Supporting Document for the AEA RCT Pre-Registration AEARCTR-0009307, "Scientific information as a coordination device in voting over climate policy instruments. Evidence from a survey experiment with real climate impacts"

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Motivation

While first-order beliefs about a policy's impacts shape preferences over policy options (Millner and Ollivier, 2016; Rinscheid and Wüstenhagen, 2018), how these preferences are expressed in ballots or other voting contexts is often influenced by strategic considerations (Abramson et al., 2004; Cain, 1978; Feddersen and Pesendorfer, 1999; Kawai and Watanabe, 2013; Myatt, 2007).

Against this backround, two questions are addressed:

1. How do first and second-order beliefs on the effectiveness of climate policy instruments affect policy choices in collective relative to individual decisions?
2. Is scientific information able to co-ordinate second-order beliefs and choices in ballots?

Choice Task

In this experiment participants can choose between real climate mitigation options that mimic real-world climate policy instruments. We compare an abstract mitigation option, i.e. the reduction of the cap in the EU Emission Trading System (EU ETS), with a concrete, intuitive and prominent option, i.e. the reductions of emissions from a coal-fired power plant in Germany, and with a linear combination of the two. In the individual choice situation, the participants in our experiment are free to choose between the following four options:

- A: Reducing the number of allowances in the EU ETS by 10 tons of CO2.

- B: Reducing the emissions from a coal-fired power plant in Germany by 10 tons.
- C: Mixed option with 5 tons each via A and B .
- D: No climate action.

In the collective choice situation, the options are the same but all CO2 reductions are multiplied by ten, i.e. each mitigation option amounts to one hundred tons of CO2. This is to keep the total impact of all decisions within a treatment roughly constant across individual and collective decisions.

Ten (one hundred) tons of CO2 are roughly equivalent to the carbon footprint of one (ten) average German citizen(s). Participants are informed that decisions are real in that the choices of randomly selected participants will be implemented with the help of the operator of a coal-fired power plant and an NGO that retires EU ETS allowances . Furthermore, we elicit participants' beliefs about the effectiveness of all options in reducing total GHG emission in the EU.

The collective choice is implemented in the form of a ballot where one of the three mitigation options must obtain at least 50 percent of votes to be implemented. It is designed to determine the role of strategic considerations in voting decisions on specific climate policies and whether scientific information on instrument effectiveness can serve as a coordination device. It allows testing whether collective choices respond more sensitive to commonly shared information than individual choices.

Experimental Conditions

Each subject makes two sequential decisions with the following within-subjects variation: in the first decision ($d = 1$), subjects *choose* individually and independently between alternatives A, B, C and D. In the second decision ($d = 2$), subjects *vote* individually and independently for one of the alternatives and the choice is implemented collectively by majority rule, as described above.

There are two between-subjects conditions. In the control condition COLCTL (code $z = 0$), no further information on the true effect of each alternative on total CO2 emissions is given. In the COLCR (code $z = 1$) condition, information on the true effect of each alternative on total CO2 emissions under the current rules of the EU ETS are given before subjects make their first decision. The target sample sizes are 600 subjects in both conditions, respectively.

Hypotheses

In conditions COLCTL and COLCR, first-order beliefs better explain individual choices ($d = 1$) than votes ($d = 2$), and second-order beliefs better explain votes ($d = 2$) than choices ($d = 1$): denote β_d^z the coefficients of first-order beliefs and γ_d^z the coefficients of second-order beliefs in a regression on mitigation decision d under condition z, then

Hypothesis 1 $\beta_1^{0,1} > \beta_2^{0,1}$ *and* $\gamma_1^{0,1} < \gamma_2^{0,1}$.

Previous research has pointed towards a preference for command-and-control over market-based environmental policies among voters (Kirchgässner and Schneider, 2003; Stadelmann-Steffen, 2011). Without additional information on the climate effectiveness of options (COLCTL, $z = 0$), participants are less likely to vote for the abstract and less prominent option to reduce the number of allowances in the EU ETS in the collective decision context than in the individual choice. Denoting a random individual's choice of alternative $X \in \{A, B, C\}$ in decision $d \in \{1, 2\}$ and experimental condition $z \in \{0, 1\}$ by X_d^z, and the probability of an event Y by $\Pr(Y)$,

Hypothesis 2 $\frac{\Pr\left(A_2^0\right)}{\Pr\left(A_2^0+B_2^0+C_2^0\right)} < \frac{\Pr\left(A_1^0\right)}{\Pr\left(A_1^0+B_1^0+C_1^0\right)}$.

In the collective ($d = 2$) choice of COLCR ($z = 1$), option A is chosen more often than in the individual ($d = 1$) choice, and more often than in the second choice of COLCTL ($z = 0$):

Hypothesis 3 $\frac{\Pr\left(A_2^1\right)}{\Pr\left(A_2^1+B_2^1+C_2^1\right)} > \frac{\Pr\left(A_1^1\right)}{\Pr\left(A_1^1+B_1^1+C_1^1\right)}$ *and* $\frac{\Pr\left(A_2^1\right)}{\Pr\left(A_2^1+B_2^1+C_2^1\right)} > \frac{\Pr\left(A_2^0\right)}{\Pr\left(A_2^0+B_2^0+C_2^0\right)}$.

There is an academic as well as public debate over whether a single instrument or a mix of instruments is most effective in achieving emission reductions (Rosenbloom et al., 2020; van den Bergh and Botzen, 2020). We test whether collective choices tend to favor mixes over extremes, e.g. in an attempt to strike a balance between opposing positions and interests:

Hypothesis 4 $\frac{\Pr\left(C_2^0\right)}{\Pr\left(A_2^0+B_2^0+C_2^0\right)} > \frac{\Pr\left(C_1^0\right)}{\Pr\left(A_1^0+B_1^0+C_1^0\right)}$.

References

Abramson, P. R., Aldrich, J. H., Diamond, M., Diskin, A., Levine, R., and Scotto, T. J. (2004). Strategic abandonment or sincerely second best? *Journal of Politics*, 66:706–728.

Cain, B. E. (1978). Strategic voting in Britain. *American Journal of Political Science*, 22:639–655.

Feddersen, T. and Pesendorfer, W. (1999). Elections, information aggregation, and strategic voting. *Proceedings of the National Academy of Sciences*, 96:10572–10574.

Kawai, K. and Watanabe, Y. (2013). Inferring strategic voting. *American Economic Review*, 103:624–662.

Kirchgässner, G. and Schneider, F. (2003). On the political economy of environmental policy. *Public Choice*, 115:369–396.

Millner, A. and Ollivier, H. (2016). Beliefs, politics, and environmental policy. *Review of Environmental Economics and Policy*, 10:226–244.

Myatt, D. P. (2007). On the theory of strategic voting. *Review of Economic Studies*, 74:255–281.

Rinscheid, A. and Wüstenhagen, R. (2018). Divesting, fast and slow: Affective and cognitive drivers of fading voter support for a nuclear phase-out. *Ecological Economics*, 152:51–61.

Rosenbloom, D., Markard, J., Geels, F. W., and Fuenfschilling, L. (2020). Opinion: Why carbon pricing is not sufficient to mitigate climate change—and how "sustainability transition policy" can help. *Proceedings of the National Academy of Sciences*, 117:8664–8668.

Stadelmann-Steffen, I. (2011). Citizens as veto players: climate change policy and the constraints of direct democracy. *Environmental Politics*, 20:485–507.

van den Bergh, J. and Botzen, W. (2020). Low-carbon transition is improbable without carbon pricing. *Proceedings of the National Academy of Sciences*, 117:23219–23220.