 inhabitants) close to a large city; A medium-sized town (less than 100,000 inhabitants) further away from a large city; A rural town/community

50. Was your region of residence (district) affected by severe natural disasters (e.g. floods, heavy rain, drought, etc.) in recent years?
Yes, No

51. Please indicate your marital status. I am...
Married or not married, but living in a partnership; Single (incl. divorced or widowed and living alone)

Block 12

52. Do you support Germany meeting its climate protection targets?
Yes, No

53. Have you ever heard of a carbon price before this survey?
Yes, No

54. Have you ever heard of climate money before this survey?
Yes, No

55. How often do you take part in surveys? *Less than once a year; Once a year; Once a month; Once a week; More than once a week*

56. How credible did you find the information provided in this survey?
Very credible; Rather credible; Rather untrustworthy; Very unbelievable

57. Would you say that this survey was politically neutral or politically biased?
Very left-leaning; Rather left-leaning; Balanced; Rather right-wing; Very right-wing

58. The survey is about to be finalised. You can now enter comments, remarks or suggestions in the field below.
Open text field

Note: All likert scales in this questionnaire have eleven points (from zero to ten) with five being the neutral midpoint. An example for the slider on which respondents can choose the corresponding answers is shown in Figure F4.