Carbon Pricing, Carbon Dividends and Cooperation: Experimental Evidence

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Abstract

We investigated whether carbon taxes with and without carbon dividends improve cooperative behavior to mitigate simulated climate change. We implemented a randomized controlled trial on a large sample of the U.S. general population ($N = 2{,}116$). Played in real-time in groups of four, we tested three carbon-pricing treatments and a baseline condition within a modified threshold public goods game of loss avoidance. We found that a carbon tax coupled with carbon dividends reduces carbon-emitting group consumption relative to a baseline condition with no tax, and relative to a carbon tax only. A carbon tax coupled with carbon dividends paid out to below-average polluters (asymmetric dividend) worked best, with 94% of groups remaining below a critical consumption (emission) threshold. We also found that experiencing the asymmetric dividend condition positively affected perceptions of carbon pricing with carbon dividends.

JEL: C92, H23, H30, H41, Q54
Keywords: climate change, carbon pricing, carbon tax, carbon dividend, revenue recycling, cooperation

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1. Introduction

The challenge of anthropogenic climate change is often modelled as a prisoner's dilemma (Robèrt and Broman, 2017). By this logic, collectively, countries and individuals would be better off cooperating and changing production and consumption patterns to mitigate global climate change, but individually they have an incentive to continue emitting greenhouse gases (Barrett and Dannenberg, 2012). Policymakers have grappled with means to address the climate crisis, and finding effective mechanisms and incentive structures to decrease individual CO_2 emissions remains a challenge. It is estimated that about 60% to 72% of global greenhouse gas emissions and 50% to 80% of total global land, material, and water use are associated with the production and use of products and services consumed by households (see e.g., Hertwich and Peters, 2009; Ivanova et al., 2016). To achieve the necessary emission reductions within these areas, individual behavior change and effective regulatory measures are key (Theurl et al., 2020).

A carbon tax, a fee paid by the polluter per unit of pollution (Kolstad, 2000), can be a powerful tool for reducing emissions that drive climate change (Metcalf, 2019). A carbon tax can incentivize businesses to switch to less polluting production methods and to encourage consumers to shift their demand toward less environmentally harmful goods and services (Kolstad, 1994; Mongin, 2006; Marron and Morris, 2016). Critics have pointed out that the income effect associated with carbon taxes hits financially disadvantaged individuals particularly hard, rendering this measure regressive (Grainger and Kolstad, 2010). However, a so-called carbon dividend, a refund to tax-payers as a revenue recycling policy, can be coupled with a carbon tax. This would make most low and middle income individuals net beneficiaries of such a taxation structure by offsetting the average income effect of the tax. Thus, carbon dividends can help build political support for carbon taxation by mitigating the average individual's financial burden of the tax (see e.g., Fremstad and Paul, 2017; Klenert et al., 2018). Support for this idea comes, among others, from the 2019 "Economists Statement on Carbon Dividends", which was signed by 3,623 U.S. economists and 28 Nobel laureates in The Wall Street Journal (Climate Leadership Council, 2019). Indeed, the feasibility of practical implementation has been demonstrated e.g., by Austria, Canada and Switzerland, which have all recently introduced a carbon dividend.

Part of the threat of climate change stems from the risk of reaching a tipping point, the surpassing of which would have disastrous and potentially irreversible global consequences.[1] Game-theoretically, when individuals are sufficiently fearful of the prospect of crossing a detrimental threshold, the trade-off of collective versus individual gains can best be characterized as a coordination game, rather than a prisoner's dilemma (Barrett and Dannenberg, 2012). Within this context, the Collective Risk Social Dilemma (CRSD) has been widely applied in the experimental environmental economics literature, principally to model coordination behavior between political decision-makers (see e.g., Milinski et al., 2008; Barrett and Dannenberg, 2012). The classical CRSD is a threshold public goods game of loss avoidance. If the collective contributions of all group members meet or exceed a contribution threshold, the group avoids a collective loss of income and all members retain the uncontributed remainder of their initial endowment. If the group's collective contributions do not reach the threshold, participants are exposed to collective risk.

[1] Examples include the collapse of the Atlantic Thermohaline Circulation, decay of the Greenland ice sheet, and ecosystem collapse (Dannenberg et al., 2015).

Despite its societal importance, the use of tax revenues to compensate citizens in the form of carbon dividends has received relatively little attention in the economics literature. To our knowledge, no experimental evidence currently exists investigating the effects of a Pigouvian carbon tax and carbon dividend as a means of revenue recycling (redistribution) on cooperation to avoid a collective loss. In the present study, we tested the effect of carbon pricing alone and in combination with two different revenue recycling schemes (symmetric and asymmetric carbon dividends, respectively). Specifically, we developed a modified version of the Collective Risk Social Dilemma (CRSD) adapted to a consumption context and conducted it on *Prolific*, with a large sample of 2,116 subjects of the U.S. general population. We examined how carbon taxes with and without carbon dividends affect coordination in the CRSD and the ability to avoid simulated climate change.

Participants were randomly assigned to groups of 4, and remained within the same assigned groups over the course of 10 rounds. In each round, participants were asked to make an individual consumption decision about a fictitious good / service from which they derived a utility, by gaining tokens (that is, the experimental currency unit), but which also produced a negative externality: a contribution to simulated CO_2 emission. Tokens accumulated via consumption could lead to a bonus payment at the end of the game. However, this bonus was only guaranteed if the group did not exceed a critical threshold of total cumulative CO_2 emissions. We measured group consumption and the portion of groups who successfully remained below the critical consumption (that is, simulated CO_2 emission) threshold.

Study participants were randomly assigned to one of four conditions: *Baseline*, *Tax*, *Symmetric* and *Asymmetric*. The *Baseline*, in which no tax or dividend was applied, served as a control condition. The *Tax* condition simulated a Pigouvian carbon tax, without any revenue recycling. The *Symmetric* and *Asymmetric* treatments simulated a carbon tax where the tax revenue is redistributed within the group via a carbon dividend. Specifically, in the *Symmetric* condition, the tax revenue was redistributed equally among all players in the group, whereas in the *Asymmetric* condition, the tax revenue was redistributed such that only below-average CO_2 emitters benefited from the dividend (polluter pays principle).

We found that the combination of a carbon tax with an asymmetric carbon dividend, rewarding the below-average emitters, worked best to reduce total consumption (CO_2 emissions). 94% of groups in the condition featuring the carbon tax accompanied by asymmetric dividends successfully remained below the tipping point. A carbon tax with a symmetric carbon dividend, distributing tax revenue in equal shares to all group-members, was also effective at reducing total consumption, relative to the tax only (*Tax*) and the baseline (*Baseline*) conditions. However, the success rate was lower than for the asymmetric distribution, with 82% of groups in this treatment remaining below the tipping point. This did not differ statistically from the *Baseline* and *Tax* conditions. Consumption levels were highest in the *Baseline* condition with no tax or dividend, and in the *Tax* condition, featuring a carbon tax without any revenue recycling. Considering the implications of this in the context of climate change, the failure rate (that is, exceeding the threshold) was four times as high in these two conditions (22% and 25%, respectively), compared to the condition with a carbon tax and asymmetric dividends (6%). We conclude that behavioral factors and incentives brought about by carbon dividends work: both scenarios in which participants paid carbon taxes and received dividend payments reduced harmful consumption. Thus, even while communication was not possible, the carbon taxes coupled with a carbon dividend led groups to reduce their consumption, and, especially when dividends were asymmetric, increased the likelihood to remain below a critical threshold.

2. Related Literature

The literature on carbon pricing and revenue recycling in the form of carbon dividends to date has emphasized the importance of developing political acceptance and public support for these measures. For example, Cherry et al. (2012) found a reluctance toward efficiency-enhancing market interventions, such as Pigouvian taxes, in a lab setting. Klenert et al., 2018 argued that an appropriate use of tax revenues can increase the acceptability of carbon taxes. Similarly, Bourgeois et al., 2021 demonstrated that revenue recycling methods such as lump-sum payments can counteract the regressive nature of a carbon tax. In a systematic review of public support for carbon taxes, Carattini et al. (2018) recommended lump-sum payments as a way to recycle the carbon tax revenue (like carbon dividends), which may reduce public resistance to carbon taxes. This is further supported by empirical evidence by Kaplowitz and McCright (2015) and Beiser-McGrath and Bernauer (2019), who found that such lump-sum payments (carbon dividends) can strongly increase public support for carbon taxes. On the other hand, a survey revealed that Canadian taxpayers in provinces subject to a carbon tax and dividend did not hold more favorable views than counterparts in provinces where the policy measures were not in place (Mildenberger et al., 2022). The authors found that support for carbon dividends among Swiss taxpayers was also low. In both cases, citizens underestimated the value of dividends received, suggesting low levels of awareness.

Fairness perceptions also play an important role in fostering acceptance of welfare-enhancing measures. For example, burden-sharing, when perceived as fair, has been shown to improve support across several different research areas (Ringius et al., 2002; Caney, 2014; Dannenberg et al., 2015; Jagers et al., 2018; Sommer et al., 2022). There is also evidence that people's worldview affects their acceptance of efficiency-enhancing policies (Cherry et al., 2017). Self-identified right-leaning individuals typically respond favorably to compensatory measures, while left-leaning individuals tend to be less supportive of tax increases when paired with simultaneous income tax reductions (Jagers et al., 2018). On the other hand, Janusch et al. (2021) showed that experience with a policy measure can affect the perception of it. In their lab experiment examining congestion pricing, Janusch et al. (2021) found that initial support for the policy was based on individual worldviews, but once participants experienced the policy, the impact on personal financial gains or losses became the decisive factor for support. In light of evidence that carbon dividends, when understood, can foster support for carbon pricing, as well as the importance of experience with policy measures in garnering acceptance, our study provides insights into the differences in attitudes toward the carbon pricing and recycling measures between conditions. Specifically, we examined whether experiencing the measures impacts perceptions of fairness and acceptance of carbon taxes with and without dividends.

Several modified forms of the CRSD have been applied in the literature, including investigations of the influence of risk and ambiguity about the detrimental threshold on coordination (McBride, 2010; Dannenberg et al., 2015), the role of unequal endowments and communication on coordination (Tavoni et al., 2011), the effect of a linear payoff function (Fischbacher et al., 2011), and the role of framing endowments in absolute and relative terms on public good contributions (Brekke et al., 2017). The present study is novel in its application of the CRSD to a consumption context, and, moreover, in its simulation of carbon pricing mechanisms.

Conducting the CRSD with subjects from the United States general population is a further important feature of the present study. The U.S. is a major global polluter in absolute and per capita terms, with heterogeneous attitudes toward climate change across the political spectrum (see, e.g., McCright and Dunlap, 2011; Baldwin and Lammers, 2016). It is, therefore, important for policymakers to understand behavior of U.S. consumers and voters regarding climate change and carbon pricing. It also provides a test case among a population that does not yet have a federal carbon tax in place. Experimental studies in the CRSD context have primarily relied on student samples. Given that students' behavior is often not representative of the general population, (see, e.g., Bellemare and Kröger, 2007; Anderson et al., 2013), using a general population sample provides greater external validity to our findings.

Our study builds upon the discussed literature and addresses several research gaps. Within the CRSD paradigm, we offer a novel experimental investigation to test whether introducing a carbon tax, coupled with two forms of carbon dividends, can improve coordination to avoid simulated climate change in a threshold public goods game of loss avoidance. Our study provides compelling evidence that achieving cooperation is not only feasible but very likely when such measures are in place. In particular, combining a carbon tax with carbon dividends appeared most promising for reduction of harmful consumption. In light of the importance of public attitudes toward carbon taxes and dividends, we explored the influence that experience of the measures in the game has on beliefs and attitudes toward them, as well as how these attitudes differ among participants with different political leanings, environmental attitudes, and levels of conservatism. Independent of the treatment condition, our results demonstrated that holding stronger pro-environmental attitudes was positively associated with group success rates (that is, remaining below the critical consumption threshold) and that being more conservative was negatively associated with group success. Self-reported Republican voters were associated with holding more negative attitudes toward carbon taxes and carbon dividends, independent of the condition. Importantly, individuals who experienced the carbon tax with an asymmetric dividend, evaluated carbon taxes and dividends more positively and expressed stronger policy support than the participants in the baseline condition. Our findings provide empirical evidence that direct experience with carbon pricing mechanisms can positively affect perceptions of them.

3. Study Design, Procedure, and Hypotheses

The present study constitutes a pre-registered[2] online experiment programmed in oTree (Chen et al., 2016), which was conducted with a U.S. general population sample recruited via Prolific (representative sampling option: $N = 1{,}124$; general population sampling: $N = 992$).[3] Our total sample size was

[2] The pre-analyses plan and the experimental software can be found at https://osf.io/epm6n/.

[3] Unfortunately, we were unable to obtain a fully representative U.S. sample in terms of age, gender and ethnicity (interlocking). Our study design necessitated the simultaneous interaction of multiple participants who formed groups. Certain demographic groups (especially participants aged 58+) took time to sample via Prolific. This implied unreasonably long wait times for other group members who were already online. We therefore, sourced the remaining sample from the general U.S. population on Prolific, without explicit stratification based on U.S. census data on age, gender, and ethnicity. The results were qualitatively consistent across both samples.

$N = 2{,}116$.[4] Participants were randomly assigned to one of four conditions (one baseline, and three stylized treatments): *Baseline*, *Tax*, *Symmetric* and *Asymmetric*. Within each condition, participants were randomly and anonymously assigned to groups of four. Group formation required all four members to be online simultaneously in real-time, and group assignment did not change throughout the experiment. Each participant received a lump sum payment equivalent to GBP 2.50 for participating in the experiment and had the opportunity to earn additional bonus payments based on behavior throughout the game. The experiment was parameterized to yield an expected additional payment of GBP 3 for the task, with a minimum possible payout of GBP zero and a maximal possible payout of GBP 8.

Participants were instructed to imagine that they could consume a good or service from which they derive a benefit, but which causes a negative externality (see the detailed instructions in Section A.1 in the Appendix). In each of 10 rounds, participants were asked to decide on the amount of consumption they wish to make. Each consumption unit corresponds to one experimental currency unit called token, which was converted to the monetary bonus payment at the end of the game. However, each consumption unit also produces one unit of simulated CO_2 emission. The bonus payment was only guaranteed if the group did not exceed a critical threshold of CO_2 emissions. Thus, consumption of tokens provided a monetary reward to individuals, but over-consumption at the group level could jeopardize everyone's monetary gains.

Ahead of the initiation of the CRSD, participants were provided with detailed instructions, specific to their assigned condition. In order to proceed to the group formation, participants were required to complete and correctly answer a comprehension check questionnaire, comprised of 9 questions. After playing 10 rounds of the CRSD, participants were asked to complete a survey, including their decision-making motivations throughout the game, the Resistance to Change Beliefs Scale (White et al., 2019), and the Revised New Environmental Paradigm (NEP) scale (Dunlap et al., 2002), to establish participants' levels of conservativism and environmental attitudes respectively. We also provided a debriefing and explanation of the carbon dividend, and asked three questions about attitudes toward the carbon tax and dividend. Finally, we collected demographic information, including political leaning.

In each round of the experiment, participants could decide on how many units $c \in [0, 2, 4]$ they want to consume, and thereby add as tokens to their personal account balance. Each unit of consumption also contributed linearly to the public bad (CO_2 emissions). The unconsumed units $(4 - c)$ were lost and could be thought of as a contribution to prevention of the public bad (since participants were foregoing the additional tokens that contribute to the bonus payment). If the group's cumulative consumption (and thus cumulative CO_2 emissions) after 10 rounds exceeded the threshold of 50% (80 units) of the maximum possible group consumption (160 units), simulated catastrophic climate change occurred with a known probability of 60%. If this happened, all (100%) of the accumulated tokens of all members of the group were lost.[5]

[4] For details regarding the representative sampling on Prolific, see Table B1 in the Appendix. The displayed relative frequencies in Table B1 correspond to a sub-sample of $N = 1{,}124$, which constitutes 53% of the total sample of $N = 2{,}116$ observations. A fraction of 1 indicates a bracket sampled precisely to its intended sample size on Prolific. Differential ratios within each stratum denote a lack of fully balanced sampling. For an overall comparison of our sample composition regarding ethnicity, age, education, gender, income, and employment status to the closest available U.S. Census data for the time frame where our data was collected, see Figures B1 to B6 in the Appendix, which show that our sample composition with respect to these variables is very similar to the general U.S. population.

[5] This probability guarantees that the Nash equilibrium, in which all participants consume 2 units in each of the 10 rounds, Pareto dominates the Nash equilibrium, in which all participants consume 4 units in each of the 10 rounds.

If the cumulative consumption did not exceed the threshold at the end of the 10 rounds (that is, participants prevented catastrophic climate change) or if catastrophic climate change did not occur (probability of 40%), each player of the group kept all their accumulated tokens. These tokens were then converted into GBP at a rate of 5:1 as a bonus payment. If all the tokens were lost due to catastrophic climate change, the bonus payment was zero.

Throughout the game, participants received multiple pieces of information to help them make their consumption decisions but they could not communicate with each other. At the end of each round, participants could see the consumption of all members of the group (including their own) for that round. They also saw the aggregate group consumption for that round, as well as the combined group consumption for all rounds played up to that point (see e.g., Milinski et al., 2008; Tavoni et al., 2011). Participants also received visual information about the cumulative consumption of the group via a progress bar (see Figures A4, A8, A12, and A16). Participants had access to a quick reference guide, in which all relevant terms and instructions were explained, in order to ensure comprehension. The quick reference guide could be accessed at any time, and provided the instructions that participants already saw at the start of the experiment, in a summarized form.

In this setup, there is a collective benefit of cooperation within the group to avoid the aggregate consumption–that is, total externalities–from exceeding 80 units. However, at the individual level, group members have an incentive to consume the maximum amount and to act as free riders. For example, a constant consumption of 2 or 4 units by each group member over the 10 rounds would represent pure strategy Nash equilibria. Participants' rational strategy depends on the history of the game, that is, past consumption patterns of the group members and beliefs regarding the remaining rounds. In any given round, and given a set of beliefs about the other group members, any of the consumption options $[0, 2, 4]$ can be rationalized. For example, if exceeding the threshold results in a lower expected payoff for a risk-neutral participant, it can be rational for her to consume zero in specific rounds, if she believes that by making such a choice, the threshold will not be exceeded. On the other hand, if this participant knows or believes that the threshold will be exceeded regardless of her own consumption, it is rational for her to consume the highest amount (4 units) and to speculate on luck.

Treatment Details

Baseline

The *Baseline* condition served as a control, in which the CRSD was played as described, without the implementation of any carbon pricing (taxation or dividend). In this condition, one unit of consumption translated to one token, and to one unit of CO_2 emission.

Tax

In the *Tax* condition, participants had to pay a carbon tax of 50% on the tokens associated with their chosen consumption in each round.[6] This means that for every unit of consumption, participants received half the number of tokens. The CO_2 emissions remained the same (one unit of emissions per unit of consumption). In this condition, the tax revenue was not redistributed or used otherwise. This avoids confounders that could be due to the way in which tax revenue is used. This procedure is similar to, for example, Sausgruber and Tyran (2005).[7] At the end of each round, when participants received the summary information of the completed round and the previous rounds, they also saw the carbon tax deductions. Specifically, they were shown how much was deducted from each participant's consumption in tokens (displayed with a negative sign), as well as the number of tokens left for each participant after the deduction of the tax, both in the current round and for all previous rounds combined. In this configuration, the relative attractiveness of coordinating toward the threshold, as opposed to consuming higher amounts, as well as other behavioral factors triggered by the tax alone, can be more accurately gauged.

In our design, the tax provides a *relative* incentive to coordinate on lower levels of group consumption, instead of consuming higher amounts. Importantly, in theory, the quantity consumed in an individually rational consumption optimum, where marginal cost (price) equals marginal utility, is reduced by an increase in marginal cost, for example, by imposing a carbon tax on a good or service. The last unit(s) of this good or service previously consumed would be expected not to be consumed after the price increase because its marginal cost would now exceed its corresponding marginal utility. This would lead to a situation where it would be individually rational to consume fewer units than before the introduction of the tax. The tax in our experiment does increase marginal cost substantially, as expressed by the reduction in tokens added to the account balance for a given consumption choice when the tax is introduced. However, by design, this never happens to a point where the marginal cost exceeds the marginal utility of an additional unit of consumption. Therefore, in our experiment, the tax in and of itself (without the coordination component) never makes a consumption reduction individually rational. In other words, if a decision is rational for a participant in *Baseline*, then, (*ceteris paribus*), the same decision remains individually rational for a participant in the *Tax* condition. Identical to the baseline condition, in any particular round and given a set of beliefs about the other group members (that might be influenced by the tax itself), any of the three consumption choices of the set $[0, 2, 4]$ can be rationalized.

In our study, the implementation of a carbon tax served to recalibrate *relative* individual incentives. Specifically, ensuring that the group consumption levels do not exceed the detrimental threshold (coordination) became relatively more attractive compared to consuming higher amounts. In our experiment, the choice was not between consuming different goods but between higher and lower levels of (harmful) consumption, the latter only being beneficial for coordination to avoid a catastrophic loss. The carbon tax increases the

[6] Unlike a classic Pigouvian tax, in our setup we did not internalize 100% of the simulated emissions. The reason for this was to keep the design as simple as possible and to establish a 1:1 relationship between a unit of consumption and a unit of pollution. In this case, a tax equal to 100% of the marginal damage caused by pollution would result in zero tokens remaining in the personal account for each unit of consumption chosen. We considered full internalization an unrealistically extreme in this context and focused on the change in the relative attractiveness of consumption versus coordination caused by the tax.

[7] To avoid confounding effects, for example, that exceeding the threshold is subjectively perceived as less problematic by losing on average smaller amounts (reduced by the tax), we set the conversion rate (token/currency) to $2.5 : 1$ to ensure the same expected payoff and decision consequences for each participant as in treatment *Baseline* to allow for an internally valid design.

marginal cost of consumption, thereby making it relatively more attractive to consume less to remain below the critical threshold. As demonstrated in Table 1, post-tax, a reduction in consumption by 2 units—equivalent to avoiding 2 units of simulated CO2 emissions—incurs a lower token cost (1 unit) compared to the pre-tax scenario (2 units). Thus, the *Tax* treatment enables us to assess the impact of reduced consumption incentives *relative* to the constant incentive of not exceeding the critical threshold in a coordination context. The *Tax* treatment further allows us to cleanly isolate the effect of symmetrical and asymmetrical revenue refunding on coordination success. We predicted that introducing the carbon tax will improve coordination and thus, success rates, relative to the *Baseline* condition (H1). Our estimate of the tax's effect on overall harmful group consumption and success rates represents a cautious projection of a Pigouvian tax's real-world potential. This is because our analysis focuses on behavioral dynamics and the altered appeal of coordination relative to consumption, without integrating the direct economic disincentives for consumption that such a tax would impose in practice.

Symmetric Dividend

In the *Symmetric* condition, everything was identical to the *Tax* condition, but in addition to paying the tax, participants in each group also received the tax revenue paid out as a dividend in each round. The tax revenue generated per round was redistributed equally among all four participants. As with tokens generated through consumption, dividends were credited as tokens to each group member's personal account each round.

Even with this mechanism, any of the three consumption choices of the set $[0, 2, 4]$ can be rationalized given the history of the game and the beliefs of the player. In other words, an individual's payoff is consistently higher when consuming more tokens, disregarding the public bad. This is identical to conditions *Baseline* and *Tax*. However, we anticipate that this mechanism facilitates coordination and boosts success rates compared to *Tax*. This expectation arises from the fact that participants with lower consumption stand to benefit the most from this setup. As a result, sacrificing consumption to coordinate to avoid surpassing the threshold becomes even more appealing, as the marginal cost of the necessary reduction in consumption decreases further. This is highlighted by considering the scenario depicted in Table 1 below.

While participant *d* only gets 50% of her tax refunded via the dividend, participants *b* and *c* get their full tax contribution refunded. With the carbon dividend, group members consuming nothing end up paying no tax at all, but may still receive more tokens from the dividend, than they would based on their consumption choices (see e.g., participant *a* in Table 1). Because participants are expected to factor in the risk of exceeding the harmful threshold, which is constant across treatments, we expected this additional relative increase in the attractiveness of coordination to further improve the success rates (H2).

From a behavioral perspective, it is also important to note that the decoupling of the tax and the dividend–that is, the framing of the incentive structure–is also likely to affect behavior and cooperation in this condition compared to simply altering the effective tax burden in relation to the *Tax* condition. As discussed by Carattini et al. (2018), support for carbon taxes is heightened by the presence of dividends. Unlike the tax condition, where participants merely experience an economic disincentive, thereby making consumption relatively less attractive to coordination, in this condition where the tax is paired with a

Table 1: Example of the basic intuition behind the effects of a carbon tax and a symmetric carbon dividend. The row labeled "Effective burden (tax + dividend)" represents the total financial impact as a percentage of the selected consumption level, derived from both the tax imposed and the dividend received. For Player A, this burden was determined using the round's financial endowment, given that their consumption level was zero.

Participant	a	b	c	d
Round Endowment	4	4	4	4
Consumption	0	2	2	4
Tax on consumption (50%)	0	1	1	2
Tokens post tax	0	1	1	2
Carbon Dividend (total = 4)	1	1	1	1
Tokens post dividend (total = 8)	1	2	2	3
Effective burden (tax + dividend)	-25% (on endowm.)	0%	0%	25%

dividend, we now also introduced a *positive* economic incentive, working in the same direction. The gain framing through the dividend, rather than the mere loss framing in the tax condition, could reduce risk-seeking behavior and, therefore, lower consumption levels (Chang et al., 1987).

Asymmetric Dividend

Our fourth condition *Asymmetric*, captures a different revenue recycling scheme, which was motivated by the "polluters-pay" principle (see, e.g., Davidson, 2021). We examined whether refunding only below-average (not median) polluters, can improve success rates in the CRSD by (i) providing strong relative incentives for coordination on the threshold instead of consuming higher amounts. Furthermore, Kallbekken et al. (2011) have found that recycling revenues to more narrowly targeted groups increases support for taxation. (ii) In our setting, this fairness aspect among other potential behavioral factors might further improve cooperation in the group. The procedure in this treatment was identical to Condition *Symmetric*, but the collected tax revenue was redistributed asymmetrically, such that only the below-average consumers / polluters benefited[8]. The tax revenue generated each round was equally distributed among those members of the group who consumed fewer units than the total group average. Table 2 illustrates this procedure.

(iii) This setup, in contrast with the other treatments, might also change individual consumption incentives without taking into account the coordination component. If not for the need to make sure to remain below the threshold, in the other three conditions, higher consumption is always associated with a higher final or expected payoff. In the *Asymmetric* treatment, however, there are cases where those who do not consume

[8] We note that, in the original conceptualization of the Polluters Pay Principle, as expressed by the OECD Guiding Principles in 1972, the polluter(s) should carry the expenses of pollution prevention measures or pay for damages caused by pollution (work programme on Trade and Environment, 1995). In our setting, this becomes evident after the dividend distribution. Polluters, along with all others in the treatment, pay the same carbon tax rate on their consumption. However, only those who pollute less than average (non- or low polluters) receive the dividend. The redistribution mechanism (dividend) does not benefit the polluters, who continue to carry the tax burden. As a result, polluters effectively pay the tax and fund the dividends received by the less polluting members.

anything at all can end up best in absolute terms. For example, participant *a*, who has chosen 0 units to consume, receives 4 tokens via the asymmetric dividend, since he is the only participant with below-average consumption. Thus, he ends up better than all the other participants with positive consumption in this round. Based on the three mechanisms described, we expected the asymmetric dividend to further improve coordination and, thus, predicted it to yield the highest success rates (H3).

Finally, given evidence for learning effects in the acceptance of welfare-enhancing measures (Janusch et al., 2021), we expected that experiencing the measures in each treatment will influence respondents' attitudes toward them. Specifically, we hypothesized that beliefs about the carbon tax' and dividends' respective efficacy and fairness in curbing climate change will be more optimistic in the treatments that experienced the dividend and tax respectively, compared to the baseline (H4).

Table 2: Example of the basic intuition behind the effects of a carbon tax and an asymmetric carbon dividend only to below-average consumers per round. The row labeled "Effective burden (tax + dividend)" represents the total financial impact as a percentage of the selected consumption level, derived from both the tax imposed and the dividend received. For Player A, this burden was determined using the round's financial endowment, given that their consumption level was zero.

Participant	**a**	**b**	**c**	**d**
Round Endowment	4	4	4	4
Consumption	0	2	2	4
Tax on consumption (50%)	0	1	1	2
Tokens post tax	0	1	1	2
Carbon Dividend (total = 4)	4	0	0	0
Tokens post dividend (total = 8)	4	1	1	2
Effective burden (tax + dividend)	-100% (on endowm.)	50%	50%	50%

We implemented the between-subjects treatment design shown in Figure 1. See the detailed instructions for each stage of the study in Section A.1 in the Appendix.

4. Results

Statistical Power, Descriptives, and Sample Balancing Checks

In compliance with our publicly accessible and registered Pre-Analysis Plan on the Open Science Framework (OSF),[9] we adhered to significance levels of 0.05, 0.01, and 0.001 for all statistical examinations within this manuscript. Prior to executing the registered primary analyses, we conducted sample balancing checks to ensure equal sample attributes across all conditions (refer to Table B2 for descriptive statistics) and to define relevant control variables. The outcomes of the sample balancing checks are exhibited in Table B3 in the Appendix. We discerned statistically significant discrepancies in participants' self-reported political

[9] https://osf.io/epm6n/; unless otherwise specified, all analyses within this section have been pre-registered on OSF.

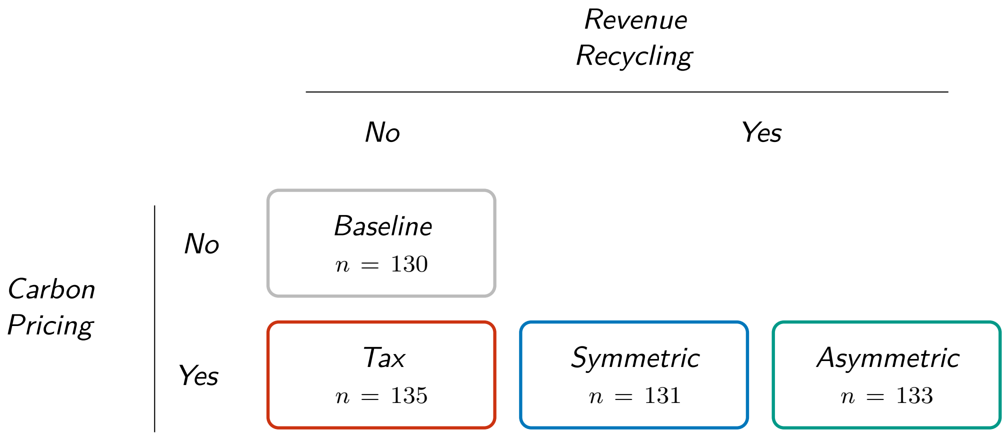

Figure 1: Treatment Design. The figure illustrates the between-subjects treatment design implemented in the experiment, including the treatment labeling, and the number of independent observations per treatment (four participants per group generate one independent observation). The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric).

inclinations between conditions *Baseline* and *Symmetric*, as well as *Asymmetric*. Moreover, we identified systematic disparities in political orientation and educational levels between conditions *Tax* and *Asymmetric*, revealing statistically significant sample differences across treatments. For our main analyses, we adopted a conservative approach and estimated supplementary econometric specifications, controlling for all self-reported participant attributes.

The primary outcome variable across all conditions were success rates, which we compared pairwise between conditions, utilizing equality of proportions z-tests. Success was defined remaining below the detrimental consumption threshold, thereby avoiding simulated catastrophic climate change. Accordingly, as a standardization of the distance between two proportions, we measured the effect sizes as Cohen's h.[10] Additionally, we compared the patterns of group consumption and resultant negative externality between treatments, by applying unpaired sample t-tests. Finally, we compared policy attitudes toward carbon taxes and carbon dividends across conditions.

We collected a sample of 2,116 participants, generating 528 independent observations (groups of 4 who completed 10 rounds), with a minimum of 130 independent observations per condition. We achieved a statistical power of at least 80% to reliably detect a standardized effect size equal to or larger than Cohen's

[10] Cohen's h is defined as the absolute difference between the arcsine transformations of the success rates, that is, $h = |\phi_1 - \phi_2|$ with $\phi_i = 2 \cdot \arcsin \sqrt{p_i}\ \forall\ i = \{1, 2\}$. For a given percentage point difference between two proportions, Cohen's h depends on the base proportion on which the effect is calculated. Cohen's h is typically interpreted based on the same rule of thumb as Cohen's d, that is, $h = 0.2$ implies a "small" effect, $h = 0.5$ portrays a "medium" effect, and $h = 0.8$ indicates a "large" effect (Cohen, 1988).

$h = 0.35$, given a Type I error rate of $\alpha = 0.05$ in a two-sided equality of proportions z-test.[11] For example, given a success rate of 50% in one condition, an h of 0.35 corresponds to a relative difference of about 17 percentage points, that is, a lower success rate of 33% or a higher success rate of 67% in another condition.

Prior to evaluating our main results, we also analyzed indicators of comprehension to ensure our results were reliable. In addition to the comprehension checks required at the start of the game, we asked participants several follow-up questions about the instructions and their understanding (see table B23). 96% of participants across conditions considered the instructions well explained and stated that they made an informed decision in each round and 97% stated that they felt they understood the game overall. Dropout rates throughout the game were also very low, with an average of 1.20% across conditions. Figure 2 gives a descriptive overview of the average consumption and success rates across conditions and Table B6 in the Appendix shows the respective summary statistics.

[11] To achieve a statistical power of at least 80% to reliably detect a small standardized effect of $h = 0.2$, we would have needed at least 390 independent observations per condition. This corresponds to 1,560 participants in each condition and thus 6,240 participants in total.

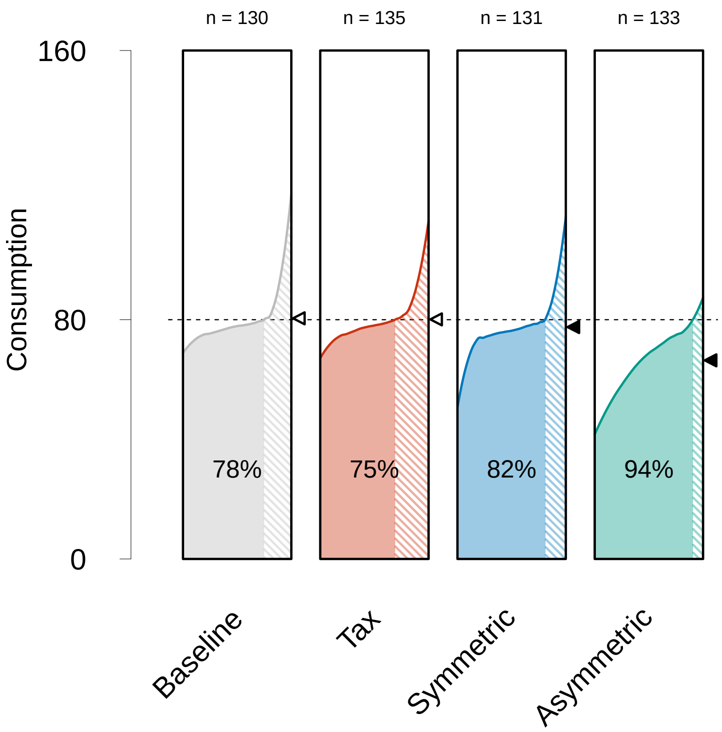

Figure 2: Overview of aggregate group consumption and success rates. Each treatment is represented by a column-bar with aggregate group consumption measured on the y-axis. The threshold consumption ($= 80$) is indicated by the dotted horizontal line. Per treatment, the final aggregate consumption of all groups are shown in ascending order. The filled area represents all groups that did not surpass the threshold ($success = 1$), while the hatched area represents groups who did ($success = 0$). The value in percent corresponds to the proportion of the filled area, that is, the success rate. Additionally, a marker (arrow) on the right side of each bar indicates the mean aggregate consumption level. A filled / empty arrow indicates a mean aggregate group consumption of ≤ 80 / > 80. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean.

Main Results

> **Result 1:** *Compared to the Baseline condition, the group success rates were statistically significantly higher in the asymmetric dividend (Asymmetric) condition, but not in the tax only (Tax) or symmetric dividend (Symmetric) conditions*

Support: We first compared success rates, our primary outcome variable, pairwise across all four conditions. Figure 3 depicts the success rates within all four conditions, ranging from 75% in *Tax* to 94% in *Asymmetric*. The whiskers in Figure 3 represent 95% confidence intervals, and the colored stars indicate statistical significance in one-sided unpaired sample z-tests of proportion compared to the respective condition (gray = *Baseline*, red = *Tax*, blue = *Symmetric*, and green = *Asymmetric*). When compared to the *Baseline* condition, we did not find a statistically significant increase in success rates in the *Tax* or the *Symmetric* condition. However, with a success rate of 94%, the *Asymmetric* condition stood out and we found statistically significantly higher success rates compared to each of the other three conditions (see Table B4 in the Appendix for details).[12] Therefore, we found support for our third hypothesis (H3), predicting that the carbon tax accompanied by the asymmetric dividend will improve cooperation and increase success rates, but found no statistical support for H1 and H2.

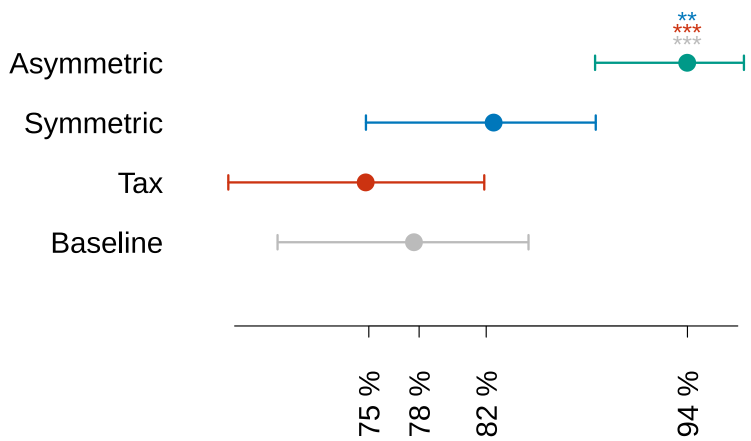

Figure 3: Success rate comparisons across treatments. Success rates for each treatment are indicated by the round marker and are based on the proportions of groups who did not surpass the threshold after all 10 rounds were played ($success = 1$). The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean. Error bars indicate 95% confidence intervals. Significance stars are based on p values of one-sided unpaired sample t-tests between conditions. Statistical details are provided in Table B4 * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Next, we examined average aggregate group consumption across the conditions. Figure 2 indicates that average aggregate group consumption (y-axis) was lower in condition *Asymmetric* relative to all other conditions. This was statistically significant (one-sided unpaired sample t-tests shown in Figure 4; see

[12] See Table B12 in the Appendix for a robustness check applying a logistic regression model with a binary dummy for success as the dependent variable: yes = 1, no = 0 and the treatment dummies as independent variables. The model confirms our main results.

Table B5 in the Appendix for further details). Additionally, we observed statistical evidence for reduced average aggregate group consumption in condition *Symmetric* when compared to the baseline and the *Tax* condition. Therefore, the condition of symmetrically redistributing the tax revenue also proved effective in lowering the average group consumption.

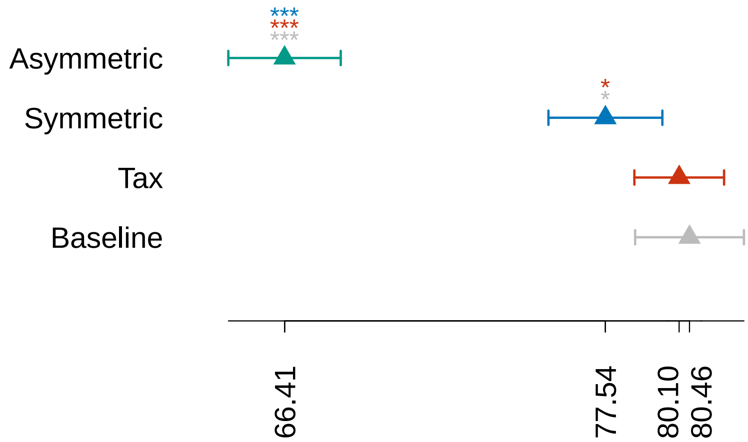

Figure 4: Aggregate average group consumption comparisons across treatments. Aggregate group consumption for each treatment are indicated by the triangle-marker. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean. Error bars indicate 95% confidence intervals. Significance stars are based on p values of one-sided unpaired sample t-tests between conditions. Statistical details are provided in Table B5 * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

We additionally assessed indicators of participants' decision-making considerations across the conditions. Specifically, we measured the reported importance that the group would not exceed the critical consumption threshold, and participants' willingness to sacrifice consumption only if other participants did so (both measured on Likert scales from 1 to 5). The results are documented in Table B7 in the Appendix. Compared with the *Baseline* condition, we found that individuals in the *Symmetric* and *Asymmetric* conditions reported a stronger desire to prevent the group from surpassing the critical consumption threshold and a greater willingness to sacrifice consumption only when other players reciprocated. We did not observe any differences between the *Baseline* and *Tax* conditions.

> **Result 2:** *Individuals in condition Asymmetric express more favourable beliefs and attitudes toward a carbon tax and carbon dividends—specifically the asymmetric dividend—compared to individuals in Baseline.*

Support: We investigated whether attitudes toward the implementation of carbon taxes and carbon dividends in society differed between conditions. We executed pairwise Mann-Whitney U tests to examine disparities, and report the results in Table B8 in the Appendix. Compared to individuals in the *Baseline* condition, those exposed to any carbon dividend treatment exhibited a stronger conviction that others in their community would support carbon emission pricing via a carbon tax. This partially supports our hypothesis H4, that beliefs about the carbon tax and dividend will be more favorable among groups who experienced the mechanism in the CRSD. Relative to the baseline, individuals in the *Asymmetric* condition exhibited stronger beliefs that pricing carbon emissions through a carbon tax with a dividend (1) would help reduce carbon emissions, (2) is a fair method of reducing carbon emissions, and (3) more strongly expressed willingness to support pricing carbon emissions through a carbon tax and dividend. We did not observe any such differences in these beliefs between *Baseline* and the *Tax* and *Symmetric* conditions.

> **Result 3:** *Exhibiting lower conservatism and more environmental concern was associated with an increased likelihood of group success. Self-reported Democrats, in particular, held more positive attitudes toward carbon taxes and dividends upon experiencing the measures (Asymmetric).*

Support: We delved further into the analysis of attitudes toward the instruments by differentiating between different levels of revealed conservatism. Table B10 in the Appendix displays the results of an univariate logistic regression model (binary dummy for success as the dependent variable: yes = 1, no = 0), while Table B14 in the Appendix reports the results of ordered logistic regression models (attitudes on Likert scales between 1 and 5 as dependent variables). Both models are specified with the Resistance to Change-Beliefs Scale as the independent variable.[13] This scale represents a validated measure of conservatism (see, e.g., White et al., 2019). Utilizing this 10-item measure (employing Likert scales between 1 and 5), our objective was to ascertain participants' genuine levels of conservatism, as opposed to merely relying on their self-reported political inclinations. Our results indicate that groups tended to be more successful when their members exhibit lower levels of conservatism (see Table B10). Surprisingly, we found that more conservatism was positively associated with beliefs in the effectiveness and fairness of carbon taxes with dividends (see Table B14).[14]

We also examined whether coordination success in environmental framing and stances toward carbon pricing instruments were associated with environmental attitudes, as measured by the validated 15-item "New Environmental Paradigm" (NEP) belief scale (Dunlap et al., 2002).[15] We present the results of univariate logistic regression models (binary dummy for success as the dependent variable: yes = 1, no = 0) and ordered logistic regression models (attitudes on Likert scales between 1 and 5 as dependent variables) in Table B11 (success rate) and Table B15 (instruments) in the Appendix. We found that individuals who exhibited greater environmental concern were associated with a higher likelihood of group success, but not with more positive stances toward the instruments.

We further investigated whether variations in behavior and stances toward the instruments between treatments differed between self-reported Republicans and Democrats. First, Tables B20, B21 (exploratory extension), and B22 (exploratory extension) detail the policy instrument stances across conditions via two-sided Mann-Whitney U tests for self-reported Republicans, Democrats, and other party supporters. Notably, self-identified Democrats' attitudes toward carbon taxes with dividends were significantly influenced by their experience in the *Asymmetric* condition. However, we did not observe this for other treatment conditions among Democrats, nor any effects among Republicans and supporters of other parties. Next, we conducted a specific moderation analysis to scrutinize variations in consumption behavior and stances toward policy instruments between Republicans and Democrats across treatments. This moderation analysis provided insight into how the effects of the experimental conditions differ between these two political groups.

[13] The first row of Table B9 in the Appendix shows average scores across treatments.
[14] For a contextualization of the results, the reader is referred to Section 5.
[15] The second row of Table B9 in the Appendix shows average scores across treatments.

We therefore configured ordered logistic regressions with individual consumption and attitudes on the 5-point Likert scales as dependent variables, a treatment dummy, a factor variable for political affiliation, and an interaction term between both as independent variables. As reported in Tables B19 and B17 in the Appendix, our analysis reveals that self-reported political leaning did not statistically significantly moderate the response to any of the policy items across the conditions. Furthermore, we did not find any systematic interaction effects between the conditions and self-reported political leaning on individual consumption across the 10 rounds. However, in round 9, we found that the treatment effect of *Symmetric* and *Asymmetric* on individual consumption compared to *Baseline* was statistically significantly stronger for self-reported republicans. As we did not detect any such effect in other rounds, we remain cautious in interpreting these findings.

We also examined the consumption dynamics of successful and unsuccessful groups over the course of the 10 rounds (see Figure B7 in the Appendix). The most common consumption frequency overall was 2 units. However, the frequency of consuming zero increased nearly threefold among participants in rounds with the potential to surpass the critical threshold. On the other hand, once the threshold was exceeded, groups were much more likely to consume the maximum of four units than in rounds prior. This provides further support that participants understood the game; in this scenario, it becomes individually rational to consume as much as possible.

In a non-preregistered exploratory extension, we also measured whether participants' demographic and socioeconomic characteristics are correlated with success rates, consumption and attitudes toward carbon taxes and carbon taxes accompanied by carbon dividends. In Table B13 in the Appendix, we present the relationships between success rates and participant characteristics by estimating multivariate logistic regression models with a binary dummy for the success of the group as the dependent variable: yes = 1, no = 0. We observed that women were linked with a higher likelihood of group success relative to men. We also found that individuals who self-reported that they did not make informed decisions throughout the game were associated with a diminished likelihood of group success (who make up less than 5% of the sample). Besides that, the associations of participants who responded with "None" or "Primary / Elementary school" when asked for their highest achieved education, or selected "Non-binary" or "I prefer not to tell" when asked for their gender, with success rates, have to be interpreted with caution due to the lack of number of observations in these categories (see Table B2). For all the remaining demographics and socioeconomic characteristics, we did not find any statistically significant relationships.

Table B18 in the Appendix presents the outcomes from multivariate ordered logistic regressions investigating the link between participants' average consumption in each of the ten rounds (the dependent variables) and their respective demographic and socioeconomic attributes (the independent variables). We found that younger individuals and women were less likely to exhibit high consumption levels, while self-identified Republicans were more prone to higher consumption across the ten rounds. Additionally, Table B16, also found in the Appendix, delineates the correlations between policy attitudes (the dependent variables) and participants' demographic and socioeconomic traits (the independent variables). The data indicates that older individuals and women had a tendency to hold less favorable attitudes and beliefs toward the proposed measures. Similarly, self-identified Republicans and other party adherents were less likely to express positive attitudes and beliefs toward the policy measures, when compared to self-identified Democrats.

Finally, we assessed whether there were any discrepancies in our results between the nationally representative sample obtained through the representative sampling option on Prolific ($N = 1{,}124$) and the rest of the general population sample ($N = 992$). Statistical tests comparing the results across the two samples, as presented in Tables B25 and B26 in the Appendix, indicated that there were virtually no statistical differences in the main outcome variables between these sub-samples.

5. Discussion and Conclusion

Social sciences have demonstrated time and again that incentives shape behavior. Anthropogenic climate change, one of the biggest global challenges we face today, is fundamentally a behavioral challenge. In order to prevent crossing irreversible environmental tipping points, appropriate incentives in the form of financial costs and rewards are powerful tools to shift behavior and mitigate climate change. In this paper we tested the effects of carbon pricing alone and in combination with two different revenue recycling schemes (carbon dividends distributed symmetrically or asymmetrically). Specifically, we examined the impact of the tax and the dividends on cooperation and group success to remain below a critical consumption threshold. We ran a modified version of the Collective Risk Social Dilemma (CRSD) with a large U.S. sample of 2,116 subjects over 10 non-independent rounds. We measured the share of groups who successfully remained below a critical threshold of simulated CO_2 emissions (success rate).

We found that a carbon tax coupled with carbon dividends, was effective at reducing total consumption (CO_2 emissions). Both in the *Symmetric* condition, where tax revenue was equally distributed among all participants, and in the *Asymmetric* condition, in which tax revenue was redistributed to below-average emitters, we observed a significantly lower consumption level relative to the *Baseline* and *Tax* conditions. The *Asymmetric* condition was most effective at reducing total consumption, and 94%—nearly all groups in this treatment—successfully remained below the critical consumption threshold (tipping point). This success rate was significantly higher than that of each of the three other conditions. Though we also observed directional evidence that success rates were higher in the symmetric dividend condition (82%) relative to the *Baseline* condition (78%), this difference was not significant.

Especially when we consider the implications of failure rates–exceeding a critical tipping point and causing irreversible environmental damage–a clear picture emerges. Failure rates in the *Baseline* and *Tax* conditions were four times as high (22% and 25%, respectively) and three times as high in the symmetric carbon dividend condition (18%), compared to the asymmetric dividend condition (6%). Thus, the strong incentives in the asymmetric condition worked well with respect to avoiding the catastrophic threshold. Our study offers robust evidence that achieving the necessary level of coordination is not just possible, but highly likely, given the right incentives. We found that combining a carbon tax with an asymmetric carbon dividend is a suitable incentive structure. Following the polluters pay principle, this incentive structure provides a strong monetary incentive for reducing harmful consumption and thus, CO_2 emissions.

Although the *Asymmetric* treatment offers promising results, it represents a departure from current real-world practices and warrants further discussion. The application of the *Asymmetric* treatment in the present study is actually a more realistic reflection of the impacts of a real-world symmetric dividend policy. A carbon tax coupled with a (symmetric) dividend would likely also modify individual economic incentives in a manner not fully encapsulated by the *Symmetric* treatment in our setting, but which is captured by the *Asymmetric* condition. In the present study, the *Symmetric* condition only introduced behavioral effects and the increased appeal of coordination compared to higher consumption. However, in the *Asymmetric* treatment, individual consumption incentives were further altered, which could make reduced consumption more lucrative than higher consumption, irrespective of the collective risk. This setting, therefore, provides a valuable view of responses to carbon tax and dividend policy designs that incorporate both economic and behavioral dimensions, as they would in practice. A limitation of our study, is that the underlying mechanisms driving the behavior in the *Asymmetric* condition cannot be fully disentangled. That is, whether, or how much, of the observed effect is due to the relatively higher attractiveness of cooperation and other associated behavioral effects due to e.g., fairness or framing, and how much is due to the individual consumption incentives that occur independently of coordination efforts, remains unclear.

It is worth noting that some groups within our *Asymmetric* condition reduced their consumption during rounds in which surpassing the threshold was impossible, leading to numerous instances where groups stayed well beneath the 80-unit threshold (see Figures 4 in the Results section). This implies that the *Asymmetric* condition was strong enough to reduce consumption beyond just avoiding the threshold. This was also observed, though to a lesser extent, in the other three treatments, even though they did not have such explicit incentives for individual consumption reduction (see Figure B13 in the Appendix for the overall pattern). This highlights the difficulties in coordinating efforts for carbon reduction. From an environmental standpoint, this is the better outcome, but policymakers ought to consider the potential of welfare losses stemming from suboptimal coordination. To encourage lower emissions by implementing asymmetric refunds in the real-world, policymakers might explore enhancing rewards for verified low-emitters, such as offering extra rebates for home-energy upgrades or rewarding below-average quarterly energy consumption, relative to the household's type and size.

We consider our findings to be conservative, lower-bound estimates of the potential impacts of the investigated carbon pricing mechanisms to mitigate a catastrophic climate event. Even when a carbon tax and a carbon tax with symmetric dividend was in place, participants in the *Tax* and *Symmetric* conditions remained individually incentivized to maximize consumption. In real-world scenarios, however, the interplay of the tax's effects, including both substitution and income effects, would make consumption individually less attractive, regardless of incentives to coordinate. Thus, we would expect a stronger reduction in the demand of environmentally harmful goods and services in real-world contexts than is captured by our experimental conditions *Tax* and *Symmetric*.

Attitudes toward and support for the tax with dividends as a policy measure were positively associated with the asymmetric dividend condition. This is in line with evidence that compensation measures can be useful tools to increase fairness perceptions among skeptics and increase policy support (Jagers et al., 2018). Learning effects in the acceptance of welfare-enhancing measures may also have played a role (Janusch et al., 2021). Our data suggests that the increased policy support may be mainly driven by self-reported Democrats, who appear most likely to hold more positive attitudes after experiencing the tax and dividend measures, relative to the *Baseline* condition. Unlike the findings reported by Mildenberger et al. (2022), our study participants demonstrated a high level of understanding regarding the carbon tax and dividend measures. This high level of understanding likely contributed to the favorable evaluations of the measures observed among participants, especially in the *Asymmetric* condition. Given these findings, policymakers implementing carbon dividends may consider prioritizing policy salience and sufficient information provision to garner support.

We also found that across all treatments, holding stronger pro-environmental attitudes correlated positively with group success rates (that is, remaining below the critical consumption threshold). Moreover, greater conservatism (scoring higher on the "Resistance to Change-Beliefs Scale") was negatively associated with group success rates. Notably, scoring higher in the "Resistance to Change Beliefs Scale" (RCBS), and thus revealing higher conservatism, was positively linked with more approval of the carbon tax with dividend. This seems to be at odds with our findings of self-reported Republicans being more critical of carbon pricing measures and dividends. Table B24 shows an OLS regression with the RCBS as dependent variable and self-reported political leaning as independent variable. We did not find any association between those two variables. This suggests that people's resistance to change does not necessarily align with their political identity. Our findings illustrate the complexities within the notion of "conservatism". Political conservatism, associated with the Republican Party in the United States, often implies limited government intervention, which could suggest resistance to a carbon tax. Yet psychological conservatism, as measured by the RCBS, captures a preference for stability, which might align with carbon tax support, if seen as preserving an environmental status quo. This seeming discrepancy suggests that self-reported political leaning may not provide an accurate reflection of an individual's conservatism, as measured by the RCBS (see, e.g., Ellis and Stimson, 2009; Everett, 2013; Zell and Bernstein, 2014). This complexity underscores the need for caution in drawing conclusions based on political affiliation alone.

Although our conclusions derive from stylized experimental data, the substantial sample size drawn from the general population bolsters our confidence in extrapolating these results to real-world contexts. We found evidence that the carbon tax and dividend mechanism alters behavior and, furthermore, experiencing the mechanism appears to have influenced participant's self-reported decision-making. Participants in both carbon dividend conditions were significantly more likely than participants in the baseline and tax conditions to agree that remaining below the threshold over the 10 rounds was important to them, and that they were only willing to sacrifice consumption when other players did so. This suggests the possibility of a virtuous cycle whereby responding to incentives alters the motivation to act a certain way.

To further improve on the generalizability of outcomes and enhance the ecological validity of the study, future research could explore the use of actual green and brown goods and services, e.g., via vouchers, rather than abstract units of consumption. Trade-offs between more and less environmentally harmful goods and services more closely captures people's preferences that affect their real-world environmental decisions. One key hurdle in climate change mitigation, not captured in our design, is the relatively long time horizon and disconnect between action and consequence. It would also be relevant to understand how the measures introduced in this study (carbon tax and dividends) affect behavior when the averse outcome of simulated catastrophic climate change and the threshold itself are ambiguous or probabilistic. Furthermore, employing an experimental framework with unequal initial endowments and consumption capacities could provide valuable insights into how preexisting inequalities coupled with carbon taxes and dividends influence coordination efforts across individuals of low-income and high-income backgrounds. Further research on improving the ex-ante acceptance of carbon taxes and carbon dividends, which our study did not address, would also be of importance. Finally, we recognize that employing the modified CRSD represents only one method to examine the impact of carbon pricing within the broader context of economics of climate change. Specifically, integrating continuous marginal costs (damage) of consumption into the game setup, without an explicit threshold, could provide further valuable insights. We underline the importance of further research to examine the generalizability of our results to, e.g., different game structures or field studies.

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Appendices

for Online Publication

Carbon Pricing, Carbon Dividends and Cooperation:
Experimental Evidence

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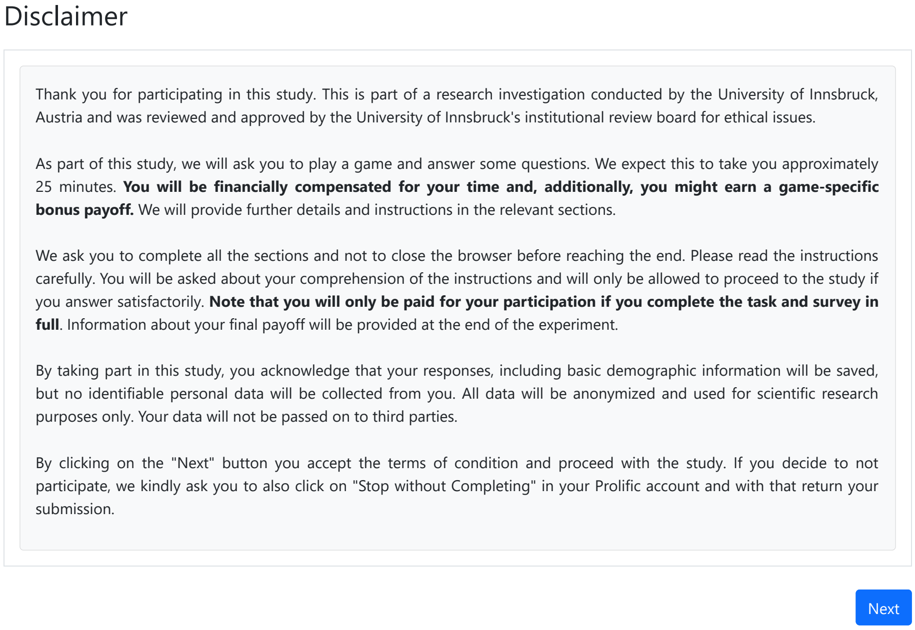
Contents

A. Experimental Software

A.1. Instructions

Figures A1–A18 show the disclaimer, experimental instructions, mentioned examples, quick guides (available during control questions and the game) for each treatment, and control questions. The full experimental software is available at https://osf.io/epm6n.


Disclaimer

Thank you for participating in this study. This is part of a research investigation conducted by the University of Innsbruck, Austria and was reviewed and approved by the University of Innsbruck's institutional review board for ethical issues.

As part of this study, we will ask you to play a game and answer some questions. We expect this to take you approximately 25 minutes. **You will be financially compensated for your time and, additionally, you might earn a game-specific bonus payoff.** We will provide further details and instructions in the relevant sections.

We ask you to complete all the sections and not to close the browser before reaching the end. Please read the instructions carefully. You will be asked about your comprehension of the instructions and will only be allowed to proceed to the study if you answer satisfactorily. **Note that you will only be paid for your participation if you complete the task and survey in full**. Information about your final payoff will be provided at the end of the experiment.

By taking part in this study, you acknowledge that your responses, including basic demographic information will be saved, but no identifiable personal data will be collected from you. All data will be anonymized and used for scientific research purposes only. Your data will not be passed on to third parties.

By clicking on the "Next" button you accept the terms of condition and proceed with the study. If you decide to not participate, we kindly ask you to also click on "Stop without Completing" in your Prolific account and with that return your submission.

Next

Figure A1: Disclaimer.

Instructions Game (Part 1/2)

General:

You will be playing a game with other people, in which your individual decisions and the decisions of others influence the group, which in turn has implications for simulated climate change. You will be able to earn money as a bonus payoff during this game, in addition to receiving a fixed payment of GBP 2.50 for your participation.

Players:

You will be assigned to a group of 4 with 3 other players participating in real-time. Each player in your group faces the same decision-making problem as you.

Premise:

The game has multiple rounds. In each round you will be asked to decide on consumption. You can imagine this being the consumption of a good or service, which you derive benefits from, but which produces some CO2 output. Thus, by consuming, you gain a financial reward: you accumulate tokens in your account balance, which can later be converted to GBP. But there is a trade-off: through consumption you contribute to the simulated emission of the greenhouse gas, CO2. Too much consumption can lead to catastrophic climate change, which causes significant economic losses to you and the others in the group.

Anonymity:

You will remain anonymous throughout the game. A single letter "nickname" (A, B, C, D) will be assigned to everyone in your group. The nickname assigned to you will be highlighted in blue throughout the game.

Rounds:

You will play for 10 rounds. In each round, all players will be asked simultaneously, "How many units do you want to consume in this round?". You can choose to consume 0 (nothing), 2 or 4 units, to be added as tokens to your account balance.

The game can only proceed to the next round if all players have submitted their consumption choice. You have a maximum of 2 minutes to make your decision in each round. If you do not select your desired consumption for a given round in time, the computer will automatically carry over whatever decision you made in the previous round (in the first round a random decision will be made in such a case). You will be able to make a choice again in the next round. If you select the desired consumption but do not confirm your decision by clicking „Next", the selected consumption will be submitted after the 2 minutes.

After each player has submitted their consumption choice, the computer will sum up the total amount consumed by the group. Consumption of the group is accumulated over the course of the 10 rounds.

There is a critical group consumption threshold of 80 units. If this amount is surpassed, simulated catastrophic climate change can occur, which would cause significant economic losses to all players. That means, if the total amount consumed by all players of the group at any point in the game surpasses 80 units, you and the others in the group are exposed to the risk of losing all tokens accumulated over the 10 rounds from consumption.

Next

Figure A2: Instructions *Baseline* Page 1 of 2.

Instructions Game (Part 2/2)

Consumption & Tokens:

Each round you make decisions about your consumption, which is then translated to tokens in your account balance.

For example, suppose in one round three players in the group select a consumption of 2 units and one player selects a consumption of 4 units. The three players who consumed 2 units would receive 2 tokens for their consumption added to their account balance in this round. The player who consumed 4 units would receive 4 tokens for their consumption added to their account balance.

As with group consumption, the tokens are accumulated in your account each round until the end of the game, where the tokens are converted to GBP to determine your bonus payoff.

Consumption-Page:

To help your decision-making, each round you will be able to view two tables: one showing the information of the previous round, and one showing the combined information for all rounds. Each table contains the consumption of each player in tokens and the total consumption of the group in tokens.

In addition, the accumulated consumption is visualized as a progress bar. Each player's aggregate consumption is marked on the bar. Your own consumption is highlighted in blue. An orange warning symbol indicates the consumption threshold, after which catastrophic climate change can occur.

Click to show example

Bonus Payoff & Catastrophic Climate Change:

You may receive a bonus payoff at the end of the game. This is determined as follows:

- If simulated catastrophic climate change occurs, you will lose all your tokens and, therefore, your bonus payoff. Catastrophic climate change occurs with a likelihood of 60% once your group surpassed the consumption threshold. The computer draws the outcome of this randomly for your group.
- If your group manages to evade simulated catastrophic climate change, your bonus is certain.
- All your accumulated and remaining tokens after this determination are converted 5:1 to GBP.

For example, if you finally accumulated 20 tokens over the course of the game, and your group managed to evade simulated catastrophic climate change, you will receive a bonus of GBP 4.

However, if your group surpassed the consumption threshold of 80 units, you have a 60% chance of simulated catastrophic climate change occurring and, therefore, receiving no bonus, and a 40% chance of simulated catastrophic climate change not occurring and, therefore, receiving your bonus of GBP 4.

Ending the Game:

The game ends after 10 rounds. After that, you will be sent to the results page indicating the final outcome of the game.

Quick Guide:

Throughout the game you can always click on "Click to show quick guide" if you want to refresh your memory of any of the terms and key parts of the game. Just remember that your timer is still running, and you have to make a decision in every round.

Next

Figure A3: Instructions *Baseline* Page 2 of 2. See Figure A4 for the example.

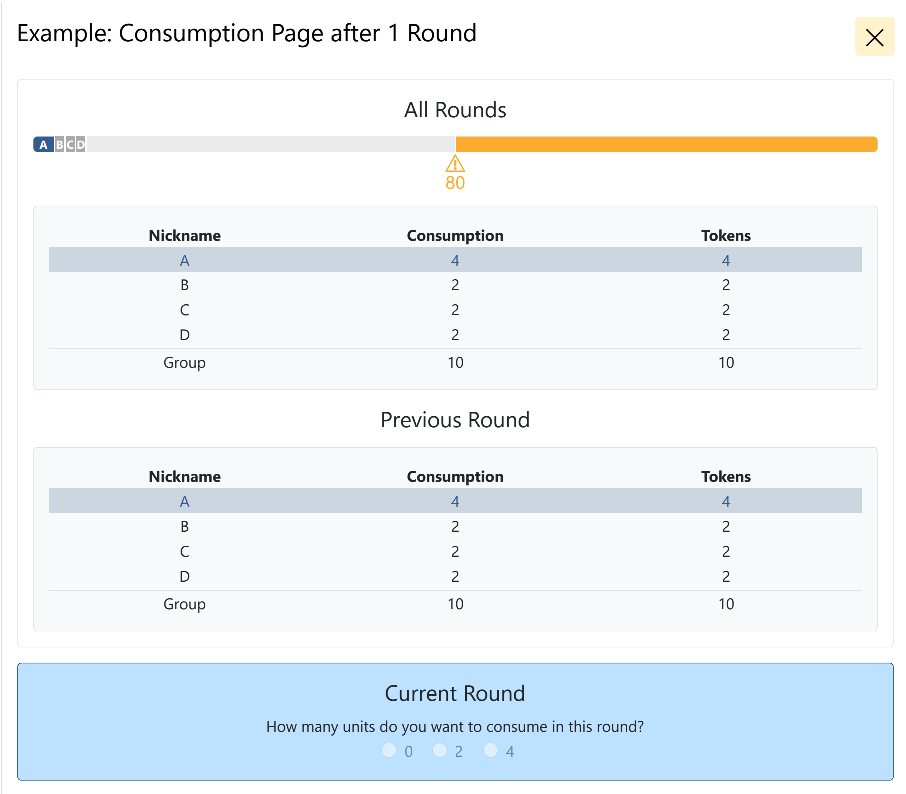


Figure A4: Example *Baseline*.

Quick Guide / Reference Key

Tokens:

Unit of monetary gain, which might be converted 5:1 to GBP at the end of the game.

Account balance:

Aggregate number of tokens personally accumulated over the course of the game.

Consumption:

Contributes to both simulated catastrophic climate change and your personal token account balance in each round.

Group consumption:

Consumption is accumulated by all 4 players over the course of the game.

Consumption threshold:

Total amount of group consumption, which, if exceeded, can cause simulated catastrophic climate change. This threshold is set to 80 units.

Catastrophic climate change:

Can occur at the end of the game with a likelihood of 60% if your group's aggregate consumption surpasses the consumption threshold of 80 units. If this happens, all your tokens will be lost.

Rounds:

The game ends after 10 rounds have been played.

Nickname:

Letters are randomly assigned as nicknames to players in the group. Your assigned nickname is indicated in blue.

Figure A5: Quick Guide *Baseline*.

Instructions Game (Part 1/2)

General:

You will be playing a game with other people, in which your individual decisions and the decisions of others influence the group, which in turn has implications for simulated climate change. You will be able to earn money as a bonus payoff during this game, in addition to receiving a fixed payment of GBP 2.50 for your participation.

Players:

You will be assigned to a group of 4 with 3 other players participating in real-time. Each player in your group faces the same decision-making problem as you.

Premise:

The game has multiple rounds. In each round you will be asked to decide on consumption. You can imagine this being the consumption of a good or service, which you derive benefits from, but which produces some CO2 output. Thus, by consuming, you gain a financial reward: you accumulate tokens in your account balance, which can later be converted to GBP. But there is a trade-off: through consumption you contribute to the simulated emission of the greenhouse gas, CO2. Too much consumption can lead to catastrophic climate change, which causes significant economic losses to you and the others in the group. Because of the environmental damage of consumption, your consumption is taxed, providing you fewer tokens per unit consumed. Your pre-tax consumption contributes to catastrophic climate change.

Anonymity:

You will remain anonymous throughout the game. A single letter "nickname" (A, B, C, D) will be assigned to everyone in your group. The nickname assigned to you will be highlighted in blue throughout the game.

Rounds:

You will play for 10 rounds. In each round, all players will be asked simultaneously, "How many units do you want to consume in this round?". You can choose to consume 0 (nothing), 2 or 4 units, to be added as tokens to your account balance.

The game can only proceed to the next round if all players have submitted their consumption choice. You have a maximum of 2 minutes to make your decision in each round. If you do not select your desired consumption for a given round in time, the computer will automatically carry over whatever decision you made in the previous round (in the first round a random decision will be made in such a case). You will be able to make a choice again in the next round. If you select the desired consumption but do not confirm your decision by clicking „Next", the selected consumption will be submitted after the 2 minutes.

After each player has submitted their consumption choice, the computer will sum up the total amount consumed by the group. Consumption of the group is accumulated over the course of the 10 rounds.

There is a critical group consumption threshold of 80 units. If this amount is surpassed, simulated catastrophic climate change can occur, which would cause significant economic losses to all players. That means, if the total amount consumed by all players of the group at any point in the game surpasses 80 units, you and the others in the group are exposed to the risk of losing all tokens accumulated over the 10 rounds from consumption.

Next

Figure A6: Instructions *Tax* Page 1 of 2.

Instructions Game (Part 2/2)

Consumption & Tokens:

Each round you make decisions about your consumption, which is then translated to tokens in your account balance. However, each unit you consume will be subject to a carbon tax of 50%. The amount of consumption remaining after tax will be added to your account balance as tokens in each round.

For example, suppose in one round three players in the group select a consumption of 2 units and one player selects a consumption of 4 units. Given the tax rate of 50%, half the consumption gets deducted as taxes from each player, while the other half gets added as tokens to the account balance. The three players who consumed 2 units would lose 1 token in taxes and receive 1 token for their consumption added to their account balance in this round. The player who consumed 4 units would lose 2 tokens in taxes and would receive 2 tokens for their consumption added to their account balance.

As with group consumption, the tokens are accumulated in your account each round until the end of the game, where the tokens are converted to GBP to determine your bonus payoff.

Consumption-Page:

To help your decision-making, each round you will be able to view two tables: one showing the information of the previous round, and one showing the combined information for all rounds. Each table contains the consumption of each player, the carbon tax deducted from each player's consumption in tokens (negative sign), and the number of tokens left for each player after the deduction of the tax. You will be able to see the individual player's amounts and the totals for the group.

In addition, the accumulated consumption is visualized as a progress bar. Each player's aggregate consumption is marked on the bar. Your own consumption is highlighted in blue. An orange warning symbol indicates the consumption threshold, after which catastrophic climate change can occur.

Click to show example

Bonus Payoff & Catastrophic Climate Change:

You may receive a bonus payoff at the end of the game. This is determined as follows:

- If simulated catastrophic climate change occurs, you will lose all your tokens and, therefore, your bonus payoff. Catastrophic climate change occurs with a likelihood of 60% once your group surpassed the consumption threshold. The computer draws the outcome of this randomly for your group.
- If your group manages to evade simulated catastrophic climate change, your bonus is certain.
- All your accumulated and remaining tokens after this determination are converted 2.5:1 to GBP.

For example, if you finally accumulated 10 tokens over the course of the game, and your group managed to evade simulated catastrophic climate change, you will receive a bonus of GBP 4.

However, if your group surpassed the consumption threshold of 80 units, you have a 60% chance of simulated catastrophic climate change occurring and, therefore, receiving no bonus, and a 40% chance of simulated catastrophic climate change not occurring and, therefore, receiving your bonus of GBP 4.

Ending the Game:

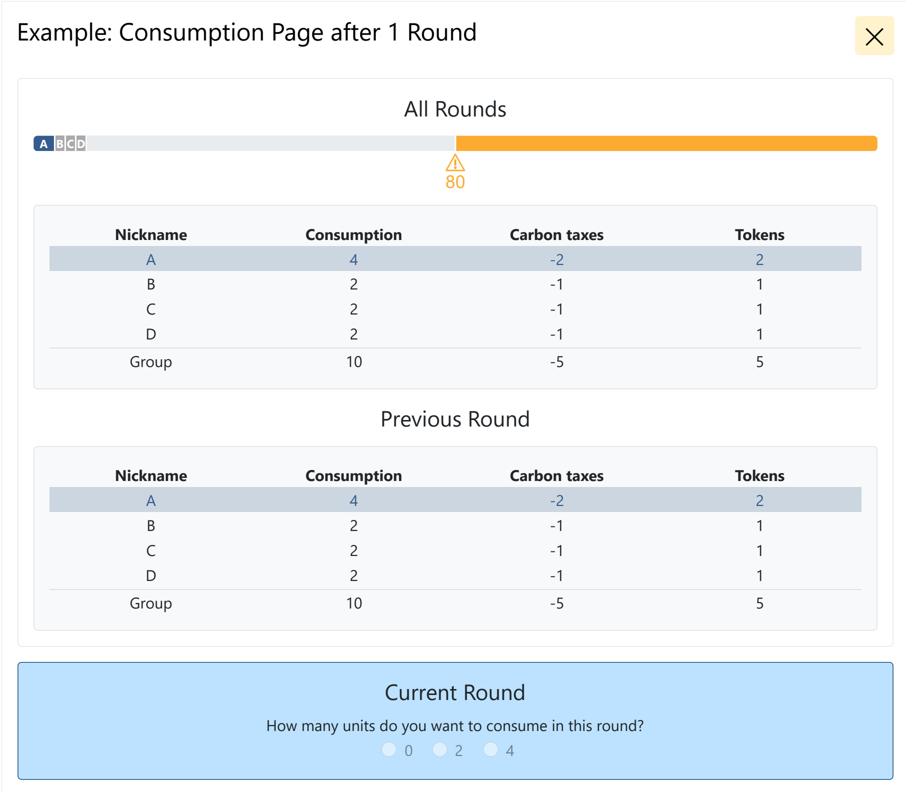
The game ends after 10 rounds. After that, you will be sent to the results page indicating the final outcome of the game.

Quick Guide:

Throughout the game you can always click on "Click to show quick guide" if you want to refresh your memory of any of the terms and key parts of the game. Just remember that your timer is still running, and you have to make a decision in every round.

Next

Figure A7: Instructions *Tax* Page 2 of 2. See Figure A8 for the example.



Example: Consumption Page after 1 Round

All Rounds

A B C D

80

Nickname	Consumption	Carbon taxes	Tokens
A	4	-2	2
B	2	-1	1
C	2	-1	1
D	2	-1	1
Group	10	-5	5

Previous Round

Nickname	Consumption	Carbon taxes	Tokens
A	4	-2	2
B	2	-1	1
C	2	-1	1
D	2	-1	1
Group	10	-5	5

Current Round

How many units do you want to consume in this round?

0 2 4

Figure A8: Example *Tax*.

Quick Guide / Reference Key

Tokens:
Unit of monetary gain, which might be converted 2.5:1 to GBP at the end of the game.

Account balance:
Aggregate number of tokens personally accumulated over the course of the game.

Consumption:
Contributes to both simulated catastrophic climate change and your personal token account balance in each round.

Group consumption:
Consumption is accumulated by all 4 players over the course of the game.

Carbon Tax:
Is set at 50%. Therefore, half of your selected consumption in tokens will be deducted as tax in each round.

Consumption threshold:
Total amount of group consumption, which, if exceeded, can cause simulated catastrophic climate change. This threshold is set to 80 units.

Catastrophic climate change:
Can occur at the end of the game with a likelihood of 60% if your group's aggregate consumption surpasses the consumption threshold of 80 units. If this happens, all your tokens will be lost.

Rounds:
The game ends after 10 rounds have been played.

Nickname:
Letters are randomly assigned as nicknames to players in the group. Your assigned nickname is indicated in blue.

Figure A9: Quick Guide *Baseline*.

Instructions Game (Part 1/2)

General:

You will be playing a game with other people, in which your individual decisions and the decisions of others influence the group, which in turn has implications for simulated climate change. You will be able to earn money as a bonus payoff during this game, in addition to receiving a fixed payment of GBP 2.50 for your participation.

Players:

You will be assigned to a group of 4 with 3 other players participating in real-time. Each player in your group faces the same decision-making problem as you.

Premise:

The game has multiple rounds. In each round you will be asked to decide on consumption. You can imagine this being the consumption of a good or service, which you derive benefits from, but which produces some CO2 output. Thus, by consuming, you gain a financial reward: you accumulate tokens in your account balance, which can later be converted to GBP. But there is a trade-off: through consumption you contribute to the simulated emission of the greenhouse gas, CO2. Too much consumption can lead to catastrophic climate change, which causes significant economic losses to you and the others in the group. Because of the environmental damage of consumption, your consumption will be subject to a carbon tax, providing you fewer tokens per unit consumed. Your pre-tax consumption contributes to catastrophic climate change. The taxes collected are distributed equally to each player. This is known as a carbon dividend.

Anonymity:

You will remain anonymous throughout the game. A single letter "nickname" (A, B, C, D) will be assigned to everyone in your group. The nickname assigned to you will be highlighted in blue throughout the game.

Rounds:

You will play for 10 rounds. In each round, all players will be asked simultaneously, "How many units do you want to consume in this round?". You can choose to consume 0 (nothing), 2 or 4 units, to be added as tokens to your account balance.

The game can only proceed to the next round if all players have submitted their consumption choice. You have a maximum of 2 minutes to make your decision in each round. If you do not select your desired consumption for a given round in time, the computer will automatically carry over whatever decision you made in the previous round (in the first round a random decision will be made in such a case). You will be able to make a choice again in the next round. If you select the desired consumption but do not confirm your decision by clicking „Next", the selected consumption will be submitted after the 2 minutes.

After each player has submitted their consumption choice, the computer will sum up the total amount consumed by the group. Consumption of the group is accumulated over the course of the 10 rounds.

There is a critical group consumption threshold of 80 units. If this amount is surpassed, simulated catastrophic climate change can occur, which would cause significant economic losses to all players. That means, if the total amount consumed by all players of the group at any point in the game surpasses 80 units, you and the others in the group are exposed to the risk of losing all tokens accumulated over the 10 rounds from consumption.

Next

Figure A10: Instructions *Symmetric* Page 1 of 2.

Instructions Game (Part 2/2)

Consumption & Tokens:

Each round you make decisions about your consumption, which is then translated to tokens in your account balance. However, each unit you consume will be subject to a carbon tax of 50%. The amount of consumption remaining after tax will be added to your account balance as tokens in each round. Additionally, in each round, the carbon taxes collected from everyone in the group will be summed up and equally redistributed to each player as a so-called carbon dividend.

For example, suppose in one round three players in the group select a consumption of 2 units and one player selects a consumption of 4 units. Given the tax rate of 50%, half the consumption gets deducted as taxes from each player, while the other half gets added as tokens to the account balance. In this case, 1 token in taxes is collected from those who consumed 2 units, and 2 tokens in taxes from the player who consumed 4 units. Because of the carbon dividend, the total amount of taxes collected (1 + 1 + 1 + 2 = 5 tokens) then gets redistributed equally among all the four players: 5 tokens / 4 = 1.25 tokens each. The three players who consumed 2 units receive 1 token for their consumption and an additional 1.25 tokens from the dividend, totalling 2.25 tokens added to their account balance for this round. The player who consumed 4 units receives 2 tokens for consumption and an additional 1.25 from the dividend, totalling 3.25 tokens added to their account balance for this round.

As with group consumption, the tokens are accumulated in your account each round until the end of the game, where the tokens are converted to GBP to determine your bonus payoff.

Consumption-Page:

To help your decision-making, each round you will be able to view two tables: one showing the information of the previous round, and one showing the combined information for all rounds. Each table contains the consumption of each player, the carbon tax deducted from each player's consumption in tokens (negative sign), the amount of redistributed carbon dividends in tokens, and the number of tokens left for each player after the deduction and redistribution of the tax. You will be able to see the individual player's amounts and the totals for the group.

In addition, the accumulated consumption is visualized as a progress bar. Each player's aggregate consumption is marked on the bar. Your own consumption is highlighted in blue. An orange warning symbol indicates the consumption threshold, after which catastrophic climate change can occur.

Click to show example

Bonus Payoff & Catastrophic Climate Change:

You may receive a bonus payoff at the end of the game. This is determined as follows:

- If simulated catastrophic climate change occurs, you will lose all your tokens and, therefore, your bonus payoff. Catastrophic climate change occurs with a likelihood of 60% once your group surpassed the consumption threshold. The computer draws the outcome of this randomly for your group.
- If your group manages to evade simulated catastrophic climate change, your bonus is certain.
- All your accumulated and remaining tokens after this determination are converted 5:1 to GBP.

For example, if you finally accumulated 20 tokens over the course of the game, and your group managed to evade simulated catastrophic climate change, you will receive a bonus of GBP 4.

However, if your group surpassed the consumption threshold of 80 units, you have a 60% chance of simulated catastrophic climate change occurring and, therefore, receiving no bonus, and a 40% chance of simulated catastrophic climate change not occurring and, therefore, receiving your bonus of GBP 4.

Ending the Game:

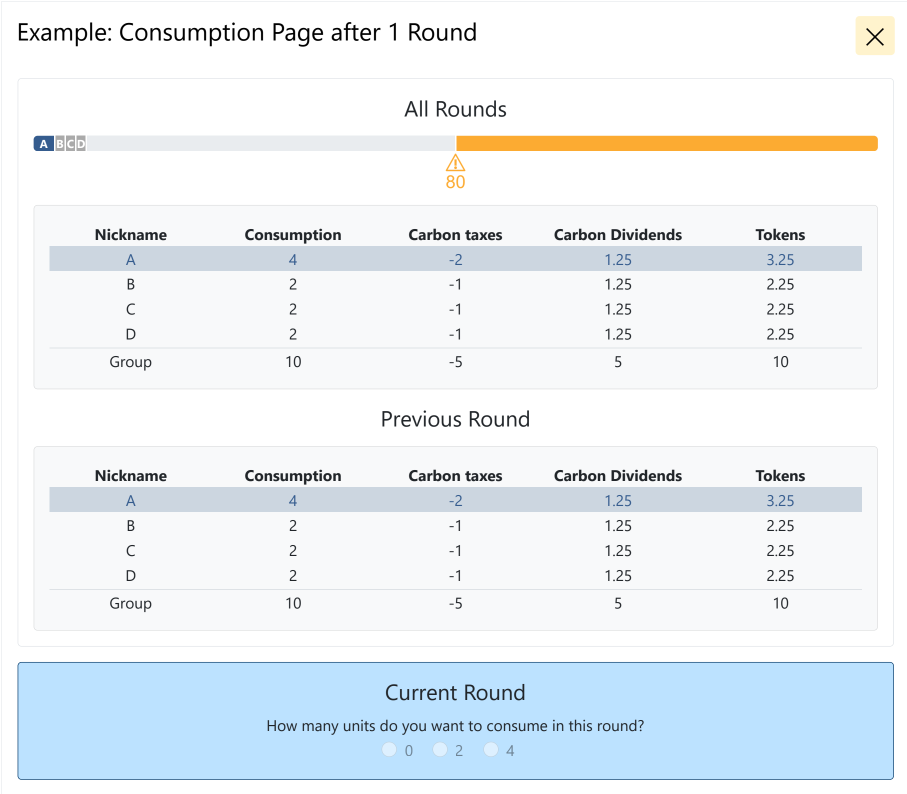
The game ends after 10 rounds. After that, you will be sent to the results page indicating the final outcome of the game.

Quick Guide:

Throughout the game you can always click on "Click to show quick guide" if you want to refresh your memory of any of the terms and key parts of the game. Just remember that your timer is still running, and you have to make a decision in every round.

Next

Figure A11: Instructions *Symmetric* Page 2 of 2. See Figure A12 for the example.



Example: Consumption Page after 1 Round

All Rounds

A B C D

80

Nickname	Consumption	Carbon taxes	Carbon Dividends	Tokens
A	4	-2	1.25	3.25
B	2	-1	1.25	2.25
C	2	-1	1.25	2.25
D	2	-1	1.25	2.25
Group	10	-5	5	10

Previous Round

Nickname	Consumption	Carbon taxes	Carbon Dividends	Tokens
A	4	-2	1.25	3.25
B	2	-1	1.25	2.25
C	2	-1	1.25	2.25
D	2	-1	1.25	2.25
Group	10	-5	5	10

Current Round

How many units do you want to consume in this round?

0 2 4

Figure A12: Example *Symmetric*.

Quick Guide / Reference Key

Tokens:
Unit of monetary gain, which might be converted 5:1 to GBP at the end of the game.

Account balance:
Aggregate number of tokens personally accumulated over the course of the game.

Consumption:
Contributes to both simulated catastrophic climate change and your personal token account balance in each round.

Group consumption:
Consumption is accumulated by all 4 players over the course of the game.

Carbon Tax:
Is set at 50%. Therefore, half of your selected consumption in tokens will be deducted as tax in each round

Carbon Dividend:
The total amount of taxes collected from all players are added up in each round and redistributed equally in tokens amongst all players of the group.

Consumption threshold:
Total amount of group consumption, which, if exceeded, can cause simulated catastrophic climate change. This threshold is set to 80 units.

Catastrophic climate change:
Can occur at the end of the game with a likelihood of 60% if your group's aggregate consumption surpasses the consumption threshold of 80 units. If this happens, all your tokens will be lost.

Rounds:
The game ends after 10 rounds have been played.

Nickname:
Letters are randomly assigned as nicknames to players in the group. Your assigned nickname is indicated in blue.

Figure A13: Quick Guide *Symmetric*.

Instructions Game (Part 1/2)

General:

You will be playing a game with other people, in which your individual decisions and the decisions of others influence the group, which in turn has implications for simulated climate change. You will be able to earn money as a bonus payoff during this game, in addition to receiving a fixed payment of GBP 2.50 for your participation.

Players:

You will be assigned to a group of 4 with 3 other players participating in real-time. Each player in your group faces the same decision-making problem as you.

Premise:

The game has multiple rounds. In each round you will be asked to decide on consumption. You can imagine this being the consumption of a good or service, which you derive benefits from, but which produces some CO2 output. Thus, by consuming, you gain a financial reward: you accumulate tokens in your account balance, which can later be converted to GBP. But there is a trade-off: through consumption you contribute to the simulated emission of the greenhouse gas, CO2. Too much consumption can lead to catastrophic climate change, which causes significant economic losses to you and the others in the group. Because of the environmental damage of consumption, your consumption will be subject to a carbon tax, providing you fewer tokens per unit consumed. Your pre-tax consumption contributes to catastrophic climate change. The taxes collected are distributed equally to players who have consumed a lower or equal number of units compared to the group average. This is known as a carbon dividend.

Anonymity:

You will remain anonymous throughout the game. A single letter "nickname" (A, B, C, D) will be assigned to everyone in your group. The nickname assigned to you will be highlighted in blue throughout the game.

Rounds:

You will play for 10 rounds. In each round, all players will be asked simultaneously, "How many units do you want to consume in this round?". You can choose to consume 0 (nothing), 2 or 4 units, to be added as tokens to your account balance.

The game can only proceed to the next round if all players have submitted their consumption choice. You have a maximum of 2 minutes to make your decision in each round. If you do not select your desired consumption for a given round in time, the computer will automatically carry over whatever decision you made in the previous round (in the first round a random decision will be made in such a case). You will be able to make a choice again in the next round. If you select the desired consumption but do not confirm your decision by clicking „Next", the selected consumption will be submitted after the 2 minutes.

After each player has submitted their consumption choice, the computer will sum up the total amount consumed by the group. Consumption of the group is accumulated over the course of the 10 rounds.

There is a critical group consumption threshold of 80 units. If this amount is surpassed, simulated catastrophic climate change can occur, which would cause significant economic losses to all players. That means, if the total amount consumed by all players of the group at any point in the game surpasses 80 units, you and the others in the group are exposed to the risk of losing all tokens accumulated over the 10 rounds from consumption.

Next

Figure A14: Instructions *Asymmetric* Page 1 of 2.

Instructions Game (Part 2/2)

Consumption & Tokens:

Each round you make decisions about your consumption, which is then translated to tokens in your account balance. However, each unit you consume will be subject to a carbon tax of 50%. The amount of consumption remaining after tax will be added to your account balance as tokens in each round. Additionally, in each round, the carbon taxes collected by everyone in the group will be summed up and equally redistributed among players who consumed a lower or equal number of units compared to the group average, as a so-called carbon dividend.

For example, suppose in one round three players in the group select a consumption of 2 units and one player selects a consumption of 4 units. Given the tax rate of 50%, half the consumption gets deducted as taxes from each player, while the other half gets added as tokens to the account balance. In this case, 1 token in taxes is collected from those who consumed 2 units, and 2 tokens in taxes from the player who consumed 4 units. Because of the carbon dividend, the total amount of taxes collected (1 + 1 + 1 + 2 = 5 tokens) then gets redistributed among those who consumed a lower or equal number of units compared to the group average. Here, the average group consumption (total consumption divided by 4 players) was (2 + 2 + 2 + 4) / 4 = 2.5 units. Since three players are below the group average consumption of 2.5 units, the total tax collected of 5 will be split among these 3 players: 5 tokens / 3 = 1.67 tokens each. The three players who consumed 2 units receive 1 token for their consumption and 1.67 tokens from the dividend, totalling 2.67 tokens added to their account balance for this round. The player who consumed 4 units receives 2 tokens for consumption and nothing from the dividend, so 2 tokens get added to their account balance for this round.

As with group consumption, the tokens are accumulated in your account each round until the end of the game, where the tokens are converted to GBP to determine your bonus payoff.

Consumption-Page:

To help your decision-making, each round you will be able to view two tables: one showing the information of the previous round, and one showing the combined information for all rounds. Each table contains the consumption of each player, the carbon tax deducted from each player's consumption in tokens (negative sign), the amount of redistributed carbon dividends in tokens, and the number of tokens left for each player after the deduction and redistribution of the tax. You will be able to see the individual player's amounts and the totals for the group.

In addition, the accumulated consumption is visualized as a progress bar. Each player's aggregate consumption is marked on the bar. Your own consumption is highlighted in blue. An orange warning symbol indicates the consumption threshold, after which catastrophic climate change can occur.

Click to show example

Bonus Payoff & Catastrophic Climate Change:

You may receive a bonus payoff at the end of the game. This is determined as follows:

- If simulated catastrophic climate change occurs, you will lose all your tokens and, therefore, your bonus payoff. Catastrophic climate change occurs with a likelihood of 60% once your group surpassed the consumption threshold. The computer draws the outcome of this randomly for your group.
- If your group manages to evade simulated catastrophic climate change, your bonus is certain.
- All your accumulated and remaining tokens after this determination are converted 5:1 to GBP.

For example, if you finally accumulated 20 tokens over the course of the game, and your group managed to evade simulated catastrophic climate change, you will receive a bonus of GBP 4.

However, if your group surpassed the consumption threshold of 80 units, you have a 60% chance of simulated catastrophic climate change occurring and, therefore, receiving no bonus, and a 40% chance of simulated catastrophic climate change not occurring and, therefore, receiving your bonus of GBP 4.

Ending the Game:

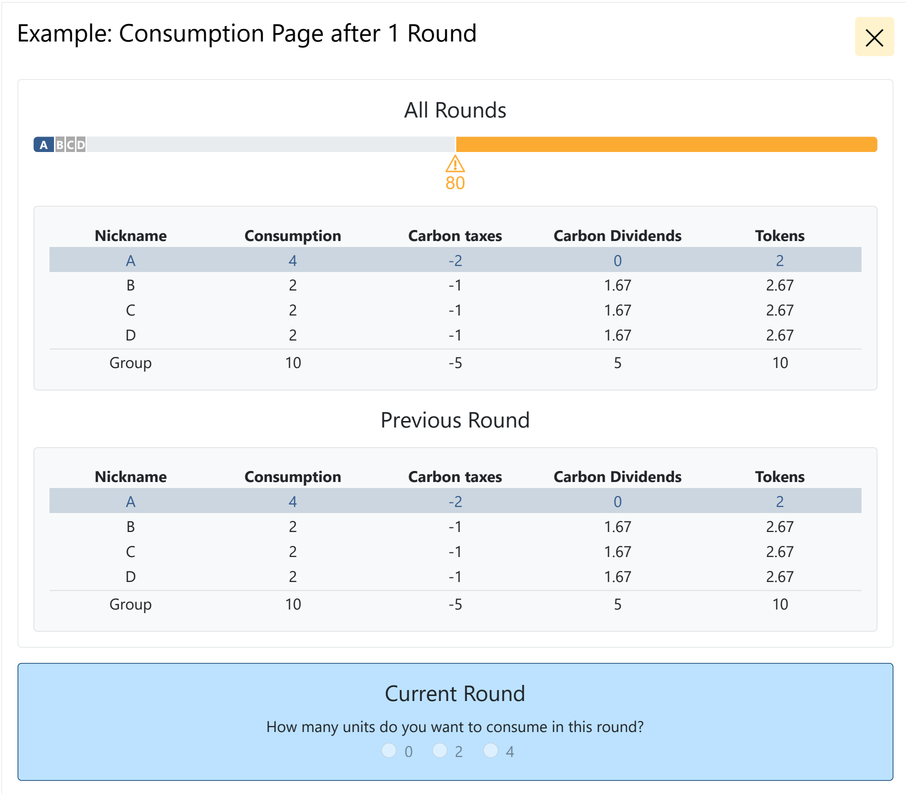
The game ends after 10 rounds. After that, you will be sent to the results page indicating the final outcome of the game.

Quick Guide:

Throughout the game you can always click on "Click to show quick guide" if you want to refresh your memory of any of the terms and key parts of the game. Just remember that your timer is still running, and you have to make a decision in every round.

Next

Figure A15: Instructions *Asymmetric* Page 2 of 2. See Figure A16 for the example.



Example: Consumption Page after 1 Round

All Rounds

A B C D

80

Nickname	Consumption	Carbon taxes	Carbon Dividends	Tokens
A	4	-2	0	2
B	2	-1	1.67	2.67
C	2	-1	1.67	2.67
D	2	-1	1.67	2.67
Group	10	-5	5	10

Previous Round

Nickname	Consumption	Carbon taxes	Carbon Dividends	Tokens
A	4	-2	0	2
B	2	-1	1.67	2.67
C	2	-1	1.67	2.67
D	2	-1	1.67	2.67
Group	10	-5	5	10

Current Round

How many units do you want to consume in this round?

0 2 4

Figure A16: Example *Asymmetric*.

Quick Guide / Reference Key

Tokens:

Unit of monetary gain, which might be converted 5:1 to GBP at the end of the game.

Account balance:

Aggregate number of tokens personally accumulated over the course of the game.

Consumption:

Contributes to both simulated catastrophic climate change and your personal token account balance in each round.

Group consumption:

Consumption is accumulated by all 4 players over the course of the game.

Carbon Tax:

Is set at 50%. Therefore, half of your selected consumption in tokens will be deducted as tax in each round

Carbon Dividend:

The total amount of taxes collected from all players are added up in each round and redistributed equally in tokens amongst all players of the group who consumed less than or equal to the group average in this round.

Consumption threshold:

Total amount of group consumption, which, if exceeded, can cause simulated catastrophic climate change. This threshold is set to 80 units.

Catastrophic climate change:

Can occur at the end of the game with a likelihood of 60% if your group's aggregate consumption surpasses the consumption threshold of 80 units. If this happens, all your tokens will be lost.

Rounds:

The game ends after 10 rounds have been played.

Nickname:

Letters are randomly assigned as nicknames to players in the group. Your assigned nickname is indicated in blue.

Figure A17: Quick Guide *Asymmetric*.

Control Questions - Attempt 1 / 2

In order to proceed, you have to correctly answer the following questions. You may check the quick guide if needed.

To prevent catastrophic climate change, which total amount of consumption must not be surpassed by the group over the course of the game?

- ◯ 0
- ◯ 80
- ◯ 160

At the end of the game, all tokens in your account will be converted to cash. Which of the following conversions is correct?

- ◯ The conversion rate is 5:1. Therefore, 100 tokens would be converted to GBP 20 in cash.
- ◯ Tokens are not converted to cash. Everyone receives a fixed payment.
- ◯ The conversion rate is 1:1. Therefore, 100 tokens would be converted to GBP 100 in cash.

How does the consumption of previous rounds carry over to future rounds?

- ◯ Each round is independent. In every round everything is reset
- ◯ Consumption is accumulated over all the rounds. I.e., each round, the consumption is added to the consumption of previous rounds.

Which conditions cause the game to end?

- ◯ The game continues infinitely until the threshold is surpassed.
- ◯ The game ends after exactly 10 rounds.

What information about past consumption is shown to everyone in each round?

- ◯ Each individual player's consumption, as well as the total group consumption for the previous round and for all rounds combined.
- ◯ No information is shown.
- ◯ Only information about of one's own past decisions is shown.

Please select "22" as the correct answer for this item.

- ◯ 71
- ◯ 22
- ◯ 19

How does your consumption translate to tokens in your account

- ◯ Consumption does not affect tokens in your account.
- ◯ More consumption leads to fewer tokens being added to your account.
- ◯ Every unit of consumption adds one token to your account.

What happens if the group surpasses the consumption threshold?

- ◯ Nothing
- ◯ The game ends
- ◯ Catastrophic climate change can occur

How likely is it that catastrophic climate change will occur once your group surpasses the consumption threshold?

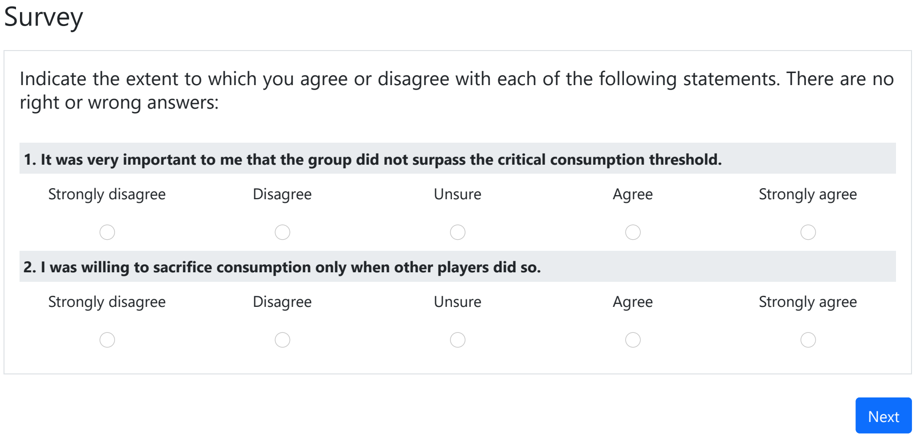
- ◯ 0%
- ◯ 60%
- ◯ 100%

Click to show quick guide | Next

Figure A18: Control Questions.

A.2. Survey

Figures A19–A25 show the content of the post-experimental survey including demographics and feedback that was collected.


Survey

Indicate the extent to which you agree or disagree with each of the following statements. There are no right or wrong answers:

1. It was very important to me that the group did not surpass the critical consumption threshold.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

2. I was willing to sacrifice consumption only when other players did so.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

Next

Figure A19: Survey items on decision making.

Survey

Click to show Explanations on Carbon Taxes and Carbon Dividends

If a **carbon tax** were implemented in the United States, please indicate the extent to which you agree or disagree with the following statements:

Remember that a carbon tax is a tax on goods and services that produce high carbon emissions.

1. I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

2. I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

3. I would support pricing carbon emissions via a carbon tax.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

4. I believe other people in my community would support pricing carbon emissions via a carbon tax.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

If a **carbon tax and dividend** were implemented in the United States, please indicate the extent to which you agree or disagree with the following statements:

Remember that a carbon tax with dividend means that the tax revenue gets redistributed by being paid out in cash to the taxpayers.

1. I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

2. I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

3. I would support pricing carbon emissions via a carbon tax and dividend.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

4. I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

5. Which type of carbon dividend, if any, would you be more likely to support?

○ Symmetric dividend (equal distribution of carbon taxes)

○ Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)

○ Neither

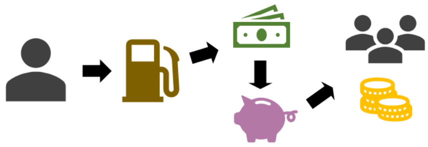
Next

Figure A20: Survey items on carbon taxes and carbon dividends. See Figure A21 for the explanations.

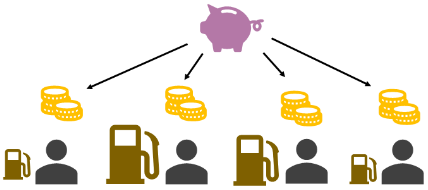
Explanations on Carbon Taxes and Carbon Dividends:

Policymakers have long grappled with the question of how to encourage the reduction of CO2 emissions. One possible approach is by pricing carbon emissions. This could be done by introducing a carbon tax with a so-called carbon dividend. This works in the following way:

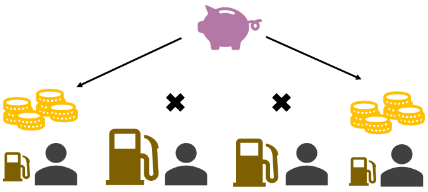
A carbon tax means that carbon-heavy goods and services are taxed, making them more costly. By comparison, greener alternatives are relatively cheaper and become more attractive. Combined with a carbon dividend, periodically (i.e. at the end of each year), all the money collected via the carbon tax is redistributed across the population, paid out in cash (the dividend).



The dividend can be paid out symmetrically, such that the total amount of carbon tax revenue is equally distributed among all those who paid taxes, regardless of how much carbon they emitted (and therefore regardless of how much carbon taxes they paid).



The dividend can also be paid out asymmetrically, such that the total amount of carbon tax revenue is distributed to those who consumed less carbon than the average person (and therefore also paid less carbon tax than the average).



In either case, most households would benefit from a carbon dividend, because the dividend received would exceed people's share of carbon tax, and only those with above-average CO2 footprints would pay more tax than they would receive as a dividend.

Figure A21: Explanation of carbon taxes and carbon dividends.

Survey

Indicate the extent to which you agree or disagree with each of the following statements. There are no right or wrong answers:

1. Approaches used by people in the past are generally the most effective.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

2. If society is going to change, it should occur slowly and naturally.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

3. The established way of doing things should be protected and preserved.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

4. Fast or radical changes are unwise and dangerous.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

5. Traditions reflect wisdom and knowledge.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

6. Making sudden changes tends to create more problems than solutions.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

7. Slow, gradual change helps prevent catastrophes and mistakes.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

8. Quick changes are acceptable if they restore things to how they were before.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

9. Following traditions tends to create a closed-minded society.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

10. Established traditions are the best way to run society.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
○	○	○	○	○

Next

Figure A22: *Resistance to Change-Beliefs Scale* (see, e.g., White et al., 2019) survey items. Item 9 is evaluated in reverse.

Survey

Indicate the extent to which you agree or disagree with each of the following statements. There are no right or wrong answers:

1. We are approaching the limit of the number of people the Earth can support.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

2. Humans have the right to modify the natural environment to suit their needs.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

3. When humans interfere with nature it often produces disastrous consequences.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

4. Human ingenuity will ensure that we do not make the Earth unliveable.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

5. Humans are seriously abusing the environment.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

6. The Earth has plenty of natural resources if we just learn how to develop them.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

7. Plants and animals have as much right as humans to exist.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

9. Despite our special abilities, humans are still subject to the laws of nature.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

11. The Earth is like a spaceship with very limited room and resources.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

12. Humans were meant to rule over the rest of nature.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

13. The balance of nature is very delicate and easily upset.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

14. Humans will eventually learn enough about how nature works to be able to control it.

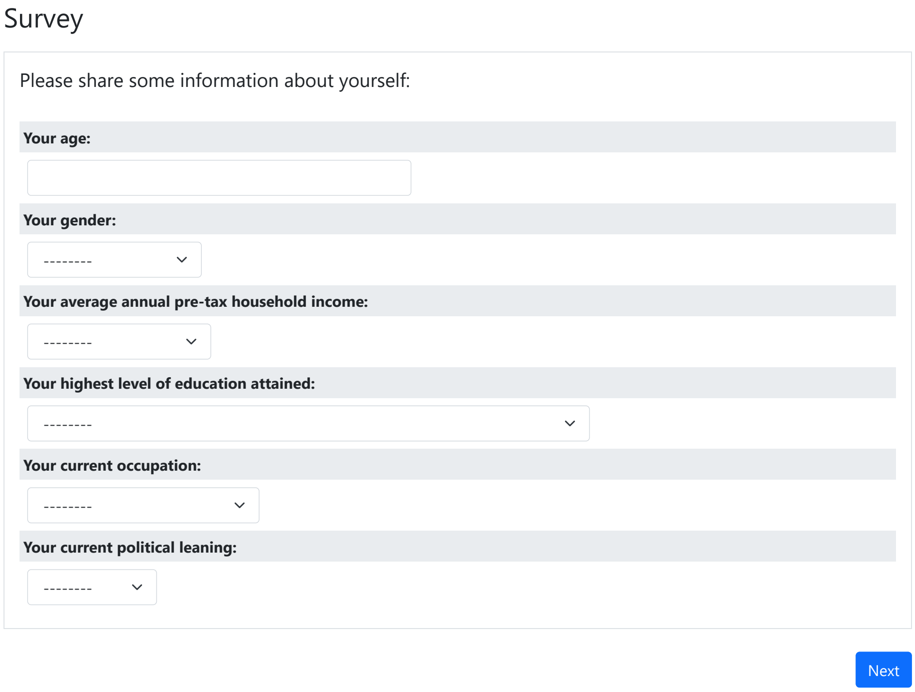
Strongly disagree | Disagree | Unsure | Agree | Strongly agree

15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Strongly disagree | Disagree | Unsure | Agree | Strongly agree

Next

Figure A23: *New Environmental Paradigm* (Dunlap et al., 2002) survey items. Even numbered items are evaluated in reverse.



Survey

Please share some information about yourself:

Your age:

Your gender:

Your average annual pre-tax household income:

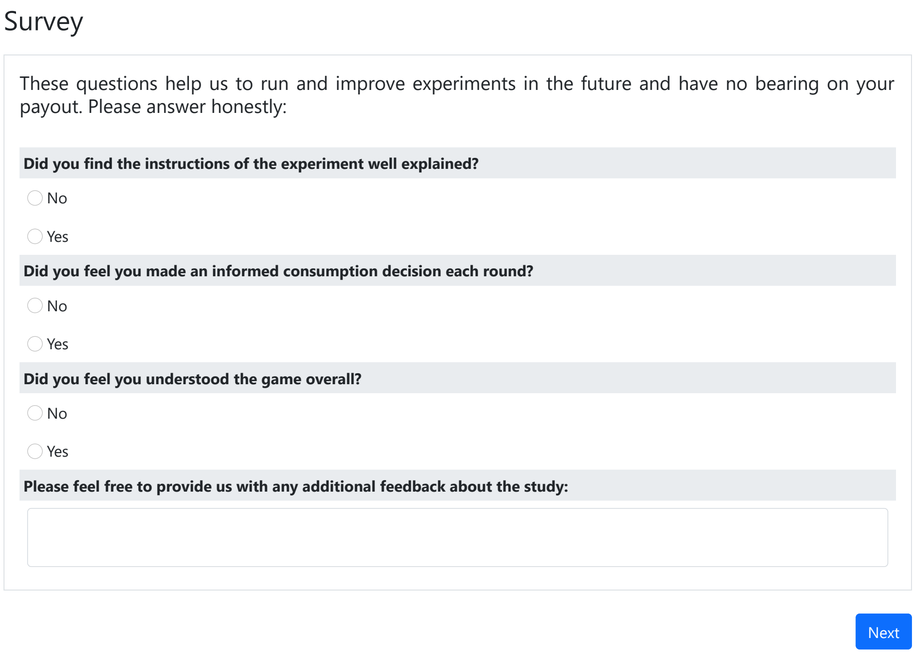
Your highest level of education attained:

Your current occupation:

Your current political leaning:

Next

Figure A24: Demographics.



Survey

These questions help us to run and improve experiments in the future and have no bearing on your payout. Please answer honestly:

Did you find the instructions of the experiment well explained?

No

Yes

Did you feel you made an informed consumption decision each round?

No

Yes

Did you feel you understood the game overall?

No

Yes

Please feel free to provide us with any additional feedback about the study:

Next

Figure A25: Feedback.

B. Supplementary Tables

Table B1: Representative data sampling statistics provided by Prolific during data collection. The exhibited relative frequencies refer to a sub-sample of $N = 1{,}124$, equating to 53% of the full sample of $N = 2{,}116$ observations. A value of 1 implies that the corresponding bracket has achieved its exact target sampling size. Nonetheless, varied fractions within each stratum suggest that the sampling across brackets was not entirely balanced. Note, that these values are not precise with respect to our actual number of observations.

Age:	
18 - 17	0.965
28 - 37	0.972
38 - 47	0.939
48 - 57	0.807
58 - 150	0.369
Sex:	
Female	0.759
Male	0.735
Ethnicity:	
Asian	0.691
Black	0.577
Mixed	0.853
Other	0.741
White	0.777

Table B2: Descriptive statistics of demographic characteristics per treatment: age in years, gender, education, occupation, income and political leaning in percent. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). Note that some categories have few to no observations. We do not omit any of these in proceeding analyses, but interpretation of these should be taken with caution. n indicates the number of observations.

	Baseline	*Tax*	*Symmetric*	*Asymmetric*
	$n = 520$	$n = 540$	$n = 524$	$n = 532$
Age	37.905	39.445	39.380	37.953
Gender:				
Male	53.6%	54.6%	56.8%	54.1%
Female	43.5%	43.2%	41.9%	43.5%
Non-Binary	2.3%	1.5%	0.8%	2.3%
Other	0.2%	0.4%	0.2%	0.2%
I prefer not to tell	0.4%	0.4%	0.4%	0.0%
Education:				
None	0.0%	0.2%	0.2%	0.0%
Primary	0.2%	0.4%	0.8%	1.1%
Secondary	28.0%	30.0%	29.1%	22.5%
Associates degree	11.8%	13.0%	12.0%	11.7%
Bachelor's degree	41.9%	40.6%	39.4%	45.4%
Professional degree	2.9%	1.9%	2.1%	1.3%
Master's degree	13.4%	12.1%	13.6%	16.6%
Doctorate degree	1.7%	1.9%	2.9%	1.3%
Occupation:				
Employed	62.1%	62.9%	60.0%	60.7%
Self employed / Freelance	13.0%	14.0%	14.5%	13.8%
Unemployed	12.0%	11.0%	12.0%	11.9%
Retired	3.3%	5.0%	6.7%	5.1%
Student	6.2%	4.8%	4.4%	6.4%
Other	3.3%	2.2%	2.3%	2.1%
Income USD:				
less than 50.000	38.1%	39.9%	38.8%	35.5%
50.000 to 59.999	11.5%	11.5%	10.9%	11.2%
60.000 to 69.999	10.1%	8.0%	9.9%	9.5%
70.000 or more	37.9%	37.6%	38.8%	42.2%
I prefer not to tell	2.5%	3.0%	1.5%	1.7%
Political Leaning:				
Republican	23.1%	23.1%	20.5%	17.2%
Democrat	57.9%	57.2%	54.1%	55.6%
Other	19.0%	19.7%	25.4%	27.2%

Table B3: Pairwise comparisons of differences in demographics across treatments. The first (upper) part shows comparisons relative to *Baseline*. The second (middle) part shows comparisons relative to *Tax*. The third (lower) part shows comparisons relative to *Symmetric*. Additionally, reference conditions are marked as "ref.". Age is compared using two-sided unpaired sample t-tests. All other demographics are compared using two-sided Mann-Whitney U tests. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Age	ref.	0.990	0.940	0.930
Gender:	ref.	0.690	0.220	0.830
Income USD:	ref.	0.760	0.800	0.340
Education:	ref.	0.220	0.670	0.140
Occupation:	ref.	0.630	0.650	0.710
Political Leaning:	ref.	0.860	0.030*	0.000***
Age		ref.	0.950	0.910
Gender:		ref.	0.400	0.850
Income USD:		ref.	0.960	0.220
Education:		ref.	0.450	0.010**
Occupation:		ref.	0.330	0.380
Political Leaning:		ref.	0.040*	0.000**
Age			ref.	0.870
Gender:			ref.	0.310
Income USD:			ref.	0.230
Education:			ref.	0.060
Occupation:			ref.	0.940
Political Leaning:			ref.	0.230

Table B4: Pairwise comparisons of success rates (one-sided unpaired sample proportion tests) across treatments. Values not in parentheses or brackets correspond to success rates of the respective row. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). Values in parentheses indicate p-values. Values in brackets indicate non-directional Cohen's h values. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline $n = 130$	*Tax* $n = 135$	*Symmetric* $n = 131$	*Asymmetric* $n = 133$
Baseline		0.777 [0.068]	0.777 [0.119]	0.777 [0.488]
Tax	0.748 (0.658)		0.748 [0.187]	0.748 [0.556]
Symmetric	0.824 (0.210)	0.824 (0.086)		0.824 [0.369]
Asymmetric	0.940*** (0.000)	0.940*** (0.000)	0.940** (0.003)	

Table B5: Pairwise comparisons of aggregate group consumption (one-sided unpaired sample t-tests) across treatments. Values not in parentheses or brackets correspond to aggregate group consumption of the respective row. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). Values in parentheses indicate p-values. Values in brackets indicate Cohen's d values. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline $n = 130$	*Tax* $n = 135$	*Symmetric* $n = 131$	*Asymmetric* $n = 133$
Baseline		80.462 [0.036]	80.462 [0.262]	80.462 [1.263]
Tax	80.104 (0.386)		80.104 [0.247]	80.104 [1.327]
Symmetric	77.542* (0.018)	77.542* (0.023)		77.542 [0.976]
Asymmetric	66.406*** (0.000)	66.406*** (0.000)	66.406*** (0.000)	

Table B6: Group level averages (mean) of success rates, aggregate group consumption, and payoffs for each treatment. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). The variable "Time" indicates the average time participants spent in the experiment in minutes and "Payoff" denotes the average payoff participants received GBP. n indicates the number of observations.

	Baseline $n = 130$	*Tax* $n = 135$	*Symmetric* $n = 131$	*Asymmetric* $n = 133$
Success Rate	0.777	0.748	0.824	0.940
Consumption	80.462	80.104	77.542	66.406
Time	18.644	20.775	20.187	20.970
Payoff	5.873	5.850	5.797	5.611

Table B7: Two-sided Mann-Whitney U tests of participant responses to survey items on their decision making process (see Figure A19 for details) pairwise compared across treatments. For the individual survey items values are given in scores. For the additional questions values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Individual Survey Items:				
Item 1	(4.455)	4.522	4.562*	4.618**
Item 2	(2.789)	2.649	2.612*	2.597*
Item 1		(4.522)	4.562	4.618**
Item 2		(2.649)	2.612	2.597
Item 1			(4.562)	4.618
Item 2			(2.612)	2.597

Item 1: It was very important to me that the group did not surpass the critical consumption threshold.
Item 2: I was willing to sacrifice consumption only when other players did so.

Table B8: Two-sided Mann-Whitney U tests of policy attitude survey items (see Figure A20 for details) pairwise compared across treatments. For the individual survey items values are given in scores. For the additional questions values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Individual Survey Items:				
Item Taxes 1	(3.634)	3.745	3.675	3.754
Item Taxes 2	(3.539)	3.645	3.549	3.677
Item Taxes 3	(3.591)	3.626	3.610	3.660
Item Taxes 3	(3.591)	3.626	3.610	3.660
Item Taxes 4	(3.072)	3.182	3.203*	3.197*
Item Dividends 1	(3.636)	3.697	3.681	3.849**
Item Dividends 2	(3.616)	3.651	3.610	3.749*
Item Dividends 3	(3.655)	3.662	3.656	3.790*
Item Dividends 4	(3.312)	3.381	3.358	3.374
Item Taxes 1		(3.745)	3.675	3.754
Item Taxes 2		(3.645)	3.549	3.677
Item Taxes 3		(3.626)	3.610	3.660
Item Taxes 4		(3.182)	3.203	3.197
Item Dividends 1		(3.697)	3.681	3.849*
Item Dividends 2		(3.651)	3.610	3.749
Item Dividends 3		(3.662)	3.656	3.790
Item Dividends 4		(3.381)	3.358	3.374
Item Taxes 1			(3.743)	3.754
Item Taxes 2			(3.644)	3.677
Item Taxes 3			(3.627)	3.660
Item Taxes 4			(3.180)	3.197
Item Dividends 1			(3.699)	3.849*
Item Dividends 2			(3.654)	3.749*
Item Dividends 3			(3.663)	3.790
Item Dividends 4			(3.384)	3.374

To be continued on next page.

Continued from Table B8.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Additional Question:				
Response Symmetric	(0.380)	0.379	0.375	0.325
Response Asymmetric	(0.432)	0.454	0.447	0.541***
Response Neither	(0.188)	0.167	0.178	0.134*
Response Symmetric		(0.379)	0.375	0.325
Response Asymmetric		(0.454)	0.447	0.541**
Response Neither		(0.167)	0.178	0.134
Response Symmetric			(0.375)	0.325
Response Asymmetric			(0.447)	0.541**
Response Neither			(0.178)	0.134

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.
Additional Question: Which type of carbon dividend, if any, would you be more likely to support?
Response Symmetric: Symmetric dividend (equal distribution of carbon taxes)
Response Asymmetric: Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)
Response Neither: Neither

Table B9: Validated *Resistance to Change-Beliefs Scale* and *New Environmental Paradigm* scores (see Figures A22 and A23 for details) for each treatment. Scores are based on the weighted averages values of the responses (items coded in reverse are considered accordingly). n indicates the number of observations.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Resistance to Change-Beliefs Scale	3.344	3.366	3.336	3.347
New Environmental Paradigm	3.000	3.020	3.017	2.919

Table B10: Univariate logistic regression of participant success rates on RC-B scores. Success rates are based on the proportions of groups who did not surpass the threshold after all 10 rounds were played ($success = 1$). Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Success Rate
	$n = 2106$
Resistance to Change-Beliefs Scale	0.865*
	(0.071)
Constant	7.197***
	(0.244)

Table B11: Univariate logistic regression of participant success rates on *New Environmental Paradigm* scores. Success rates are based on the proportions of groups who did not surpass the threshold after all 10 rounds were played ($success = 1$). Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Success Rate
	$n = 2104$
New Environmental Paradigm	1.274**
	(0.086)
Constant	1.729
	(0.366)

Table B12: Logistic regression of participant success rates on treatment dummies. Success rates are based on the proportions of groups who did not surpass the threshold after all 10 rounds were played ($success = 1$). Values not in parentheses are reported as odds ratios. Standard errors are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Success Rate $n = 2116$
Tax	0.853
	(0.290)
Symmetric	1.348
	(0.312)
Asymmetric	4.486***
	(0.422)
Constant	3.483***
	(0.211)

Table B13: Multivariate logistic regression of participant success rates on demographics. Categories with the majority of responses are chosen to be covered in the constant: *Education:* 6 ("Professional degree"), *Gender:* 1 ("Male"), *Income:* 4 ("70,000 or more"), *Occupation:* 1 ("Employed"), *Policies:* 2 ("Asymmetric dividend"), *Policital Leaning:* 2 ("Democrat"), *Binary Makers:* 2 ("Yes"). Success rates are based on the proportions of groups who did not surpass the threshold after all 10 rounds were played ($success = 1$). Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Success Rate $n = 2099$
Age	-0.003
	(0.006)
Education:	
None	13.231***
	(0.880)
Primary / Elementary school	0.870
	(1.088)
Secondary / High school	-0.257
	(0.147)
Associates degree	0.018
	(0.203)
Professional degree	-0.167
	(0.415)
Master's degree	-0.008
	(0.189)
Doctorate degree	-0.240
	(0.417)
Gender:	
Female	0.327**
	(0.127)
Non-binary	0.746
	(0.528)
Other	-1.137
	(0.968)
I prefer not to tell	13.435***
	(0.570)
Constant	1.758***
	(0.331)

To be continued on next page.

Continued from Table B13.

	Success Rate $n = 2100$
Income USD:	
less than 50,000	−0.212 (0.152)
50,000 to 59,999	−0.311 (0.204)
60,000 to 69,999	−0.064 (0.231)
I prefer not to tell	−0.373 (0.422)
Occupation:	
Self-employed / Freelance	0.217 (0.193)
Unemployed	−0.108 (0.186)
Retired	0.174 (0.273)
Student	0.096 (0.286)
Other	−0.004 (0.364)
Policies:	
Symmetric dividend	0.002 (0.130)
Neither	−0.256 (0.170)
Political Leaning:	
Republican	−0.018 (0.157)
Other	−0.031 (0.147)
Good Explanation: No	−0.301 (0.266)
Informed Decision: No	−0.683* (0.290)
Understood Game: No	−0.237 (0.352)
Time Control	*Yes*

Table B14: Univariate ordered logistic regression of policy attitude survey items (see Figure A20 for item descriptions) on *Resistance to Change-Beliefs Scale* scores. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Item Taxes 1 $n = 2096$	*Item Taxes 2* $n = 2096$	*Item Taxes 3* $n = 2096$	*Item Taxes 4* $n = 2096$	*Item Dividends 1* $n = 2096$	*Item Dividends 2* $n = 2096$	*Item Taxes Dividends 3* $n = 2096$	*Item Dividends 4* $n = 2096$
Resistance to Change-Beliefs Scale	0.909*	0.944	0.958	0.967	0.944	0.964	0.967	1.025
	(0.048)	(0.049)	(0.051)	(0.048)	(0.050)	(0.049)	(0.049)	(0.049)

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.

Table B15: Univariate ordered logistic regression of policy attitude survey items (see Figure A20 for item descriptions) on *New Environmental Paradigm* scores. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Item Taxes 1 $n = 2094$	*Item Taxes 2* $n = 2094$	*Item Taxes 3* $n = 2094$	*Item Taxes 4* $n = 2094$	*Item Dividends 1* $n = 2094$	*Item Dividends 2* $n = 2094$	*Item Taxes Dividends 3* $n = 2094$	*Item Dividends 4* $n = 2094$
New Environmental Paradigm	1.058	1.072	1.062	1.019	1.055	1.030	1.004	0.972
	(0.058)	(0.058)	(0.058)	(0.057)	(0.058)	(0.057)	(0.055)	(0.055)

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.

Table B16: Multivariate ordered logistic regression of policy attitude survey items (see Figure A20 for item descriptions) on demographics. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Item Taxes 1 $n = 2104$	*Item Taxes 2* $n = 2104$	*Item Taxes 3* $n = 2104$	*Item Taxes 4* $n = 2104$	*Item Dividends 1* $n = 2104$	*Item Dividends 2* $n = 2104$	*Item Dividends 3* $n = 2104$	*Item Dividends 4* $n = 2104$
Age	0.983***	0.985***	0.985***	0.987***	0.985***	0.986***	0.987***	0.987***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Education:								
None	1645531***	2.958	2.561	0.140***	1380961***	1456288***	2.072	2.506
	(0.000)	(1.189)	(1.242)	(0.125)	(0.000)	(0.000)	(1.259)	(2.302)
Primary / Elementary school	1.085	0.806	0.741	0.213***	3.482*	1.747	1.598	0.389*
	(0.655)	(0.514)	(0.505)	(0.393)	(0.550)	(0.670)	(0.602)	(0.458)
Secondary / High school	0.941	0.837	0.855	0.964	1.017	0.928	0.957	0.950
	(0.105)	(0.106)	(0.104)	(0.103)	(0.108)	(0.105)	(0.108)	(0.108)
Associates degree	0.942	0.808	0.854	0.859	0.800	0.796	0.794	0.888
	(0.141)	(0.129)	(0.142)	(0.139)	(0.136)	(0.133)	(0.139)	(0.138)
Professional degree	1.203	0.917	0.940	0.804	1.472	1.290	1.120	0.745
	(0.247)	(0.280)	(0.266)	(0.268)	(0.257)	(0.246)	(0.263)	(0.239)
Master's degree	1.136	0.994	0.956	1.059	1.116	1.047	1.056	0.994
	(0.117)	(0.130)	(0.123)	(0.122)	(0.122)	(0.123)	(0.120)	(0.122)
Doctorate degree	1.548	1.229	1.417	1.193	1.222	0.882	1.328	1.229
	(0.323)	(0.271)	(0.262)	(0.295)	(0.276)	(0.229)	(0.265)	(0.276)
Gender:								
Female	0.856	0.964	0.945	0.765**	0.821*	0.867	0.847*	0.684***
	(0.083)	(0.081)	(0.083)	(0.084)	(0.084)	(0.083)	(0.082)	(0.081)
Non-binary	1.623	1.963	2.418*	1.121	1.228	1.563	1.218	1.078
	(0.308)	(0.424)	(0.390)	(0.260)	(0.326)	(0.351)	(0.353)	(0.261)
Other	3.377	3.677	3.420	6.554	1.119	2.372	2.358	4.567***
	(1.025)	(0.957)	(0.977)	(1.027)	(0.906)	(0.476)	(0.513)	(0.448)
I prefer not to tell	1.414	0.734	0.732	0.746	0.357	0.376	0.302*	0.411
	(1.088)	(0.835)	(0.771)	(0.779)	(0.604)	(0.775)	(0.514)	(0.546)
Income:								
less than USD 50,000	0.815*	0.906	0.870	0.874	0.862	0.912	0.945	0.848
	(0.103)	(0.098)	(0.100)	(0.102)	(0.094)	(0.097)	(0.095)	(0.096)
USD 50,000 to USD 59,999	0.898	0.984	0.861	1.114	0.954	0.944	0.954	1.068
	(0.141)	(0.141)	(0.139)	(0.141)	(0.143)	(0.142)	(0.145)	(0.135)
USD 60,000 to USD 69,999	0.720*	0.772	0.732	0.724*	0.821	0.892	0.868	0.717*
	(0.153)	(0.156)	(0.170)	(0.147)	(0.157)	(0.149)	(0.154)	(0.145)
I prefer not to tell	0.473**	0.503*	0.411**	0.461**	0.479**	0.573	0.399**	0.392***
	(0.254)	(0.280)	(0.290)	(0.293)	(0.264)	(0.289)	(0.279)	(0.281)

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Continued from Table B16.

	Item Taxes 1 $n = 2104$	*Item Taxes 2* $n = 2104$	*Item Taxes 3* $n = 2104$	*Item Taxes 4* $n = 2104$	*Item Dividends 1* $n = 2104$	*Item Dividends 2* $n = 2104$	*Item Dividends 3* $n = 2104$	*Item Dividends 4* $n = 2104$
Occupation:								
Self-employed / Freelance	0.791	0.815	0.771	0.827	1.000	0.950	1.004	1.030
	(0.139)	(0.143)	(0.134)	(0.126)	(0.139)	(0.146)	(0.140)	(0.131)
Unemployed	0.910	0.825	0.885	0.696**	1.114	0.981	1.054	0.795
	(0.129)	(0.123)	(0.126)	(0.131)	(0.129)	(0.119)	(0.125)	(0.127)
Retired	1.216	1.122	0.968	1.091	1.357	1.045	0.994	1.330
	(0.220)	(0.213)	(0.222)	(0.213)	(0.221)	(0.218)	(0.227)	(0.204)
Student	1.037	1.046	1.111	0.945	0.910	1.004	0.880	0.773
	(0.175)	(0.173)	(0.174)	(0.179)	(0.176)	(0.161)	(0.160)	(0.174)
I prefer not to tell	0.757	0.689	0.769	0.880	0.733	0.630	0.669	0.649
	(0.243)	(0.242)	(0.261)	(0.241)	(0.273)	(0.273)	(0.267)	(0.234)
Political Leaning:								
Republican	0.286***	0.245***	0.183***	0.511***	0.314***	0.266***	0.217***	0.516***
	(0.116)	(0.117)	(0.118)	(0.112)	(0.110)	(0.116)	(0.121)	(0.108)
Other	0.375***	0.345***	0.319***	0.680***	0.404***	0.372***	0.330***	0.606***
	(0.104)	(0.106)	(0.103)	(0.102)	(0.107)	(0.102)	(0.106)	(0.102)

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.

Table B17: Multivariate ordered logistic regression of policy attitude survey items (see Figure A20 for item descriptions) on treatments, political leaning, and their interactions. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Item Taxes 1 $n = 2104$	*Item Taxes 2* $n = 2104$	*Item Taxes 3* $n = 2104$	*Item Taxes 4* $n = 2104$	*Item Dividends 1* $n = 2104$	*Item Dividends 2* $n = 2104$	*Item Taxes Dividends 3* $n = 2104$	*Item Dividends 4* $n = 2104$
Treatment:								
Tax	1.066	1.088	1.052	1.084	0.995	1.034	0.925	0.991
	(0.146)	(0.143)	(0.150)	(0.152)	(0.142)	(0.149)	(0.141)	(0.143)
Symmetric	1.060	1.170	1.097	1.304	1.414*	1.313*	1.364*	1.215
	(0.143)	(0.141)	(0.141)	(0.146)	(0.142)	(0.138)	(0.141)	(0.146)
Asymmetric	1.019	0.999	1.100	1.260	1.068	0.905	0.947	1.080
	(0.153)	(0.142)	(0.147)	(0.140)	(0.151)	(0.148)	(0.148)	(0.140)
Political Leaning:								
Republican	0.220***	0.203***	0.187***	0.508***	0.250***	0.231***	0.194***	0.483***
	(0.210)	(0.216)	(0.221)	(0.191)	(0.208)	(0.202)	(0.207)	(0.185)
Other	0.299***	0.303***	0.297***	0.640	0.367***	0.338***	0.297***	0.643
	(0.238)	(0.215)	(0.222)	(0.244)	(0.236)	(0.206)	(0.230)	(0.238)
Interactions:								
Tax:Republican	1.637	1.437	1.149	1.289	1.456	1.200	1.493	1.380
	(0.287)	(0.296)	(0.300)	(0.299)	(0.269)	(0.279)	(0.281)	(0.271)
Asymmetric:Republican	1.379	1.125	0.786	0.915	1.279	0.875	0.683	0.765
	(0.331)	(0.315)	(0.314)	(0.295)	(0.339)	(0.314)	(0.323)	(0.296)
Symmetric:Republican	1.137	1.129	0.881	0.925	1.239	1.378	1.303	1.276
	(0.320)	(0.322)	(0.321)	(0.304)	(0.304)	(0.322)	(0.320)	(0.307)
Tax:Other	1.236	1.233	1.022	1.361	1.235	1.128	1.202	1.296
	(0.325)	(0.335)	(0.328)	(0.318)	(0.343)	(0.325)	(0.334)	(0.319)
Asymmetric:Other	1.456	1.178	1.227	0.931	0.986	0.994	1.009	0.842
	(0.293)	(0.279)	(0.280)	(0.303)	(0.290)	(0.261)	(0.283)	(0.303)
Symmetric:Other	1.260	1.090	1.012	1.078	1.114	1.240	1.222	0.863
	(0.314)	(0.294)	(0.300)	(0.314)	(0.315)	(0.292)	(0.311)	(0.306)

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.

Table B18: Multivariate ordered logistic regression of individual consumption across all 10 rounds on demographics. Available consumption choices in all rounds were 0, 2, or 4 units. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Round 1 $n = 2104$	*Round 2* $n = 2104$	*Round 3* $n = 2104$	*Round 4* $n = 2104$	*Round 5* $n = 2104$	*Round 6* $n = 2104$	*Round 7* $n = 2104$	*Round 8* $n = 2104$	*Round 9* $n = 2104$	*Round 10* $n = 2104$
Age	0.982***	0.992*	0.987***	0.991*	0.992*	0.992*	0.996	0.995	0.996	1.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Education:										
None	0.189	0.268	0.248	0.300	0.272	0.301	0.305	0.376	0.532	1.036
	(1.390)	(1.360)	(1.346)	(1.344)	(1.338)	(1.333)	(1.323)	(1.316)	(1.291)	(1.276)
Primary / Elementary school	0.397	0.907	0.991	2.498	1.153	0.670	0.691	1.937	0.976	0.372
	(0.607)	(0.542)	(0.586)	(0.560)	(0.534)	(0.538)	(0.529)	(0.576)	(0.525)	(0.667)
Secondary / High school	1.310*	0.980	0.995	1.210	1.158	1.007	1.115	0.996	1.000	0.949
	(0.125)	(0.115)	(0.111)	(0.111)	(0.110)	(0.110)	(0.109)	(0.108)	(0.106)	(0.110)
Associates degree	1.280	0.871	0.940	1.206	0.820	0.851	1.018	0.942	0.866	0.917
	(0.157)	(0.144)	(0.141)	(0.140)	(0.141)	(0.138)	(0.137)	(0.134)	(0.135)	(0.139)
Professional degree	1.527	1.162	1.236	1.331	1.391	1.424	0.980	1.064	1.152	1.008
	(0.341)	(0.303)	(0.295)	(0.295)	(0.301)	(0.295)	(0.296)	(0.291)	(0.284)	(0.310)
Master's degree	1.264	1.224	1.148	1.027	0.956	1.022	1.036	1.015	1.048	0.986
	(0.148)	(0.136)	(0.133)	(0.132)	(0.131)	(0.132)	(0.129)	(0.129)	(0.127)	(0.130)
Doctorate degree	1.205	1.156	1.827	1.841	1.340	1.336	1.236	0.873	0.784	0.596
	(0.364)	(0.314)	(0.321)	(0.326)	(0.310)	(0.311)	(0.304)	(0.305)	(0.309)	(0.334)
Gender:										
Female	0.680***	0.591***	0.698***	0.703***	0.621***	0.694***	0.788**	0.809*	0.955	0.912
	(0.100)	(0.092)	(0.089)	(0.089)	(0.088)	(0.088)	(0.086)	(0.085)	(0.084)	(0.087))
Non-binary	0.599	0.502*	0.476*	0.433*	0.502*	0.757	0.519*	0.919	1.264	0.952
	(0.373)	(0.340)	(0.330)	(0.331)	(0.326)	(0.327)	(0.323)	(0.323)	(0.313)	(0.331))
Other	0.140*	0.882	1.822	1.520	0.689	0.439	0.960	1.115	0.658	0.634
	(0.984)	(0.929)	(0.908)	(0.811)	(0.849)	(0.790)	(0.833)	(0.906)	(0.784)	(0.870))
I prefer not to tell	0.165*	0.695	0.350	1.774	0.255	0.728	1.089	1.073	1.764	1.052
	(0.844)	(0.840)	(0.762)	(0.783)	(0.858)	(0.786)	(0.739)	(0.782)	(0.805)	(0.717)
Income:										
less than USD 50,000	1.080	0.886	1.290*	1.072	1.008	1.041	0.962	1.068	1.056	1.103
	(0.117)	(0.107)	(0.105)	(0.104)	(0.104)	(0.103)	(0.102)	(0.101)	(0.100)	(0.104)
USD 50,000 to USD 59,999	1.464*	1.129	1.134	0.970	0.908	0.835	1.196	0.927	1.037	1.332*
	(0.163)	(0.149)	(0.147)	(0.146)	(0.145)	(0.144)	(0.142)	(0.142)	(0.139)	(0.144)
USD 60,000 to USD 69,999	1.204	0.985	1.165	0.993	0.890	0.798	1.045	0.906	1.228	1.403*
	(0.175)	(0.161)	(0.157)	(0.154)	(0.154)	(0.156)	(0.151)	(0.149)	(0.150)	(0.149)
I prefer not to tell	1.972*	1.666	2.024*	1.469	1.201	1.568	1.356	0.679	0.892	1.683
	(0.335)	(0.328)	(0.304)	(0.317)	(0.310)	(0.296)	(0.299)	(0.297)	(0.295)	(0.299)

To be continued on next page.

Continued from Table B18.

	Round 1 $n = 2104$	*Round 2* $n = 2104$	*Round 3* $n = 2104$	*Round 4* $n = 2104$	*Round 5* $n = 2104$	*Round 6* $n = 2104$	*Round 7* $n = 2104$	*Round 8* $n = 2104$	*Round 9* $n = 2104$	*Round 10* $n = 2104$
Occupation:										
Self-employed / Freelance	0.961	0.820	0.973	0.790	0.752*	0.782	0.799	0.876	0.845	0.909
	(0.147)	(0.134)	(0.132)	(0.131)	(0.131)	(0.131)	(0.129)	(0.127)	(0.127)	(0.131)
Unemployed	0.684*	0.797	0.698*	0.786	0.719*	0.613***	0.911	0.752*	0.841	0.740*
	(0.161)	(0.148)	(0.143)	(0.144)	(0.142)	(0.142)	(0.138)	(0.139)	(0.136)	(0.146)
Retired	1.076	0.700	0.883	0.741	0.599*	0.703	0.957	0.796	0.781	1.039
	(0.244)	(0.219)	(0.220)	(0.217)	(0.214)	(0.213)	(0.214)	(0.208)	(0.208)	(0.212)
Student	0.943	1.020	0.496***	0.769	0.651*	0.890	0.618*	0.911	1.104	1.222
	(0.228)	(0.207)	(0.202)	(0.198)	(0.199)	(0.196)	(0.193)	(0.192)	(0.189)	(0.192)
I prefer not to tell	0.705	0.985	0.669	0.640	0.850	0.647	0.774	0.716	0.871	0.559
	(0.314)	(0.305)	(0.288)	(0.285)	(0.282)	(0.276)	(0.279)	(0.275)	(0.270)	(0.304)
Political Leaning:										
Republican	1.099	1.144	1.220	1.471***	1.287*	1.223	1.327**	1.274*	1.184	1.033
	(0.124)	(0.114)	(0.112)	(0.111)	(0.111)	(0.110)	(0.109)	(0.108)	(0.106)	(0.110)
Other	0.835	0.815	0.842	1.030	1.148	1.123	1.056	1.135	0.910	1.042
	(0.121)	(0.110)	(0.108)	(0.107)	(0.107)	(0.106)	(0.105)	(0.104)	(0.102)	(0.105)

Table B19: Multivariate ordered logistic regression of individual consumption across all 10 rounds on treatments, political leaning, and their interactions. Available consumption choices in all rounds were 0, 2, or 4 units. Values not in parentheses are reported as odds ratios. Standard errors, clustered on group level, are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Round 1 $n = 2104$	*Round 2* $n = 2104$	*Round 3* $n = 2104$	*Round 4* $n = 2104$	*Round 5* $n = 2104$	*Round 6* $n = 2104$	*Round 7* $n = 2104$	*Round 8* $n = 2104$	*Round 9* $n = 2104$	*Round 10* $n = 2104$
Treatment:										
Tax	0.764	0.797	1.020	0.934	1.097	0.976	1.074	0.856	1.104	0.846
	(0.175)	(0.163)	(0.157)	(0.157)	(0.155)	(0.153)	(0.153)	(0.152)	(0.151)	(0.157)
Asymmetric	0.349***	0.275***	0.364***	0.423***	0.405***	0.437***	0.570***	0.659**	1.011	1.120
	(0.179)	(0.167)	(0.161)	(0.161)	(0.158)	(0.158)	(0.158)	(0.154)	(0.152)	(0.157)
Symmetric	0.449***	0.633**	0.727*	0.693*	1.089	0.808	0.881	1.060	1.019	0.946
	(0.180)	(0.166)	(0.161)	(0.160)	(0.157)	(0.155)	(0.155)	(0.155)	(0.153)	(0.159)
Political Leaning:										
Republican	0.973	0.939	1.188	1.229	1.404	1.226	1.397	0.989	0.825	1.200
	(0.235)	(0.215)	(0.210)	(0.206)	(0.206)	(0.206)	(0.207)	(0.202)	(0.200)	(0.207)
Other	0.913	0.802	0.758	0.912	1.319	0.926	1.005	0.913	0.713	0.699
	(0.253)	(0.233)	(0.226)	(0.230)	(0.222)	(0.222)	(0.221)	(0.221)	(0.215)	(0.232)
Interactions:										
Tax:Republican	0.815	1.402	0.828	1.128	0.643	0.777	0.736	1.276	1.178	0.946
	(0.331)	(0.304)	(0.297)	(0.292)	(0.291)	(0.288)	(0.287)	(0.286)	(0.282)	(0.294)
Asymmetric:Republican	1.212	1.050	0.993	1.338	1.398	1.049	1.097	1.708	1.950*	0.779
	(0.351)	(0.326)	(0.318)	(0.320)	(0.319)	(0.319)	(0.314)	(0.305)	(0.303)	(0.306)
Symmetric:Republican	1.520	1.106	1.077	1.260	0.775	1.018	1.130	1.285	1.855*	0.797
	(0.344)	(0.315)	(0.307)	(0.299)	(0.302)	(0.298)	(0.298)	(0.294)	(0.286)	(0.300)
Tax:Other	0.812	1.279	1.312	1.080	0.970	1.159	0.992	1.485	1.180	1.401
	(0.357)	(0.324)	(0.315)	(0.317)	(0.311)	(0.310)	(0.306)	(0.305)	(0.300)	(0.321)
Asymmetric:Other	0.963	1.049	1.310	1.197	1.304	1.559	1.273	1.547	1.437	1.611
	(0.334)	(0.308)	(0.302)	(0.305)	(0.298)	(0.299)	(0.297)	(0.293)	(0.286)	(0.300)
Symmetric:Other	1.475	1.144	1.334	1.679	0.627	1.423	1.092	1.072	1.386	1.734
	(0.344)	(0.316)	(0.307)	(0.307)	(0.301)	(0.302)	(0.296)	(0.296)	(0.292)	(0.306)

Table B20: Two-sided Mann-Whitney U tests of policy attitude survey items (see Figure A20 for details) pairwise compared across treatments only for participants with *"Republican"* political leaning. For the individual survey items values are given in scores. For the additional question values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline	*Tax*	*Symmetric*	*Asymmetric*
	$n = 119$	$n = 124$	$n = 107$	$n = 91$
Individual Survey Items:				
Item Taxes 1	(3.084)	3.403*	3.187	3.297
Item Taxes 2	(2.882)	3.153	2.963	3.077
Item Taxes 3	(2.882)	3.016	2.879	2.802
Item Taxes 4	(2.798)	2.984	2.897	2.901
Item Dividends 1	(3.109)	3.347	3.280	3.429*
Item Dividends 2	(3.017)	3.139	3.150	3.088
Item Dividends 3	(3.000)	3.185	3.103	2.934
Item Dividends 4	(3.000)	3.202	3.206	2.989
Item Taxes 1		(3.403)	3.187	3.297
Item Taxes 2		(3.153)	2.963	3.077
Item Taxes 3		(3.016)	2.879	2.802
Item Taxes 4		(2.984)	2.897	2.901
Item Dividends 1		(3.347)	3.280	3.429
Item Dividends 2		(3.139)	3.150	3.088
Item Dividends 3		(3.185)	3.103	2.934
Item Dividends 4		(3.202)	3.206	2.989
Item Taxes 1			(3.187)	3.297
Item Taxes 2			(2.963)	3.077
Item Taxes 3			(2.879)	2.802
Item Taxes 4			(2.897)	2.901
Item Dividends 1			(3.280)	3.429
Item Dividends 2			(3.150)	3.088
Item Dividends 3			(3.103)	2.934
Item Dividends 4			(3.206)	2.989

To be continued on next page.

Continued from Table B20.

	Baseline $n = 119$	*Tax* $n = 124$	*Symmetric* $n = 107$	*Asymmetric* $n = 91$
Additional Question:				
Response Symmetric	(0.361)	0.395	0.308	0.275
Response Asymmetric	(0.319)	0.339	0.336	0.407
Response Neither	(0.319)	0.266	0.355	0.319
Response Symmetric		(0.395)	0.308	0.275
Response Asymmetric		(0.339)	0.336	0.407
Response Neither		(0.266)	0.355	0.319
Response Symmetric			(0.308)	0.275
Response Asymmetric			(0.336)	0.407
Response Neither			(0.355)	0.319

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.
Additional Question: Which type of carbon dividend, if any, would you be more likely to support?
Response Symmetric: Symmetric dividend (equal distribution of carbon taxes)
Response Asymmetric: Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)
Response Neither: Neither

Table B21: Two-sided Mann-Whitney U tests of policy attitude survey items (see Figure A20 for details) pairwise compared across treatments only for participants with *"Democrat"* political leaning. For the individual survey items values are given in scores. For the additional question values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline	*Tax*	*Symmetric*	*Asymmetric*
	$n = 298$	$n = 307$	$n = 283$	$n = 294$
Individual Survey Items:				
Item Taxes 1	(3.973)	3.990	3.972	3.997
Item Taxes 2	(3.926)	3.948	3.926	4.017
Item Taxes 3	(4.000)	4.000	4.042	4.044
Item Taxes 4	(3.225)	3.257	3.360	3.364
Item Dividends 1	(3.950)	3.932	3.943	4.116*
Item Dividends 2	(3.963)	3.964	3.912	4.102*
Item Dividends 3	(4.050)	3.977	4.004	4.201*
Item Dividends 4	(3.487)	3.466	3.505	3.578
Item Taxes 1		(3.990)	3.972	3.997
Item Taxes 2		(3.948)	3.926	4.017
Item Taxes 3		(4.000)	4.042	4.044
Item Taxes 4		(3.257)	3.360	3.364
Item Dividends 1		(3.932)	3.943	4.116*
Item Dividends 2		(3.964)	3.912	4.102
Item Dividends 3		(3.977)	4.004	4.201**
Item Dividends 4		(3.466)	3.505	3.578
Item Taxes 1			(3.972)	3.997
Item Taxes 2			(3.926)	4.017
Item Taxes 3			(4.042)	4.044
Item Taxes 4			(3.360)	3.364
Item Dividends 1			(3.943)	4.116
Item Dividends 2			(3.912)	4.102**
Item Dividends 3			(4.004)	4.201**
Item Dividends 4			(3.505)	3.578

To be continued on next page.

Continued from Table B21.

	Baseline $n = 298$	*Tax* $n = 307$	*Symmetric* $n = 283$	*Asymmetric* $n = 294$
Additional Question:				
Response Symmetric	(0.396)	0.381	0.410	0.354
Response Asymmetric	(0.513)	0.534	0.519	0.588
Response Neither	(0.091)	0.085	0.071	0.058
Response Symmetric		(0.381)	0.410	0.354
Response Asymmetric		(0.534)	0.519	0.588
Response Neither		(0.085)	0.071	0.058
Response Symmetric			(0.410)	0.354
Response Asymmetric			(0.519)	0.588
Response Neither			(0.071)	0.058

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.
Additional Question: Which type of carbon dividend, if any, would you be more likely to support?
Response Symmetric: Symmetric dividend (equal distribution of carbon taxes)
Response Asymmetric: Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)
Response Neither: Neither

Table B22: Two-sided Mann-Whitney U tests of policy attitude survey items (see Figure A20 for details) pairwise compared across treatments only for participants with *"Other"* political leaning. For the individual survey items values are given in scores. For the additional question values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Baseline	*Tax*	*Symmetric*	*Asymmetric*
	$n = 98$	$n = 106$	$n = 133$	$n = 144$
Individual Survey Items:				
Item Taxes 1	(3.255)	3.425	3.436	3.549
Item Taxes 2	(3.163)	3.330	3.218	3.361
Item Taxes 3	(3.214)	3.245	3.278	3.417
Item Taxes 4	(2.939)	3.179	3.113	3.042
Item Dividends 1	(3.337)	3.434	3.444	3.569
Item Dividends 2	(3.286)	3.349	3.338	3.444
Item Dividends 3	(3.255)	3.311	3.361	3.493
Item Dividends 4	(3.163)	3.349	3.165	3.201
Item Taxes 1		(3.425)	3.436	3.549
Item Taxes 2		(3.330)	3.218	3.361
Item Taxes 3		(3.245)	3.278	3.417
Item Taxes 4		(3.179)	3.113	3.042
Item Dividends 1		(3.434)	3.444	3.569
Item Dividends 2		(3.349)	3.338	3.444
Item Dividends 3		(3.311)	3.361	3.493
Item Dividends 4		(3.349)	3.165	3.201
Item Taxes 1			(3.436)	3.549
Item Taxes 2			(3.218)	3.361
Item Taxes 3			(3.278)	3.417
Item Taxes 4			(3.113)	3.042
Item Dividends 1			(3.444)	3.569
Item Dividends 2			(3.338)	3.444
Item Dividends 3			(3.361)	3.493
Item Dividends 4			(3.165)	3.201

To be continued on next page.

Continued from Table B22.

	Baseline $n = 98$	*Tax* $n = 106$	*Symmetric* $n = 133$	*Asymmetric* $n = 144$
Additional Question:				
Response Symmetric	(0.357)	0.358	0.353	0.299
Response Asymmetric	(0.316)	0.349	0.383	0.528**
Response Neither	(0.327)	0.292	0.263	0.174**
Response Symmetric		(0.358)	0.353	0.299
Response Asymmetric		(0.349)	0.383	0.528**
Response Neither		(0.292)	0.263	0.174*
Response Symmetric			(0.353)	0.299
Response Asymmetric			(0.383)	0.528*
Response Neither			(0.263)	0.174

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.
Additional Question: Which type of carbon dividend, if any, would you be more likely to support?
Response Symmetric: Symmetric dividend (equal distribution of carbon taxes)
Response Asymmetric: Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)
Response Neither: Neither

Table B23: Relative frequencies of passive (automatically filled) decisions and positive responses to feedback questions (see Figure A25 for details) for each treatment. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations.

	Baseline $n = 520$	*Tax* $n = 540$	*Symmetric* $n = 524$	*Asymmetric* $n = 532$
Autofill	1.3%	1.2%	0.8%	1.4%
Good Explanation	98.1%	95.3%	95.8%	94.5%
Informed Decision	98.3%	95.3%	95.6%	94.9%
Understood Game	98.3%	96.5%	97.3%	96.0%

Table B24: Linear regression of *Resistance to Change-Beliefs Scale* scores on self-stated political leaning dummies. The category with the majority of responses ("Democrat") is chosen to be covered in the constant. Standard errors are provided in parentheses. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Resistance to Change-Beliefs Scale
	$n = 2094$
Republican	0.003
	(0.045)
Other	0.034
	(0.041)
Constant	2.968***
	(0.023)

Table B25: Comparisons of success rates (one-sided unpaired sample proportion tests) between the representative segment ("representative") of our sample and the broader general population part ("standard") overall and separately for each treatment. Values not in parentheses or brackets correspond to success rates. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). Values in parentheses indicate p-values. Values in brackets indicate non-directional Cohen's h values. n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	representative	standard	p-value	Cohen's h
Overall	0.829	0.815	(0.744)	[0.038]
	$n = 281$	$n = 281$		
Baseline	0.800	0.750	(0.637)	[0.120]
	$n = 70$	$n = 60$		
Tax	0.737	0.763	(0.886)	[0.060]
	$n = 76$	$n = 59$		
Symmetric	0.838	0.810	(0.840)	[0.075]
	$n = 68$	$n = 63$		
Asymmetric	0.955	0.924	(0.699)	[0.131]
	$n = 67$	$n = 66$		

Table B26: Two-sided Mann-Whitney U tests of policy attitude survey items (see Figure A20 for details) compared between the representative segment ("representative") of our sample and the broader general population part ("standard") overall and separately for each treatment. For the individual survey items values are given in scores. For the additional question values are given in proportions. Reference values are in parentheses. Scores are based on the weighted averages values of the responses. Responses to all items were given as values from from 1 to 5 corresponding to *Strongly disagree*, *Disagree*, *Unsure*, *Agree*, and *Strongly agree*. The *Baseline* condition implements neither carbon pricing nor revenue recycling. The *Tax* treatment introduces carbon pricing without revenue recycling. *Symmetric* applies both carbon pricing and symmetric revenue recycling within the group. *Asymmetric* also employs carbon pricing and revenue recycling, but distribution is equal only for consumers below the mean (asymmetric). n indicates the number of observations. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

	Overall			*Baseline*			*Tax*			*Symmetric*			*Asymmetric*		
	representative $n = 1116$	standard $n = 990$		representative $n = 277$	standard $n = 239$		representative $n = 303$	standard $n = 235$		representative $n = 271$	standard $n = 252$		representative $n = 265$	standard $n = 264$	
Individual Survey Items:															
Item Taxes 1	3.711	3.694	(0.760)	3.682	3.577	(0.297)	3.749	3.740	(0.972)	3.638	3.714	(0.613)	3.770	3.739	(0.988)
Item Taxes 2	3.608	3.597	(0.776)	3.560	3.515	(0.522)	3.657	3.630	(0.901)	3.528	3.571	(0.867)	3.687	3.667	(0.910)
Item Taxes 3	3.614	3.631	(0.861)	3.617	3.561	(0.580)	3.644	3.604	(0.675)	3.542	3.683	(0.337)	3.649	3.670	(0.713)
Item Taxes 4	3.144	3.186	(0.363)	3.112	3.025	(0.346)	3.175	3.191	(0.894)	3.144	3.266	(0.276)	3.143	3.250	(0.165)
Item Dividends 1	3.706	3.727	(0.639)	3.697	3.565	(0.096)	3.677	3.723	(0.525)	3.638	3.726	(0.443)	3.819	3.879	(0.253)
Item Dividends 2	3.666	3.646	(0.508)	3.682	3.540	(0.034)*	3.650	3.651	(0.833)	3.594	3.627	(0.987)	3.740	3.758	(0.589)
Item Dividends 3	3.685	3.697	(0.977)	3.708	3.594	(0.105)	3.634	3.698	(0.384)	3.642	3.671	(0.957)	3.766	3.814	(0.421)
Item Dividends 4	3.385	3.324	(0.192)	3.386	3.226	(0.056)	3.380	3.383	(0.956)	3.387	3.325	(0.414)	3.389	3.360	(0.994)
Additional Question:															
Response Symmetric	1.349	0.361	(0.819)	0.359	0.364	(0.971)	0.355	0.409	(0.241)	0.342	0.365	(0.647)	0.293	0.314	(0.655)
Response Asymmetric	1.688	0.478	(0.405)	0.395	0.431	(0.457)	0.444	0.464	(0.712)	0.388	0.460	(0.114)	0.461	0.553	(0.041)*
Response Neither	0.635	0.159	(0.446)	0.158	0.205	(0.202)	0.197	0.128	(0.042)*	0.161	0.175	(0.769)	0.118	0.133	(0.719)

Item Taxes 1: I believe pricing carbon emissions through a carbon tax would help reduce carbon emissions.
Item Taxes 2: I consider pricing carbon emissions via a carbon tax to be a fair method of reducing carbon emissions.
Item Taxes 3: I would support pricing carbon emissions via a carbon tax.
Item Taxes 4: I believe other people in my community would support pricing carbon emissions via a carbon tax.
Item Dividends 1: I believe pricing carbon emissions through a carbon tax with a carbon dividend would help reduce carbon emissions.
Item Dividends 2: I consider pricing carbon emissions via a carbon tax and dividend to be a fair method of reducing carbon emissions.
Item Dividends 3: I would support pricing carbon emissions via a carbon tax and dividend.
Item Dividends 4: I believe other people in my community would support pricing carbon emissions via a carbon tax and dividend.
Additional Question: Which type of carbon dividend, if any, would you be more likely to support?
Response Symmetric: Symmetric dividend (equal distribution of carbon taxes)
Response Asymmetric: Asymmetric dividend (distribution of carbon taxes only among below-average carbon emitters)
Response Neither: Neither

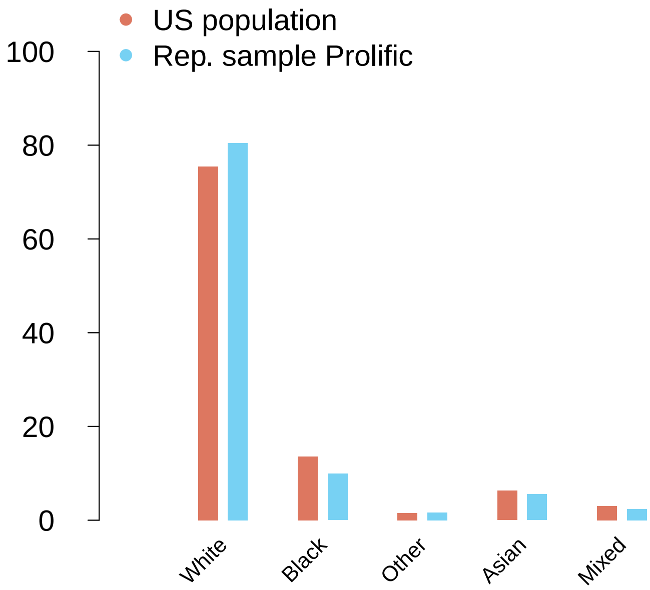

Figure B1: Comparison of ethnicity between the 2022 US population and our Prolific representative sample in percent. US population data was retrieved from (U.S. Census Bureau, 2023b). Ethnicities are aggregated to match the brackets, which were provided by Prolific. The data for the representative sample collected on Prolific refers to the data provided by Prolific and not to the self reported data we collected at the end of our study.

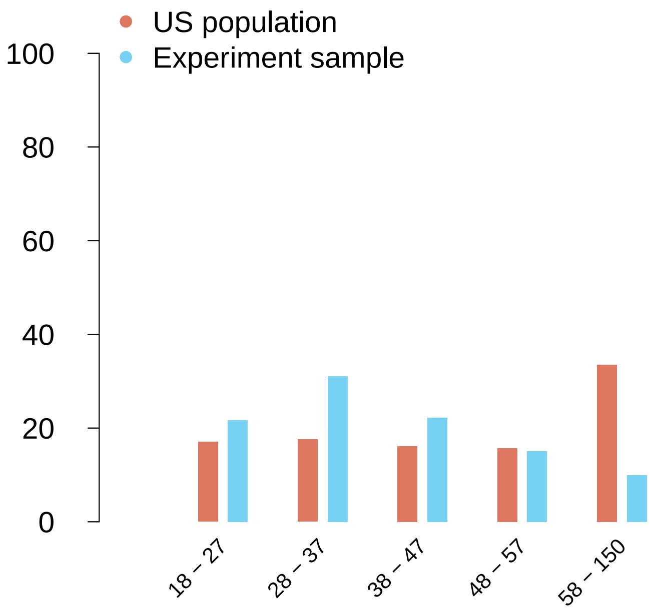

Figure B2: Comparison of age between the 2022 US population and our entire study sample in percent. US population data was retrieved from (U.S. Census Bureau, 2023b). The data for our entire study sample refers to the self reported data we collected at the end of our study.

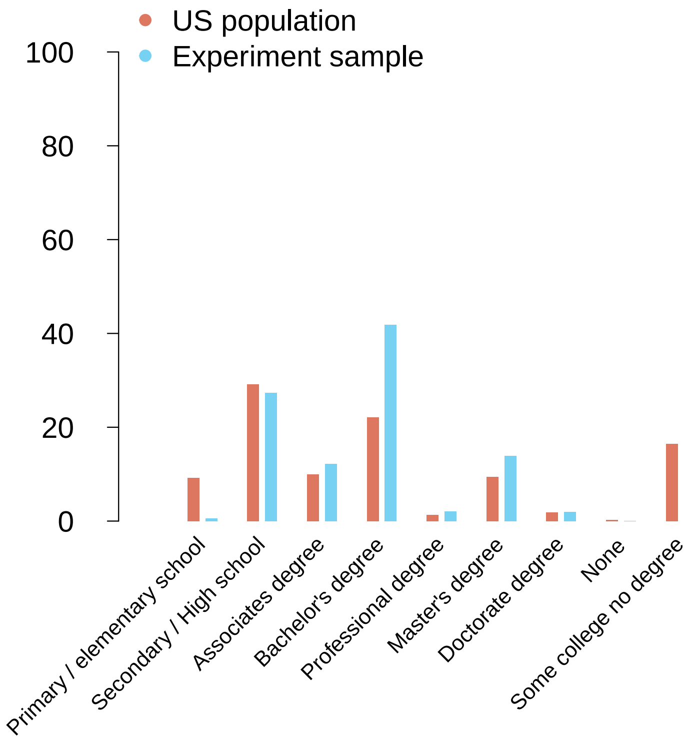

Figure B3: Comparison of education between the 2022 US population and our entire study sample in percent. Education brackets refer to the choices, which were available responses in our survey. However, with the bracket "Some college no degree" as an exception to this. US population data was retrieved from (U.S. Census Bureau, 2023a). The data for our entire study sample refers to the self reported data we collected at the end of our study.

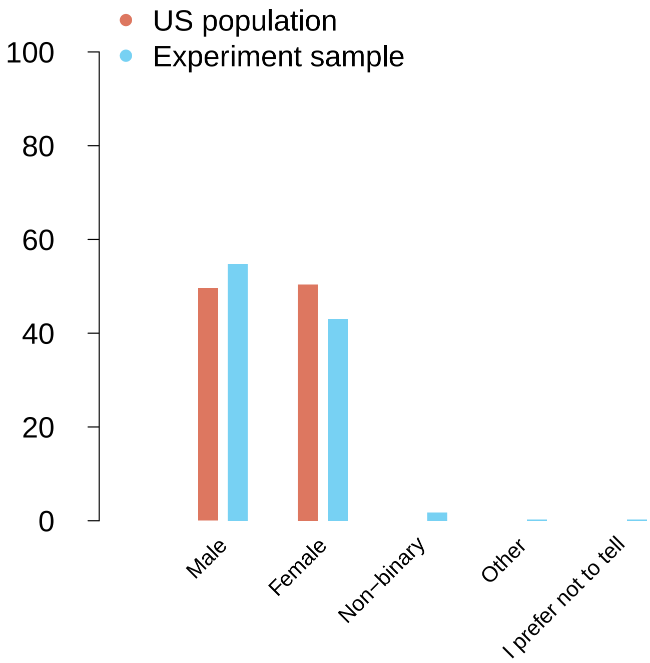

Figure B4: Comparison of sex / gender between the 2022 US population and our entire study sample in percent. Sex / gender brackets refer to the choices, which were available responses in our survey. US population data was retrieved from (U.S. Census Bureau, 2023b). The data for our entire study sample refers to the self reported data we collected at the end of our study.

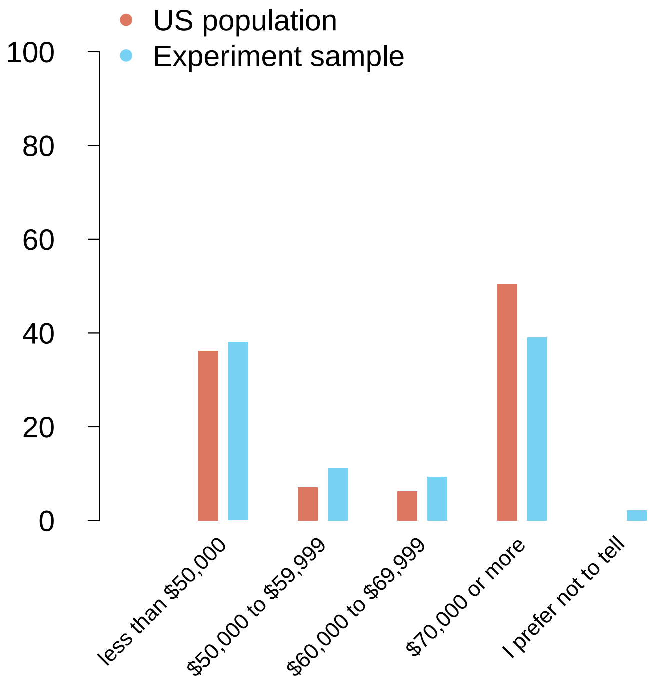

Figure B5: Comparison of income between the 2021 US population and our entire study sample in percent. Income brackets refer to the choices, which were available responses in our survey. US population data was retrieved from (U.S. Census Bureau, 2022). The data for our entire study sample refers to the self reported data we collected at the end of our study.

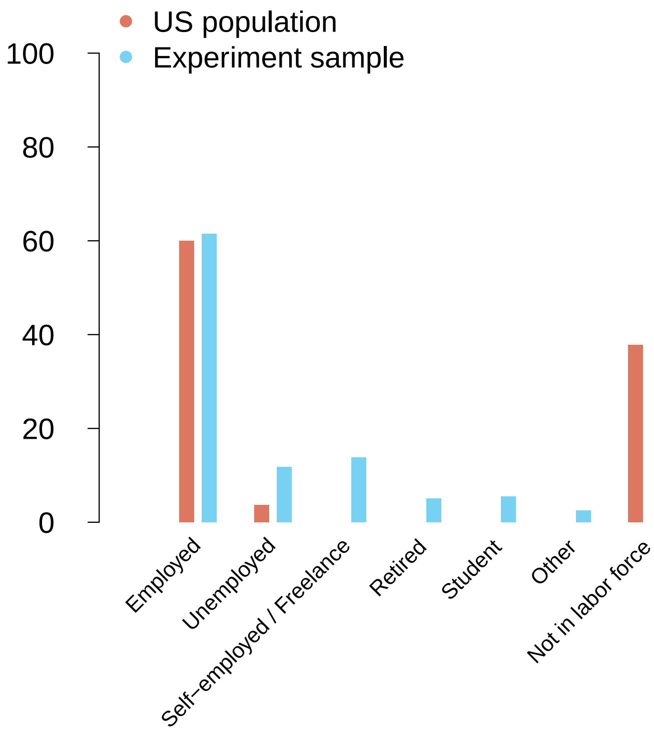

Figure B6: Comparison of labor force / occupation between the 2022 US population and our entire study sample in percent. Labor force / Occupation brackets refer to the choices, which were available responses in our survey. The category "Not in labor force" was not included in our survey, and is defined by the U.S. Bureau of Labor Statistics as persons who are neither employed nor unemployed. This category includes retired persons, students, those taking care of children or other family members, and others who are neither working nor seeking work. US population data was retrieved from (U.S. Bureau of Labor Statistics, 2024). The data for our entire study sample refers to the self reported data we collected at the end of our study.

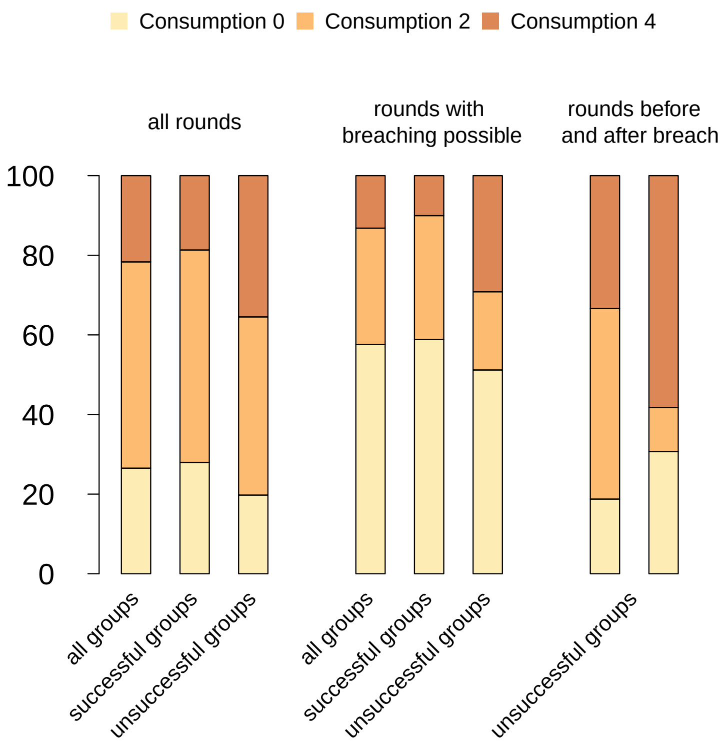

Figure B7: Comparison of consumption choice frequencies in percent for different stages in the experiment for all treatments together. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

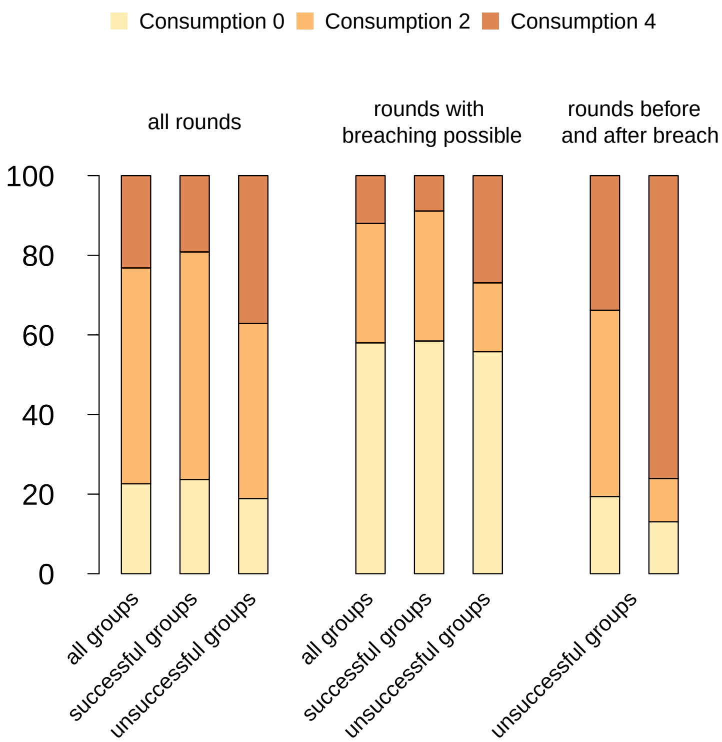

Figure B8: Comparison of consumption choice frequencies in percent for different stages in the experiment for the treatment *Baseline*. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

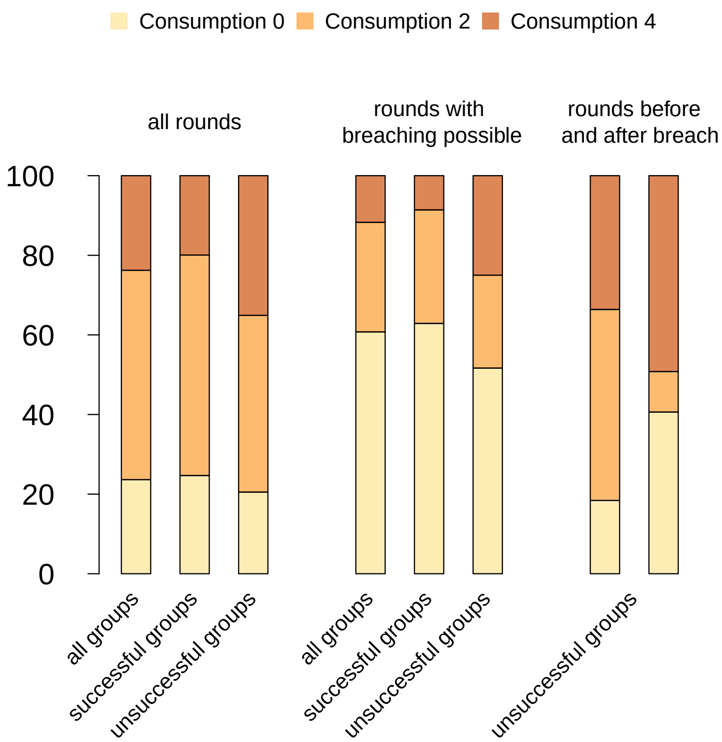

Figure B9: Comparison of consumption choice frequencies in percent for different stages in the experiment for the treatment *Tax*. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

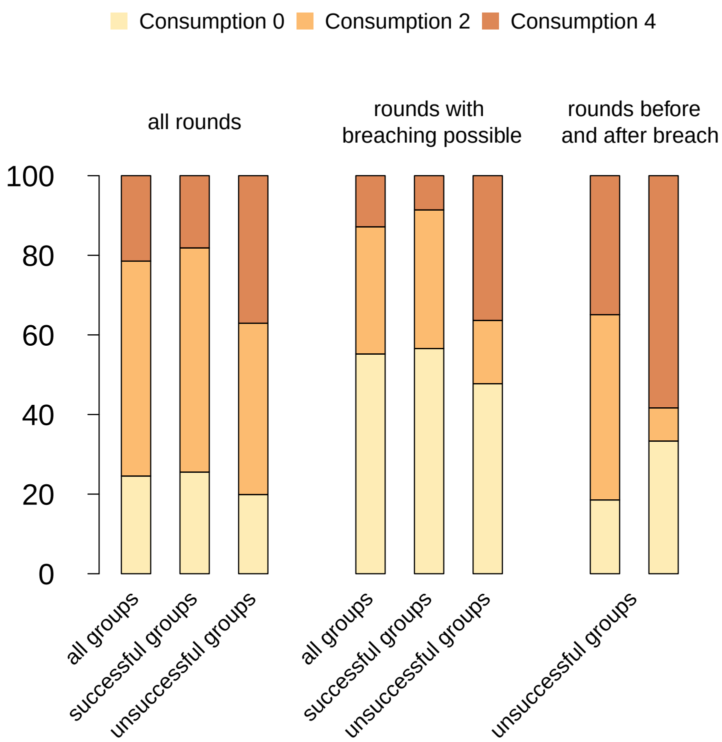

Figure B10: Comparison of consumption choice frequencies in percent for different stages in the experiment for the treatment *Symmetric*. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

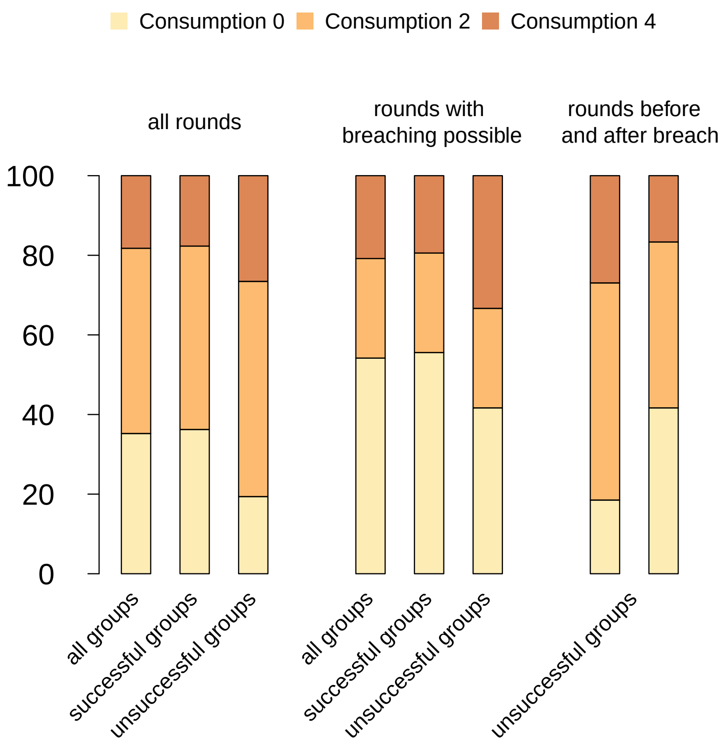

Figure B11: Comparison of consumption choice frequencies in percent for different stages in the experiment for the treatment *Asymmetric*. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

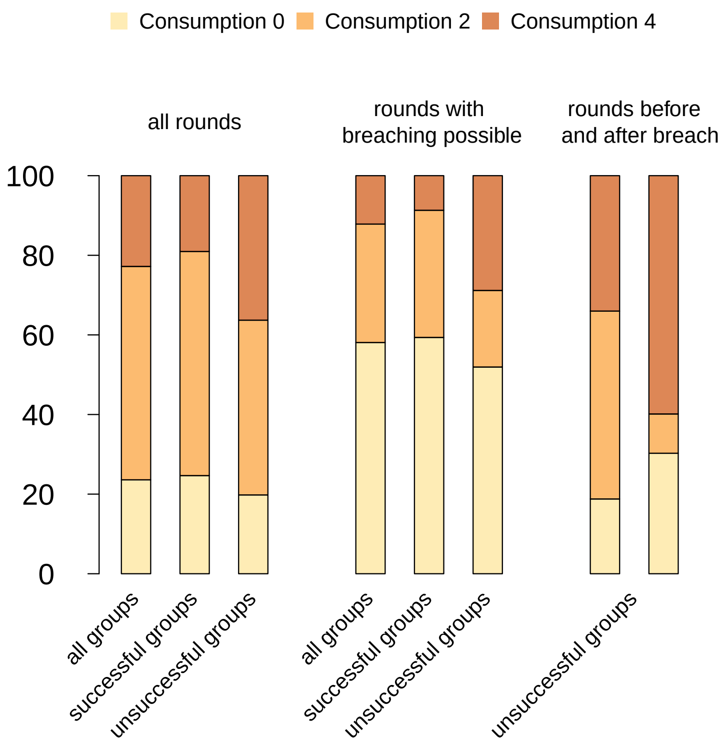

Figure B12: Comparison of consumption choice frequencies in percent for different stages in the experiment for all treatments except *Asymmetric*. Consumption choices correspond to the consumption levels of 0, 2, and 4, which were available for all participants in every round of the game. The label "all rounds" refers to the entire 10 rounds of the game. The label "rounds with breaching possible" refers to all rounds where aggregate group consumption was still below the threshold (80), while also close enough to the threshold, such that surpassing it would have been possible in the respective round. The label "rounds before and after breach" refers to first, rounds before and including where aggregate group consumption surpassed the threshold and, second, all rounds where aggregate group consumption was already beyond the threshold.

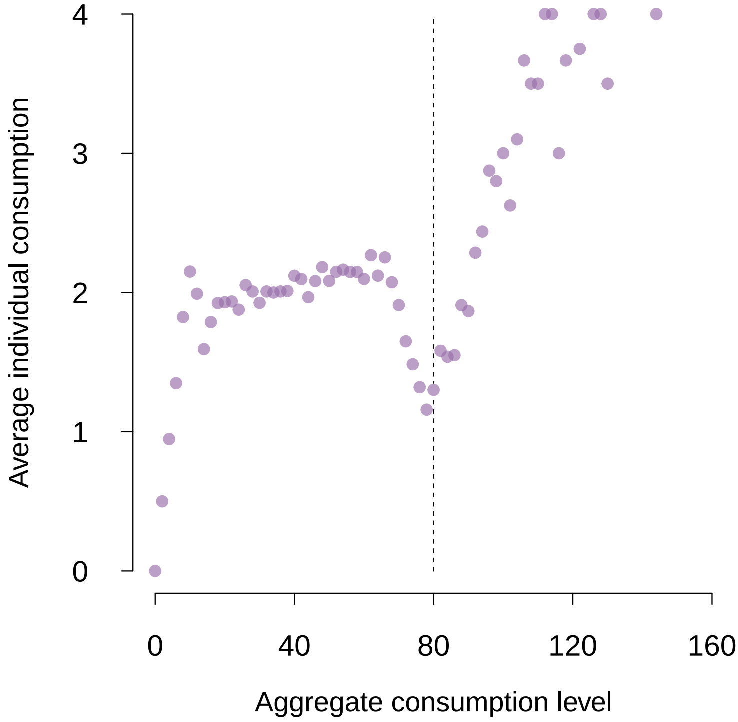

Figure B13: Scatterplot of average individual consumption on aggregate group consumption. Each point in this plot correspons to the average individual consumption for a given level of aggregate group consumption. As some levels of aggregate group consumption occurred more often, this figure might suggest a lower sample size than actually present.