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How to Increase Public Support for Carbon Pricing

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How to Increase Public Support for Carbon Pricing

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Discussion Paper No. 489

December 21, 2023

How to Increase Public Support for Carbon Pricing ^{*}

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Abstract

The public acceptability of a carbon price depends on how the revenues from carbon pricing are used. In a fully incentivised experiment with a large representative sample of the German population, we compare five different revenue recycling schemes and show that support for a carbon price is maximised by a “Climate Premium” that pays a fixed, uniform, upfront payment to each person. This recycling scheme receives more support than tax and dividend schemes, than using revenues for the general budget of the government, and than earmarking revenues for environmental projects. Furthermore, we show that participants and experts underestimate the public support for carbon pricing.

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1 Introduction

Many policymakers have tried and failed to implement carbon pricing. In Switzerland, a proposal to increase an existing carbon price did not succeed in a popular vote in 2021; in France, the yellow vest movement forced President Macron to withdraw a carbon tax on fossil fuels; in the US, carbon pricing is so unpopular that none of the major political parties embraces it. Overall, only 23% of global greenhouse gas emissions are subject to carbon pricing¹.

There are several reasons for popular resistance. Some voters do not trust the government and believe that a carbon price is just a disguised tax increase^{2,3}. Others feel that carbon pricing is unjust because it disproportionately hurts the poor^{4,5}. Many people see that they have to pay more, but they do not see the benefits in terms of reduced emissions and tax revenues that can be used for other beneficial purposes^{6,7}. Can smart carbon pricing address these concerns and gain more public support?

Previous research has shown that specific uses of the revenue can increase public support for carbon pricing^{8,9}, in particular earmarking revenues for green investments or energy efficiency programmes¹⁰, and returning revenues to citizens (“tax and dividend”)^{8,11–13}. However, this literature is inconclusive in which revenue recycling scheme receives the most public support.

This paper makes three contributions. First, it shows experimentally that public support for a carbon price is maximised by a “Climate Premium” that compensates citizens at the time when the carbon price is introduced with a fixed payment equal to the expected revenues from carbon pricing¹⁴. This scheme not only makes it salient that carbon pricing is not a disguised tax increase, it also eliminates any uncertainty about the amount people will receive. Such a scheme has been implemented successfully in Austria in 2022.

Second, in contrast to previous analyses, our study is based on a fully incentivised experiment with a large, representative sample of the German population. In the experiment, subjects make purchase decisions that result in real carbon emissions, and they have to pay a real carbon price of €50 per ton of CO₂. We consider five conditions that differ in how the revenues from carbon pricing are used. We measure public support by letting people vote on the introduction of carbon pricing. Our design combines the best aspects of and improves upon both surveys and laboratory experiments, the two methods commonly used to study support for climate policy^{8,15–26}. Surveys often use representative samples, but they are not incentivised and have been shown to overestimate public support for pro-environmental policies²⁷. In contrast, our design uses monetary incentives to elicit participants’ true preferences. Laboratory studies, instead, are usually incentivised, but they rely on small and non-representative samples (often undergraduates) and use experimental designs in which externalities are imposed on other experimental participants but not on the environment. In contrast, our experiment uses CO₂ emissions as externalities and a representative sample of the population.

Third, our innovative methodology can uncover misperceptions about the effectiveness of the carbon price in reducing consumption and about the public support for carbon pricing. Beliefs about the policies' effectiveness to curb climate change have a strong impact on voters' support²², but there is only indirect and mixed evidence on how people expect others to adjust consumption following the implementation of a carbon price^{21,28}. Furthermore, by conducting an expert survey in which 369 experts predict the outcome of the experiment, we show that experts strongly underestimate the public support for smart carbon pricing schemes.

2 Results

We conducted an experiment with 1,100 participants who are representative of the German population in terms of gender, age (older than 18 years old), income, education, and region of residence. Participants had to make two purchase decisions about a valuable but CO₂-generating product. The first decision involved a low price per unit, while the second decision had an additional carbon price (€ 50 per ton). Following these decisions, the participants voted to determine whether to implement the purchase decision *with* or *without* the carbon price. Importantly, all decisions in the experiment have real consequences. The participants' purchase decisions resulted in monetary payoffs and real CO₂ emissions. By voting, each participant had an equal chance to determine whether purchase decisions with or without a carbon price were relevant to their own and other participants' payoffs.

In five within-subject conditions, the participants voted on whether or not to implement carbon pricing schemes that differed in how revenues from carbon pricing were used. In the "State Budget" condition, the money went to the general budget of the German federal government. In the "Climate Projects" condition, the revenues were spent on government-approved environmental projects. The "Redistribute All" and "Redistribute Poor" conditions mimicked "tax and dividend" schemes: the revenues were divided equally either among all participants or among those participants who had reported an income below € 2,100 (median income). In the "Climate Premium" condition, participants were promised a fixed and immediate payment in case the carbon price was implemented. In two between-subjects treatments, we used either a € 1.40 or a € 1.70 premium, both of which are somewhat lower than the actual revenue per head generated by the carbon price.

Finally, we conducted an expert survey ($N = 369$) with environmental, behavioural, and public economists working in Germany, Austria, and Switzerland (response rate 28.0%). We asked these experts to estimate the purchase decisions and the vote shares for carbon pricing in the different conditions.

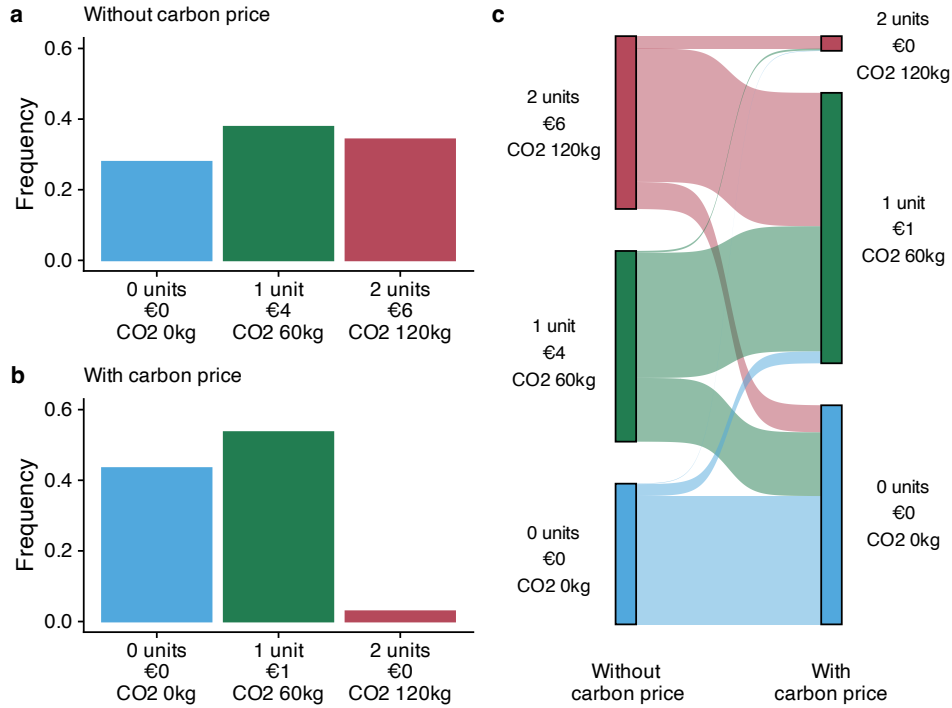


Fig. 1: Purchase decisions. (a) Scenario when the price of each product was €3 (without carbon price). (b) Scenario when the price of each product was increased €6 (with a carbon price). (c) A Sankey diagram representing participants' responses to a price increase.

2.1 Buying behaviour

Fig. 1a illustrates the distribution of purchase decisions without a carbon price. Although it is profitable to buy both products, only 34.3% of our sample do so, suggesting that many participants are foregoing private gains for the sake of the environment. This result suggests that the participants expect their decisions to affect real CO₂ emissions. Indeed, 77.9% explicitly confirm that they believe that their purchases reduce the number of offsets bought by the experimenter (as described in the instructions). Fig. 1b shows a sharp and significant drop in the number of units bought when the carbon price is introduced and that CO₂ emissions are reduced significantly (units purchased per person: 1.06 without carbon price and 0.60 without; $t(1099) = 24.10$; $p < 0.001$). The figure also shows that, when there is a carbon price, very few subjects (2.9%) buy two products, a dominated choice because people do not earn anything from this decision, but they emit 120kg of CO₂. Fig. 1c depicts how participants adapt their consumption with the introduction of a carbon price. Only very few subjects (2.8%) purchase more products with than without the carbon price. These low numbers suggest that almost all the participants understand the experiment.^a

^aSee Supplementary Methods for additional information regarding the measures taken to ensure data quality. We also show that the results remain unaffected by variations in task comprehension or attentiveness levels.

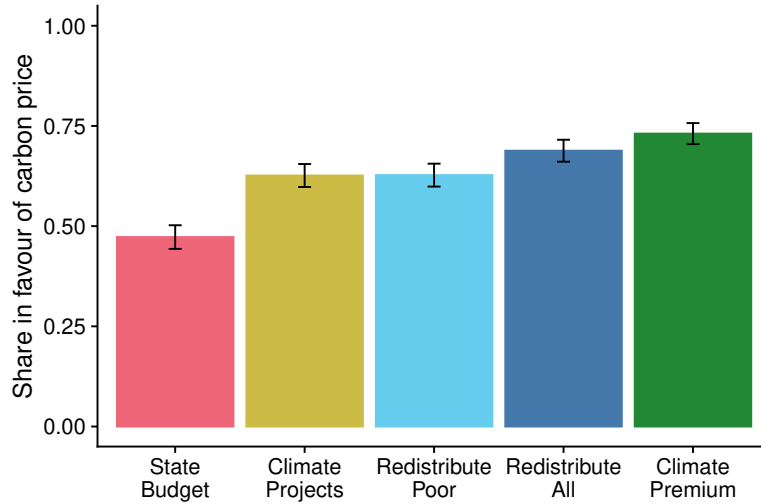


Fig. 2: Share of participants voting in favour of a carbon price under five revenue recycling schemes. The bars indicate 95% CI.

2.2 Voting behaviour

Fig. 2 displays the voting decisions.^b There is substantial heterogeneity in support depending on the revenue recycling scheme. When revenues go to the general budget of the federal government, a minority of participants votes for carbon pricing (47.3%). This is reflected in reported low trust in the government: 52.5% (21.5%) disagreed (agreed) with the statement “I have confidence in the German government to use taxpayers’ money wisely.”

However, the majority approves the carbon price under the other revenue recycling schemes. In conditions Climate Projects and Redistribute Poor, 62.6% and 62.7% of the votes are in favour of the carbon price. This percentage grows to 68.8% in the Redistribute All condition and further jumps to 73.1% in the Climate Premium condition. All of these schemes receive significantly more than 50% of the votes ($p < 0.001$). Interestingly, Redistribute All fares better than Redistribute Poor, because richer participants are significantly less likely to vote in favour of the latter (54.5% vs. 68.8%; $z = 6.63$; $p < 0.001$) while poorer participants support both schemes similarly (70.6% vs. 68.8%; $z = 1.09$; $p = 0.275$). The share of votes in favour of the Climate Premium is significantly higher than for any other scheme (vs. State Budget $z = 14.84$, vs. Climate Projects $z = 7.35$, vs. Redistribute Poor $z = 7.55$, vs. Redistribute All $z = 3.49$; all $p < 0.01$ with Bonferroni correction). These results are not affected by the order of presentation of the five schemes (Supplementary Figure 6).

Overall, these results show that the Climate Premium is the most popular scheme, and they confirm that revenue recycling is an effective lever to increase support for carbon prices. Choosing the right mechanism can increase support by more than 25 percentage points.

^bSupplementary Table 4 shows which demographic characteristics are predictive of overall voting behaviour.

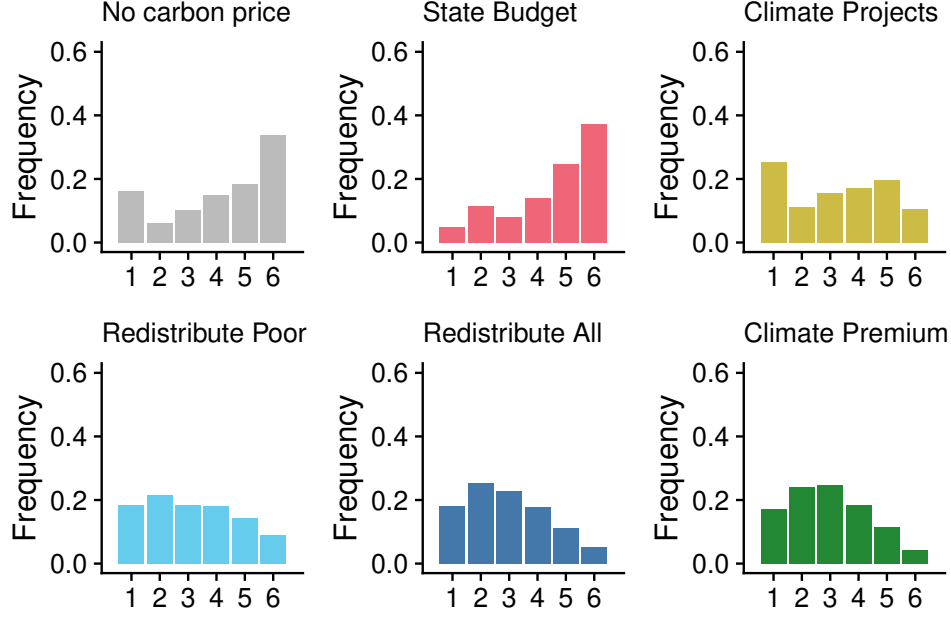


Fig. 3: Ranking of the five revenue recycling schemes and “No carbon price,” from 1 (the most preferred) to 6 (the least preferred). See Supplementary Methods for the construction of the variable.

2.3 Other desirable properties of a Climate Premium

In this section, we show that the Climate Premium is budget-friendly, it receives majority support among all demographic groups, and it is the proposal that the fewest number of participants consider to be the worst policy.

First, the Climate Premium is budget-friendly. In the € 1.70 treatment, the premium was calibrated such that the total transfer was expected to be similar to the carbon pricing revenues. The calibration was successful: revenues turned out to be € 1.78 per person ($SD = 1.64$, 95% CI [1.687, 1.881]). However, we also conducted a much more conservative € 1.40 treatment in order to test whether the support is sensitive to the amount of the premium. This is not the case: Even with the reduced premium, the Climate Premium scheme receives more votes than any other revenue recycling mechanism (vs. State Budget $z = 9.87$, vs. Climate project $z = 5.08$, vs. Redistribute Poor $z = 5.72$, vs. Redistribute All $z = 3.03$; all $p < 0.05$ with Bonferroni correction; Supplementary Figure 4). Furthermore, there is no significant difference between support for the Climate Premium with a € 1.40 and € 1.70 payment (74.0% vs. 72.2%; $z = 0.68$; 95% CI [-0.034, 0.071]; $p = 0.497$). Hence, the Climate Premium can be budget-friendly without compromising support.

Second, the popularity of the Climate Premium is not specific to one particular group of voters. Supplementary Figure 5 and Supplementary Table 3 show that the Climate Premium receives majority support in all demographic groups, including among conservatives (58.8%) and people who self-report that they are not much concerned about climate change (51.3%). Hence, the Climate Premium seems acceptable to a wide range of demographic groups and political parties, a property that it shares only with the Redistribute All condition.

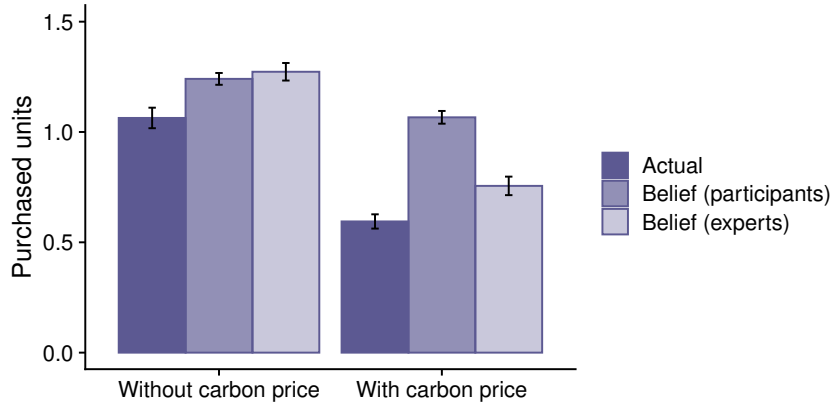


Fig. 4: Actual and guessed number of products purchased. The bars indicate 95% CI.

Finally, it is more difficult to implement a policy that is strongly opposed by some minority groups. In fact, there is recent evidence that politicians prefer policies that few people see as the worst possible option²⁹. Fig. 3 shows that only 4.2% of the subjects consider the Climate Premium the worst policy. This number is significantly lower than the corresponding shares for State Budget (37.2%), Climate Projects (10.6%), and Redistribute Poor (9.1%) and insignificantly so for Redistribute All (5.2%). The number is also significantly lower than the share of subjects who consider no carbon price as the worst option (33.7%). While very few subjects consider the Climate Premium the worst option, there are also only few subjects (17.2%) for whom it is their most preferred. Instead, most subjects give it a medium rank. Compared to other schemes, in particular Climate Projects, the Climate Premium is thus not as polarising. This result suggests that the Climate Premium could be a compromise solution that enables the implementation of a carbon price.

2.4 Misperceptions

Voting decisions are affected by expectations about the behaviour of others⁶. In our experiment, the decision to vote for a carbon price depends on the belief on how this price will affect the purchasing behaviour of all other subjects: The change in behaviour will affect the amount of carbon emissions and revenues. Therefore, we elicited the participants' beliefs about how many units are bought with and without the carbon price. We also elicited subjects' beliefs about the voting results in different conditions.

Beliefs about buying behaviour. The participants significantly underestimated the effect of the carbon price on buying behaviour. Fig. 4 shows that, on average, participants believe that the carbon price reduces purchases by 0.17 units ($SD = 0.41$), significantly less than the actual drop of 0.47 units ($t(1099) = -13.56$; 95% CI $[-0.338, -0.252]$; $p < 0.001$) which is more than 2.5 times larger. This misperception is important because beliefs about the effectiveness of climate policy are a key driver of public support²².

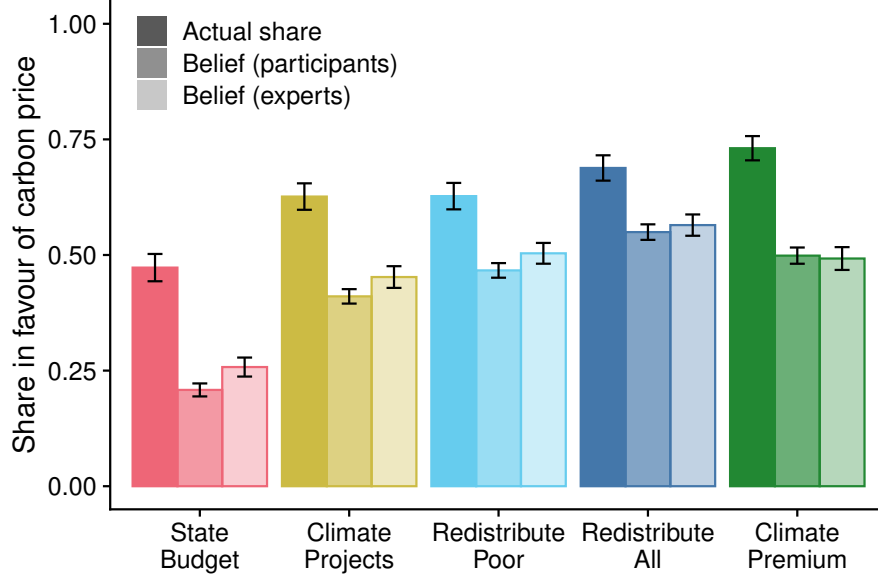


Fig. 5: Actual and guessed shares of participants voting in favour of carbon price. The bars indicate 95% CI.

Furthermore, the same Fig. 4 shows that the participants overestimate the number of units bought when the carbon price is in place. Participants buy only 0.59 units on average, but they believe that the number is 1.07, almost twice as high. This misperception makes it unlikely that the participants voted in favour of the Climate Premium because they mistakenly believed they would receive a higher payment in the Climate Premium than in the Redistribute All condition. Such a belief would have arisen if the participants had underestimated the consumption with the carbon price.

These misperceptions are consistent with previous evidence that individuals ignore the effect of taxes on prices³⁰ and underestimate other people's behavioural responses to policy changes⁶.

Beliefs about voting behaviour. Fig. 5 shows that participants strongly and significantly underestimate the support for carbon pricing, regardless of the revenue recycling scheme. Averaged over all conditions, they predict 42.7% instead of 62.9% of votes in favour of the carbon price. The underestimation is especially large in the State Budget (26.5 percentage points) and Climate Premium (23.2 percentage points) conditions. Other studies have shown that correcting similar misperceptions raises individual willingness to act against climate change as well as support for climate policies^{31,32}.

2.5 Expert Predictions

In contrast to the participants, the experts did not underestimate the effect of the carbon price on consumption (Fig. 4). On average, they predict that the carbon price results in a drop of 0.52 units, which is not significantly different from the actual drop of 0.47 ($t(1032) =$

1.691; 95% CI $[-0.008, 0.104]$; $p = 0.091$). However, experts significantly underestimate the support for carbon pricing. Averaged over all conditions, experts expect that 45.4% of votes are in favour, while the actual number is 62.9%. Importantly, the experts mistakenly predict that the Redistribute All condition and not the Climate Premium is the policy receiving the highest support (56.5% vs. 49.2%; $t(368) = 6.569$, 95% CI $[0.051, 0.094]$; $p < 0.001$). Hence, the economics profession is too pessimistic about the public support for a smart carbon pricing scheme and holds mistaken beliefs about which scheme is the most popular.

3 Discussion

The literature on the public support for carbon pricing has so far relied either on unincentivised surveys or on experiments with non-representative subjects. This study combines these two approaches in a fully incentivised representative survey experiment, which has several advantages. First, it provides financial incentives for the participants to truthfully report their preferences for carbon taxes. This feature mitigates concerns that participants' responses are influenced by image concerns and desirability bias, which might artificially inflate the stated support for carbon pricing. The presence of incentives is particularly important if different revenue recycling schemes are compared. In fact, previous evidence indicates that the magnitude of the bias in survey responses varies with the type of policy the participants have to opine upon²⁷.

Second, in the experiment, consumption and voting decisions result in real CO₂ emissions, while most other experiments on climate policies rely on monetary externalities on fellow subjects. In our setting, less consumption results in lower CO₂ emissions, which has a negligible effect on the climate. This is also true if a small country (such as Germany) reduces its carbon emissions.

Third, our experiment uses a representative sample of the population. Thus, the results are not biased by a selective subject pool, such as the young, well-educated, and mostly liberal undergraduate students that are typically used in economic experiments.

The results show that support for carbon pricing is maximised if revenues are redistributed as a Climate Premium: a salient, upfront, fixed, and equal payment. The Climate Premium outperforms the revenue recycling schemes that have been more commonly studied, such as tax and dividend schemes and schemes that use tax revenues to finance environmental projects or go to the general budget. In addition, the Climate Premium has several properties that make it appealing to policymakers: it is budget-friendly, it achieves majority support in all demographic groups, and it is the policy that is rated the least preferred by the fewest people. Our results contrast with expert predictions. Experts expected the tax and dividend schemes to fare better than the Climate Premium. Moreover, they generally underestimate the support for carbon pricing.

The experiment provides additional support for important earlier findings. First, it con-

firms that revenue recycling is a strong driver of support for carbon pricing. Second, it confirms that people underestimate the support of others for costly climate policies. Third, it shows that people underestimate the effectiveness of carbon taxes in reducing emissions. These three results appear to be robust to an array of different research designs.

4 Methods

The experiment was carried out in June 2023 in collaboration with Bilendi (www.bilendi.co.uk), a market research company specialising in online surveys with proprietary panels in several European countries. There were 1,100 participants representative of the German population (see Supplementary Table 1 for a summary of demographic characteristics). The instructions, available in Supplementary Information C, utilised straightforward language, visual aids, comprehension questions, and attention checks, to ensure that participants understood the procedures.

Participants could buy zero, one, or two fictitious products. The first product had a value of €7, the second a value of €5. Participants could buy the second product only if they bought the first. The purchase of each product resulted in the emission of 60kg of CO₂ (see below). In the first decision, each product had a price of €3. Thus, participants earned €4 if they bought one product ($7 - 3$) and €6 if they bought two ($7 + 5 - 3 - 3$). In the second decision, the price of each product increased to €6. Consequently, participants earned €1 for purchasing one product ($7 - 6$) but nothing for buying both ($7 + 5 - 6 - 6$). This price increase mirrors the effect of a carbon price of €50 per ton of CO₂. At this stage, participants did not know that the price increase was due to a carbon price.

Decisions had real-world consequences. The payment received by each participant at the end of the experiment and the amount of CO₂ emissions depended on the number of products they bought and on which of the two decisions was implemented at the voting stage. We committed to buy offsets from Carbonfund.org for 60kg of CO₂ for each product *not* purchased. Hence, the number of offsets was reduced by 60kg of CO₂ each time a participant decided to buy a product, effectively increasing total CO₂ emissions by this amount³³. Participants were sent proof of purchase for the offsets after all data had been collected (Supplementary Methods).

Participants had been informed that they were part of a group of 50 individuals drawn from a representative sample of the German population and that the vote of one randomly selected group member determined which of the two purchase decisions would be implemented for the entire group. This procedure, called “random dictator” in the experimental economics literature, ensured that each participant had an equal probability of deciding the outcome of the vote for the whole group (including themselves). With this procedure, participants have an incentive to vote according to their true preferences (truth-telling is a dominant strategy).

At the voting stage, participants voted in five distinct conditions that differed in how the

revenues from carbon pricing were used. Every participant encountered all conditions in random order, knowing that one of them would be randomly chosen to determine their payoffs (Supplementary Table 2). In the “State Budget” condition, the revenues went to the German federal government.^c In the “Climate Projects” condition, the revenues were given to a German organisation supported by the German National Climate Protection Initiative (Nationale Klimaschutzinitiative; <https://www.klimaschutz.de>). In the “Redistribute All” condition, each group member received an equal share of the carbon price revenues. In the “Redistribute Poor” condition, revenues were evenly divided among group members with a monthly income below € 2,100, the median income in our sample.^d In both the Redistribute All and the Redistribute Poor conditions, the money was transferred to the participants two weeks after the completion of the experiment. In the “Climate Premium” condition, participants were given a fixed payment if the carbon price was implemented. The payment was either € 1.40 or € 1.70 with 550 participants in each treatment. These payments were made within two days of participation in the experiment.

Finally, participants were asked to answer survey questions. First, they ranked the five different revenue recycling schemes. Then, they reported their beliefs about the purchasing and voting behaviour of the other group members. These belief elicitation were incentivised with € 10 for the correct prediction of one randomly selected question, an incentive-compatible beliefs elicitation procedure³⁴. Finally, participants answered questions about their time and risk preferences as well as their political preferences.

For the expert survey, we contacted 1,318 academic economists, of which 481 started the survey, and 369 completed it and are in our data. Experts were shown a simplified version of the instructions and asked to predict the purchase and voting decisions. They could earn € 40 if their estimate in a randomly chosen prediction question was at most two percentage points below or above the actual percentage. The instructions are available in Supplementary Information C.

Further details on methods can be found in the Supplementary Methods.

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^cThe money was transferred to the German government via a payment to a bank account dedicated to reducing the federal debt.

^dThis threshold was established by asking 250 participants of a pilot study recruited from the same subject pool about their monthly income.

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Supplementary Information

How to Increase Public Support for Carbon Pricing

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A Supplementary Methods

A.1 Main Experiment

A.1.1 Data quality

We took great care to ensure the comprehensibility of the experiment for all participants, including those with lower educational backgrounds. To achieve this objective, we divided the experiment into four sections, each accompanied by its instructions. We minimised textual content, employed simplified language, and incorporated visual aids extensively to explain the consequences of each possible decision. Additionally, we presented 12 comprehension questions organised into eight sets. Participants were required to provide accurate responses to all questions before advancing in the experiment. Finally, during the consumption decision with the carbon tax, participants were asked to confirm their choice in case they opted to buy both products. The prompt stated:

“Are you sure you want to buy both products? Please note: The additional purchase of **Product BLUE** will reduce your payout and increase CO₂ emissions.”

We implemented this prompt because buying two products under the tax is most likely due to confusion. In any case, the participants could confirm their choice and buy both products if so they wished. The English translation of the instructions, along with the experiment interfaces, is available in Supplementary Information [C.1](#).

To screen out the participants who were not fully engaged, we incorporated an attention check on the first page of the experiment. Participants who did not pass this check were not allowed to participate in the experiment. Additionally, a second attention check was introduced in the final questionnaire. In this case, participants who failed it were still allowed to complete the experiment.

A.1.2 Ranking

In the final phase of the experiment, participants were asked to order five revenue recycling schemes, from the most preferred (1) to the least preferred (5). We combine this ordinal data (\geq_o) with participants’ voting decisions to construct a variable capturing the “ranking” (\geq_r) of the five schemes and the baseline of “No carbon price.”

Given a participant’s ordering data, schemes that received positive votes are placed above, while those that received negative votes are placed below the “No carbon price” baseline. The participant’s original ordering is respected within each category.

This rule implies that the “No carbon price” baseline would be ranked “the most preferred” (“the least preferred”) scheme if a participant voted against (in favour of) all five recycling schemes.

For example, suppose a participant voted in favour of schemes S_1 , S_2 , and S_3 , and against schemes S_4 and S_5 . Suppose also that the participant ordered them $S_2 \geq_o S_4 \geq_o S_1 \geq_o S_5 \geq_o S_3$ in the questionnaire. Then, we assign a ranking of $S_2 \geq_r S_1 \geq_r S_3 \geq_r S_0 \geq_r S_4 \geq_r S_5$ to this participant, where S_0 indicates the baseline, “No carbon price.”

A.1.3 Robustness

The main qualitative results regarding purchase and voting decisions remain after excluding participants who exhibit signs of confusion or inattentiveness. In Supplementary Figure 7, we look at average units purchased (panel a) and support for revenue recycling schemes (panel b) in four subsamples of participants:

- Sample 1 excludes participants who did not believe that their purchases would reduce the number of offsets bought by the experimenter.
- Sample 2 excludes participants who were unable to provide correct answers on the first attempt in three or more out of the 12 comprehension questions.
- Sample 3 excludes participants who failed the second attention check in the final questionnaire.
- Sample 4 applies all the exclusion criteria above.

The patterns are not affected by the level of understanding of the task or the attentiveness.

A.1.4 Preregistration



CONFIDENTIAL - FOR PEER-REVIEW ONLY Public Support for Carbon Pricing (#134346)

Created: 06/02/2023 07:21 AM (PT)

This is an anonymized copy (without author names) of the pre-registration. It was created by the author(s) to use during peer-review.
A non-anonymized version (containing author names) should be made available by the authors when the work it supports is made public.

1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?

We investigate which forms of redistribution schemes attract stronger support for carbon pricing from an approximately representative sample (in gender, age, region of residence, and income) of the German population.

3) Describe the key dependent variable(s) specifying how they will be measured.

The key dependent variable is the binary voting decision indicating the participant's attitude toward carbon pricing (1: in favor; 0: against).

Participants can buy up to 2 units of a virtual product. Buying the product is profitable but the consumption of each unit leads to CO2 emissions. Each participant decides how many units to buy, without and with a carbon price. They are then matched into groups of 50 and vote on whether to implement the decision with the carbon price or the one without it. They make 5 voting decisions as described below.

4) How many and which conditions will participants be assigned to?

All participants will make 5 voting decisions (in random order), which differ in the way the revenue from the carbon price will be redistributed. The 5 redistribution schemes are:

- [A] The revenue accrues to the budget of the federal government.
- [B] The revenue from a group of 50 participants is redistributed equally among all the group members.
- [C] The participants receive a fixed monetary transfer independent of the amount of tax revenue coming from the group.
- [D] The revenue from a group is redistributed equally among low-income members of the group.
- [E] The revenue is donated to climate projects supported by the German government.

There will be 2 between-subject conditions, which differ in the size of the lump-sum climate premium in policy [C]: 1.70 euros in condition 1 and 1.40 euros in condition 2.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

We will regress voting decisions on dummies for redistribution schemes, without and with demographic controls such as age, gender, income, etc. The main specification will pool the 2 between-subject conditions in policy [C].

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

There will not be any outliers. We will conduct additional analyses to test whether performance in the comprehension questions as well as the second attention check question is related to voting and buying behavior.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

We aim at collecting 1100 observations, 550 in each condition. This number was determined based on pilot data with 100 participants and power calculations (allowing us to detect about a 4 percentage point difference in support with 80% power). The pilot data was used solely for the calibration of experimental parameters and will not be included in the analysis.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

We will correlate voting decisions with buying decisions and demographics as well as beliefs and personal characteristics, such as political orientation, climate attitudes, and economic preferences (risk and time), that we elicit in the post-experimental questionnaire.

We will conduct additional analyses to test whether performance in the comprehension questions and the second attention question is related to buying and voting decisions.

Finally, we will conduct a forecasting survey with German-based researchers in the fields of behavioral, environmental, and public economics.

A.1.5 Carbon offset certificate and invoice



Carbon Offset Certificate

PROUDLY PRESENTED TO

LMU München - Experiment

FOR OFFSETTING

96 Tonne(s) of CO₂

DATE

07/10/2023

Your carbon offset purchase supports third-party verified greenhouse gas emission reduction projects around the world.



Supplementary Figure 1: Certificate.

Carbonfund

Invoice for order 76311

Order Date: July 10, 2023

Billing Address

Andrej Woerner
Geschwister-Scholl-Platz 1
80539 München
Germany

Shipping Address

Shipping Method

No shipping

SKU	Product	Quantity	Price
Custom-Purchase-One-Time	<u>Custom Purchase One-Time</u> Name for Certificate: LMU München - Experiment	1	\$1,200
Subtotal:			\$1,200
Payment method:			Credit Card
Total:			\$1,200

Customer Details

- Email: andrej.woerner@econ.lmu.de

Diese Zahlung ist das Resultat von Teilnehmerentscheidungen des Experiments "Öffentliche Unterstützung einer CO2-Bepreisung" der LMU München.

Supplementary Figure 2: Invoice.

A.2 Expert Survey

We manually assembled a list of economists working in the fields of environmental, public, and behavioural economics, with a particular focus on economists working in Germany, Austria, and Switzerland. More precisely, our research assistants were instructed to:

1. find a list of all German, Austrian, and German-speaking Swiss universities (no Fachhochschulen) and of all Economic Research Institutes (restrict attention to “Leibniz Institute”),
2. go to the websites of the Economics departments of all German-speaking universities and look for chairs on relevant topics (e.g., Environmental Economics, Energy Economics, Resource Economics, Public Economics, Fiscal Economics, Economics of Taxation, Experimental Economics, Behavioural Economics), and
3. include all the members working at these research groups: Professors, Assistant Professors and Postdocs, and Ph.D. students.

The list, assembled in May 2023, includes 1,318 academic economists. We call them “experts.” We invited these 1,318 experts to participate in our survey (Supplementary Figure 3), of which 481 started and 369 completed. See Supplementary Table 5 for the demographic characteristics of the experts.

The structure of the survey was identical to the main experiment. After reading a simplified version of the instructions (Supplementary Information C.2), experts were asked to make two purchase decisions and five voting decisions. Importantly, these decisions were hypothetical and had no material consequences. The purpose of the purchasing and voting stages was to make experts familiarise themselves with the environment of the main experiment. Note also that the experts were randomly assigned to a € 1.40 or a € 1.70 Climate Premium treatment, as in the main experiment.

We elicited the experts’ predictions regarding the behaviour, two purchase decisions and five voting decisions, of the 1,100 participants in the main experiment. The experts could earn € 40 if their estimate in a randomly chosen prediction question were at most two percentage points below or above the actual percentage. Seventeen experts were entitled to the bonus, but three were not paid out since they did not provide their contact information.

Dear [expert's name],

Our research group at LMU Munich has conducted a representative study on the German population's approval of different variants of CO₂ pricing.

We are now interested in what experts like you expect the population to think about this issue. We are therefore asking you for your assessment.

It will take about 10 minutes to answer our questions. If your expectations are correct, you could win a prize of 40 euros.

Here is the link to the survey.

[Link to the survey]

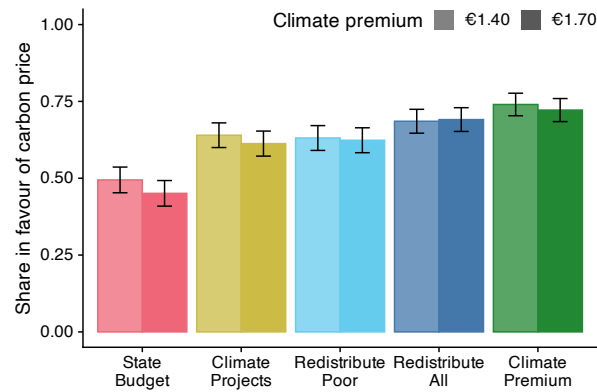
Have fun and thank you very much! We look forward to hearing your opinion.

Best regards,

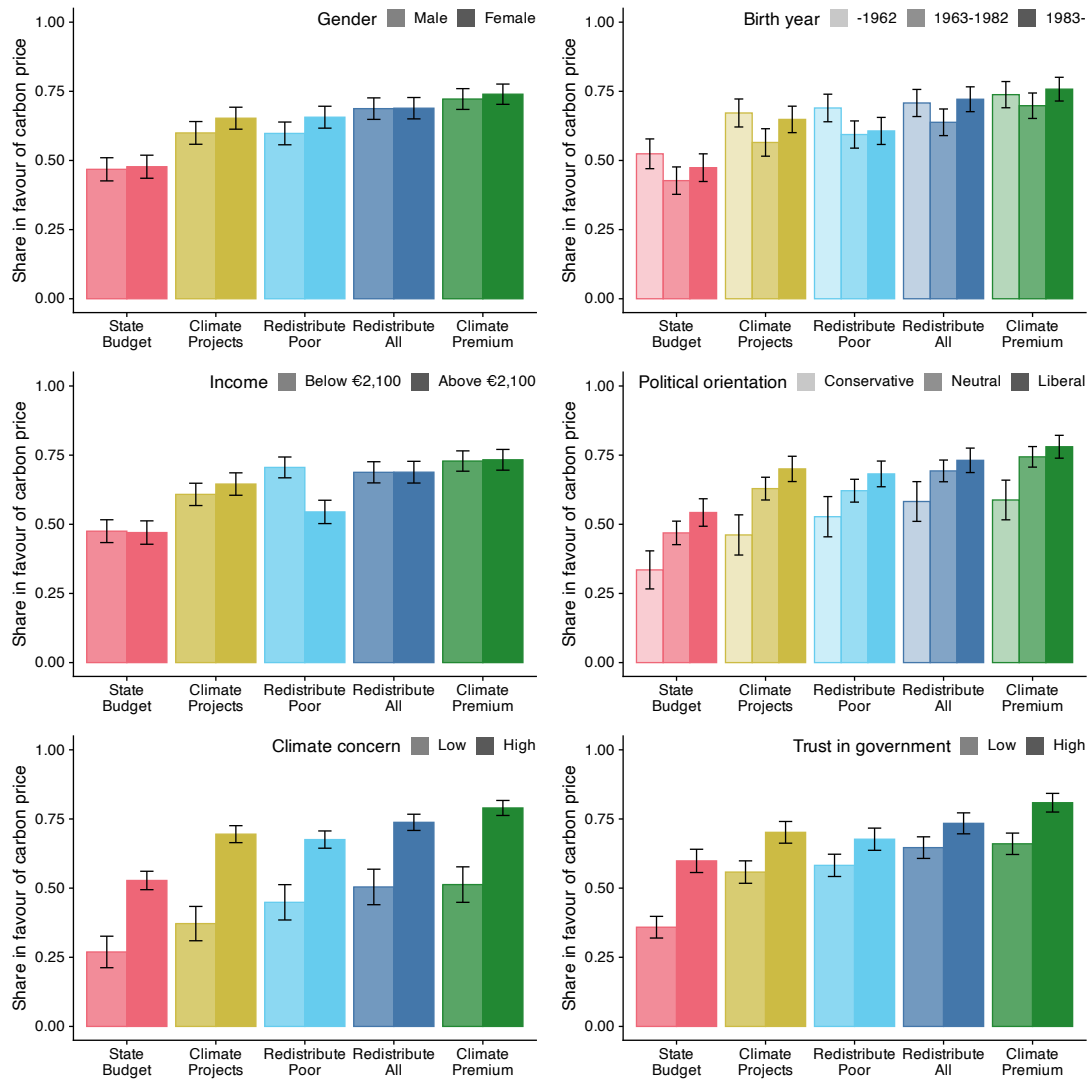
Klaus M. Schmidt

Supplementary Figure 3: Invitation to the prediction survey sent to the experts.

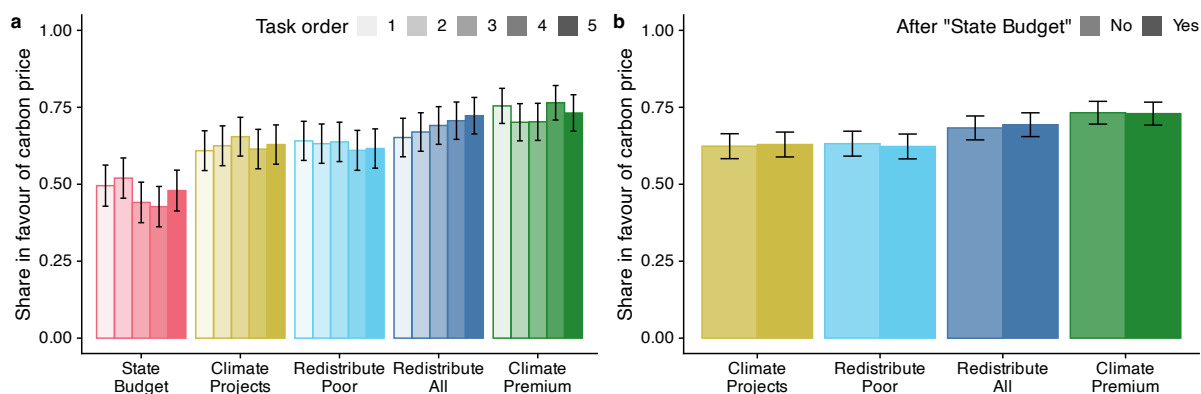
B Supplementary Results



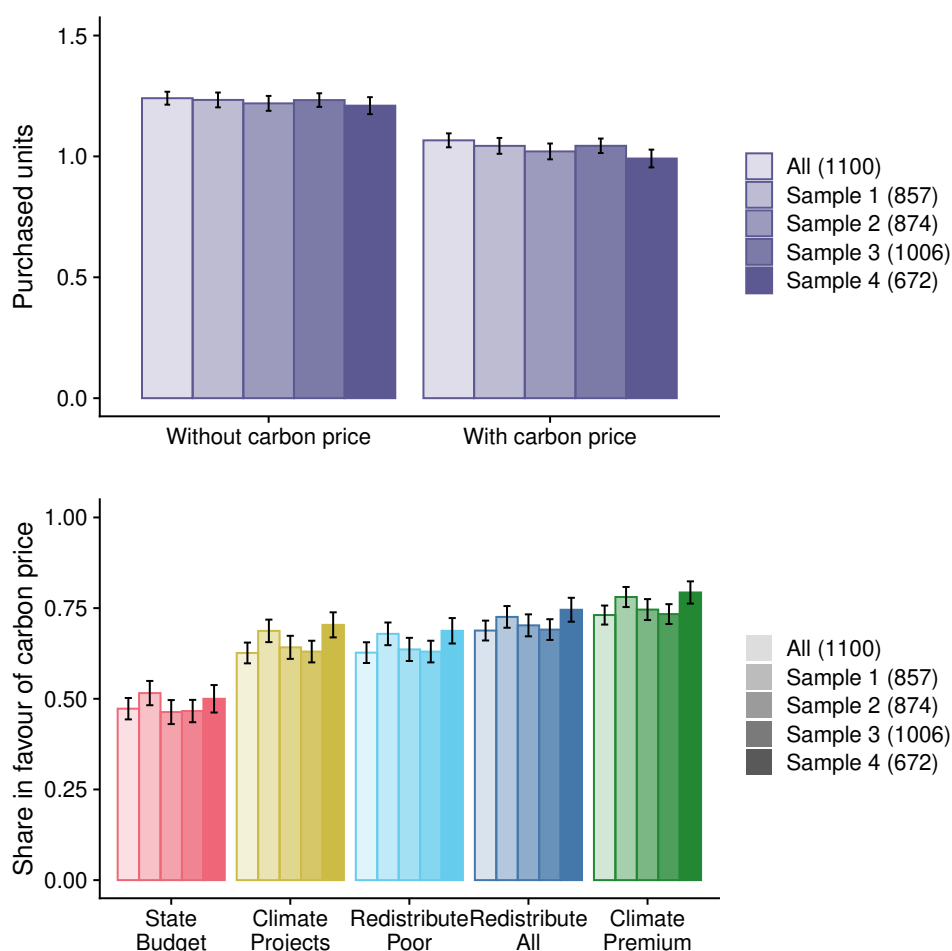
Supplementary Figure 4: No effects of the size of Climate Premium on policy support. *Notes:* The bars indicate 95% CI.



Supplementary Figure 5: Heterogeneity in policy support. *Notes:* The bars indicate 95% CI.



Supplementary Figure 6: Irrelevance of the order of presentation.



Supplementary Figure 7: Purchase and voting decisions by the degree of understanding and attentiveness. *Notes:* Sample 1 excludes participants who did not believe that their purchases would reduce the number of offsets bought by the experimenter. Sample 2 excludes participants who were unable to provide correct answers on the first attempt in three or more out of the 12 comprehension questions. Sample 3 excludes participants who failed the second attention check in the final questionnaire. Sample 4 applies all the exclusion criteria above.

Supplementary Table 1: Demographic characteristics (main experiment).

			Premium		
	<i>N</i>	All	€ 1.40	€ 1.70	
<i>Birth year</i>					
1983-	384	0.349	0.351	0.347	$\chi(2) = 2.48$ $p = 0.29$
1963-1982	384	0.349	0.329	0.369	
-1962	332	0.302	0.320	0.284	
<i>Gender</i>					
Female	553	0.504	0.491	0.516	$\chi(1) = 0.62$ $p = 0.432$
Male	545	0.496	0.509	0.484	
<i>Education level</i>					
1	329	0.371	0.380	0.363	$\chi(3) = 1.5$ $p = 0.682$
2	336	0.379	0.366	0.392	
3	198	0.223	0.227	0.220	
4	23	0.026	0.027	0.024	
<i>Income below €2,100</i>					
No	536	0.487	0.498	0.476	$\chi(1) = 0.44$ $p = 0.507$
Yes	564	0.513	0.502	0.524	
<i>Party</i>					
AfD	183	0.166	0.156	0.176	$\chi(5) = 7.98$ $p = 0.157$
CDU/CSU	288	0.262	0.282	0.242	
Die Gruenen	165	0.150	0.136	0.164	
Die Linke	100	0.091	0.076	0.105	
FDP	111	0.101	0.113	0.089	
SPD	253	0.230	0.236	0.224	
<i>Political orientation</i>					
Conservative	50	0.045	0.045	0.045	$\chi(4) = 5.32$ $p = 0.256$
Somewhat conservative	132	0.120	0.140	0.100	
Neutral	531	0.483	0.462	0.504	
Somewhat liberal	272	0.247	0.255	0.240	
Liberal	115	0.105	0.098	0.111	
<i>Big city</i>					
No	421	0.383	0.384	0.382	$\chi(2) = 0.04$ $p = 0.979$
Yes	654	0.595	0.595	0.595	
N/A	25	0.023	0.022	0.024	
<i>Former East Germany</i>					
No	933	0.848	0.869	0.827	$\chi(1) = 3.42$ $p = 0.065$
Yes	167	0.152	0.131	0.173	

Notes: Education level: 1 (No secondary school certificate or Basic secondary school certificate), 2 (Intermediate secondary school certificate or Other), 3 (Higher education entrance qualification), 4 (Bachelor's/Master's degree or Doctorate/Ph.D.). A city is classified as *big city* if it has more than 100,000 inhabitants, based on the data from the Federal Office of Statistics ([Statistisches Bundesamt, 2023](#)).

Supplementary Table 2: Order of five revenue recycling schemes in the voting phase.

Task	State Budget	Redistribute All	Climate Premium	Redistribute Poor	Climate Projects
1	216	224	220	220	220
2	225	218	221	220	216
3	220	220	222	218	220
4	220	218	221	218	223
5	219	220	216	224	221

Supplementary Table 3: Policy support by demographic groups.

	N	State Budget	Climate Project	Redistribute Poor	Redistribute All	Climate Premium
<i>Birth year</i>						
1983-	384	0.474	0.648	0.607	0.721	0.758
1963-1982	384	0.427	0.565	0.594	0.638	0.698
-1962	332	0.524	0.672	0.690	0.708	0.738
<i>Gender</i>						
Female	553	0.477	0.653	0.656	0.689	0.740
Male	545	0.468	0.600	0.596	0.686	0.721
<i>Education level</i>						
1	329	0.480	0.623	0.669	0.672	0.720
2	336	0.414	0.607	0.631	0.702	0.741
3	198	0.485	0.667	0.611	0.692	0.747
4	237	0.536	0.624	0.578	0.688	0.717
<i>Income below €2,100</i>						
No	536	0.470	0.646	0.545	0.688	0.733
Yes	564	0.475	0.608	0.706	0.688	0.729
<i>Party</i>						
CDU/CSU	288	0.455	0.618	0.597	0.649	0.729
SPD	253	0.577	0.684	0.696	0.743	0.814
Die Grünen	165	0.667	0.848	0.812	0.830	0.885
FDP	111	0.333	0.495	0.432	0.631	0.586
Die Linke	100	0.440	0.690	0.650	0.690	0.690
AfD	183	0.284	0.404	0.519	0.579	0.590
<i>Political orientation</i>						
Conservative	182	0.335	0.462	0.527	0.582	0.588
Neutral	531	0.469	0.629	0.621	0.693	0.744
Liberal	387	0.543	0.700	0.682	0.731	0.780
<i>Climate concern</i>						
Low	234	0.269	0.372	0.449	0.504	0.513
High	866	0.528	0.695	0.676	0.738	0.790
<i>Big city</i>						
No	421	0.470	0.610	0.653	0.701	0.751
Yes	654	0.472	0.639	0.612	0.683	0.717
N/A	25	0.520	0.560	0.600	0.600	0.760
<i>Former East Germany</i>						
No	933	0.473	0.628	0.628	0.685	0.734
Yes	167	0.473	0.617	0.623	0.707	0.713

Notes: Education level: 1 (No secondary school certificate or Basic secondary school certificate), 2 (Intermediate secondary school certificate or Other), 3 (Higher education entrance qualification), 4 (Bachelor's/Master's degree or Doctorate/Ph.D.). A city is classified as *big city* if it has more than 100,000 inhabitants, based on the data from the Federal Office of Statistics ([Statistisches Bundesamt, 2023](#)).

Supplementary Table 4: Voting decisions and the effect of demographic characteristics.

	(1)	(2)	(3)	(4)
State Budget	0.473*** (0.015)			
Climate Projects	0.626*** (0.015)	0.154*** (0.016)	0.154*** (0.016)	0.154*** (0.016)
Redistribute Poor	0.627*** (0.015)	0.155*** (0.016)	0.155*** (0.016)	0.155*** (0.016)
Redistribute All	0.688*** (0.014)	0.215*** (0.016)	0.215*** (0.016)	0.215*** (0.016)
Climate Premium	0.731*** (0.013)	0.258*** (0.016)	0.258*** (0.016)	0.258*** (0.016)
Birth year: 1963-1982		-0.053** (0.027)	-0.047* (0.025)	-0.048* (0.025)
Birth year: <1962		0.030 (0.028)	0.012 (0.027)	0.007 (0.027)
Female		0.026 (0.022)	0.011 (0.021)	0.011 (0.021)
Education level: 2		-0.004 (0.029)	0.006 (0.028)	0.003 (0.028)
Education level: 3		0.019 (0.035)	0.010 (0.033)	0.004 (0.033)
Education level: 4		0.015 (0.036)	-0.019 (0.033)	-0.034 (0.034)
Income below € 2,100		0.024 (0.024)	0.039* (0.022)	0.048** (0.022)
Pol. orientation: Neutral			0.094*** (0.030)	0.082*** (0.030)
Pol. orientation: Liberal			0.120*** (0.032)	0.095*** (0.032)
Trust in government: High			0.114*** (0.021)	0.112*** (0.021)
Climate concern: High			0.227*** (0.027)	0.197*** (0.028)
Time preferences				0.029*** (0.005)
Risk preferences				-0.009** (0.005)
Former East Germany		-0.003 (0.031)	0.011 (0.029)	0.012 (0.029)
Big city		-0.003 (0.008)	-0.003 (0.007)	-0.002 (0.007)
Constant		0.454*** (0.038)	0.141*** (0.045)	0.038 (0.054)
Observations	5,500	5,500	5,500	5,500
R ²	0.641	0.040	0.109	0.124

Notes: Linear probability model. The dependent variable is a dummy indicating support for the revenue recycling scheme. Model (1) does not include the constant. State Budget – Climate Premium are dummy variables corresponding to each condition. List of control variables: age bracket (baseline: born after 1983), gender (baseline: male), education, income (baseline: above € 2,100), political orientation (baseline: conservative), trust in government (baseline: low), climate concern (baseline: low), time/risk preferences (11 levels), former East Germany, and big city. Standard errors clustered at the individual level are reported in parentheses. *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$.


Supplementary Table 5: Demographic characteristics (expert survey).

			Premium		
	<i>N</i>	All	€ 1.40	€ 1.70	
<i>Age</i>					
18-29	85	0.230	0.156	0.300	$\chi(5) = 11.45$ $p = 0.043$
30-39	160	0.434	0.475	0.395	
40-49	72	0.195	0.223	0.168	
50-59	37	0.100	0.101	0.100	
60-69	12	0.033	0.034	0.032	
70+	3	0.008	0.011	0.005	
<i>Gender</i>					
Female	116	0.317	0.337	0.298	$\chi(1) = 0.48$ $p = 0.488$
Male	250	0.683	0.663	0.702	
<i>Position</i>					
Graduate Student	148	0.401	0.346	0.453	$\chi(5) = 6.8$ $p = 0.236$
Postdoc, Assistant Professor	95	0.257	0.313	0.205	
Associate Professor	21	0.057	0.056	0.058	
Full Professor	86	0.233	0.235	0.232	
Non-academic Researcher	8	0.022	0.022	0.021	
Other	11	0.030	0.028	0.032	

C Instructions and the Interface

C.1 Main Experiment

Consent

 Please read the following instructions carefully.

Voluntariness

Your participation in the experiment is voluntary. You can revoke your participation at any time. If you end the experiment prematurely by closing the browser window, the data you entered will be deleted. Please note, however, that you will not receive any payment.

Procedure

The experiment will take approximately **25 minutes**.

During the course of the experiment, you will have to make some decisions. Each of these decision situations will be described in detail beforehand.

You must perform the experiment on a computer, laptop, or cell phone without interruption. During the whole experiment, we ask you not to communicate with other people, not to start other programs on the computer, and not to use your cell phone for other purposes.

Please note that there are attention checks built into the experiment. If you do not answer them correctly, you will be excluded from the experiment prematurely.

Confidentiality

All data collected will be analyzed anonymously. Your name will not be linked to any decisions made in this experiment.

Payouts

For completed participation in this experiment, you will receive a monetary payout consisting of a fixed and variable amount.

Please note that you will not know your payout amount immediately at the end of the experiment. You will be informed about your payout amount separately in the coming days.

Declaration of consent

By clicking “I agree” below, you confirm that you are at least 18 years old, have read the consent form, and agree to participate in this experiment under the rules and regulations listed.

[Consent] Do you agree to participate in this experiment?

- | | |
|---|-----|
| <input type="checkbox"/> I agree | [1] |
| <input type="checkbox"/> I do not agree | [0] |

Questionnaire

Please first complete the following questionnaire. All answers will be completely anonymised and cannot be associated with you after the experiment has been completed.

[Q.0.1] What is your year of birth? [Text box]

[Q.0.2] What is your gender?

- ☐ Female [1]
- ☐ Male [2]
- ☐ Diverse [3]

[Q.0.3] What is your highest educational qualification?

- ☐ No secondary school certificate [1]
- ☐ Basic secondary school certificate [2]
- ☐ Intermediate secondary school certificate [3]
- ☐ (Specialized) Higher education entrance qualification [4]
- ☐ Bachelor's/Master's degree [5]
- ☐ Doctorate/Ph.D. [6]
- ☐ Other: [Text box] [7]

[Q.0.4] What is your occupation? [Text box]

[Q.0.5] We are now checking your attention. Please answer "Fully agree".

- ☐ Do not agree at all [1]
- ☐ Strongly disagree [2]
- ☐ Neither disagree nor agree [3]
- ☐ Somewhat agree [4]
- ☐ Fully agree [5]

[Q.0.6] What is your monthly disposable income, i.e. the amount in euros that you can dispose of each month, after deduction of taxes and social security contributions, to finance all your expenses? [Text box]

[Q.0.7] What kind of device are you using to participate in this study?

- ☐ Laptop or desktop computer [1]
- ☐ Tablet [2]
- ☐ Mobile phone [3]

Welcome

[1/5]

This is a study by researchers at Ludwig Maximilian University of Munich.



[2/5]

The study takes approximately **25 minutes**.

You will receive a payout for completed participation in this study.

[3/5]

⚠ Please read the instructions carefully.

We will ask you questions that will test your understanding and attention. If you answer them incorrectly, unfortunately, you will not be able to participate in the study and will not receive any bonus payment.

You can only proceed if you answer all the questions in the quiz correctly. If you want to return to the instructions, please click on the ← button.

[4/5]

The experiment consists of **4 parts**.

- In **Part 1** and **Part 2**, you make purchase decisions. One of the two parts is selected and determines your bonus payout.
- In **Part 3**, you make several decisions that affect which of the top two parts is selected.
- In **Part 4**, you fill out a questionnaire.

[5/5]

A The Ethics Committee of LMU Munich has approved this study. You can contact the Ethics Committee via ethics-committee@econ.lmu.de.

In order to obtain approval, we have pledged not to provide misleading or untrue information.

Everything you read in the instructions is TRUE.

Quiz

[CQ.0] According to the ethics protocol under which we are conducting this study, all information you read must be truthful and not misleading.

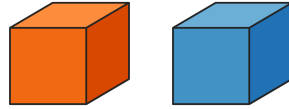
- ☐ True [1]
- ☐ False [2]

Part 1

[1/8]

In Part 1, you can buy two “virtual” products:

Product ORANGE and **Product BLUE**.



[2/8]

When you buy a product, you will receive the following payout.

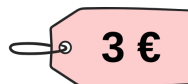
- The value of **Product ORANGE** is 7 euros.



- The value of **Product BLUE** is 5 euros.



- Each product costs 3 euros.



[3/8]

If you buy **Product ORANGE** and **Product BLUE**, you will receive a total of 6 euros.

$$\begin{array}{rcl} \text{Orange Box} & 7 \text{ €} - 3 \text{ €} & = 4 \text{ €} \\ \text{Blue Box} & 5 \text{ €} - 3 \text{ €} & = 2 \text{ €} \\ & + & \\ & & = 6 \text{ €} \end{array}$$

If you buy only **Product ORANGE**, you will receive 4 euros.

$$\text{Orange Box} \quad 7 \text{ €} - 3 \text{ €} = 4 \text{ €}$$

You can not buy **Product BLUE** alone.

If you do not buy any product, you will receive 0 euros.

$$\text{Orange Box} \quad \text{Blue Box} = 0 \text{ €}$$

[4/8]

When you buy products, you **emit** CO₂.

Emissions are equal to **60kg of CO₂** for each product you purchase.

$$\begin{array}{rcl} \text{Orange Box} & 7 \text{ €} & \text{and} \quad \text{CO}_2 \quad 60 \text{ kg} \\ \text{Blue Box} & 5 \text{ €} & \text{and} \quad \text{CO}_2 \quad 60 \text{ kg} \end{array}$$

60kg is approximately equal to the amount of CO₂ produced by a **300 km** car trip.

Scientists agree that CO₂ emissions are the most important cause of climate change.

[5/8]

If you buy both **Product ORANGE** and **Product BLUE**, you will receive a total of 6 euros and you emit 120kg of CO₂.



If you buy only **Product ORANGE**, you will receive 4 euros and you emit 60kg of CO₂.



If you do not buy either product, you will receive 0 euros and you will not emit any CO₂.



[6/8]

⚠ Your purchase decision has a real impact on CO₂ emissions.

Here we explain why this is so. There is an organisation called Carbonfund.org that carries out projects that permanently reduce CO₂ in the earth's atmosphere. For a fixed amount, Carbonfund.org reduces the CO₂ content of the atmosphere by one ton.

The experimental laboratory of the LMU Munich (MELESSA) has pledged, via Carbonfund.org, to remove 120kg of CO₂ from the atmosphere for each participant in this experiment. However, this amount decreases by 60kg with each product purchased. So, if you buy both products, 120kg less CO₂ will be neutralised, i.e. there will be permanently 120kg more CO₂ in the atmosphere than if you do not buy any product.

[7/8]

You will receive a link to the receipt proving our purchase of CO₂ certificates via Carbonfund.org approximately 2 weeks after the end of the study.

So you can be sure that **the transfer to Carbonfund.org is really done.**

[8/8]

In summary, you will select one of the following three options in this part.

- Option 1: You buy both **Product ORANGE** and **Product BLUE**



- Option 2: You buy only **Product ORANGE**



- Option 3: You do not buy a product



Before proceeding, you must complete a quiz.

Quiz

[CQ.1.1] 1. What happens when you buy both products?

- ☐ You receive a total of 6 euros and emit 120kg of CO₂. [1]
- ☐ You receive a total of 4 euros and emit 60kg of CO₂. [2]
- ☐ You receive 0 euros and emit no CO₂. [3]

[CQ.1.2] 2. What happens if you buy only **Product ORANGE**?

- ☐ You receive a total of 6 euros and emit 120kg of CO₂. [1]
- ☐ You receive a total of 4 euros and emit 60kg of CO₂. [2]
- ☐ You receive 0 euros and emit no CO₂. [3]

[CQ.1.3] 3. What happens if you do not buy a product?

- ☐ You receive a total of 6 euros and emit 120kg of CO₂. [1]
- ☐ You receive a total of 4 euros and emit 60kg of CO₂. [2]
- ☐ You receive 0 euros and emit no CO₂. [3]

[CQ.1.4] 4. Your decisions affect the level of CO₂ in the atmosphere.

- ☐ True [1]
- ☐ False [2]

Your decision for Part 1

Please select an option.

- ☐ Option 1: You buy both **Product ORANGE** and **Product BLUE**



- ☐ Option 2: You buy only **Product ORANGE**



- ☐ Option 3: You do not buy a product

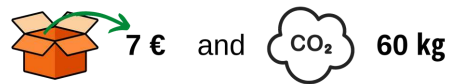


Part 2

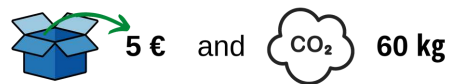
[1/4]

In Part 2, you can again buy two products, **Product ORANGE** and **Product BLUE**. Their values are the same as in Part 1, and you emit 60kg of CO₂ for each product you buy.

- **Product ORANGE** has a value of 7 euros, and emits 60kg CO₂.

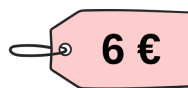


- **Product BLUE** has a value of 5 euros, and emits 60kg CO₂.



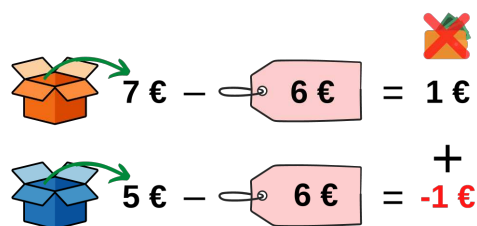
[2/4]

In Part 2, the price for each product is 6 euros.

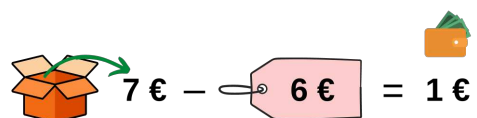


[3/4]

If you buy **Product ORANGE** and **Product BLUE**, you will receive a total of 0 euros.



If you buy only **Product ORANGE**, you will receive 1 euro.



You can not buy **Product BLUE** alone.

If you do not buy any product, you will receive 0 euros.

[4/4]

In summary, you will select one of the following three options in this part.

- Option 1: You buy both **Product ORANGE** and **Product BLUE**



- Option 2: You buy only **Product ORANGE**



- Option 3: You do not buy a product



Before proceeding, you must complete a quiz.

Quiz

[CQ.2] The price in Part 2 is ...

- ☐ lower than in Part 1. [1]
- ☐ the same as in Part 1. [2]
- ☐ higher than in Part 1. [3]

Your decision for Part 2

Please select an option.

- ☐ Option 1: You buy both **Product ORANGE** and **Product BLUE**



- ☐ Option 2: You buy only **Product ORANGE**



- ☐ Option 3: You do not buy a product



[Following message pops up if a participant chose Option 1.]

⚠ Are you sure you want to buy both products?

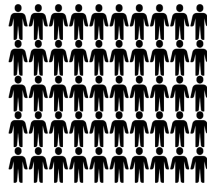
Please note: The additional purchase of **Product BLUE** will reduce your payout and increase CO₂ emissions.

Part 3

[1/7]

In this experiment, you are part of a **group of 50 consumers**. You will remain part of this group for the entire study.

Each member of the group has or will answer exactly the same questions as you.



[2/7]

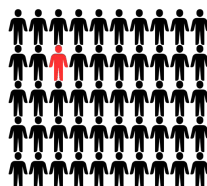
Your group members are drawn from a **representative sample of the German population** in terms of gender, age, region, education, and income.

This means, for example, that since 51% of the German population is female, a randomly selected member of your group has a 51% probability of being female.

[3/7]

You now take part in 5 votes. At the end of the study, the computer randomly draws a number between 1 and 5. This number decides which of the 5 votes is payout-relevant.

One of the 50 group members is **randomly selected** and her or his vote alone decides the outcome of the payout-relevant vote.



Important: This group member could be you! Therefore, in all votes you should vote for the option you think is better.

Before proceeding, you will have to complete a quiz.

Quiz

[CQ.3.1] 1. Which statement is true about your group members?

- ☐ Your group members come from a representative sample of the German population in terms of gender, age, region, education, and income. [1]
- ☐ Your group members are not representative of the German population in terms of gender, age, region, education, and income. [2]

[CQ.3.2] 2. Which of the following statements is true about your choices in this part?

- ☐ It is certain that my decisions in this part will determine the outcome of the payout-relevant vote. [1]
- ☐ There is a small chance that my decisions in this part will determine the outcome of the payout-relevant vote. [2]
- ☐ There is no chance that my decisions in this part will determine the outcome of the payout-relevant vote. [3]

[4/7]

In Part 1, the price for each product was **3 euros**. In Part 2, the price for each product was **6 euros**.

The price in Part 2 was higher than in Part 1 because in Part 2, in addition to the product price of 3 euros, a CO₂ price of **3 euros** had to be paid per product (this corresponds to a CO₂ price of 50 euros per ton of CO₂).



The CO₂ price was introduced to reduce the total amount of emissions.

[5/7]

The money generated by the CO₂ price in this group goes into a common pot.



[6/7]

[This screen is for “State budget” condition]



- ⚠ The money in the common pot goes to the German state budget.**
All taxes paid to the federal government go into the German state budget.

[6/7]

[This screen is for “Redistribute all” condition]



- ⚠ The money in the common pot will be divided equally among all 50 group members.**
You will receive this payment approximately 2 weeks after the end of the study.

[6/7]

[This screen is for “Climate premium” condition]



- ⚠ To compensate for the CO2 price, each group member receives an additional Climate Premium of 1.4/1.7 euros.**
You will receive this payment immediately after completing the survey.
The payment is fixed and independent of the amount of money in the common pot (but the pot helps with funding).

[6/7]

[This screen is for “Redistribute poor” condition]



⚠ The money in the common pot is divided equally among group members who reported having a monthly disposable income of less than 2,100 euros.

In a previous study, 50% of participants had a monthly disposable income of less than 2,100 euros.

You reported a monthly disposable income of [≤ 2100]/[> 2100] euros, so you **will**/**will not** receive a portion of the money.

You will receive this payment about 2 weeks after the end of the study.

[6/7]

[This screen is for “Climate project” condition]



⚠ The money in the common pot is transferred to an organisation supported by the *National Climate Protection Initiative*, through which the German government has been funding climate protection projects in Germany since 2008.

The *National Climate Protection Initiative* covers “a broad spectrum of climate protection activities: From the development of long-term strategies to concrete assistance and investment support measures.”

Quiz

[CQ.3.3] What happens to the money in the common pot?

- ☐ It remains with the researchers. [1]
- ☐ [State budget] It goes to the German state budget. [2]
- ☐ [Redistribute all] It is divided equally among all group members. [2]
- ☐ [Climate premium] Each participant receives a fixed additional payout of 1.4/1.7 euros as a climate premium. [2]
- ☐ [Redistribute poor] It will be divided equally among the group members who have declared having a monthly disposable income of less than 2,100 euros. [2]
- ☐ [Climate project] It is transferred to an organisation supported by the *National Climate Protection Initiative*. [2]










[7/7]


You can now vote on which decisions in the study are payout-relevant.

You can vote for one of the following two options.










- The decisions **without a CO₂ price** are payout-relevant (Part 1).
- The decisions **with a CO₂ price** are payout-relevant (Part 2).


Decisions in Part 1: Without CO₂ price

	→		6 €		120 kg
or					
	→		4 €		60 kg
or					
	→		0 €		0 kg



Decisions in Part 2: With CO₂ price

	→		0 €		120 kg
or					
	→		1 €		60 kg
or					
	→		0 €		0 kg



The money in the common pot goes to the German state budget.

[This illustration is for “State budget” condition]

Your decision for Vote 1

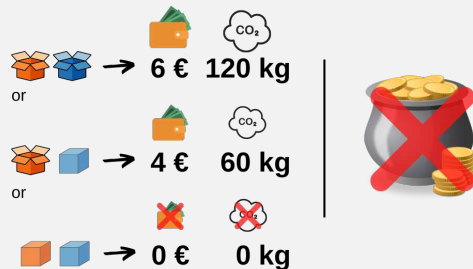
Please select an option.

I vote against the introduction of CO₂ pricing (Part 1).

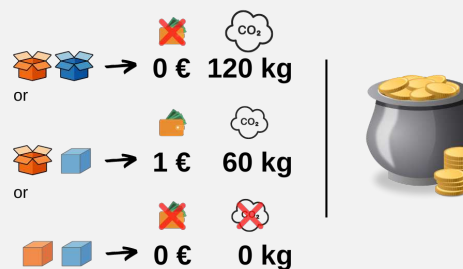
I vote for the introduction of CO₂ pricing (Part 2).

Please explain in a few complete sentences why you decide against or in favour of the introduction of CO₂ pricing. [Text box]

Part 1



Part 2



The money in the common pot goes to the German state budget.

[This illustration is for “State budget” condition]

Votes 2 to 5

For each of the following scenarios, you vote again on the introduction of a CO₂ price.

As before, the money generated by the CO₂ price in this group goes into a **common pot** in all subsequent scenarios.



The scenarios differ from each other because **the money in the common pot is used differently.**

Remember: There is a small chance that your vote will decide which part of the experiment is implemented for you and your group.

[Similar sets of instructions, quiz, and decision screen follow.]

Part 4

This is the last part of the study. Please answer the questions on the next pages.

Questionnaire [1/5]

[Q.4.1.1] 1.1. The following scenarios differ in how the revenues from CO₂ pricing are distributed. Please now rank the five possible scenarios in order of how desirable you consider them to be. Please place your preferred distribution on the 1 and your least preferred on the 5. [Order randomised]

- The money in the common pot is divided equally among group members who have declared having a monthly disposable income of less than 2,100 euros.
- To compensate for the CO₂ price, each group member will receive an additional payment of 1.4/1.7 euros.
- The money in the pot goes to the German state budget.
- The money in the common pot will be transferred to an organisation supported by the *National Climate Protection Initiative*, through which the German government has been funding climate protection projects in Germany since 2008.
- The money in the common pot is divided equally among all group members.

[Q.4.1.2] 1.2. In Part 3, you voted several times against or in favour of a CO₂ price of 3 euros for each product purchased. Please refer to Vote 1 in Part 3, in which the money generated by the CO₂ price ... [description of the redistribution scheme]. Imagine if the CO₂ price had been different. Would you agree to CO₂ pricing for the following six scenarios?

	Yes	No
CO ₂ price of 0.5 euros	<input type="checkbox"/>	<input type="checkbox"/>
CO ₂ price of 1.5 euros	<input type="checkbox"/>	<input type="checkbox"/>
CO ₂ price of 2.5 euros	<input type="checkbox"/>	<input type="checkbox"/>
CO ₂ price of 3.5 euros	<input type="checkbox"/>	<input type="checkbox"/>
CO ₂ price of 4.5 euros	<input type="checkbox"/>	<input type="checkbox"/>
CO ₂ price of 5.5 euros	<input type="checkbox"/>	<input type="checkbox"/>

[Q.4.1.3] 1.3. Please indicate how strongly you agree with the following statement: Instead of a tax, the purchase of product BLUE should be banned altogether.

- ☐ Strongly disagree [1]
- ☐ Disagree [2]
- ☐ Neutral [3]
- ☐ Agree [4]
- ☐ Strongly agree [5]

Questionnaire [2/5]

The following seven questions are about your expectations regarding the behaviour of the other group members. You will be rewarded for the accuracy of your answers. For this, one of the following seven questions will be randomly selected and you will receive an additional 10.00 euros if you have given the correct answer.

[Q.4.2.1] 2.1. Please refer to Part 1, where there was no CO₂ pricing and the price for each product purchased was therefore 3 euros. How many of the other 49 group members do you think chose each of the three options?

Move the sliders below to express your guess. Note that the sum of the three answers must add up to 49.

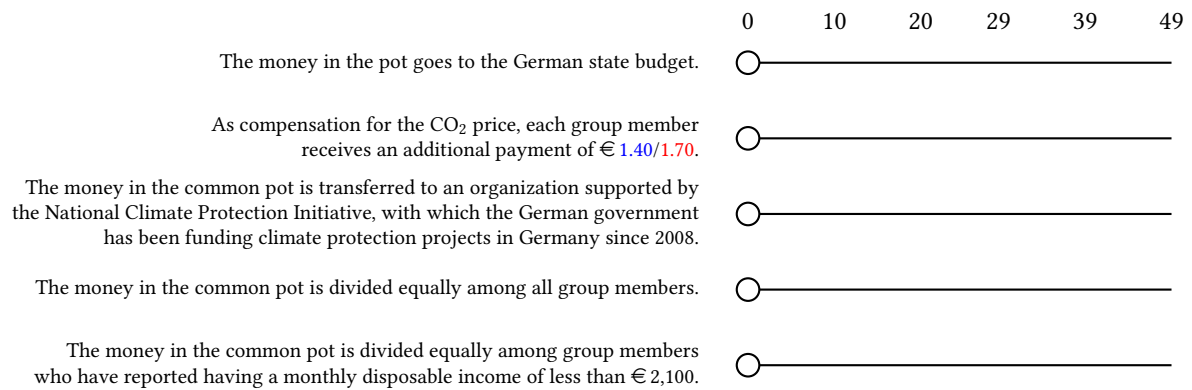
	0	10	20	29	39	49
Buy both Product ORANGE and Product BLUE	<input type="range"/>					
Buy Product ORANGE only	<input type="range"/>					
Do not buy a product	<input type="range"/>					
Total:						0

[Q.4.2.2] 2.2. Please refer to Part 2, where there was a CO₂ price of 3 euros for each product purchased and the price for each purchased product was therefore 6 euros. How many of the other 49 group members do you think chose each of the three options?

Move the sliders below to express your guess. Note that the sum of the three answers must add up to 49.

	0	10	20	29	39	49
Buy both Product ORANGE and Product BLUE	<input type="range"/>					
Buy Product ORANGE only	<input type="range"/>					
Do not buy a product	<input type="range"/>					
Total:						0

[Q.4.2.3] 2.3. In Part 3, how many of the other 49 group members voted in favour of introducing a CO₂ price in each case? [Order randomised]



Questionnaire [3/5]

We would like to know even more about you now.

[Q.4.3.1] 3.1. Where would you rank yourself if 1 stands for “The government should stay out of the economy and trust the market” and 5 stands for “The government should control the economy”?

[Q.4.3.2] 3.2. Where would you rank yourself if 1 stands for “The state should stay out of the redistribution of income and wealth” and 5 stands for “The state should redistribute income and wealth”?

[Q.4.3.3] 3.3. Where would you classify yourself if 1 stands for “socially conservative” and 5 for “socially liberal”?

[Q.4.3.4] 3.4. Which of the following parties is closest to your political views? [Order randomised]

- ☐ AfD
- ☐ Bündnis 90/Die Grünen
- ☐ CDU/CSU
- ☐ Die Linke
- ☐ FDP
- ☐ SPD

[Q.4.3.5] 3.5. Please indicate how strongly you agree with the following statements. [1: Strongly disagree; 3: Neutral; 5: Strongly agree]

- If the government levies a tax to solve a problem, the revenue from that tax should be used to solve the same problem. For example, the revenue from tobacco taxes should be used to fund the health care system.
- The impact of new policies on people’s finances should be easy to understand. The government should introduce simple measures, even if more complicated ones are more effective.
- If the government wants people to change their behaviour, it should compensate them for the cost of change.
- We now check your attention. Please answer “Disagree”.
- I have confidence in the German government to use taxpayers’ money wisely.

[Q.4.3.6] 3.6. Please tell us in general terms how much you are willing or unwilling to take risks. Please use a scale from 0 to 10, where 0 means ‘not at all willing to take risks’ and 10 means ‘very willing to take risks’. You can also use any number between 0 and 10 to indicate where you see yourself on the scale by using (the numbers) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10.

[Q.4.3.7] 3.7. How much would you be willing to give up something that benefits you today in order to benefit more in the future? 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’. You can also use any number between 0 and 10 to indicate where you see yourself on the scale by using (the numbers) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10.

Questionnaire [4/5]

[Q.4.4.1] 4.1. Please indicate how strongly you agree with the following statements. [1: Strongly disagree; 3: Neutral; 5: Strongly agree]

- I am convinced that climate change exists.
- I am convinced that climate change is mainly caused by humans.
- I am concerned about climate change.
- The emission of CO₂ should be regulated.

[Q.4.4.2] 4.2. Climate change is a significant problem. [1: Strongly disagree; 3: Neutral; 5: Strongly agree]

[Q.4.4.3] 4.3. How likely is it that humanity will stop climate change by the end of the century? [1: Very unlikely; 4: Very likely]

[Q.4.4.4] 4.4. To what extent do you think climate change is already affecting or will negatively affect your life? [1: Not at all; 2: A little; 3: Moderately; 4: Quite a lot; 5: Very much]

[Q.4.4.5] 4.5. Germany should bear a large part of the cost of combating climate change. [1: Strongly disagree; 3: Neutral; 5: Strongly agree]

[Q.4.4.6] 4.6. Germany should provide substantial financial assistance to the countries most affected by the consequences of climate change. [1: Strongly disagree; 3: Neutral; 5: Strongly agree]

[Q.4.4.7] 4.7. How many countries in the world have produced more CO₂ emissions in their entire history than Germany? countries have polluted more than Germany.

[Q.4.4.8] 4.8. How many countries in the world are more vulnerable to climate change than Germany? Countries are more vulnerable to climate change.

[Q.4.4.9] 4.9. You now have the choice between several options, which differ in an additional payout for you and an additional CO₂ compensation by Carbonfund.org. The option you choose will be implemented by us. Please indicate which of the following options you prefer:

- | | |
|--|-----|
| <input type="checkbox"/> 0.50 euros for you and 0kg additional CO ₂ compensation | [1] |
| <input type="checkbox"/> 0.40 euros for you and 8kg additional CO ₂ compensation | [2] |
| <input type="checkbox"/> 0.30 euros for you and 14kg additional CO ₂ compensation | [3] |
| <input type="checkbox"/> 0.20 euros for you and 18kg additional CO ₂ compensation | [4] |
| <input type="checkbox"/> 0.10 euros for you and 20kg additional CO ₂ compensation | [5] |
| <input type="checkbox"/> 0.00 euros for you and 21kg additional CO ₂ compensation | [6] |

Questionnaire [5/5]

[Q.4.5.1] 5.1. Do you trust those responsible for this study that they will indeed buy CO₂ certificates as described in the instructions?

☐ Yes [1]

☐ No [2]

[Q.4.5.2] 5.2. Do you have feedback on this survey? [Text box]

C.2 Expert Survey

Welcome to this study!

Voluntariness

Your participation in the experiment is voluntary. You can revoke your participation at any time.

Procedure

The study will take approximately **10 minutes**.

Confidentiality

All data collected will be analyzed anonymously.

Payouts

You may receive a monetary payment for completing your participation in this study.

Declaration of consent

By clicking “I agree” below, you confirm that you are at least 18 years old, have read the consent form, and agree to participate in this experiment under the rules and regulations listed.

[Consent] Do you agree to participate in this experiment?

- | | |
|---|-----|
| <input type="checkbox"/> I agree | [1] |
| <input type="checkbox"/> I do not agree | [0] |

Welcome

[1/2]

Thank you for your participation! In this study, we kindly request your assessment of the level of approval within the German population for various forms of CO₂ pricing.

We collected this approval through an online experiment in June 2023 with 1,100 participants. The participants were recruited through the online platform *Bilendi* and are representative of the adult German population in terms of

- age,
- gender,
- region,
- income, and
- education.

Both the experiment and this study were preregistered.

[2/2]

You will now be taken quickly through the original experiment. This experiment consisted of 4 parts.

In Parts 1 to 3, you will make the same decisions as the experiment participants. Unlike the experiment, your decisions in Parts 1 to 3 are hypothetical.

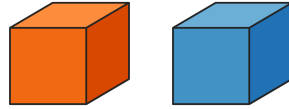
In Part 4, we will ask you for incentivised assessments of the decision-making behaviour of the experiment participants.

Part 1

[1/5]

In Part 1, you can buy two “virtual” products:

Product ORANGE and **Product BLUE**.



[2/5]

When you buy a product, you will receive the following payout.

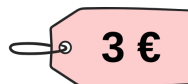
- The value of **Product ORANGE** is 7 euros.



- The value of **Product BLUE** is 5 euros.



- Each product costs 3 euros.



[3/5]

If you buy **Product ORANGE** and **Product BLUE**, you will receive a total of 6 euros.

$$\begin{array}{rcl} \text{Orange box} & 7 \text{ €} - 3 \text{ €} & = 4 \text{ €} \\ \text{Blue box} & 5 \text{ €} - 3 \text{ €} & = 2 \text{ €} \\ & + & \\ & & = 6 \text{ €} \end{array}$$

If you buy only **Product ORANGE**, you will receive 4 euros.

$$\text{Orange box} \quad 7 \text{ €} - 3 \text{ €} = 4 \text{ €}$$

You can not buy **Product BLUE** alone.

If you do not buy any product, you will receive 0 euros.

$$\text{Orange box} \quad \text{Blue box} = 0 \text{ €}$$

[4/5]

When you buy products, you **emit** CO₂.

Emissions are equal to **60kg of CO₂** for each product you purchase.

$$\begin{array}{rcl} \text{Orange box} & 7 \text{ €} & \text{and} \quad \text{CO}_2 \quad 60 \text{ kg} \\ \text{Blue box} & 5 \text{ €} & \text{and} \quad \text{CO}_2 \quad 60 \text{ kg} \end{array}$$

60kg is approximately equal to the amount of CO₂ produced by a **300 km** car trip.

Scientists agree that CO₂ emissions are the most important cause of climate change.

▲ Your purchase decision has a real impact on CO₂ emissions.

Here we explain why this is so. There is an organisation called Carbonfund.org that carries out projects that permanently reduce CO₂ in the earth's atmosphere. For a fixed amount, Carbonfund.org reduces the CO₂ content of the atmosphere by one ton.

The experimental laboratory of the LMU Munich (MELESSA) has pledged, via Carbonfund.org, to remove 120kg of CO₂ from the atmosphere for each participant in this experiment. However, this amount decreases by 60kg with each product purchased. So, if you buy both products, 120kg less CO₂ will be neutralised, i.e. there will be permanently 120kg more CO₂ in the atmosphere than if you do not buy any product.

Your decision for Part 1

Please select an option.

- ☐ Option 1: You buy both **Product ORANGE** and **Product BLUE**



- ☐ Option 2: You buy only **Product ORANGE**



- ☐ Option 3: You do not buy a product

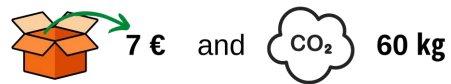


Part 2

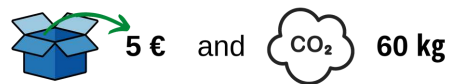
[1/3]

In Part 2, you can again buy two products, **Product ORANGE** and **Product BLUE**. Their values are the same as in Part 1, and you emit 60kg of CO₂ for each product you buy.

- **Product ORANGE** has a value of 7 euros, and emits 60kg CO₂.

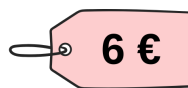


- **Product BLUE** has a value of 5 euros, and emits 60kg CO₂.



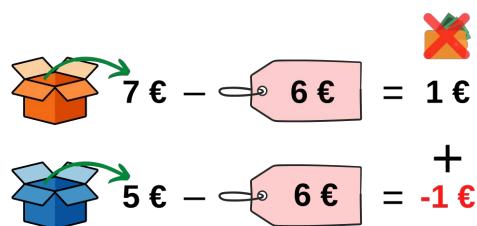
[2/3]

In Part 2, the price for each product is 6 euros.

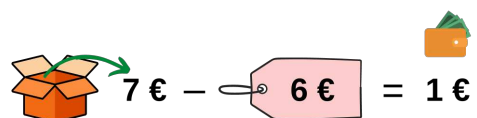


[3/3]

If you buy **Product ORANGE** and **Product BLUE**, you will receive a total of 0 euros.



If you buy only **Product ORANGE**, you will receive 1 euro.



You can not buy **Product BLUE** alone.

If you do not buy any product, you will receive 0 euros.

Your decision for Part 2

Please select an option.

- ☐ Option 1: You buy both **Product ORANGE** and **Product BLUE**



- ☐ Option 2: You buy only **Product ORANGE**



- ☐ Option 3: You do not buy a product



[Following message pops up if a participant chose Option 1.]

⚠ Are you sure you want to buy both products?

Please note: The additional purchase of **Product BLUE** will reduce your payout and increase CO₂ emissions.

Part 3

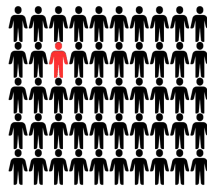
[1/4]

In this experiment, you are part of a **group of 50 consumers**. You will remain part of this group for the entire study.

Each member of the group has or will answer exactly the same questions as you.

You now take part in 5 votes. At the end of the study, the computer randomly draws a number between 1 and 5. This number decides which of the 5 votes is payout-relevant.

One of the 50 group members is **randomly selected** and her or his vote alone decides the outcome of the payout-relevant vote.



[2/4]

In Part 1, the price for each product was **3 euros**. In Part 2, the price for each product was **6 euros**.

The price in Part 2 was higher than in Part 1 because in Part 2, in addition to the product price of 3 euros, a CO₂ price of **3 euros** had to be paid per product (this corresponds to a CO₂ price of 50 euros per ton of CO₂).

$$\begin{array}{|c|} \hline \text{Product} \\ \hline 3 \text{ €} \\ \hline \end{array} + \begin{array}{|c|} \hline \text{CO}_2 \\ \hline 3 \text{ €} \\ \hline \end{array} = \begin{array}{|c|} \hline 6 \text{ €} \\ \hline \end{array}$$

The CO₂ price was introduced to reduce the total amount of emissions.

[3/4]

For the following five scenarios, you will vote on the introduction of CO₂ pricing.

You can vote for one of the following two options in each case.

- The decisions **without a CO₂ price** are payout-relevant (Part 1).
- The decisions **with a CO₂ price** are payout-relevant (Part 2).

[4/4]

The money generated by the CO₂ price in this group goes into a **common pot**.



The scenarios differ in how **the money in the common pot** is used.

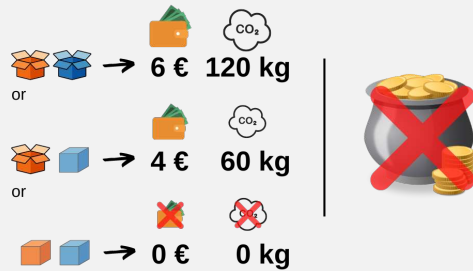
Your decision for Vote 1

Please select an option.

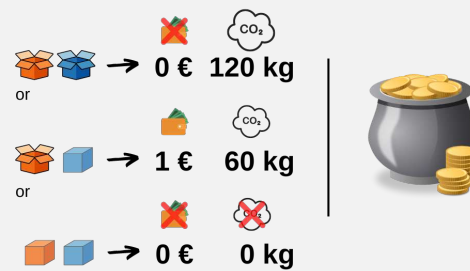
I vote against the introduction of CO₂ pricing (Part 1).

I vote for the introduction of CO₂ pricing (Part 2).

Part 1



Part 2



The money in the common pot goes to the German state budget.

[This illustration is for “State budget” condition. Decision pages for Votes 2 to 5 follow.]

[Q.3.rankings] The following scenarios differ in how the revenues from CO₂ pricing are distributed. Please now rank the five possible scenarios in order of how desirable you consider them to be. Please place your preferred distribution on the 1 and your least preferred on the 5. [Order randomised]

- The money in the common pot is divided equally among group members who have declared having a monthly disposable income of less than 2,100 euros.
- To compensate for the CO₂ price, each group member will receive an additional payment of 1.4/1.7 euros.
- The money in the pot goes to the German state budget.
- The money in the common pot will be transferred to an organisation supported by the *National Climate Protection Initiative*, through which the German government has been funding climate protection projects in Germany since 2008.
- The money in the common pot is divided equally among all group members.

Part 4

[1/2]

This is the last part of the study.

In the following seven questions, we will ask about your expectations regarding the behaviour of the 1,100 experiment participants.

You will be compensated for the accuracy of your answers. One of the following seven questions will be randomly selected, and you will receive € 40 if your answer deviates by a maximum of 2 percentage points from the correct answer.

[Q.4.1.1] 1.1. Please refer to Part 1, where there was no CO₂ pricing and the price for each product purchased was therefore 3 euros. What percentage of the experiment participants chose each of the three options?

Move the sliders below to express your guess. Note that the sum of the three answers must add up to 100.

	0	10	20	30	40	50	60	70	80	90	100
Buy both Product ORANGE and Product BLUE	<input type="text"/>										
Buy Product ORANGE only	<input type="text"/>										
Do not buy product	<input type="text"/>										
Total:											0

[Q.4.1.2] 1.2. Please refer to Part 2, where there was a CO₂ price of 3 euros for each product purchased and the price for each purchased product was therefore 6 euros. What percentage of the experiment participants chose each of the three options?

Move the sliders below to express your guess. Note that the sum of the three answers must add up to 100.

	0	10	20	30	40	50	60	70	80	90	100
Buy both Product ORANGE and Product BLUE	<input type="text"/>										
Buy Product ORANGE only	<input type="text"/>										
Do not buy product	<input type="text"/>										
Total:											0

[Q.4.1.3] 1.3. What percentage of the experiment participants chose to introduce CO₂ pricing in Part 3?

	0	10	20	30	40	50	60	70	80	90	100
The money in the pot goes to the German state budget.	<input type="radio"/>										
As compensation for the CO ₂ price, each group member receives an additional payment of € 1.40/1.70.	<input type="radio"/>										
The money in the common pot is transferred to an organisation supported by the National Climate Protection Initiative, with which the German government has been funding climate protection projects in Germany since 2008.	<input type="radio"/>										
The money in the common pot is divided equally among all group members.	<input type="radio"/>										
The money in the common pot is divided equally among group members who have reported having a monthly disposable income of less than € 2,100.	<input type="radio"/>										

Thank you for your participation. This is the final section of the survey. We would appreciate it if you could share some information about yourself. This information will only be used to distinguish patterns in the responses of different expert types.

[Q.4.2.1] 2.1. How old are you?

- ☐ 18-29 years old [1]
- ☐ 30-39 years old [2]
- ☐ 40-49 years old [3]
- ☐ 50-59 years old [4]
- ☐ 60-69 years old [5]
- ☐ 70+ years old [6]

[Q.4.2.2] 2.2. What is your gender?

- ☐ Female [1]
- ☐ Male [2]
- ☐ Diverse [3]

[Q.4.2.3] 2.3. What position do you hold?

- ☐ Graduate Student (Master, PhD) [1]
- ☐ Junior Faculty (Post-Doc, Assistant Professor) [2]
- ☐ Associate Professor [3]
- ☐ Full Professor [4]
- ☐ Non-academic Researcher [5]
- ☐ Other: [Text box] [7]

[Q.4.2.4] 2.4. If you have any comments, please enter them below. We would like to hear your feedback. [Text box]

Through the following link, you can provide your email address. This will allow us to contact you if you have won € 40 in the previous assessment questions. Please enter the following code: XXXXXXXX

Link: <https://melessa.limequery.com/XXXXXXX>

References

Statistisches Bundesamt, “Städte (Alle Gemeinden mit Stadtrecht) nach Fläche, Bevölkerung und Bevölkerungsdichte am 31.12.2022,” 2023. Statistisches Bundesamt. <https://www.destatis.de/DE/Themen/Laender-Regionen/Regionales/Gemeindeverzeichnis/Administrativ/05-staedte.html>.