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Social and environmental preferences: measuring how people make tradeoffs among themselves, others, and collective goods

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Abstract

Social preferences like social value orientation are considered a promising solution to social dilemmas, such as mitigating anthropogenic climate change. However, evidence on the relationship between social preferences and environmental concerns is mixed, possibly because these constructs have commonly been measured by distinct methods that do not facilitate direct comparisons. We address this gap by introducing an incentivized preference-based measurement approach, extending a subject's concerns for the wellbeing of others to a subject's willingness to support environmental and humanitarian endeavors, based on a simple social preferences utility function. In this measurement approach, subjects make resource allocation choices with real consequences and the design ensures comparability of different revealed preferences (i.e., people's willingness to make tradeoffs between themselves and others via donations to NGOs supporting different environmental and social causes). We then use this measurement method in an exploratory fashion to consistently assess preferences for environmental and humanitarian concerns in a laboratory experiment. We find that social and environmental value orientations are robustly interrelated, and further that people are generally more willing to pay to benefit people in need, compared to abstract environmental causes. We conclude that interventions to nudge people towards proenvironmental behavior will have a greater impact if human suffering resulting from global climate change is made more salient.

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1 Introduction

One of the major challenges facing humanity is global climate change. In order to address this challenge and mitigate the environmental effects of large-scale industrialization, the actions of multiple decision makers (DMs) must be coordinated. Collective action problems like this can be difficult to solve as effective resolutions pit private interests against collective concerns (see e.g., Dawes 1980; Kollock 1998; Dawes and Messick 2000). Contributing to promote environmental well-being is thus a social dilemma (see, for instance, Hardin 1968; Milinski et al. 2006; Ostrom 2014), an unfortunate situation where typical market forces do not give rise to efficient outcomes. However, one of the most promising endogenous drivers of cooperation in social dilemmas are social preferences, that is, many DMs take the welfare of others into account as they make choices in interdependent situations. Concretely, many DMs are willing to forgo some of their own material gain in order to increase the well-being of others, a concept referred to as social value orientation (SVO, e.g. Balliet et al. 2009; Murphy and Ackermann 2014). As such, sufficient SVO can act as a solution to social dilemmas and further be useful in mitigating climate change (Gowdy 2008; Fehr-Duda and Fehr 2016).

On the one hand, the potential of SVO for mitigating climate change would be supported if it is correlated with various forms of proenvironmental behaviors and attitudes. A number of studies examined such relationships in various areas, including commuting preferences in terms of using public transportation instead of one's private car (Van Vugt et al. 1996; Van Vugt et al. 1995). But although an effect was found in both studies, it was not very pronounced and in a more recent study, the relationship could not be detected (Joireman et al. 2004). Further evidence for a potential relationship between SVO and proenvironmental behavior is mixed as well. For instance, Van Lange et al. (2007) found only a marginally significant relation between SVO and donations to environmental organizations, but a significant association between SVO and the total number of donation decisions across a variety of different causes (i.e. third world organizations, charity organizations, health organizations, etc.). Joireman et al. (2001) also found that SVO was directly related to intentions to take proenvironmental action, but not to actual proenvironmental behavior. The relationship between SVO and proenvironmental behavior remains ambiguous, and may have been obscured by the various different measurement methods used to elicit proenvironmental behavior.

On the other hand, SVO captures a very specific phenomenon: the tradeoff that DMs are willing to make for the benefit of a single and anonymous other person (for a review see Murphy and Ackermann 2014). This corresponds to a simple social preferences utility function in the form $U(\pi_s, \pi_o) = \pi_s + \alpha * \pi_o$ where α is the weight DMs attach to the payoff of this anonymous other person. SVO is thus equivalent to a certain type of social preferences studied in economics (see e.g. Rasmußen 2015), where it is termed altruistic preferences in cases where a DM gains utility from the the payoff of another person ($\alpha > 0$) and spiteful preferences, where a DM loses utility from the payoff of

another person (Fehr and Fischbacher 2002). Given what this specific type of social preferences captures, it is to be expected that SVO is able to partly explain behavior in anonymous laboratory settings of social dilemmas (Ackermann and Murphy 2019).

Climate change, however, entails entities of a different scale and kind, for example the protection of biodiversity in general, or of a specific species in particular. It is therefore unlikely that a DM's SVO directly captures all individual preferences relevant to overcome the social dilemma of mitigating climate change. This can be alleviated by taking into account the tradeoffs DMs are willing to make for other relevant entities associated with climate change and thus by extending the scope of social preferences to capture the weight DMs attach to, for example, protecting the environment (Shogren et al. 2010). This extension of the concept of SVO to encompass tradeoffs with large-scale entities or causes also draws upon the use of high-resolution measures of distributive social preferences to assess the concern for entities or causes. Using such measures then allows us to establish a DM's concern reflected in the parameter α of the above mentioned utility function. While, in the paper at hand, we will discuss and measure this extended form of SVO with the example of climate change, it can of course be applied to any large-scale entity or cause.

An obstacle to be overcome is finding a way for DMs to make incentivized tradeoff decisions with entities or causes (e.g., reducing deforestation). In everyday life monetary transfers to organizations that take action to foster a cause are commonly used. For instance, in European countries like Germany or Austria, around half of all the respondents in a representative survey state that they have given money to charity in the last month.[1] So if a DM is confronted with the consequences of deforestation wants to take action, he or she can transfer money to an NGO that opposes deforestation. Similarly, if a DM is concerned about the consequences of the carbon emissions of his or her flight, airlines offer the option of making payments to organizations that take measures to offset their carbon emissions. Transfer of money to organizations has also been successfully utilized in economic experiments. For example, Eckel and Grossman (1996) use donations to charity to introduce consequences outside the laboratory in the context of a dictator game, as did subsequent experiments (e.g. Eckel and Grossman 2003, 2004; Eckel et al. 2014). Donations as measures of environmental behavior in laboratory experiments were also used by Li et al. (2011), Blanco et al. (2012), Bachke et al. (2016), Ibanez et al. (2016) and Tonin and Vlassopoulos (2016).

When valuing a DM's concern for some general entity, the scope and specificity of this entity can vary and this is likely to influence the weight that people attach to monetary transfers to NGOs acting in this regard. Examples for such varying scope and specificity can be found in the literature. Birol et al. (2006) studied people's valuations of a specific wetland in Greece and used focus groups to identify all the relevant aspects to be valued. Even more specific, Falk and Szech (2013) allowed subjects to make payments to safe a single mouse from being killed. On the other end of the spectrum would be a description that is as general as possible, asking people to make distribution decisions with the cause of preserving biodiversity or preserving endangered species, and there is evidence that the associations of people with these

[1] Data from the World Giving Index 2015. Report available online under www.cafonline.org/about-us/publications/2015-publications/world-giving-index-2015 (accessed on 18.06.2018).

phenomenons are also often vague and tied in with other beliefs (Whitmarsh 2009). We argue that such vague descriptions measure a DM's weight for different causes on a level of generality and vagueness that is comparable to the other entity in the traditional measures of SVO and social preferences, which is usually described as an anonymous other person. For example, the SVO Slider Measure states that a DM has been "randomly paired with another person, whom we will refer to as the other. This other person is someone you do not know and will remain mutually anonymous".[2] Similarly, Charness and Rabin (2002) tell DMs that they "will be anonymously paired with one (or more) other people".

In the paper at hand, we will present the results of a laboratory experiment measuring a DM's concern for climate change-related causes at such a very general level. We systematically vary what the other entity is, thereby measuring a DM's value orientations towards other individuals (SVO), towards different and very general environmental causes (EVO, including CO_2 compensation, preservation of the rain-forest and preservation of biodiversity), and towards humanitarian causes (HVO) to capture the human suffering that is likely to occur as a result of climate change (Springmann et al. 2016). We use a high-resolution measure of social preferences (Murphy and Ackermann 2014; Murphy et al. 2011) and do so in an incentive compatible way, such that people make real resource trade-off decisions with real consequences.

We contribute to the existing literature by *(a)* extending the concept of *value orientation* to encompass tradeoffs people are willing to make between their own benefit and the benefit of *some other entity or cause*. This does not mean that such tradeoffs have not been made with e.g. dictator games combined with donations, but we make a case of explicitly estimating the weight parameter of an SVO utility function. This allows us to use the measures developed for eliciting people's SVO. Due to this particular measurement approach, our design also differs from that of other studies in which people's willingness to pay (WTP) for environmental issues was measured (e.g. López-Mosquera et al. 2014; Yang et al. 2014) in that we elicit the tradeoffs people are willing to make between their own material benefit and the benefit accruing to particular environmental issues, rather than asking for WTP in absolute terms or in an auction. One disadvantage of directly asking WTP is that responses can not easily be evaluated in terms of decision quality.[3] This shortcoming can be addressed, at least to some degree, by using the SVO measures like the Slider Measure developed by Murphy et al. (2011). Because of the structure of its allocation tasks, the transitivity (i.e., internal consistency) of a subject's responses can be assessed. Random responding likely results in an intransitive choice pattern and this can be detected during data analysis and dubious responses can be excluded from consideration. In addition, the use of the SVO Slider Measure allows for a fully incentivized design, an aspect that is often not present in choice experiments, which are subject to a hypothetical bias (e.g. Moser et al. 2014; Birol et al. 2006).

We *(b)* report on a laboratory experiment successfully implementing the SVO Slider Measure for some selected causes on a level of generality comparable to that of SVO and compare the respective weight that subjects attach to those causes. This also leads

[2] Available online: http://ryanomurphy.com (accessed on 18.06.2018).

[3] See e.g. the discussion of this issue for Vickrey second price auctions by Beltramo et al. (2015).

to *(c)* first evidence of ways to build upon people's existent other-regarding preferences in order to foster greater proenvironmental behavior.

We finally *(d)* measure the degree to which SVO is related to environmental concerns when implementing a consistent, high-resolution and incentivized measure. We do so using a consistent methodology (established by Ackermann et al. 2016) for assessing a person's degree of environmental and humanitarian concerns (EVO and HVO) also ensures a common basis for assessing valuation and therefore facilitates comparability of the results. Our study is exploratory, as we refrain from formulating explicit hypotheses on the expected correlations. The exploratory approach using a consistent measurement method seems warranted as to date the evidence regarding the relationship between social preferences and environmental concerns is mixed at best (e.g. Cameron et al. 1998; Joireman et al. 2001, 2004; Schuler 2012; Van Lange et al. 2007; Van Vugt et al. 1996; Van Vugt et al. 1995).

2 Method

The experimental procedure consisted of two phases. In the first experimental phase, subjects completed the SVO Slider Measure (Murphy et al. 2011) with standard instructions, such that we measured the tradeoffs DMs were willing to make between their own monetary gain and the monetary gain of an anonymous other person. In the second experimental phase, subjects again completed the Slider Measure, but this time with a different other. The purpose was to measure the tradeoffs that DMs were willing to make between their own monetary gain and monetary gains that are transferred to different causes (e.g., a proenvironmental or prosocial/charitable organization). This general approach measured a DM's value orientations for different other causes and entities in a comparable way.

Based on data from previous experiments (e.g. Ackermann et al. 2016), we expected to observe effects of small to medium size ($d = .3$). Given an alpha level of .05, a power of .80, and the two-tailed Wilcoxon signed-rank test for matched pairs to analyze the differences between the measures of interest, a sample size of $N = 94$ would be required to detect effects of that size reliably (computed by means of G*power, see Faul et al. 2007). Based on these estimates and the possibility that some subjects may be excluded based on decision quality like intransitivity, a total of 110 subjects were recruited and participated in the experiment in eight separate experimental sessions. The number of participants per session varied between 12 and 16. The participants were university students and were recruited via ORSEE (Greiner 2004). This ensured that no subject participated in the experiment twice. The experiment interface was programmed in z-Tree (Fischbacher 2007) and conducted at the MaxJungLab at the University of Graz.

All parts of the experiment were conducted with full incentive compatibility and no deception was used at any time in this research. Subjects were informed that choices were made using experimental currency units that were then converted into Euros at the end of the sessions at a rate of 100 currency units equals 4 Euros. An experimental

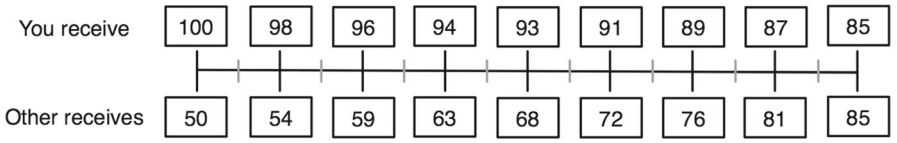

Fig. 1 An example item from the SVO Slider Measure

session lasted for about 50 minutes and subjects earned 9.8 Euros (min = 6.9 Euros, max = 12.0 Euros, sd = 1.0 Euros) on average.[4]

2.1 Phase 1: measuring social value orientation

Upon arrival at the laboratory, subjects were randomly assigned to computer workstations by drawing shuffled cards and were then asked to read the printed instructions provided. The instructions explained that they were about to make fifteen monetary allocation decisions where they would distribute resources between themselves and an anonymous other person. They were also informed that one randomly selected decision would be relevant for payment, resulting in a real payoff for themselves and an anonymous other person. Subjects were further informed that there would be a second phase of the experiment, but they received no information about the subsequent tasks. After all subjects had finished reading the instructions they were given the opportunity to ask questions. After each subject indicated his or her understanding of the instructions regarding phase 1 of the experiment, the subjects completed the SVO Slider Measure, which was implemented in a z-Tree module developed by Crosetto et al. (2012).

The SVO Slider Measure (Murphy et al. 2011) consists of six primary and nine secondary items. Each of these 15 choice tasks provides a well structured range of options for allocating resources (i.e., experimental currency units [ECUs]) between the DM and another entity. Figure 1 shows one of the 15 items as an example. From the decision maker's pattern of choices in the primary items (1–6), a continuous score of that DM's SVO can be computed and expressed in terms of an angle (SVO°). A positive angular degree indicates a positive concern for the other's payoff (with high prosociality indicated by an SVO° $= 45$, or even altruism where SVO° > 45), while an individualistic (i.e., narrowly self-interested) person would score an SVO° close to 0. A negative angular degree indicates a negative concern for the other person's payoff (which is the willingness of a DM to give up resources in order to reduce the payoff of another person). SVO° can be transformed (by taking its tangent) into the parameter α which represents the weight the DM attaches to the payoff for another person in a simple social preferences utility function $U(\pi_s, \pi_o) = \pi_s + \alpha * \pi_o$, where π_s is the payoff for the self (i.e., for the DM), and π_o is the payoff for the other (Murphy and Ackermann 2015).

[4] Data, materials and questionnaires are available from the authors upon request.

2.2 Phase 2: measuring value orientations regarding the environment and people in need

We measured a subject's degree of proenvironmentalism in three domains, namely in a general domain (CO_2 compensation), with respect to wildlife separated into the domain of flora (rain forest preservation) and the domain of fauna (preservation of endangered animals). We use the term environmental value orientation (EVO) to refer to the weight a DM attaches to supporting particular environmental causes that correspond to these three environmental domains. As an additional (non-environmental) domain, we assess subjects' degrees of prosociality in terms of generally supporting people in need, which we will refer to as humanitarian value orientation (HVO). We address HVO separately from social value orientation (SVO) because SVO captures subjects' willingness to forgo own gains for the benefit of a single unspecified anonymous other person, while HVO captures the willingness to make trade-offs for the benefit of people who are known to be in need. Previous work has already shown that the trade-offs people make when allocating resources between the self and another person can depend significantly on the characteristics of this other person (see, e.g. Ackermann et al. 2016). In essence, HVO is introduced to capture the detrimental effects that climate change is expected to have on humans as outlined in Sect. 1 and it allows us to make several important comparisons. First, we can compare the weights subjects attach to the welfare of an anonymous other person to the weights they attach to the welfare of people in need. And second, we can compare the weights subjects attach to the welfare of people in need to the weights they attach to different proenvironmental causes.

At the beginning of the second phase of the experiment, DMs were informed on their computer screens that they would again make distributive choices, but this time the other party would be a nonprofit organization (NPO) supporting a particular cause. We selected four different causes and employed a within-subject design, such that each subject completed the Slider Measure with each of the four causes in fully randomized order.

The four selected causes are the following:

1. CO_2 compensation (EVO_1)
2. Rainforest preservation (EVO_2)
3. Preservation of endangered animals (EVO_3)
4. Medical humanitarian aid (HVO)

The first three undertakings cover proenvironmental causes and sustainability in a broad sense, while the fourth cause addresses humanitarian aid which is a also a part of social sustainability. The corresponding measures are referred to as assessments of environmental value orientations ($EVO_{1,2,3}$), and humanitarian value orientation (HVO), respectively.

For assessing EVO_1, EVO_2, and EVO_3 subjects were informed that the resources allocated to the other party would be transferred to a qualified NPO promoting "climate protection through projects to reduce carbon emissions" (EVO_1), "the preservation of the rainforest by means of buying forest areas" (EVO_2), and "the preservation of biodiversity by means of protecting endangered animals" (EVO_3), respectively.

Finally, for assessing HVO, subjects were informed that the resources allocated to the other party will be transferred to a qualified NPO providing "medical aid for people affected by catastrophes" (HVO).

The corresponding organizations were (1) Atmosfair, (2) Save the Rainforest (Rettet den Regenwald e.V.), (3) World Wildlife Fund (WWF) and (4) Doctors Without Borders. However, the names of the four NPOs were not revealed to the subjects at this point of the experiment. Subjects were only informed that all the organizations are active on a global scale and have a verifiable guarantee for how donated money is used. The names of the organizations were not revealed to the subjects in order to avoid potentially biasing responses from individuals with strong (positive or negative) feelings towards a particular organization; the intention of this experimental design feature was to focus subjects' attention on the general cause, rather than the particular organizations. The four different causes were presented in random order to mitigate potential spillover effects.

After reading the instructions for the second phase of the experiment, subjects were shown the description of the first cause on their screen and asked to comment on what they thought about it. After making their comments, subjects completed the six primary Slider Measure items with respect to the corresponding cause itself as the other party. After all subjects completed all decisions, they were presented with the next cause; this procedure continued until all the allocation decisions for the four different causes had been made.

A total of 291.44 Euros were allocated to NPOs by subjects in the randomly drawn decisions of phase 2 and money was then transferred to the corresponding organizations by the authors after data collection had been completed. As promised in the instructions, subjects received an email containing the confirmation, details, and receipts of the transfers.

Out of the total 110 subjects participating in the experiment, 12 subjects showed an intransitive choice pattern in at least one of the five Slider Measure sets they had completed (i.e., in at least one of the five measures: SVO, $EVO_{1,2,3}$, and HVO). We exclude those cases as it indicates random responding or inattentiveness, and base our analysis reported in the subsequent section on the 98 subjects who showed fully transitive choice patterns in all of the conditions.

At the very end of each experimental session, subjects completed several questionnaires to assess their attitudes towards environmental and social issues, as well as regarding the causes they had been presented with. Subjects were first asked to rate the importance of each of the four causes and then to rank the four causes from most important to least important, without ties. Also, for each of the four causes subjects were asked to rate how effective they think it is to support the respective cause by means of monetary transfers to NGOs. Further, the subjects were asked about their attitudes towards charitable giving and NPOs in general. Subsequently, the subjects were asked to complete the Environmental Attitude Scale (EnvAtt; Diekmann and Preisendörfer 2001), the General Ecological Behavior Scale (GEB; Kaiser 1998) and four sub-scales of the Sustainable Development Value Scale (SDV; Shepherd et al. 2009), namely equality considerations (SDVequ), solidarity considerations (SDVsol), respect for nature (SDVnat), and shared responsibility considerations (SDVresp). Additionally, we used a scale by Stern et al. (1993) for measuring beliefs in adverse

consequences (AC) for the self (ACego), for others (ACsoc), for the biosphere (ACbio), and also included a scale assessing the willingness to take political action for protecting the environment (ACpolit). Those scales were selected, as relevant sub-scales of them capture the constructs that we assess with the Slider Measure in phase 2 of the experiment and they will be used to establish convergent and discriminant validity of our EVO and HVO measures in Sect. 3.2.

3 Results

We present our results in two parts. In the first part we focus on the weights that subjects attach to the different causes in absolute terms, looking at both the distribution and central tendency. In the second part, we will look into the relation of the weights with SVO and its robustness. We also address the validity of our results.

3.1 Weights attached to the different causes

Figure 2 is a dense visual representation, showing the results from this experiment in a thorough way. It displays the distributions of SVO, the three EVOs, and HVO on the left side. The right side of it shows scatterplots displaying the relation between SVO on the x-axes, and $EVO_{1,2,3}$ as well as HVO on the respective y-axes. These scatter plots use SVO as a baseline, and then display how the different EVOs and HVO are related to it. If by and large the points were on the diagonal, then there would be evidence that the two variables show similar values for our subjects, indicating a similar level of concern for an anonymous other and the respective cause. Points off of the diagonal indicate construct divergence and a mean shift is indicated by the majority of the points being above or below the diagonal. Descriptive statistics concerning the five distributions are reported in Table 1, while Table 2 reports non-parametric test statistics informing about the differences between the distributions.

The distribution of SVO angles is not significantly different from the distribution of EVO angles, except for EVO_2. Specifically, the weights subjects attach to the cause of preserving the rain forest are higher than the weights they attach to the monetary benefit of an anonymous other person on the aggregate. However, the distribution of HVO angles is significantly different from the distribution of SVO angles as well, and moreover it is different from the distribution of both the EVO_1 and the EVO_3 angles. The distribution of HVO angles is shifted to the right compared to the distributions of SVO and $EVO_{1,3}$. That is, subjects are willing to pay about as much (or—compared to EVO_2—slightly less) for the benefit of an anonymous other person as they are willing to pay for supporting environmental causes on the aggregate, but show a higher willingness to make costly tradeoffs for the cause of providing medical humanitarian aid in general. That is, the median of HVO angles is significantly higher than the median of SVO angles and higher than any of the three EVO angles' medians (see Tables 1, 2). Also, the proportion of altruistic choice patterns is substantially higher in HVO (13.3%) as compared to EVO_2 (8.2%), EVO_3 (9.2%), EVO_1 (4.1%), and SVO (0%). On average, subjects are willing to give up .77 monetary units in order to increase the

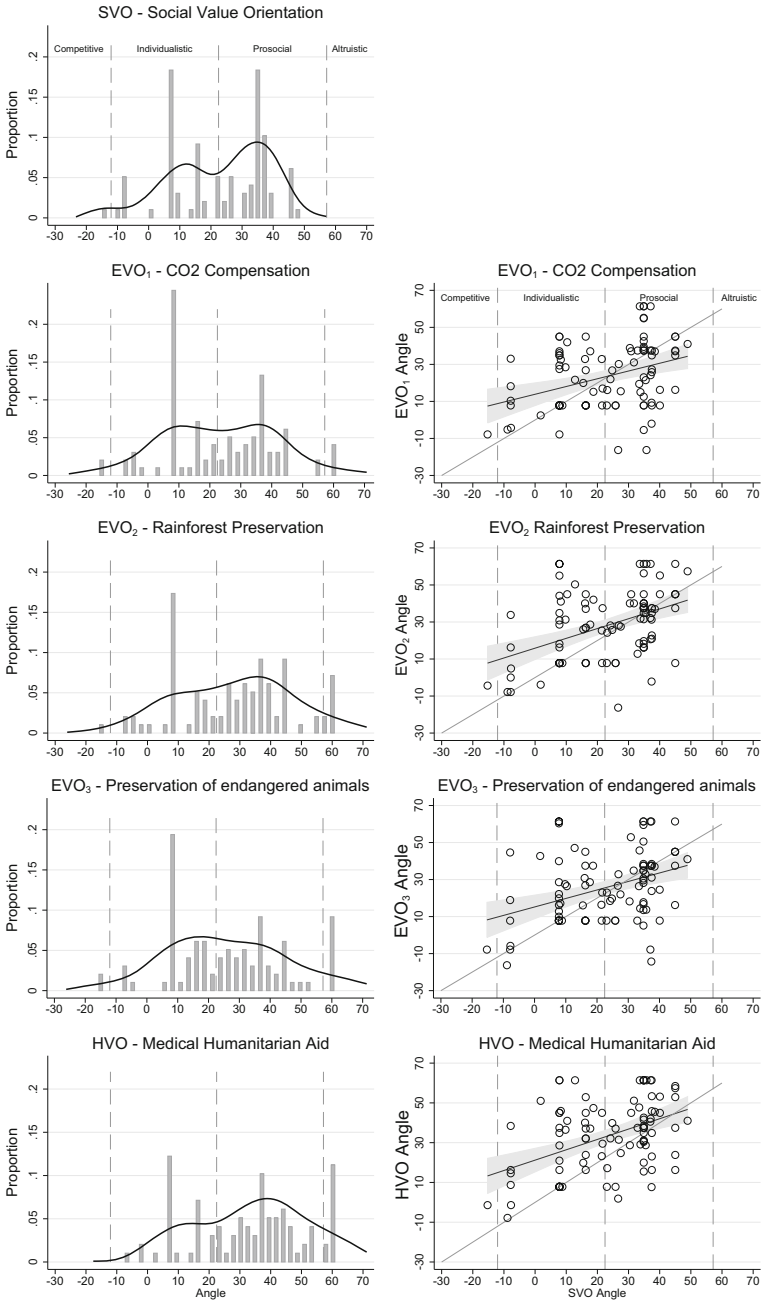

Fig. 2 SVO, $EVO_{1,2,3}$, and HVO. *Note* Cases that lie on the diagonal (light grey line) of the scatterplots have the same EVO/HVO and SVO angle. The dark grey lines are OLS regression lines with a 95% confidence interval. The vertical dashed lines denote the areas of the different categorized value orientations of the decision makers according to the labels in the uppermost scatterplot. The diagrams in the left column include kernel density estimations

Table 1 Descriptive statistics of SVO, $EVO_{1,2,3}$, and HVO angles

Condition	Median	Mean	SD
SVO	25.8° (.48)	23.1° (.46)	15.3° (.32)
EVO_1	23.6° (.44)	23.5° (.50)	17.9° (.45)
EVO_2	29.7° (.57)	28.1° (.62)	18.6° (.51)
EVO_3	25.5° (.48)	25.8° (.57)	18.7° (.51)
HVO	36.8° (.75)	33.2° (.77)	18.0° (.53)

The values reported in parentheses are the corresponding descriptives of the weights α which result from taking the tangent of the subjects' angles. These α values facilitate the interpretation of how much weight is put on the benefit to the other party in relation to a DM's own welfare, i.e., what proportion of a unit of one's own monetary holdings a DM would be willing to give up in order to increase the other party's payoff by exactly one monetary unit

donation to medical humanitarian aid by one monetary unit, while they are only willing to give up between .46 and .62 monetary units in order to increase the donations to environmental causes—or increase an anonymous other person's payoff—by one monetary unit (see Table 1). If we consider all decisions made by subjects in the Slider Measure, the average donation—had we paid out all decisions—in the humanitarian aid condition would have been 71.5 ECUs, compared to the maximum average donation of 68.42 ECUs in the environmental conditions. In other words, subjects donated 4.5% more in the humanitarian aid condition than in the most "profitable" environmental condition. This difference does not appear very large *per se*, but if we consider worldwide fund raising, a 4.5% increase in revenue would have a considerable impact.

Along with the weight people attach to the four different causes (i.e., $EVO_{1,2,3}$ and HVO), we have also elicited the subjects' opinions about the importance of these causes and how effective pecuniary support for these causes is perceived to be. Figure 3 shows the descriptive statistics in this respect. Clearly, the cause that is rated as most important and most effective on the aggregate is medical humanitarian aid. In fact, the absolute majority of subjects (52.04%) indicated that medical humanitarian aid is the most important cause among the four causes under consideration by assigning it the first rank.

Subject's higher willingness to make costly tradeoffs for medical humanitarian aid as compared to environmental causes may be explained by higher subjective importance and effectiveness ratings. That is, the revealed support for a particular cause is dependent, at least in part, on how important and (especially) how effective monetary support for the corresponding cause is perceived to be. However, even if we statistically control for subjects' SVOs and their ratings of the four causes' importance and effectiveness, subjects' willingness to make costly tradeoffs for medical humanitarian aid is still significantly higher than for any of the three environmental causes (see Table 3).

Table 2 Results of Wilcoxon signed rank tests for differences between SVO, $EVO_{1,2,3}$ and HVO

	SVO	EVO_1	EVO_2	EVO_3
SVO				
EVO_1	.30			
EVO_2	2.64**	2.74**		
EVO_3	1.04	1.19	2.04*	
HVO	5.07***	5.49***	3.34***	4.72***

The table reports the absolute values of the test statistic *Z*. Levels of statistical significance are indicated as $*p < .05$, $**p < .01$, and $***p < .001$. K–S tests corroborate these differences, except for the comparisons between EVO_1 and EVO_2, and between EVO_2 and HVO

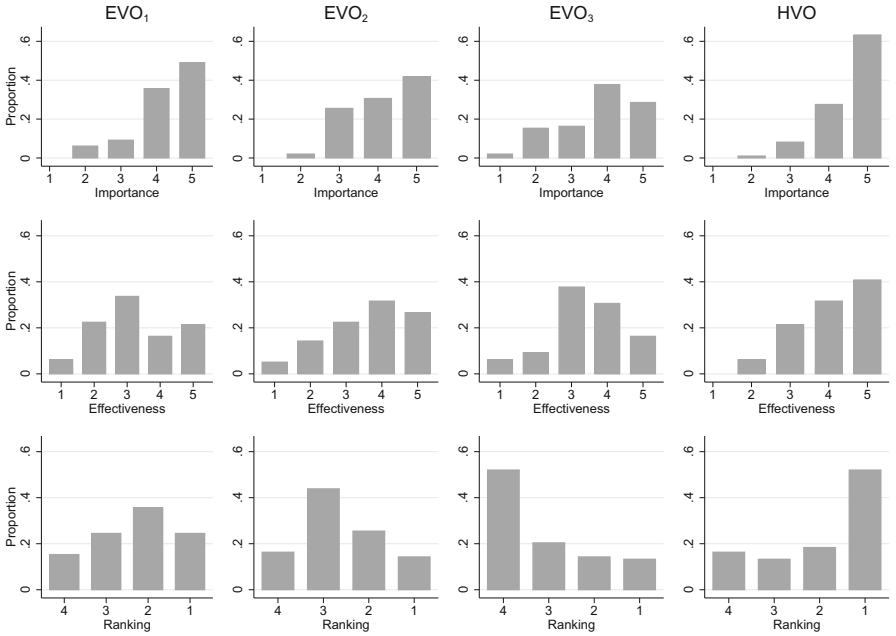

Fig. 3 Subjective importance, effectiveness, and ranking of the four causes

3.2 Measurement validity of the weights people attach to different causes and their relationship to SVO

The scatter plots depicted on the right side of Fig. 2 indicate a positive relationship between SVO with $EVO_{1,2,3}$ and HVO, which is corroborated by the significant correlations shown in Table 4. Moreover, the correlations among the three EVOs and HVO are high and significant as well. This is clear evidence that social and environmental values are related. However the correlations between SVO and the other value orientations are not approaching 1.0 either, indicating some degree of construct differentiation.

Table 3 HVO impact when controlling for SVO, and ratings of importance and effectiveness

CVO angles	
SVO	.442 (.362)***
Cause importance	2.646 (.133)**
Cause effectiveness	5.409 (.331)***
HVO dummy	2.647 (.062)**
N	392
R^2	.33

This table shows the results of an OLS regression with the angles from all the four conditions (i.e., $EVO_{1,2,3}$ and HVO) together as the dependent variable—here labeled as Cause-specific Value Orientation angles [CVO angles]. The predictors used here are SVO, cause effectiveness, cause importance, and a dummy for the medical humanitarian aid condition (i.e., the condition in which HVO was assessed). Standardized beta values are reported. The model uses robust standard errors clustered on subjects as the independent units of observation. Constant omitted

Levels of statistical significance are indicated as $*p < .1$, $**p < .05$, and $***p < .01$

Table 4 Correlations among social and environmental value orientations

	SVO	EVO_1	EVO_2	EVO_3	HVO
SVO	–				
EVO_1	.36	–			
EVO_2	.44	.64	–		
EVO_3	.37	.64	.69		
HVO	.44	.54	.71	.69	–

All correlations in the table are significant with $p < .01$

To further test the robustness of the relationship of SVO with $EVO_{1,2,3}$ and HVO, we estimate regression models separately for each of the causes and in addition to SVO include the perceived effectiveness of giving money to a NGO for each cause and the subjective importance of the cause as independent variables (Table 5).

The regressions are also intended to shed light on the measurement validity of our proenvironmental and humanitarian aid preferences. To this end we include the General Ecological Behavior Scale and the Awareness of Consequences sub-scales for *self*, *other people* and *the biosphere* and the *Solidarity* sub-scale of the Sustainable Development Value Scale. The scales capture different aspects corresponding to the different causes we studied and are meant to establish convergent and discriminant validity of the weights we elicited using the SVO Slider Measure. In addition, they also serve as control variables for the above established bivariate relationship between SVO and the weights.

For SVO, we find significant positive effects in all models. Therefore, the conclusion that SVO is related to pro-environmental and humanitarian concerns holds even when controlling for the above mentioned variables. For the control variables we find the expected positive effect of the perceived effectiveness of giving to a charity on the

weights we elicited with the Slider measure, while there are no consistent effects of the perceived importance of the cause in our regression models.

Regarding measurement validity we do not find significant effects for both the *self* and *other people* AC sub-scale or the environmental attitudes scale for any of our causes. However, for the *Biosphere* AC sub-scale significant positive effects are observed for EVO_2 and EVO_3 ($p < .10$) only. This is in support of measurement validity of these two EVOs, as they capture rainforest preservation and preservation of endangered animals respectively and no effects are observed for the more general cause of CO_2 compensation and the non-related cause of medical humanitarian aid. The *Solidarity* sub-scale yields a significant positive effect for HVO only, also supporting the validity of this measure as the sub-scale captures agreement with the belief that "those who suffer or who benefit least deserve help from those who benefit most" (Shepherd et al. 2009). The only scale yielding a significant effect for carbon reduction is the GEB scale, which is a unidimensional and very broad measure of ecological behavior across different domains and that has a very low specificity (Kaiser 1998). It is therefore evidence of convergent validity that this item yields a significant effect on the most general of our climate change-related causes, compensating CO_2 emissions. Concluding we argue that despite some "noise", the general pattern of results in the regressions is in favor of the assumption that the use of the SVO Slider Measure yields valid weights that subjects attach to these causes and also that we measure distinct constructs.

4 Discussion and conclusion

We conducted a study introducing a novel measurement concept for assessing ecological and humanitarian concerns in the form of a modified use of the SVO Slider Measure. This provided a direct measurement of people's social, humanitarian and environmental preferences, incentivized through donations to NGOs active in the respective areas. When comparing the results for different climate change related causes we find that subjects in our study have stronger preferences for humanitarian aid as compared to the environmental causes, indicated by a shift to the right of the HVO angles compared to the EVO distributions. Subjects are willing to pay more for humanitarian aid than they are willing to pay for environmental causes related to climate change (i.e., $EVO_{1,2}$ in our study). This result has important practical implications. It means that the proximate suffering of people has a higher impact on the willingness to make costly tradeoffs for a prosocial cause, compared to the consequences of global climate change for the environment in general, flora, and fauna. This is mirrored by survey research showing that for Switzerland and Austria, only between 4 and 8% give to environmental NGOs, while around 57% give to various humanitarian causes (Helmig et al. 2010; Neumayr and Schober 2012; Neumayr and Schneider 2013).

Furthermore, we shed light on the to date unclear relationship between SVO and proenvironmental preferences. We find that social (i.e., SVO but also HVO) and environmental (i.e., $EVO_{1,2,3}$) value orientations are strongly and robustly related to each other, and conclude that a consistent measurement method facilitates the detection of this relationship.

Table 5 OLS Regressions on weights attached to different causes

	(1) EVO_1	(2) EVO_2	(3) EVO_3	(4) HVO
Cause effectiveness	3.697***	4.865***	4.866***	7.060***
	(.248)	(.307)	(.277)	(.366)
Cause importance	2.215	4.012**	2.207	− 2.270
	(.108)	(.187)	(.129)	(− .087)
SVO	.280***	.377***	.407***	.436***
	(.239)	(.310)	(.332)	(.370)
Environmental attitudes	− .630	− 2.952	− 2.795	− .970
	(− .023)	(− .103)	(− .097)	(− .035)
GEB	13.44***	10.80**	6.778	5.401
	(.319)	(.247)	(.154)	(.127)
AC: Self	.640	− 1.679	5.930	3.518
	(.016)	(− .040)	(.140)	(.086)
AC: Other people	− 1.430	− 5.516	− 3.298	− 5.393
	(− .037)	(− .137)	(− .081)	(− .138)
AC: Biosphere	2.566	6.698**	6.437*	3.079
	(.079)	(.198)	(.189)	(.094)
SDV: Solidarity with suffering people	1.914	1.340	1.258	2.722**
	(.144)	(.097)	(.090)	(.203)
N	98	98	98	98
R^2	.349	.402	.318	.361

Standardized beta values are reported in parenthesis. Inclusion of subjects general attitude towards charitable giving and NGOs as control variable in all four models yields no significant results and leaves all other regression coefficients virtually unchanged. Constants omitted

Levels of statistical significance are indicated as $*p < .1$, $**p < .05$, and $***p < .01$

However, our study is not without important restrictions, which mainly stem from the fact that we intended to deliver a first and very general exploratory implementation of eliciting exact social preference function parameters for climate-change related causes [research building on this approach has recently been published by Berger (2019)]. First our results are based on a student sample and interpretations of possible policy implications of our results should consider this. Second, bias could be introduced by the use of donations to NGOs to generate real life consequences of the decisions in the laboratory. We aimed at countering this by not disclosing the specific NGOs in question and elicited how effective people judged donations to NGOs as a way to support the different causes, e.g. with regard to overhead ratios (Burkart et al. 2017). Our results regarding the stronger support of humanitarian causes and the relationship between SVO and humanitarian and environmental preferences holds when controlling for perceived effectiveness. With donations as a mechanism to generate externalities in experiments becoming more common (see Sect. 1), it should be kept in mind that the effect of such externalities may be influenced by subjects' beliefs about various aspects of donations and NGOs. Finally, while the consistent measurement

approach yields comparable result for the different causes, it may also cause an overestimation of the correlations reported in this paper due to common method variance (see e.g. Spector 2006).

One additional potential restriction are the very short and vague descriptions that were used. We consider this approach to be in line with seminal work by Liebrand (1984) who simply uses a general *random other person* who is affected by the DM's choices. It is possible that a person puts different weights on saving different species from extinction or that saving a single animal would generate different weights as compared to saving the entire species. But rather than specify a specific other person in the measure, DMs in experiments are usually asked to consider a general *random other person* and it is this abstraction that provides the standard context for measuring social preferences, at least as a first approximation as subsequent studies can address the effect of specific information about the other person (see e.g. Ackermann et al. 2016). Therefore, we use general and nonspecific environmental causes, rather than specific particular organizations or specific projects to provide a starting point that is best in line with existent research. Therefore, we consider this vagueness not a limitation, but rather a useful (if not a necessary) abstraction in order to elicit people's general social and proenvironmental preferences.

These restrictions can serve as a starting point for a number of directions that future research could take. This could, for example, include studies that go beyond student populations to measure the weight that the general population attaches to different aspects of climate change as compared to their own individual gains, or to extend beyond climate change issues to environmental issues and their human costs in general (Behrens et al. 2018). Another fruitful implementation of our methodology would be the testing of different wordings and descriptions of various aspects and consequences of climate change, to optimize policy measures or increase donations to NGOs. Finally, we can imagine a host of studies aiming to increase the weight people attach to a specific aspect or consequence of climate change by manipulating various independent variables, like information about the donation of others. Such studies could hold the descriptions of causes constant over treatments, thus mitigating the effects different wordings might have on the outcomes.

To summarize, we find that directly contributing resources to ameliorate the suffering of people is considered more agreeable, more important, and more effective than contributions to abstract environmental causes. Hence, policy makers may be well advised to tune their messages to be concordant with these existent social preferences. Rather than promote abstract benefits or improvements to plant diversity and animal life, environmental issues should be couched in terms of mitigating human suffering. Rather than show pictures of smoke stacks or a forlorn polar bear on a diminishing ice shelf, people may be more effectively motivated to make contributions by reminding them of the real human cost of climate change.[5] Recasting environmental goals as humanitarian undertakings builds on people's intrinsic prosocial preferences and estab-

[5] As of June 2014, the earthday.org website shows several rotating pictures of the following images: a modern cityscape, a rain forest canopy, a herd of Asian elephants, sunflowers in a field, and an Indian temple in silhouette against a body of water. It is hard to find the human element in any of these images and this disconnect may undermine the intended goals of the proenvironmental organization, by focusing viewers' attention upon *non-human* consequences of climate change.

lishes a direct pathway to promote and foster cooperative collective action. This insight provides an opportunity for designers of campaigns and advertisements addressing environmental issues to be more effective by highlighting and showing the negative consequences of global warming *for humans*. Such a reorientation promotes cooperative behavior by bringing distant consequences to proximate awareness, thereby making the victims more salient (in this respect, see also Small and Loewenstein 2003; Small et al. 2007). People may want to mitigate climate change not primarily for the sake of the planet, but more so for the sake of other humans, and it may thus be wise to highlight the *ends* of saving humans, rather than the *means* of saving the planet. This nudging builds upon people's endogenous social preferences and provides a more efficacious pathway for promoting environmentally-friendly choices.

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