Eating informed: The impact of animal-based food information on carbon offsetting choices

Thibaut Arpinon and Doris Läpple

Georg-August-University of Göttingen, Germany

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[PRELIMINARY VERSION, PLEASE DO NOT CIRCULATE]

Abstract

Animal-based products are receiving increasing public attention in relation to their impact on climate change. While reducing the consumption of animal-based products is important, emissions remain as most people oppose vegan diets. In this paper, we study the causal effect of providing information about greenhouse gas emissions from dairy and meat consumption on people's willingness to offset carbon emissions and compare this to carbon-offsetting choices for car journeys. We use a pre-registered charity dictator game with an Irish representative sample, where people are randomly assigned into one of the three treatments and an active control group. Pilot data show that people are willing to donate about €7.55 for carbon offsetting. We expect the findings to be useful for strategies to reduce greenhouse gas emissions from the consumption of animal-based products.

Keywords: Dairy and meat consumption, charity dictator game, carbon offsetting, climate change.

JEL classification:

1 Introduction

Food choices, especially those involving animal-based products, have become more than a dietary concern, they are a critical step towards climate change mitigation. In fact, reducing the consumption of animal-based foods in developed countries is now widely accepted as a key part of mitigating climate change (Parlasca and Qaim 2022; Kwasny, Dobernig, and Riefler 2022). Yet, one barrier is that individuals are often uninformed about the impact of dietary changes on climate change (Macdiarmid, Douglas, and Campbell 2016; De Boer, De Witt, and Aiking 2016) and underestimate their carbon footprint from food consumption (Camilleri et al. 2019; Cologna, Berthold, and Siegrist 2022). However, understanding the emissions linked to one's activities enables a person to make informed decisions regarding options to reduce those emissions (Schleich et al. 2024).

Applying carbon footprint labels to food products is the most direct approach in attempting to influence consumer food choices (Camilleri et al. 2019). Yet, carbon labels are not always effective and remain poorly understood (Grunert, Hieke, and Wills 2014; Rondoni and Grasso 2021). In addition, people are less willing to contribute to climate change if the required lifestyle changes as seen as too drastic (Andre et al. 2024). People generally like to continue eating the food they know and enjoy following the norm (Bonnet et al. 2020). Moreover, there is a resistance to eating less meat (Macdiarmid, Douglas, and Campbell 2016). In this context, carbon offsetting may provide an alternative opportunity to reduce emissions from food consumption.

In this paper, we explore people's willingness to offset carbon emissions as a way to reduce residual emissions from animal-based food consumption. Specifically, we study the causal effect of providing information about greenhouse gas emissions from dairy and meat consumption on people's carbon offsetting choices and compare this to carbon offsetting choices for car journeys and no information provision.

Our study builds upon a growing literature on voluntary carbon offsetting choices, which is currently a key topic of inquiry in economics. Andor et al. (2022), for example, reveal that people who relate consequences to their own behavior are more likely to contribute to climate change mitigation. This is important in our context as people underestimate the impact of switching to a sustainable diet, but correctly estimate the use of cars (Cologna, Berthold, and Siegrist 2022).

Closest related to our paper are studies that explore the impact of information on carbon offsetting behavior, in line with the idea of the importance of carbon literacy. The concept was first developed by Whitmarsh, Seyfang, and O'Neill (2011) and recently analyzed by Schleich et al. (2024). It rests on the understanding that informing people about the emissions resulting from their activities is a crucial strategy for reducing greenhouse gas emissions (Schleich et al. 2024). In this context, Bernard, Tzamourani, and Weber (2023) assess the impact of activating personal norms on people's stated willingness to offset carbon emissions from flying. Their survey experiment provides information on ways to reduce personal carbon emissions (i.e., avoiding excessive meat

consumption, unnecessary flights and car journeys) and reveals an increase in individuals' stated willingness to pay (WTP) for carbon offsetting post-information. Schleich and Alsheimer (2022) studied how people react to learning about their own carbon footprint. They also looked at what happens when people see how their footprint compares to the 1.5°C per-capita greenhouse gas emissions goal. Their findings indicate that revealing individual carbon footprints increases the stated average WTP by one-third, with impacts solely on the intensive margin and not the extensive margin. Conversely, adding information about the gap between personal and target footprints shows no significant effect on WTP. Similarly, Löschel, Sturm, and Uehleke (2017) do not find an effect of information about other people's behavior on voluntary climate change mitigation. In contrast, a study conducted by Engler et al. (2022) shows that environmentally and socially conscious people not only adopt more climate-friendly behaviors but are also more responsive to information about descriptive and injunctive social norms.

As such, a significant literature has established that people are open to voluntarily offsetting their emissions, yet evidence from information provision is mixed. In addition, whether people's willingness to offset their greenhouse gas emissions extends to dietary choices has not been directly explored, and remains an open question. The fact that animal-based food products are associated with high greenhouse gas emissions (Poore and Nemecek 2018), which are commonly underestimated (Cologna, Berthold, and Siegrist 2022), further underlines the importance of this inquiry. Thus, assessing people's voluntary carbon offsetting behavior between animal-based products (i.e. dairy and meat) and traveling by car is the main contribution of our paper.

We use a pre-registered online survey experiment based on a within-between-subject design. The experiment consists of two donation choices of participants from a representative sample of the Irish population. Initially, participants are endowed with €20 and can allocate any amount to a carbon sequestration project run by EcoTree, a European company that conducts carbon offsetting projects in Europe and elsewhere. After the baseline donation, participants are randomly allocated into one of three treatments (i.e. dairy, meat, or car) or an active control. The treatments provide participants with information on greenhouse gas emissions from the production and consumption of dairy, meat, and travelling by car in Ireland. The active control is similar in length but provides information on tea consumption in Ireland with no information on greenhouse gas emissions. Participants are then asked to make a second donation. One of the two donations is randomly selected and applied for payment.

Findings from pilot data involving only the active control indicate that participants donate €7.55 on average. In addition, we find no differences between the first and second donations, which confirms that the active control does not impact donations. Looking into the determinants of the donation, we find no heterogeneity among participants in terms of socio-demographic characteristics. However, participants with greater levels of concern and awareness of the consequences of climate change donate more. Similarly, participants who trust and see carbon offsetting as efficient also donate more. These results show that greater carbon literacy is linked with a higher WTP for

donations. In turn, this aligns with our pre-registered hypotheses that information on greenhouse gas emissions from animal-based foods will increase carbon literacy and lead to a higher WTP for carbon offset.

The remainder of the paper is organized as follows. Section 2 details the experimental design and sample. Section 3 presents the results from the pilot data. Last, section 4 concludes the paper.

2 Experimental design

[The following section is written in the past tense, however the final data collection has not taken place yet.]

Our experimental design is based on a charity donation game. The game follows a standard dictator game, except that instead of allocating money to someone else, participants have the choice to donate money for carbon offsetting. Participants were given an initial endowment of €20 as bonus payments on top of a regular payment for survey participation. During the survey experiment, they could donate some, all, or none of this amount to a carbon offset company. We used EcoTree, a European company dedicated to nature-based solutions for addressing climate change. They are certified as a B-Corp™, which reflects their commitment to high standards of verified social and environmental performance, accountability, and transparency.[1] EcoTree offers a range of high-quality carbon sequestration initiatives across Europe, including the restoration of the Louverné forest and the maintenance of the Ploërdut wetland. Despite climate change being a global problem, we deliberately chose a company that provides carbon offsetting in Europe to have a closer regional connection of carbon offsetting for participants.

We implemented a within-between subject design, as shown in figure 1. This implies that within the survey experiment, each participant made two donation decisions, and we randomly drew one of the choices to count for the donation decision. This point was clearly emphasized in the experimental instructions.

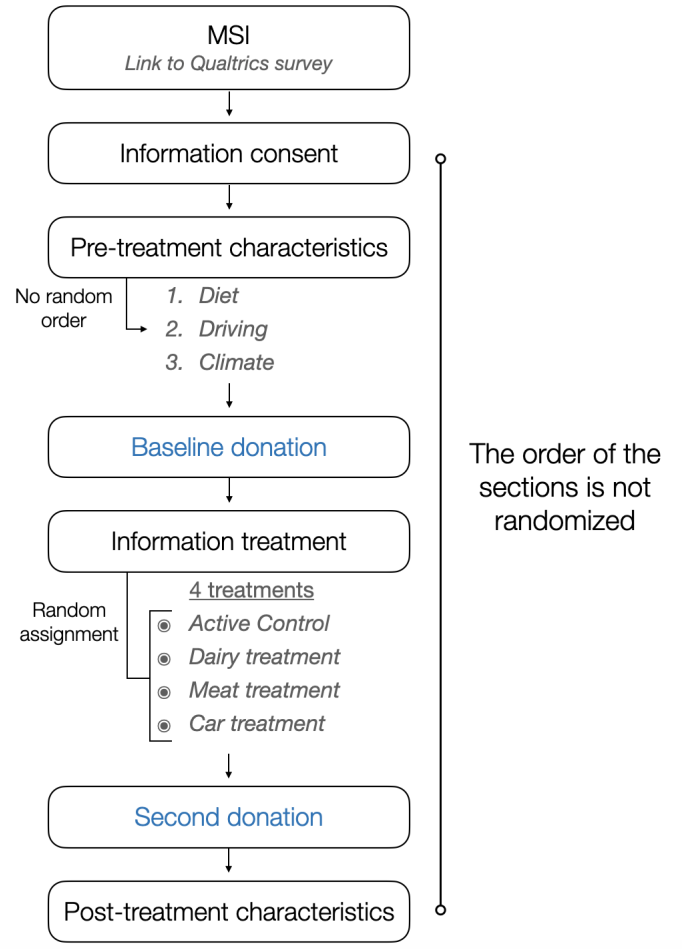
2.1 Pre-treatment characteristics

After providing informed consent, participants answered a set of questions related to dietary choices, car traveling habits, and attitudes toward climate change. First, we asked participants to report their dietary preferences (i.e., *eat meat and dairy without limiting consumption*, *limited meat and dairy*, *vegetarian*, *vegan*, *other*). We also asked participants how important certain food characteristics were to them (e.g., nutritional value) and the consumption frequency of food items.[2] Second,

1. You can find more information on their website https://ecotree.green/en/companies/csr.

2. The items were adapted depending on the dietary preferences so that we did not ask vegetarians and vegans to report their meat consumption.

Figure 1: Experimental procedure.



we inquired about driving licenses, the type of car owned (i.e., *electric, hybrid or regular*), and how many kilometers participants traveled by car in a typical week. In addition, we also asked about their main and secondary means of transportation. Third, participants reported their level of concern about climate change (5-point Likert scale, from *not at all concerned* to *extremely concerned*). To further capture the participants' attitudes towards different aspects of climate change, we adapted questions used by Van Valkengoed, Steg, and Perlaviciute (2021). Here, participants report their level of agreement to multiple climate change-related statements (5-point Likert scale, from *strongly disagree* to *strongly agree*). In particular, we aimed to capture participants' climate change beliefs in relation to *reality*, *trust in scientific predictions*, *human impact*, *negative consequences*, *time to consequences*, and *personal impact*. The questions are summarized in Table A.1 in Appendix A. After completing these questions, participants moved on to the baseline donation.

2.2 Baseline donation

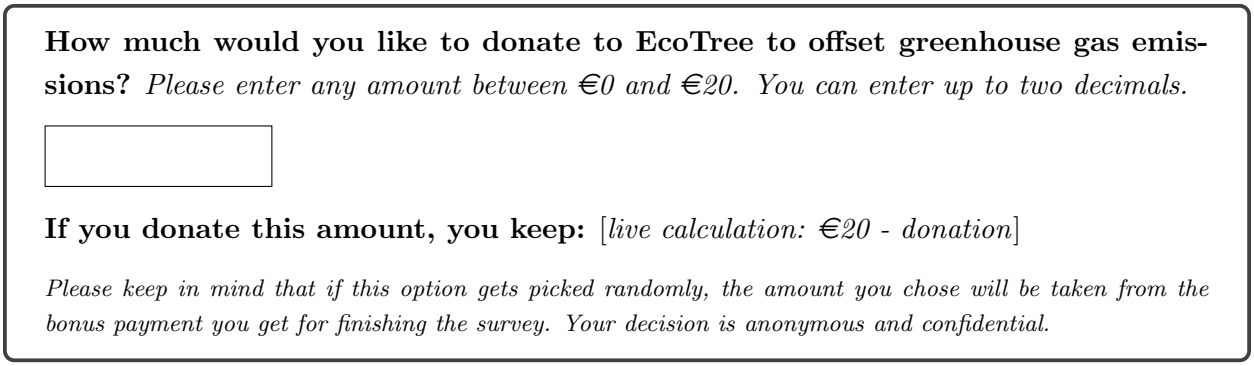
In this section of the experiment, we introduced the donation game and the structure of the payoffs. We also introduced EcoTree and explained carbon offsetting in simple terms with examples of carbon offsetting projects supported by EcoTree. Participants were also given a link to visit the EcoTree website. Lastly, we showed participants a table illustrating how much greenhouse gases can be removed with up to €20 (see Table 1). We deliberately used a table with multiple values to avoid any anchoring. This initial explanation was followed by three comprehension questions. Participants were only allowed to proceed if they answered all three questions correctly. In case of a wrong answer, participants were allowed to read the explanation text again.

Table 1: Overview of carbon offset donations

Donation	**Kilograms of greenhouse gases removed**
€1	13 kg
€5	65 kg
€10	130 kg
€15	195 kg
€20	260 kg

Participants were then presented with the first donation decision (see Figure 2), for which they could manually enter any amount between €0 and €20, with up to two decimals. As a visual clue, we included a live calculation of the participants' remaining bonus payment for any typed amount. As such, the implications of their donations were made salient. We also reminded people that if this decision was chosen, the amount would be subtracted from their payment. The table with information on how much greenhouse gas emissions could be offset with up to €20 was also shown again on this screen, below the donation.

Figure 2: Baseline donation



2.3 Treatments

After the baseline donation, participants were randomly allocated into one of the three treatments (i.e., *Dairy*, *Meat*, or *Car*) or the active control.[3] In all conditions, participants were presented with a short text containing information before making the second donation to EcoTree. In the active control, participants received facts on tea drinking in Ireland (see Figure A.1 in Appendix A). The active control text was similar to the treatment texts' length but did not contain any information on greenhouse gas emissions. Participants were then re-shown the donation table from the baseline decision and proceeded to make their second donation.

In the treatments, participants received information on greenhouse gas emissions in Ireland. All treatments' texts were the same length and followed the same structure (see Figure 3 for an example), with the only variation between treatments being the nature of the information. In *dairy* (respectively *meat*), participants received information on the emissions from dairy (respectively meat) production and consumption in Ireland. In the *car* treatment, participants received information on the emissions from the transportation sector and cars traveling in Ireland. The structure of the information was as follows.

First, we described the sectors' proportion of greenhouse gas emissions in Ireland's total emissions. Second, we provided statistics for the average Irish person, where we adjusted the timing so that the absolute greenhouse gases resulting from dairy consumption, meat consumption, and traveling by car were about 200 kg of greenhouse gases per person.[4] This was followed by a description of how greenhouse gases can be reduced. This is important as carbon offsetting should only be used for unavoidable emissions. Specifically, in the dairy and meat treatment, we suggested moving to plant-based diet alternatives and reducing dairy and meat consumption. For the car traveling treatment, we suggested alternatives to driving, such as public transport, walking, or cycling. Third, we informed participants that as long as humans continue this particular activity (i.e. consuming dairy or meat, traveling by car), it will not be possible to eliminate all greenhouse gas emissions from said activities. We then highlighted to participants that they could donate to EcoTree to offset the emissions from such activities, which was followed by a table describing how much greenhouse gases can be offset with up to €20. The tables were similar to the baseline donation table but included an additional column showing how many weeks/months of consuming dairy or meat or traveling by car could be offset with up to €20. Participants were then offered to make their second donation, similar to the structure of the baseline donation, and including the table with the greenhouse gases offset and time frames below the donation question as a reminder.

3. The randomization was counterbalanced in Qualtrics using the "evenly present" randomizer function.
4. We felt it was more important to show similar absolute amounts of greenhouse gas emissions than time frames.

Figure 3: Information provision in the dairy treatment

Please read the following text carefully.

Dairy production in Ireland is responsible for about 15% of the country's total greenhouse gas emissions. A big part of this comes from the fact that cows produce a greenhouse gas called methane during their digestive processes.

In Ireland, the average person consumes around 118 liters of milk, about 22 kilograms of cheese, and various other dairy products such as yogurt and butter each year. This overall **dairy consumption results in annual emissions of just over 200 kilograms of greenhouse gases per person.**

The most critical step in fighting climate change is to reduce greenhouse gas emissions released into the air. For example, people can lower greenhouse gas emissions by cutting down on dairy consumption and switching to plant-based alternatives such as oat and almond drinks or soy-based yogurts.

However, it is impossible to eliminate all greenhouse gas emissions when consuming dairy products. To remove so-called unavoidable greenhouse gas emissions, one option is using a method called carbon sequestration. This involves taking greenhouse gas emissions out of the air by planting trees and restoring peatlands. **Yet, this is a costly process.**

To offset the greenhouse gas emissions from dairy consumption, you can choose to donate money to a carbon sequestration project run by EcoTree, the company we've introduced before. You can check their website here: *EcoTree.green*.

Here are some interesting facts about how much greenhouse gases from dairy consumption can be offset with up to €20. But please remember that it is entirely up to you, if and how much you decide to donate.

Donation	**Dairy consumption greenhouse gases removed**	**Kilograms of greenhouse gases removed**
€1	About 3 weeks	13 kg
€5	About 3-4 months	65 kg
€10	About 7-8 months	130 kg
€15	About 11-12 months	195 kg
€20	About 15 months	260 kg

The second donation was followed by a question on whether the participants intended to change their consumption behavior after learning about their greenhouse gas emissions volume. We also provided a list of common reasons for donating (or not) that participants could tick if they applied to how they felt. The reasons are listed in Table A.2 and A.3 in Appendix A.

2.4 Post-treatment characteristics

In the last section, participants answered additional questions. First, we exposed participants to an attention check from Stantcheva (2023). This question is designed to capture whether participants

gave their full attention to the survey and whether they believe that their answers should be used by the research team.[5] Second, regardless of the condition, participants provided their views on carbon offsetting. We used a carbon offset scale (5-point Likert scale, from *strongly disagree* to *strongly agree*), designed by the research team, to capture the attitudes toward carbon offsetting. The validity of the scale was assessed during a pilot session, in which it provided great internal consistency (Cronbach's $\alpha = 0.76$). The questions are summarized in Table A.4 in Appendix A. Lastly, participants answered standard socio-demographics questions about age, gender, income, education, farming background, area of residence, and transportation in the area of residence.

2.5 Sample

In January 2024, we collected 50 observations on Prolific. We only ran the active control branch of the experiment.[6] The participants were all Irish and we applied the gender-balanced filter. The pilot data served two purposes. First, it allowed us to verify the flow of the survey experiment and assess the ease of comprehension and consistency of the measures for the final data collection. Second, this data was used to calibrate the power analysis (see Appendix B).

The planned sample is composed of 600 participants and representative of the Irish population on age and gender. Participants will be recruited online using the survey provider MSI.[7] The sample size was determined using a power analysis with a Minimum Detectable Effect approach. We detail the power analysis in Appendix B. After applying the pre-registered exclusion rules, the final sample is composed of [to be determined] observations.

3 Results and Discussion

[In what follows, we provide some results based on the pilot data. These analyses do not reflect the final planned analyses and are purely exploratory.]

3.1 Descriptive statistics

In this section, we briefly present the descriptive statistics of the pilot data sample. The mean age in the sample is 39, which is close to the mean age in Ireland (38.8).[8] Participants are mostly university educated, with 76% reporting a 3^{rd} level degree or higher, and mostly live in an urban or suburban area (74%). Interestingly, 50% of participants report using a car as their main transportation, and

5. We did not pre-register an exclusion rule based on this question as we believe that the donations are independent of their attention. However, we use this variable as a robustness check.

6. We only ran this branch to avoid potential follow-up biases (Albers and Lakens 2018).

7. For more information please visit https://site.msi-aci.com/.

8. According to the Central Statistics Office: https://www.cso.ie/en/releasesandpublications/ep/p-cpsr/censusofpopulation2022-summaryresults/.

88% of the sample reports consuming meat and dairy, with over 50% reporting consuming meat and dairy without any limitation. Overall, the sample is well-balanced.

Table 2: Pilot data descriptive statistics

	Mean (sd)
Age	39 (±10.78)
	Frequencies
Females	50%
Education (3^{rd} level or higher)	76%
Annual income	
Less than €20,000	24%
Between €20,001 and €70,000	68%
More than €70,001	8%
Living area	
City or urban	44%
Suburban	30%
Rural	26%
From a farming background	
Yes	18%
Main transportation car	
Yes	50%
Dietary preferences	
Eat meat and dairy without limitation	54%
Try to limit meat and dairy	34%
Plant-based diet	12%

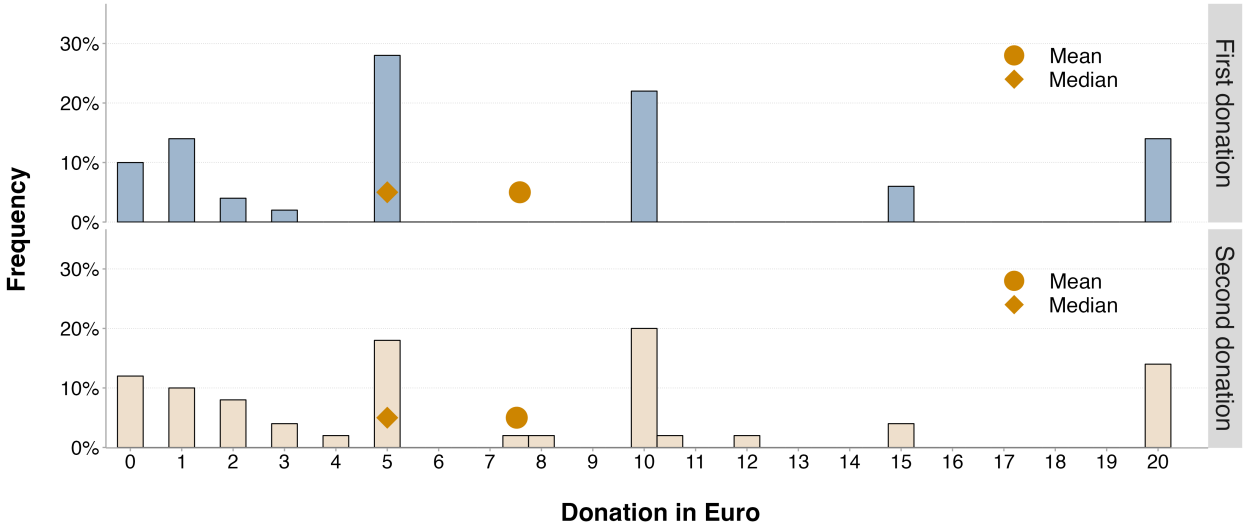
3.2 Donations to offset carbon

In the pilot, participants had the opportunity to make two donations to EcoTree, knowing that one donation would be randomly selected and applied for bonus payment.[9] Figure 4 displays the distribution of donations. The average first donation was €7.58, with 7 participants giving all their endowment (i.e., €20) and 5 participants donating €0. The average second donation was €7.52, with 7 participants giving all their endowment (i.e., €20) and 6 participants donating €0. For both donations, the median value was €5. In total, 13 participants switched their donation amount between the first and second donation, among which 7 donated more in the second donation and 6 donated less. When comparing the two donations, we find no significant differences (two-sided Wilcoxon rank-sum test, p-value > 0.1). While we mainly ran the pilot data to recover the mean

9. In the pilot, participants were made aware that only one in ten participants would be selected for payoffs.

and standard deviation of the donations to calibrate the power analysis, this result confirms the validity of the active control condition. Indeed, the active control is used to provide a cognitive task that is similar in length to the treatments but is unrelated to greenhouse gas emissions. The absence of difference between the first and second donation pre-confirms the validity of the procedure, even though more data is needed to fully confirm.

Figure 4: First and second donations from the pilot data.



We now explore the donation heterogeneity among participants. One important note is that we focus the analysis on the first donation, as it is unaffected by any treatment exposition.[10] Table 3 displays the results from a Tobit regression using the first donation as the dependent variable. The results show that the first donation is not correlated to participants' characteristics. Some results are surprising. First, the donation is uncorrelated with the level of income. Second, higher levels of education are uncorrelated with the donation, which suggests that the level of information on climate change is relatively homogeneous across education levels. However, the coefficients are positive and increase with the level of education, indicating greater donations for participants with more education. Third, it is now well-accepted that driving a car is a high-emission behavior. One would expect that individuals who report car driving as their main means of transportation would be likely to donate more to compensate for greenhouse gas emissions. However, we find no statistically significant differences between those who report using their car as a main means of transportation and those who report other means of transportation. Even more so, the effect size is negative, suggesting lower donations. Lastly, the dietary preferences of individuals are uncorrelated to donations. However, we observe two contradictory trends. On the one hand, individuals who report limiting meat and dairy have a positive coefficient, suggesting greater donation than those who do not try to limit. On the other hand, participants who report following a plant-based diet

10. Due to the absence of difference between the first and second donation, we expect that the results would hold for the second donation.

(i.e., vegetarians and vegans) have a negative coefficient, suggesting lower donations than meat and dairy eaters. One possible explanation here is that vegetarians and vegans are aware of the benefits of their dietary habits on greenhouse gas emissions, and thus do not feel the need to offset their greenhouse gas emissions. All the results presented in this section will be explored again using the final data.

Table 3: Heterogeneity analysis for the first donation

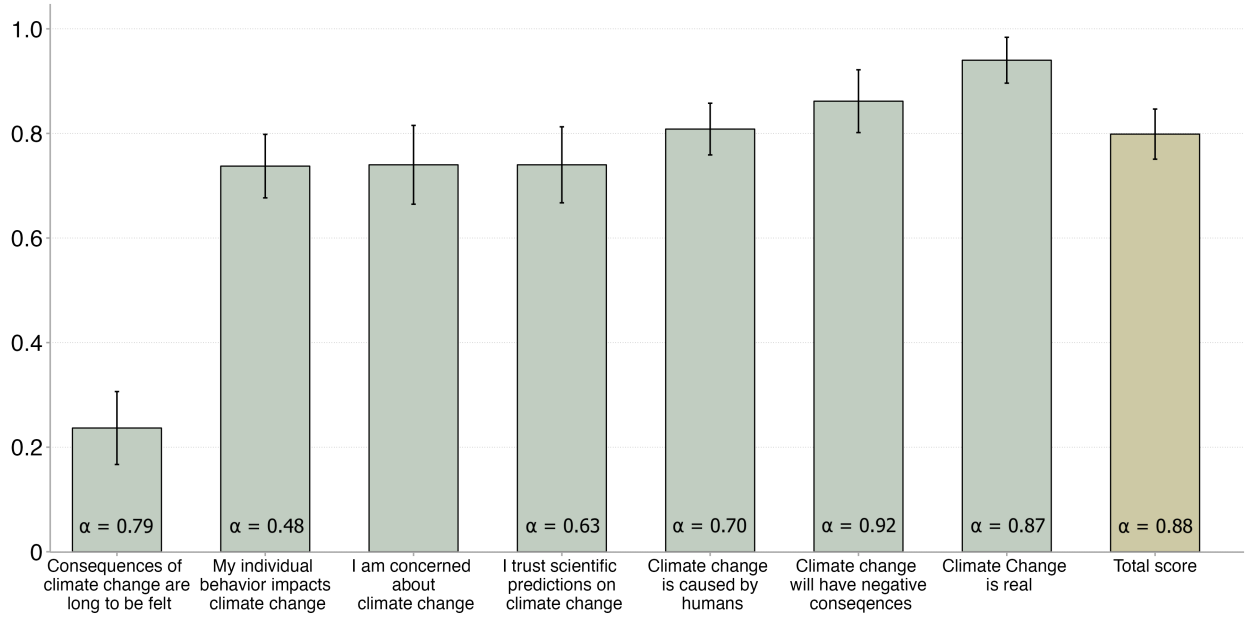
	Dependent variable:					
	First donation					
	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.040					
	(0.112)					
Female (*ref male*)		-1.994				
		(2.410)				
Income (*ref less than €20,000*)						
Between €20,001-50,000			-0.481			
			(2.977)			
Between €50,001-70,000			-1.870			
			(3.502)			
Above €70,000			-1.929			
			(4.748)			
Education (*ref some certification*)						
Third-level				1.187		
				(2.969)		
Msc or higher				2.450		
				(3.391)		
Diet (*ref meat and dairy without limiting*)						
Limit meat and dairy					3.324	
					(2.468)	
Plant-based					-4.225	
					(3.611)	
Main transport car						-3.196
						(2.343)
Observations	50	49	50	49	50	50
Uncensored	38	37	38	37	38	38
Left-censored	5	5	5	5	5	5
Right-censored	7	7	7	7	7	7
Log Likelihood	-147.865	-144.587	-147.730	-144.587	-145.844	-147.908

Note: *p<0.1; **p<0.05; ***p<0.01. Results from a Tobit regression bounded at 0 and 20. Standard errors are shown in parentheses.

3.3 Attitudes toward climate change and carbon offsetting

In this section, we explore participants' attitudes towards climate change and carbon offsetting. First, we assess the participants' perspectives on climate change using the questions presented in Section 2.1. The results are presented in Figure 5. The internal consistency of the scales is satisfactory, with Cronbach's alphas ranging from 0.63 to 0.92, except for the individual behavior impact on climate change.[11] Overall, participants appear relatively aware of climate change and related consequences. All scale scores are above 0.7, highlighting a high level of agreement with the fact that climate change is real, that it will have negative consequences, that it is caused by humans, and that participants' behavior has an impact. Participants also show a high level of concern about climate change and trust scientific predictions. The sole low score (i.e., more disagreement) is whether climate change consequences are long to be felt. However, this score is reversed and thus in line with the other scores. Last, we combine all the scores into a climate change scale score.[12] This is designed to capture the general attitudes on activities surrounding climate change, with higher scores denoting more concern and awareness about climate change. The scale yields great internal consistency (Cronbach's $\alpha = 0.88$). The total score mean is 0.8, reflecting that participants have a high overall concern and awareness about climate change.

Figure 5: Climate change attitude scales



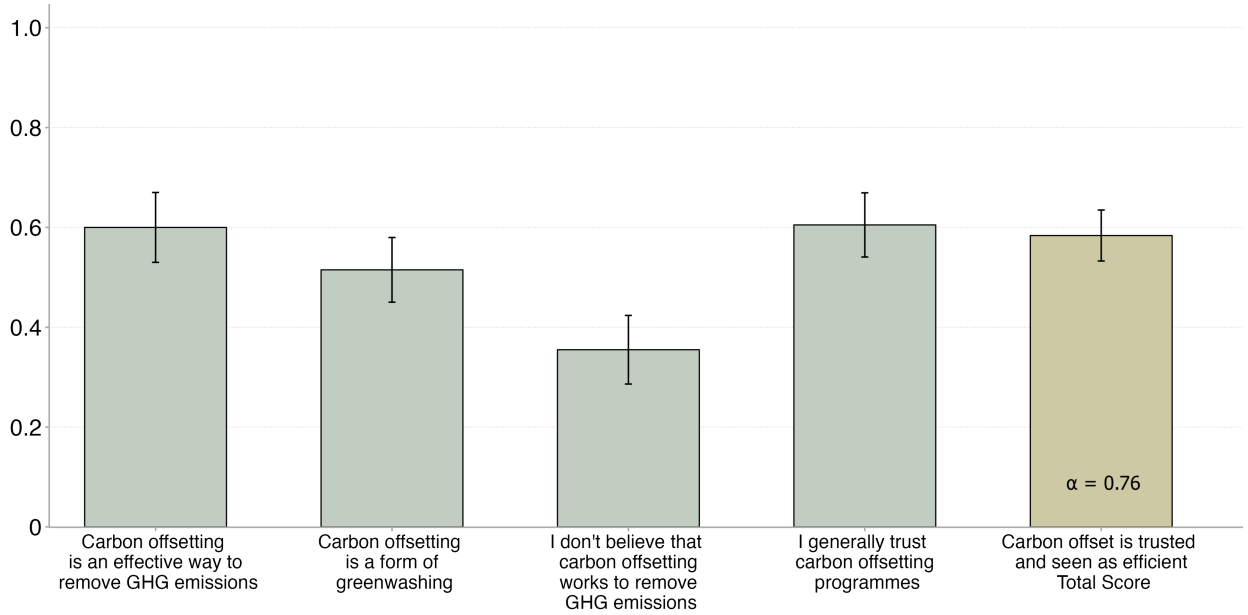
Note: The scores to scales are normalized between 0 and 1. Error bars represent the 95% confidence intervals. The α represent the Cronbach's alpha for each scale. The question for concern about climate change does not have a Cronbach alpha as this scale only contained one question. For the total score calculation, the item "consequences of climate change are long to be felt" is reversed.

11. For the individual behavior impact on climate change, the Cronbach alpha is low due to poor consistency on one of the statements. When removing the statement, the α increases to 0.78.

12. For this total score, we include the response to the concern for climate item and reverse the scores to the item "consequences of climate change are long to be felt".

Next, we turn to participants' views on carbon offsetting. We use the carbon offset scale presented in Section 2.1. Figure 6 displays the scores for each item and the aggregated scale score. The internal consistency of the scale is satisfactory, with a Cronbach alpha of 0.76. The total score on the scale is close to 0.6, which denotes that participants mostly trust carbon offsetting and perceive it as efficient. However, the agreement score to the item "Carbon offsetting is a form of greenwashing" is 0.5. This denotes that participants neither agree nor disagree with the statement, highlighting possible misperceptions about the objective of carbon offsetting.

Figure 6: Carbon offsetting beliefs scale



Note: The scores to scales are normalized between 0 and 1. Error bars represent the 95% confidence intervals. The α represent the Cronbach's alpha for each scale.

Finally, we analyze the correlation between climate change, carbon offsetting, and carbon offset donations. Table 4 displays the results from a Tobit regression using the first donation as the dependent variable. For the carbon offsetting beliefs, the more participants trust and see carbon offsetting as efficient, the more they donate (p-value < 0.05). For climate change, donations increase with the reported level of concern (p-value < 0.01). Lastly, the total score for the climate change scale is positively correlated with the first donation (p-value < 0.05), which shows that participants who display greater awareness and concern about climate change, donate more. While these results are purely exploratory, they reveal some tendencies about the donation behavior for carbon offsetting.

Table 4: Role of climate change and carbon offset attitudes on the first donation

	Dependent variable:			
	First donation			
	(1)	(2)	(3)	(4)
Carbon offsetting beliefs	13.743**			7.07
	(6.326)			(6.497)
Concern for climate change		15.409***		
		(4.023)		
Climate change scale			17.750**	15.581**
			(6.905)	(7.491)
Controls	No	No	No	Yes
Uncensored	38	38	38	38
Left-censored	5	5	5	5
Right-censored	7	7	7	7
Log Likelihood	-145.616	-140.992	-144.630	-138.149

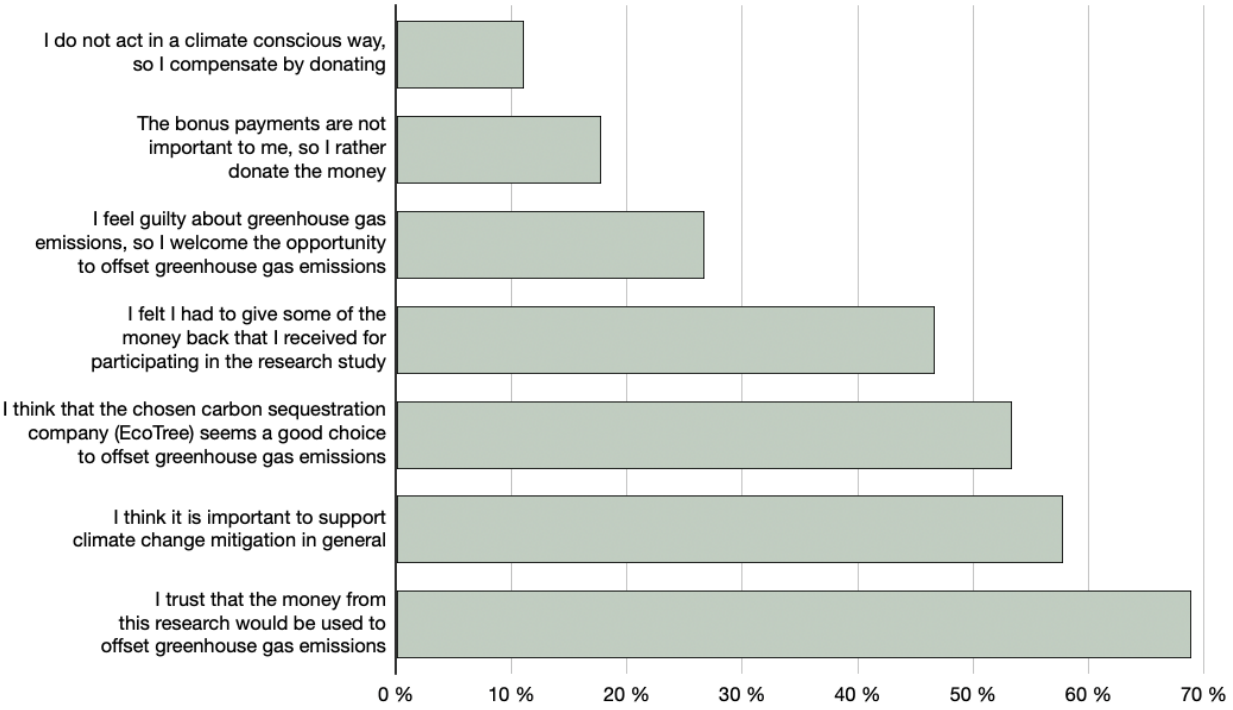
Note: *p<0.1; **p<0.05; ***p<0.01. Results from a Tobit regression bounded at 0 and 20. Standard errors are shown in parentheses.

3.4 Reasons for donating (or not)

Last, we explore the participants' main reasons for donating (or not). After completing the second donation, participants were asked for feedback on their reasons for donating (or not).[13] Figure 7 displays the reasons for donating. In total, 45 participants gave at least part of their endowment in one of the two donations. The two main reasons ticked for donating are that participants trust that the money will be used to offset greenhouse gas emissions (68.9%) and that they support carbon mitigation in general (57.8%). Over 50% also believe that EcoTree seems a good choice to offset carbon. The behavioral aspect appears to be a small driver for donations. Indeed, only about 25% report donating because they feel guilty about their greenhouse gas emissions, and about 10% donate to compensate because they do not act in a climate-conscious way. Lastly, 46.7% ticked that they felt they had to give some of the money back for participating. Interestingly, among the 21 participants who ticked they felt they had to give, 3 ticked only this statement and their mean donation is low at €1.33. Additionally, only 3 participants ticked both that they felt they had to give and that the bonus payments were not important to them. We now turn to those who did not give anything.[14] In total, 5 participants did not give any share of their endowment in both donations. We note that the main reasons ticked for not donating (i.e., 60% or 3 participants) is

13. The reasons are listed in Table A.2 and A.3 in Appendix A.
14. We do not display a graph due to the low number of observations.

Figure 7: Reasons for donating



Note: We included all participants who gave at least part of their endowment, either in the first or second donation, or both (N = 45).

that the bonus payments are important so they would rather keep the money. We do not further discuss these results due to the low number of observations.

4 Conclusion

Food consumption, especially animal-based food consumption, contribute to one's environmental footprint. However, two barriers currently prevent individuals from switching towards more environmental friendly food choices. First, individuals are often under-informed and underestimate the environmental consequences of their eating behaviors. Second, individuals are unwilling to forego animal-based food, despite being informed about the associated negative externalities, even with external nudges such as labels and visual cues. Nevertheless, the climatic urgency calls for immediate and efficient interventions to reduce one's carbon footprint. To this end, several companies have developed carbon offsetting solutions as way of mitigating carbon emissions. Individuals can now donate to fund carbon sequestration projects, such as replanting forests or creation of windfarms.

In this paper, we study the causal impact of animal-based food carbon emission information on individuals' willingness to pay for carbon offsets. We introduce a representative sample of the Irish population to a carbon offsetting company, EcoTree, and explain the tenants of carbon offsetting.

Participants are then endowed €20 and are offered to donate any amount from this endowment to EcoTree. We provide a conversion table showing the kilograms of greenhouse gas emissions that are compensated by a series of possible donations. Using a between-subject design, we then inform participants of the greenhouse gas emissions from either meat consumption, dairy consumption, or car travel. We add an additional condition in which participants are exposed to information that is similar in length to the treatments, but that contains no greenhouse gas information. Participants are then re-endowed with €20 and are offered to make a second donation to EcoTree. Following our pre-registered hypotheses, we estimate the information impact by comparing donations after being exposed to animal-based food consumption emissions against receiving no information on greenhouse gas emissions. We also compare animal-based food emission information to car traveling emission information.

[The following results are based on the pilot data. These analyses do not reflect the final planned analyses and are purely exploratory.]

The results from the pilot data (i.e., active control) allowed us to gather some insights into the final experiment while providing data to calibrate the power analysis. First, we found no differences between the first and second donations, with a respective average donation mean of €7.58 and €7.52. The absence of difference is aligned with our priors that the active control is not sufficiently informative to induce a variation in donations. Second, we explored the heterogeneity in donations and found no significant differences between sample sub-groups. This lack of differences is likely due to the small sample size involved, as some of the effect sizes are large. Third, we looked into attitudes towards climate change and carbon offsetting. Overall, participants in the pilot data had a high concern and awareness for climate change and mostly perceived carbon offsetting as efficient and trustful. Interestingly, greater concern and awareness for climate change were correlated with higher first donations. The same goes for carbon offsetting, as participants who perceived carbon offsetting as more efficient and trustworthy donated more. Last, we looked into the reasons for donating, or not. The main reasons for donating were that participants trust that their donations will be used to offset greenhouse gas emissions and that they believe supporting climate change mitigation, in general, is important. One surprising result was that almost 50% of the participants who donated felt that they had to give some of the money back. However, only 3 participants solely ticked this statement and their average donation was low (€1.33).

The final data collection will allow us to test the pre-registered hypotheses and assess the causal impact of animal-based food greenhouse gas emission information on the willingness to pay for carbon offsets. The results from the pilot data, especially the positive correlation between climate change attitudes and donation, solidify our priors on the role of information and climate change literacy. Indeed, we expect that information provision, in particular new information on greenhouse gas emissions from animal-based food, will further educate individuals and lead to increased WTP for carbon offsets.

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A Additional tables and figures

Table A.1: 16-item climate scale adapted from Van Valkengoed, Steg, and Perlaviciute (2021)

To what extent do you agree with the following statements? *There are no right or wrong answers, you should simply indicate your opinion.*
Answers range from *strongly disagree* to *strongly agree*.
1. I do not believe that climate change is real
2. Climate change is happening
3. When it comes to climate change, we cannot trust scientists' predictions
4. Scientists benefit by overstating the impact of climate change
5. Human activities are a major cause of climate change
6. Climate change is mostly caused by human activities
7. Climate change is mainly due to natural cycles
8. Overall, climate change will bring more negative than positive consequences to the world
9. The consequences of climate change will be very serious
10. Climate change will bring about serious negative consequences
11. It will be a long time before the consequences of climate change are felt
12. Climate change will only affect future generations
13. The consequences of climate change will only be experienced in the far future
14. My behavior influences climate change
15. Governments, industries, and big companies are solely responsible for climate change
16. We should all be individually committed to fight against climate change

Figure A.1: Information provision in the active control

Please read the following text carefully.

Ireland is the number one tea-drinking country in the world. **Ireland is the number one tea-drinking country in the world.**

In Ireland, it is estimated that **an average person drinks between 6 and 7 cups of tea a day**, which adds up to about **7lbs of tea leaves per year**. The market for tea in Ireland is estimated at a market worth of €82 million and sales have doubled in the past five years.

However, tea was not a common drink in Ireland at first. First imported in the mid-18th century from southeast Asia, tea was expensive to import and consumed only by wealthy people. In 1835, an Irish merchant named Samuel Bewley established the first direct route between China and Dublin. This led to direct import to Ireland and dramatically reduced the cost of tea. From there, the popularity of tea in Ireland rapidly increased and reached the lower socioeconomic classes.

Today, Ireland has its signature tea called "Irish breakfast tea", which results from a mix of Assam tea leaves from India and Ceylon tea leaves from Sri Lanka. The most common way to drink tea in Ireland is to mix it with milk and sugar, but every Irish tea consumer has a preference. Tea in Ireland is more than just a drink, it is a social custom that represents Irish hospitality.

On the next page, you will have the opportunity to make the second donation. As a reminder, here is the information on the donation.

To remove so-called unavoidable greenhouse gas emissions, one option is using a method called carbon sequestration. This involves taking greenhouse gas emissions out of the air by planting trees and restoring peatlands. **Yet, this is a costly process.**

To offset the greenhouse gas emissions, you can choose to donate money to a carbon sequestration project run by EcoTree, the company we've introduced before. You can check their website here: *EcoTree.green*.

Here are some interesting facts about how much greenhouse gases can be offset with up to €20. But please remember it is entirely up to you, if and how much you decide to donate.

Donation	**Kilograms of greenhouse gases removed**
€1	13 kg
€5	65 kg
€10	130 kg
€15	195 kg
€20	260 kg

Table A.2: Reasons for donating

We would like to learn more about your motivation why you decided to donate money to offset your greenhouse gas emissions. *Please tick the reasons that apply the most. There are no right or wrong answers.*

1. I think it is important to support climate change mitigation in general
2. I do not act in a climate-conscious way, so I compensate by donating
3. The bonus payments are not important to me, so I rather donate the money
4. I think that the chosen carbon sequestration company (EcoTree) seems a good choice to offset greenhouse gas emissions
5. I feel guilty about greenhouse gas emissions, so I welcome the opportunity to offset greenhouse gas emissions
6. I trust that the money from this research would be used to offset greenhouse gas emissions
7. I felt I had to give some of the money back that I received for participating in the research study
8. Other (please specify):

Table A.3: Reasons for not donating

We would like to learn more about your motivation why you decided not to donate money to offset your greenhouse gas emissions. *Please tick the reasons that apply the most. There are no right or wrong answers.*

1. I don't think it is important to support climate change mitigation in general
2. I already act in a climate-conscious way, so I do not need to compensate by donating
3. The bonus payments are important to me, so I rather keep the money
4. I do not think that the chosen carbon sequestration company (EcoTree) seems a good choice to offset greenhouse gas emissions
5. I do not feel guilty about greenhouse gas emissions, so I do not welcome the opportunity to offset greenhouse gas emissions
6. I do not trust that the money from this research would be used to offset greenhouse gas emissions
7. Other (please specify):

Table A.4: Carbon offsetting scale

To what extent do you agree with the following statements? *There are no right or wrong answers, you should simply indicate your opinion.*

Answers range from *strongly disagree* to *strongly agree*.

1. Carbon offsetting is an effective way to remove unavoidable greenhouse gas emissions
2. Carbon offsetting is a form of greenwashing
3. I don't believe that carbon offsetting works to remove greenhouse gas emissions from the atmosphere
4. I generally trust carbon offsetting programs offered by organizations, such as EcoTree or my climate

B Power analysis

We defined the sample size using a power analysis calibrated on pilot data. In January 2024, we ran a pilot session with 50 participants on Prolific. To stay as close as possible to the final experiment, we only recruited Irish participants and requested a gender-balanced sample. Participants underwent the full experiment protocol but we were only assigned to the control condition (i.e., active control).[15]. For financial reasons, participants were all endowed with €20 and we randomly selected only 1 out of 10 participants to effectively apply their decision (i.e., selected participants received the undonated amount as a bonus payment). We emphasized this point clearly in the explanations.

To calibrate the power analysis, we recovered the pilot's mean and standard deviation of the second donation. We fix the sample to 150 observations per condition and focus on a standard β level of 0.8 or 80% with an α level of 0.05 or 5%. We use a Minimum Detectable Effect (MDE) approach and assess the power of our study by simulating the probability of detecting an effect (i.e., $1-\beta$) for increasing levels of effect sizes. We simulate 1,000 trials for each effect size level and estimate the treatment effect using the marginal effects of a Tobit regression model. One important note is that we assess the power of our design according to the pre-registered hypothesis testing procedure, which requires 300 observations. Indeed, for our final analysis, we plan to compare the control condition to the three treatment conditions individually (i.e., dairy, meat, and transport), which involves comparing the control (n = 150) to one of the treatments (n = 150), yielding a final total sample size of N = 600. Figure B.2 reports the power analysis results.

For a sample size of 150 observations per condition, the statistical power reaches the 80% β level when the effect size is 25%, corresponding to an increase of €1.80 in donations in the treatment group. We are satisfied with this level of power for two reasons. First, the study closest to ours, by Bernard, Tzamourani, and Weber (2023), finds an effect size of 40% (up to %50 for one condition). Based on this result and our priors, we expect that the effect size will be lower in our experiment due to the differences in our experimental procedure. In particular, based on the meta-analysis by Larney, Rotella, and Barclay (2019), we expect that the higher stakes in our experimental design, driven by the non-hypothetical nature of the donation, will lower the donations and the effect size. This prior belief is further confirmed by the lower endowment share that our pilot participants donated to offset carbon (i.e., 38%), in comparison to the share donated (i.e., 65%) in a similar experiment by Andor et al. (2022), which involved lower stakes.[16] Second, we will compare the effect sizes in our final sample to a pre-defined Smallest Effect Size of Interest (SESOI) that we infer from a cost-benefit analysis.

15. We did not run any of the treatments to avoid potential Follow-up bias (Albers and Lakens 2018).

16. Andor et al. (2022) applied 1 out of 100 decisions, whereas we used 1 out of 10 in our pilot and will effectively apply all decisions in our final experiment.

Figure B.2: Statistical power for increasing levels of effect sizes.