

Reflecting on Sacrifices Made by Past Generations Increases a Sense of Obligation Towards Future Generations

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Abstract

Tackling climate change presents an intergenerational dilemma: People must make sacrifices today, to benefit future generations. What causes people to feel an obligation to benefit future generations? Past research has suggested “intergenerational reciprocity” as a potential driver, but this research is quite domain specific, and it is unknown how well it applies to climate change. We explored a novel means of invoking a sense of intergenerational reciprocity: inducing reflection on the sacrifices made by previous generations. Our studies revealed that such reflection predicts and causes a heightened sense of moral obligation towards future generations, mediated by gratitude. However, there are also some downsides (e.g., feelings of unworthiness), and perceptions of obligation do not substantially affect pro-environmental attitudes or motivations. Thus, while reflecting on past generations’ sacrifices can generate a sense of intergenerational obligation, it is limited in the extent to which it can increase pro-environmental concern.

Keywords

environmental psychology, pro-environmental attitudes, moral obligation, gratitude

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Climate change represents an increasing existential threat. A recent estimate suggests that there is now a one in 20 chance of a greater than 5°C increase in average global temperatures by the year 2100 (Xu & Ramanathan, 2017), which would cause huge numbers of deaths and displacements (Mora et al., 2017). There is, accordingly, great interest in helping humans prevent, mitigate, or adapt to this grim future. Of the many psychological challenges that confront efforts to motivate concern about climate change (Gifford, 2011), one in particular stands out—its distant time horizon. While the effects of climate change are already being felt in some parts of the world (e.g., the bleaching of the Great Barrier Reef in Australia; Ainsworth et al., 2016), the most severe effects will be felt by future generations (Gardiner, 2006; Xu & Ramanathan, 2017). The temporal distance of these impacts presents a barrier to action, but it also highlights how climate change calls forth our moral obligations to future generations (Gardiner, 2006; Gifford, 2011). A sense of moral obligation is a precursor to moral action in a number of domains (Harland, Staats, & Wilke, 1999; Johnson-Grey, Graham, & Wood, 2018) and may also help motivate sacrifices that need to be made for the sake of future generations.

Intergenerational Dilemmas and Reciprocity

How could such a sense of moral obligation be encouraged? One hurdle is that climate change represents an “intergenerational dilemma,” in that “the interests of present decision makers . . . conflict with the interests of future others” (Wade-Benzoni & Tost, 2009, p. 166). Individuals in the future cannot directly reciprocate any beneficial (or harmful) actions that redound to them from previous generations. Thus, just as with many public goods dilemmas, there is no clear self-interested reason why a person should choose to forgo benefit for themselves to aid the welfare of individuals in the future, particularly if they share no salient connection with those individuals. This poses a stark problem, especially given the scale of the societal effort required to combat

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climate change: Some authors have argued that it will approximate the effort required during WWII (McKibben, 2016, *New Republic*).

Notwithstanding this daunting challenge, there may be ways of increasing people's sense of moral obligation towards future generations, which is the topic we explore in this article. Charitable giving towards socially and geographically distant others is commonplace (Giving USA, 2018), and it does not seem infeasible that "giving" to temporally distant others could also hold appeal under the right conditions.

Intergenerational dilemmas have already been studied in a variety of laboratory contexts, yielding several insights. One in particular is that people seem capable of feeling a sense of reciprocity towards past generations, which they then "pay forward" to future generations. In several pioneering studies of "intergenerational dilemmas," Wade-Benzoni (2002) showed that the beneficence of past generations can positively influence the actions of a current generation. In one study, participants imagined themselves as the retiring CEO of a commercial fishing business, who must decide how much fish stock to leave for the next generation. The beneficence (i.e., abstention) of previous generations was manipulated. When past generations had acted to preserve the fish stock for the current generation, participants were inclined to preserve more of the fish stock as compared to when past generations had not preserved the stock (see also Bang, Koval, & Wade-Benzoni, 2017, Study 2). In a second study, participants were asked to recommend a gasoline tax, which would impose a small burden on the current generation for the benefit of future generations. When past generations' gasoline taxation policies were framed as beneficial to current generations, participants were more inclined to recommend higher taxes than when past generations' policies were framed as selfish. Complementing these hypothetical cases, in two further studies, Wade-Benzoni also examined people's "intergenerational" behavior in laboratory games. Participants were first bequeathed an amount of money from a previous participant. This amount was identical across conditions, but it was framed either as generous (representing a substantial portion of the prior participant's endowment) or as stingy (representing only a small portion). Consistent with the earlier results, participants left a larger amount of their endowment when the previous generation had been generous towards them. The advantage of these latter studies was that there was a financial cost in being generous—the third study showed that participants left US\$1.39 more for the next participant when the prior participant had been generous rather than selfish (Study 3; for a similar demonstration, see Bang et al., 2017).

These intriguing studies have been extended in a number of directions. Using the same paradigm as in Wade-Benzoni's (2002) fisheries study, Bang et al. (2017, Study 2) showed that the generous *intention* of a past generation of fishery managers positively impacted the current generation's harvesting choices, whereas the actual outcome of those past

choices (which could vary owing to the vagaries of nature) did not. One reason this appears to happen is that being the intended beneficiary of generosity by past generations increases a sense of "stewardship," that is, a sense that one has a responsibility to protect the interests of those affected by one's own decision-making (see, for example, Bang et al., 2017; Bennett et al., 2018). In Bang et al.'s third study, financial allocations to subsequent generations were mediated by a sense of stewardship towards the next generation.

Another potentially important mediator was uncovered by Markowitz (2012) in his (unpublished) doctoral dissertation, which extended Wade-Benzoni's (2002) theorizing. Although this research did not replicate the direct effects of the original gas tax framing,¹ it did find correlations between participants' gratitude towards past generations and their perceptions of responsibility towards future others, and between gratitude towards past generations and concern for environmental issues and environmental stewardship more generally. Gratitude is a prosocial moral emotion which appears to promote relationship formation (Algoe, Haidt, & Gable, 2008) and cooperation (DeSteno, Bartlett, Baumann, Williams, & Dickens, 2010). It originates from an event in the past but can motivate actions that benefit people in the present or future (Anderson, Teisl, & Noblet, 2012). Markowitz's research suggests that eliciting gratitude towards past generations may therefore be one way to enhance people's sense of moral obligation towards future generations. Accordingly, our goal in the present project was to investigate whether reflecting on the sacrifices made by past generations might generate gratitude, and in turn, a sense of moral obligation towards future generations.

The intergenerational relation we study is more distant and diffuse than those investigated in previous studies. In Wade-Benzoni's (2002) scenario studies, the conceptual relation between the gratitude eliciting event and the subsequent behavior was quite close—participants considered the hypothetical fishing behavior of a previous generation before deciding on their own fishing behavior, or they considered the hypothetical taxation policies of a previous generation before recommending a new taxation policy (see also Bang et al., 2017; Markowitz, 2012; Wade-Benzoni, Hernandez, Medvec, & Messick, 2008). In these cases, the relevant actions occurred within the same behavioral domain. The temporal relation between the generations in these studies was also very close: Obligation was induced by making some participants the beneficiaries of another participant's prior action, presumably only a short time in the past. Moreover, the past actions were merely hypothetical, rather than real. In Wade-Benzoni's (2002) laboratory studies, the past actions were real (rather than hypothetical), but their relation to the target action was also domain specific—participants considered the financial generosity of a past participant before deciding how much money to leave for a subsequent participant (as was also done in Gray, Ward, & Norton, 2014; and Bang et al., 2017, Study 1).

However, many intergenerational environmental problems do not fit this template. First, they are often much broader in scope (e.g., sea level rise), rather than being specific to a particular domain (e.g., fishing stocks in a given area). Second, they often arise from actions taken much further back in time than can be modeled directly by different “generations” of participants in a single laboratory study. Third, the actions performed by past generations that caused environmental problems in the first place may not always correspond to the actions required by present societies to deal with these problems (it is not always a case of simply reversing prior actions, owing to technological and social changes). And fourth, our current knowledge of the causes of many environmental problems outstrips that possessed by previous generations, meaning that the actions of past generations cannot necessarily be held to the same standards of evaluation. These factors arguably limit the extent to which a sense of intergenerational reciprocity can be inculcated within the environmental domain. But they also suggest a different approach to studying the problem.

In particular, there may be other ways to generate a more general sense of intergenerational reciprocity. One possibility is to ask people to consider other large-scale societal challenges during which past generations made sacrifices that clearly benefited present generations—such as the sacrifices made during WWII or the Great Depression. Present generations may feel gratitude and admiration for these sacrifices, emotions which in turn prompt a sense of obligation to benefit future generations. To our knowledge, no previous studies have investigated intergenerational reciprocity in this broader way. The question in this article is whether reflecting on these types of sacrifices by past generations generates a sense of moral obligation towards future generations because it evokes a general feeling of gratitude towards past generations. If such reflection can be used to leverage a sense of moral obligation towards future generations, this could represent one means of addressing the intergenerational dilemma of climate change. It also raises several interesting follow-up questions about psychological mechanisms that we turn to next.

Gratitude or Unworthiness

Reflecting on the sacrifices made by previous generations may increase gratitude, but it might also have other, less salutary effects. For instance, considering the sacrifices made by people during WWII might evoke gratitude, but it may also make current problems seem insignificant by comparison—which, depending on one’s perspective, could be either encouraging (“we can definitely solve this one”) or demotivating (“we can’t even solve this less challenging problem”). Considering the thrift and resourcefulness of one’s grandparents during the Great Depression might make current excesses seem immoral or imprudent; we might accordingly feel grateful for our grandparents’ sacrifices, but also unworthy of them. Given these various possibilities, in the

following studies we investigate several different pathways by which reflecting on past generations’ sacrifices could affect people’s sense of moral obligation towards future generations (positively or negatively).

Finally, we also assessed a range of downstream environmental variables, the most important of which was participants’ willingness to sacrifice in the environmental domain for future generations. A sense of moral obligation has been linked to behavior and behavioral intentions across a wide variety of domains (Johnson-Grey et al., 2018). Especially relevant to our studies, Bang et al.’s (2017) measure of stewardship, which includes some moral obligation items, predicted beneficent financial decisions towards subsequent experimental “generations.” We were therefore curious as to whether a sense of moral obligation to future generations would translate into environmentally relevant attitudes and motivations. Furthermore, examining willingness to sacrifice in the environmental domain constitutes a more demanding test of the positive effects of reflecting on past generations’ sacrifices than does simply examining perceived obligations.

Full materials and data for all studies are available on the Open Science Framework (OSF; osf.io/34jhs), and we report all measures, manipulations, and exclusions for each study below. We also report a sensitivity power analysis for each study. For every study, we stopped data collection before analyzing the data.

Study 1

In Study 1, we experimentally manipulated perceptions of past generations’ sacrifices: Participants responded to a writing prompt asking them to reflect either on the sacrifices made by past generations, or alternatively, on the fashion choices made by past generations (complete wording of these and other experimental prompts are provided on the OSF: osf.io/b8ytq).² We predicted that gratitude and sense of obligation towards future generations would both be higher in the past sacrifices condition, and that gratitude would mediate the effect of condition on sense of obligation. We also included a measure of the perceived importance of various environmental issues, to investigate whether these judgments would also be influenced by the manipulation, and related to a sense of obligation towards future generations.

Method

Participants. Two hundred participants were recruited through Amazon Mechanical Turk (AMT) (113 men, 84 women, two other; $M_{\text{age}} = 36.50$ years, $SD = 11.22$). The study was run online using Qualtrics survey software. A sensitivity analysis indicated that this sample size allowed 80% power to detect a minimum effect of Cohen’s $d = 0.40$, in an independent samples t -test (two-tailed $\alpha = .05$; Faul, Erdfelder, Lang, & Buchner, 2007).

Table 1. Descriptive Statistics and Zero-Order Correlations for all Measures in Study 1.

	Measure	Condition, M (SD)		Correlations	
		Control (n = 106)	Sacrifices (n = 93)	2	3
1	Gratitude	5.70 (1.17) _a	6.15 (0.87) _b	.366***	.186**
2	Obligation	4.89 (1.44) _a	5.57 (1.19) _b		.271***
3	Environmental importance	5.72 (1.25)	5.60 (1.36)		—

Note. Within each row, different subscripts indicate significant differences between conditions, at $p < .01$. For the correlations, ** $p < .01$. *** $p < .001$.

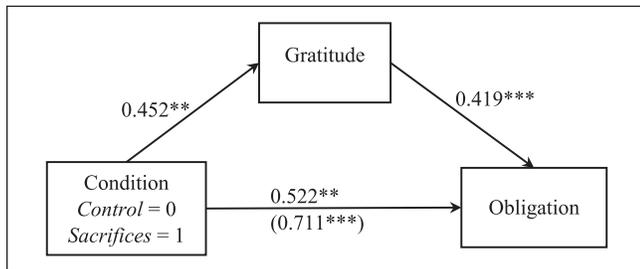


Figure 1. Summary of mediation model, Study 1. The total effect (in brackets) was larger than the direct effect, suggesting partial mediation (Baron & Kenny, 1986). The indirect effect was significant, point estimate = 0.190, 95% CIs = [0.060, 0.390]. CI = confidence interval. ** $p < .01$. *** $p < .001$.

Procedure and materials. After reading a brief description of the study and consenting to participate, participants were randomly assigned to either the experimental or the control condition. In the experimental (sacrifices) condition, they were given the following writing prompt:

We would like you to spend some time thinking about the connection between past generations and your life. Specifically, we would like you to think about **the sacrifices made by members of past generations during their lives (e.g., in times of war, hardship, etc.), and the ways those sacrifices benefited you.**

Which sacrifices made by members of past generations are most important in allowing you to enjoy your current way of life? In what ways have the sacrifices made by your parents, grandparents, or great grandparents (including those made during the wars of the past century), allowed you to live the life you lead today?

In the control condition, participants were prompted to reflect on the fashion choices made by past generations. Thus, participants in the control condition were also thinking about the past, but were unlikely to be considering the sacrifice or hardships faced by past generations; consideration of past *sacrifices* would therefore be unique to the experimental condition. In both conditions, participants were asked to write for 2 min, and the next button was hidden until 2 min had elapsed.

Participants next indicated the extent to which they felt gratitude towards past generations by responding to two statements: “My current lifestyle is only possible thanks to the sacrifices made by past generations,” and “I feel thankful for the sacrifices made by past generations” (1 = *Strongly disagree*, 7 = *Strongly agree*; $\alpha = .855$). On the following page they responded to two statements assessing a sense of obligation towards future generations: “When deciding how to live, I have a duty to consider the impact of my actions on future generations,” and “When deciding what to do or buy, I feel a sense of concern for future generations” (1 = *Strongly disagree*, 7 = *Strongly agree*; $\alpha = .777$).

Participants were then asked to consider and rate the importance of 12 different social and political issues on a 7-point scale (1 = *Not at all important*, 4 = *Moderately important*, 7 = *Extremely important*). The environmental issues of interest were environmental pollution, sustainability, and global warming. Each of these items made explicit reference to the future benefits of pro-environmental policies, and responses to these items were combined into single measure, $\alpha = .859$.³ Finally, participants indicated their age, gender, political orientation (1 = *very liberal*, 7 = *very conservative*; we also included *libertarian* and *apolitical/not interested* as additional response options), religious identification, and level of religiosity.

Results and Discussion

Due to an unknown error, data from one participant failed to save. Descriptive statistics and correlations among all measures are presented in Table 1. Gratitude was significantly higher in the past sacrifices condition than in the control condition, $t(197) = -3.054$, $p = .003$, $d = 0.44$. The sense of obligation towards future generations was also higher in the past sacrifices condition than in the control condition, $t(197) = -3.780$, $p < .001$, $d = 0.51$. As predicted, a test of the indirect effect using the PROCESS Macro for SPSS (Hayes, 2018) revealed evidence consistent with gratitude partially mediating the effect of condition on obligation towards future generations (see Figure 1). The indirect effect was significant (point estimate = 0.190, 95% confidence intervals [CIs] = [0.060, 0.390]), with an effect size of $\kappa^2 = .07$ (a medium effect, Preacher & Kelley, 2011). This study thus reveals novel experimental evidence that reflecting

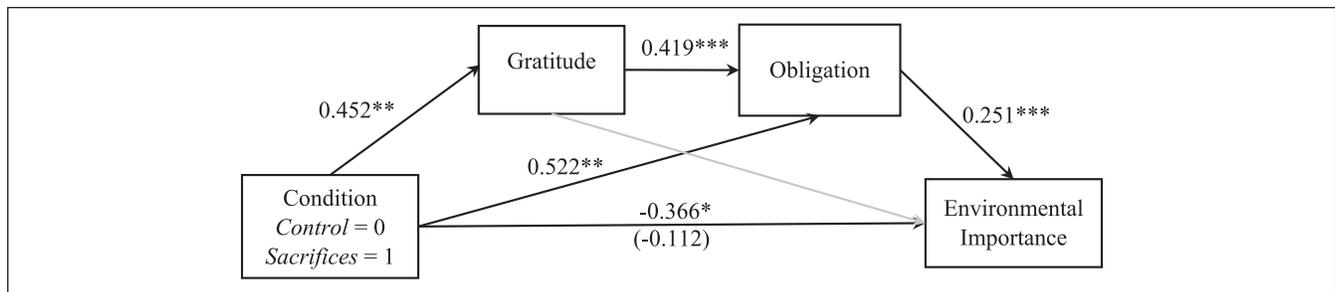


Figure 2. Summary of serial mediation model, Study 1. Non-significant paths are in gray. The total effect of condition on environmental importance (in brackets) was not significant, yet the direct effect was significant and negative, suggesting the presence of suppressor variables. The indirect effect of condition on the pro-environmental measure via gratitude and obligation was significant, point estimate = 0.048, 95% CIs = [0.014, 0.127]. CI = confidence interval.

* $p < .05$. ** $p < .01$. *** $p < .001$.

broadly on past generations' sacrifices can evoke a sense of intergenerational reciprocity, including a sense of obligation towards future generations.

The perceived importance of environmental issues was not significantly influenced by the manipulation, $t(197) = 0.656, p = .513, d = 0.09$. However, this composite measure was positively correlated with a sense of obligation towards future generations (see Table 1). Indirect effects can be meaningful in the absence of direct effects under some conditions, for example, if the experimental manipulation had a range of different effects (Rucker, Preacher, Tormala, & Petty, 2011). We were particularly interested in the possibility that reflecting on sacrifices may have indirectly influenced the pro-environmental measure through gratitude and obligation. We therefore also ran the serial mediation model illustrated in Figure 2. The indirect effect of condition on the pro-environmental measure via gratitude and obligation was significant, point estimate = 0.048, 95% CIs = [0.014, 0.127],⁴ thereby providing evidence consistent with the possibility described above. Furthermore, in this model, the residual direct effect of condition on the pro-environmental measure was significant and negative (direct effect = -0.366 , 95% CIs = $[-0.730, -0.002]$, see Figure 2). This suggests the presence of suppressor variables (Rucker et al., 2011); in other words, the manipulation may have had multiple effects on the environmental outcome measure, some positive and some negative, resulting in a non-significant total effect. We return to this issue in Study 3.

Replication of Study 1

We also conducted an additional study, almost identical to Study 1, which replicated the effect of the manipulation on gratitude and obligation, and the mediation paths illustrated in Figures 1 and 2. In this replication study, we also included a different set of pro-environmental outcome measures: Rather than focusing on the perceived importance of environmental policies, we instead asked participants the extent to which they would be willing to make sacrifices for the

environment in their own lives. The indirect effect of condition on this measure, via gratitude and obligation, was also significant and positive in this study (as in the main Study 1, and as depicted by Figure 2). However, unlike the mediation model in Study 1, in the replication study the direct effect of the manipulation on the environmental outcome measure was also (nonsignificantly) positive rather than negative, such that individuals who reflected on sacrifices indicated (nonsignificantly) greater willingness to make sacrifices for the environment in their own lives. Further information about this study is available in the Supplemental Materials.

Study 2

In Study 2, we extended the previous studies in the following ways. First, we included a second experimental condition, in which we asked participants to reflect on a *lack of* sacrifices made by past generations. The purpose of this new condition was to explore how much the sense of obligation towards future generations depends on feelings of gratitude. On one hand, reflecting on past generations' lack of sacrifices may be dispiriting, depressing participants' gratitude, and thus making them feel less obligation towards future generations. On the other hand, it might evoke a compensatory sense of obligation, as participants rally to make up for the failure of previous generations; in this way, a sense of obligation towards future generations could arise without gratitude. Including a lack of sacrifice condition allowed us to test these competing possibilities. Second, in this study, we included an additional outcome measure, which asked concretely about willingness to forego income or pay more tax to prevent environmental pollution (Eom, Kim, Sherman, & Ishii, 2016).

Method

Participants. As this study had three conditions, we recruited 450 participants through AMT (228 men, 222 women; $M_{age} = 37.09$ years, $SD = 11.99$). The study was run online

Table 2. Descriptive Statistics and Zero-Order Correlations for all Measures in Study 2.

Measure	Condition, <i>M</i> (<i>SD</i>)			Correlations	
	Control (<i>n</i> = 160)	Sacrifices (<i>n</i> = 154)	Lack (<i>n</i> = 137)	2	3
1 Gratitude	5.73 _a (1.29)	6.30 _b (1.09)	4.54 _c (1.71)	.210***	.021
2 Obligation ^a	5.01 _a (1.50)	5.39 _b (1.20)	5.22 _{a,b} (1.50)		.350***
3 Giving up income	4.50 (1.84)	4.53 (1.62)	4.41 (1.84)		—

Note. Within each row, different subscripts indicate significant differences between conditions, at $p < .001$.

^aFor obligation, the difference between control and past sacrifices conditions was significant at $p = .017$.

For the correlations, ** $p < .01$. *** $p < .001$.

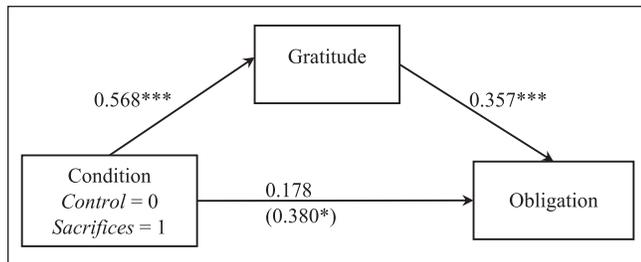


Figure 3. Summary of mediation model, Study 2; comparing only the control and past sacrifices conditions, $n = 314$. The total effect (in brackets) was significant while the direct effect was not, consistent with gratitude mediating the effect of the manipulation on obligation. The indirect effect was significant, point estimate = 0.202, 95% CIs = [0.095, 0.365]. CI = confidence interval.

* $p < .05$. *** $p < .001$.

using Qualtrics survey software. A sensitivity analysis indicated that this sample size allowed 80% power to detect a minimum effect of $\eta^2 = 0.02$, in a one-way analysis of variance (ANOVA; two-tailed $\alpha = .05$; Faul et al., 2007). This effect size translates into a Cohen's d of 0.29 (Lenhard & Lenhard, 2016).

Materials and procedure. The materials and procedure were largely similar to those in the previous study, except that participants were randomly assigned to one of three conditions. The novel “lack of sacrifices” condition emphasized that participants should think about “the sacrifices for the future that members of past generations failed to make during their lives,” and the ways this lack of sacrifices impacted them.

The wording of the past sacrifices condition was also changed slightly, to parallel the lack of sacrifices condition as much as possible. The gratitude items were reworded to ensure that they would make sense for all conditions (“To what extent did past generations make meaningful sacrifices that benefited you?” “To what extent do you feel grateful towards past generations?” 1 = *not at all*, 7 = *a great deal*; $\alpha = .920$). The obligation measure ($\alpha = .801$) was the same as in the previous studies. The final measure in this study included two items measuring people's willingness to give up income, contingent on knowing that it would be used to combat pollution (e.g., “I would agree to an increase in taxes

if the extra money were used to prevent environmental pollution,” $\alpha = .854$, Eom et al., 2016). Items within each scale were presented in a random order.⁵

Results

Descriptive statistics and correlations among all measures across all conditions are provided in Table 2. Participants reported more gratitude in the past sacrifices condition than in the control and lack of sacrifices conditions, and more gratitude in the control condition than in the lack of sacrifices condition, all contrasts significant at $p < .001$; $F(2, 448) = 61.426$, $p < .001$, $\eta_p^2 = .22$, see descriptive statistics in Table 2.

The effect of condition on obligation was not significant overall, $F(2, 448) = 2.884$, $p = .057$, $\eta_p^2 = .01$. However, for the sake of consistency with previous studies, we followed up this analysis with paired contrasts. The lack of sacrifices conditions did not significantly differ from control, $t(295) = 1.201$, $p = .231$, $d = 0.14$, nor from the sacrifices condition, $t(289) = 1.075$, $p = .283$, $d = 0.13$. However, as predicted, and consistent with the prior studies, the control and past sacrifices conditions differed significantly, $t(312) = 2.471$, $p = .014$, $d = 0.28$.

As in previous studies, we ran the mediation model depicted in Figure 3, comparing only control and past sacrifices conditions. The indirect effect of condition on obligation through gratitude was again significant, point estimate = 0.202, 95% CIs = [0.095, 0.365].

The effect of condition on willingness to give up income was not significant, $F(2, 448) = 0.183$, $p = .833$, $\eta_p^2 < .01$, notwithstanding this measure's correlation with obligation (see Table 2). To explore this further, we ran a serial mediation model (matching the model run for Study 1), using only the control and past sacrifices conditions. The indirect effect of condition on willingness to give up income, via gratitude and obligation, was significant; point estimate = 0.097, 95% CIs = [0.035, 0.160]; see Figure 4.

The lack of sacrifice condition significantly depressed gratitude relative to the control (and sacrifices) conditions; however, it also increased a sense of obligation relative to the control condition, albeit not significantly (see Table 2). To

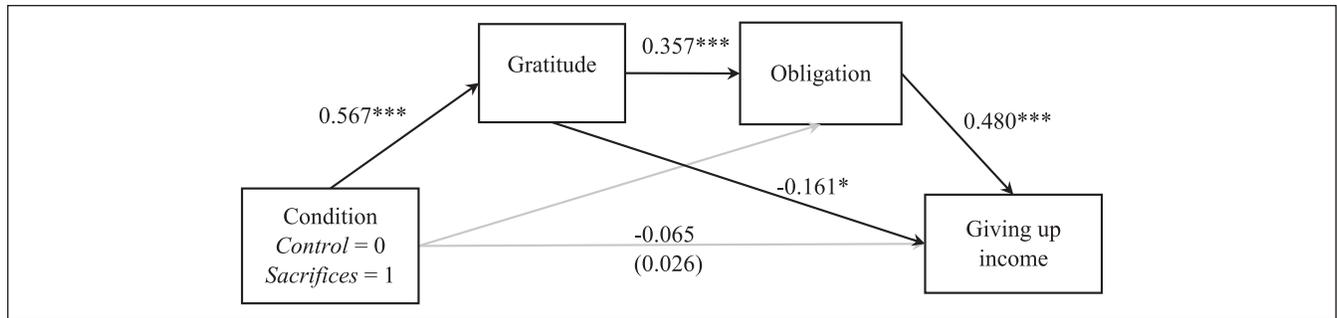


Figure 4. Summary of serial mediation model, Study 2; comparing only the control and past sacrifices conditions, $n = 314$. Non-significant paths are in gray. Neither the total effect (in brackets) nor the direct effect were significant, but the indirect effect of condition on willingness to give up income, via gratitude and obligation, was significant; point estimate = 0.097, 95% CIs = [0.035, 0.160]. CI = confidence interval.

* $p < .05$. *** $p < .001$.

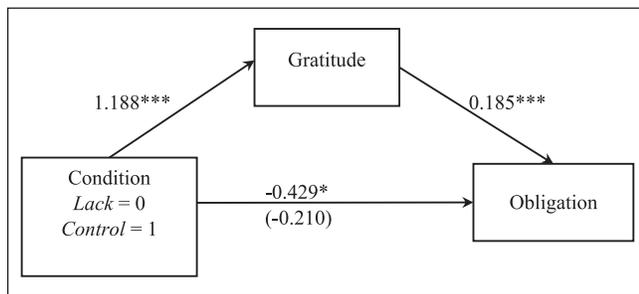


Figure 5. Summary of mediation model, Study 2; comparing only the control and lack of sacrifices conditions, $n = 297$. The total effect (in brackets) was not significant, but the direct effect was significant and negative. The indirect effect was also significant, point estimate = 0.219, 95% CIs = [0.081, 0.401]. CI = confidence interval.

* $p < .05$. *** $p < .001$.

shed light on this effect, we ran the same mediation model as in Figure 3, contrasting only the lack of sacrifices condition (coded as 0) and the control condition (coded as 1; see Figure 5). In this analysis, there was a significant indirect effect of condition on obligation via gratitude (point estimate = 0.219, 95% CIs = [0.081, 0.401]), indicating that the lack of sacrifices condition suppressed obligation by suppressing gratitude. However, there was also a significant direct effect (effect estimate = -0.429 , 95% CIs = [-0.793 , -0.065]), indicating that once the suppressing effect of lowered gratitude was accounted for, the lack of sacrifices condition increased a sense of obligation towards future generations, relative to the control condition. We speculate that this effect may reflect a desire to compensate for past generations' lack of sacrifice.

Discussion

Study 2 replicated the finding that reflecting on the sacrifices made by past generations increases a sense of obligation towards future generations (statistically mediated by gratitude). The importance of gratitude in predicting a sense of obligation was reinforced by the inclusion of a lack of

sacrifices condition. In this condition, gratitude was suppressed, which decreased participants' sense of obligation towards future generations (relative to control). However, the direct effect of this condition was to increase a sense of obligation, thus suggesting a competing, compensatory response, and that gratitude is not the only pathway through which a sense of obligation towards future generations can arise. As in the prior studies, the effect of the sacrifices manipulation on a pro-environmental outcome measure was weak and indirect (despite a strong correlation between obligation and this measure).⁶

The evidence thus far indicates that reflecting on past sacrifices may have multiple psychological effects. Reflecting on past generations' sacrifices can seemingly induce gratitude, and a sense of obligation towards future generations. But there is also evidence that it has other psychological effects which may serve to *decrease* participants' sense of obligation. For instance, in Study 1, once the effects of gratitude and obligation were accounted for, the direct effect of the sacrifices manipulation on environmental outcome measures was negative. This effect was also negative (though not significantly so) in Study 2. Our goal in the next study was to gather more evidence about the full range of psychological effects produced by the sacrifices manipulation.

Study 3

In Study 3, participants were randomly assigned to one of three conditions: a past sacrifices condition, a general gratitude condition, and a control condition. In addition to measuring gratitude and obligation, we also assessed two potential suppressors of the effect of sacrifices on obligation: impressions of the present generation's unworthiness (by comparison to past generations and their sacrifices), and judgments that current generation's problems are trivial compared to the problems faced and overcome by past generations.

The inclusion of a general gratitude condition allows us to extend our understanding of the sacrifices manipulation.

Three main possibilities were of interest. First, if the sense of obligation produced by this condition exceeds that produced in the past sacrifices condition, then (assuming that levels of gratitude in these conditions are similar) this would provide additional evidence for the suppressive effects of reflecting on past generations' sacrifices—that is, such reflection can produce gratitude but this is counterweighted by other effects. Alternatively, if the sense of obligation produced in the general gratitude condition is not as great as that produced in the past sacrifices condition, then (assuming similar levels of gratitude) this would indicate that there is something unique about the sense of obligation towards future generations produced by intergenerational gratitude, that exceeds what can be produced by a more generic sense of gratitude. Finally, if levels of obligation (and gratitude) are equal across both conditions, then this would indicate that there is nothing unique about the gratitude produced by reflecting on past generations' sacrifices.

Method

We again recruited 450 participants through AMT. The final data file included 454 participants: 274 men, 175 women, five other ($M_{\text{age}} = 35.70$ years, $SD = 11.64$). A sensitivity analysis indicated that this sample size allowed 80% power to detect a minimum effect of $f = 0.15$, in a one-way ANOVA (two-tailed $\alpha = .05$; Faul et al., 2007).

Materials and procedure

Experimental conditions. Participants were randomly assigned either to the past sacrifices, general gratitude, or control conditions. In the general gratitude condition, participants were asked to reflect on something they felt grateful for: "Specifically, we would like you to think about the many things in your life . . . that you currently feel grateful for . . . , and the ways these things currently impact you." This manipulation was loosely based on one developed by Emmons and McCullough (2003). The wording of the past sacrifices condition was similar to that used previously in Study 2, but we changed the wording slightly to match the general gratitude condition (e.g., ending with "how have these sacrifices enhanced the quality of your life today?"). We also changed the control condition to be a writing task about differences in musical taste between people of past and current generations, rather than about differences in fashion (Study 1). Varying the control condition in this way helps establish that differences between the control and experimental conditions are not due to idiosyncratic features of the control condition, but instead reflect differences produced by the experimental condition (i.e., the reflection on intergenerational sacrifice). (As another means of varying the control condition, Supplemental Study S2 involved a no-writing control condition; see Supplemental Materials, and meta-analysis below.) In this study, the next button appeared after 1 min. Full writing prompts are provided at osf.io/9mwnc.

Mediation measures and obligation. Next, we asked participants how they were currently feeling, and included "unworthy" and "thankful" as the items of interest among a larger list.⁷ Participants responded on a 7-point scale, 1 = *not at all*, 7 = *a great deal*. They next responded to three items assessing a sense of obligation (similar to those in previous studies, for example, "I feel a sense of concern for the welfare of future generations," $\alpha = .898$), and three items assessing triviality (e.g., "Modern problems are of trivial importance compared to those faced by previous generations").⁸ Unworthiness and a sense of triviality were included to gauge their potential suppressing effects and to ensure a more complete mediation model. These scales were presented in a random order for each participant, and items within each scale were also presented in a random order.

Pro-environmental attitude and motivation measures. As in previous studies, we also included two pro-environmental measures. The first pro-environmental measure assessed belief in an obligation to endure hardships *as a group* (e.g., "In order to protect the environment in the future, we should accept making painful compromises that will cause discomfort for people in the present day," $\alpha = .939$); this was a three-item scale which we modified from research investigating perceptions of group suffering in the context of intergroup conflict (Kahn, Klar, & Roccas, 2017). The second scale consisted of five items assessing participants' willingness to sacrifice for the environment (e.g., "I am willing to do things for the environment, even if I'm not thanked for my efforts," $\alpha = .953$; Davis, Le, & Coy, 2011). These two scales were presented separately, in a random order, and items within each scale were also presented in a random order for each participant. At the end of the study, participants provided demographic information (age, gender, political orientation, religiosity), were debriefed, and thanked.

Results

Descriptive statistics across all conditions and correlations among measures are provided in Table 3. Consistent with previous studies, there was a significant effect of condition on gratitude, $F(2, 451) = 62.895, p < .001, \eta_p^2 = .22$; participants reported more gratitude in the sacrifices and general gratitude conditions than in the control condition; although the gratitude and past sacrifices conditions did not differ (see Table 3). This indicates that reflecting on the sacrifices of past generations does not induce a stronger feeling of gratitude than does a more generic gratitude manipulation. The effect of condition on obligation was not significant overall, $F(2, 451) = 2.522, p = .081, \eta_p^2 = .01$. However, when comparing just the sacrifices and control conditions, as in the previous studies, we found that the effect on obligation was significant, $F(1, 295) = 4.066, p = .045, \eta_p^2 = .01$. The sacrifices and gratitude conditions also did not differ, again indicating that the sacrifices manipulation produces no greater

Table 3. Descriptive Statistics and Zero-Order Correlations for all Measures in Study 3.

Measure	Condition, <i>M</i> (<i>SD</i>)			Correlations						
	Control (<i>n</i> = 157)	Sacrifices (<i>n</i> = 140)	General gratitude (<i>n</i> = 157)	2	3	4	5	6	7	
1 Gratitude	4.16 _a (1.98)	5.93 _b (1.51)	5.96 _b (1.27)	.305***	.023	.123**	.127**	.198***	.173***	
2 Obligation	5.21 _a (1.34)	5.63 _b (1.37)	5.59 _{a,b} (1.30)		-.012	-.025	.531***	.625***	.616***	
3 Unworthiness	1.49 _a (1.07)	2.30 _b (1.64)	1.77 _a (1.22)			.136***	-.060	-.117*	-.094*	
4 Trivial	3.54 _a (1.58)	4.22 _b (1.67)	3.83 _a (1.62)				-.063	-.093*	-.083	
5 Group obligation to endure hardship	4.97 (1.52)	5.24 (1.46)	5.19 (1.30)					.759***	.939***	
6 Willingness to sacrifice	5.04 (1.46)	5.23 (1.46)	5.27 (1.27)						.936***	
7 Combined pro-environmental outcome	5.01 (1.38)	5.24 (1.38)	5.23 (1.20)						—	

Note. Within each row, different subscripts indicate significant differences between conditions, at $p < .05$. As in Study 2, we did not find a significant effect of condition on perceptions of group obligation to endure hardships for environmental reasons, $F(2, 451) = 1.479, p = .229, \eta_p^2 < .01$; nor on willingness to sacrifice for the environment, $F(2, 451) = 1.205, p = .301, \eta_p^2 < .01$. In this study, gratitude was assessed by a single item asking participants to indicate how “thankful” they felt.

For the correlations, ** $p < .01$. *** $p < .001$.

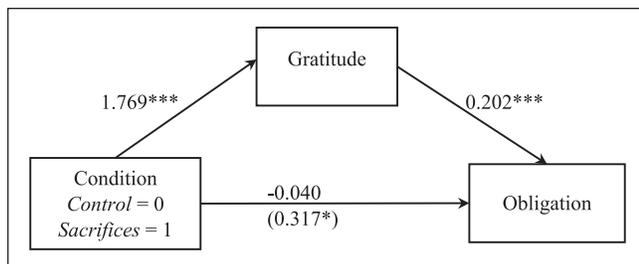


Figure 6. Summary of mediation model, Study 3; comparing only control and past sacrifices conditions, $n = 297$. The total effect (in brackets) was significant, the direct effect was not, consistent with gratitude mediating the effect of the manipulation on obligation. The indirect effect was significant, point estimate = 0.357, 95% CIs = [0.191, 0.563]. In this study, gratitude was assessed by a single item asking participants to indicate how “thankful” they felt. CI = confidence interval.

* $p < .05$. *** $p < .001$.

boost over the generic gratitude manipulation on this measure. See Table 3 for all comparisons between conditions.

As in the previous studies, we again ran the mediation model with gratitude, comparing only the sacrifices and control conditions. The indirect effect of condition through gratitude was again significant, point estimate = 0.357, 95% CIs = [0.191, 0.563]; in this model, the direct effect was negative (suggesting the possible presence of suppressor variables) although not significant; see Figure 6.

In this study, the second question of interest concerned possible negative, or suppressive, effects of reflecting on past sacrifices. And indeed, participants reported a significantly greater sense of unworthiness in the past sacrifices

condition than in the other two conditions, as expected, $F(2, 451) = 14.175, p < .001, \eta_p^2 = .06$ (see Table 3 for comparisons between conditions). There was also a significant effect of condition on the perception that current generations’ problems are trivial compared to past generations’ problems, $F(2, 451) = 6.579, p = .002, \eta_p^2 = .03$; see Table 3, reflecting elevated scores on this measure in the past sacrifices condition.

To investigate whether these negative feelings function as possible suppressors of the effect of reflecting on past sacrifices on the pro-environmental measures, we tested the path model depicted in Figure 7 (using the lavaan package for R; Rosseel, 2012), comparing only the sacrifices and control conditions. The two pro-environmental measures were highly correlated (see Table 3) and loaded on a single factor in an exploratory factor analysis (see Supplemental Materials); we therefore combined them into a single environmental measure for this analysis ($\alpha = .955$). Unworthiness correlated with this combined measure (see Table 3), but contrary to our prediction, triviality did not; so we only included unworthiness as a potential suppressor in this model (see Figure 7).

The direct effect of condition on the pro-environmental measure (dashed gray line) was not significant (effect estimate = 0.139, $p = .345$). However, the indirect path, condition \rightarrow gratitude \rightarrow obligation \rightarrow pro-environmental measures, was significant, consistent with previous studies (indirect effect = 0.221, $p < .001$). In addition, the indirect path, condition \rightarrow unworthiness \rightarrow pro-environmental measures, was also significant, and negative (indirect effect = $-0.085, p = .038$), thus capturing (part of) the suppression effect.⁹

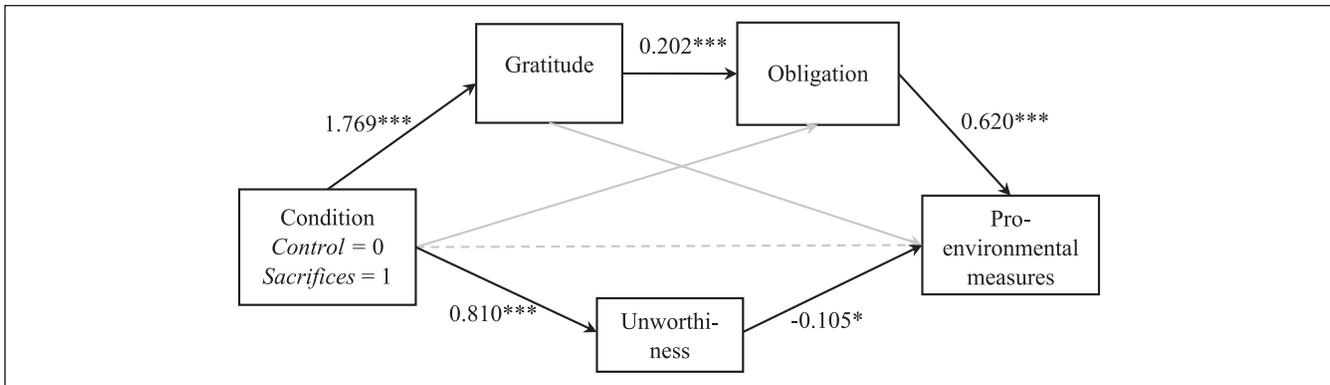


Figure 7. Summary of path model, Study 3; comparing only control and past sacrifices conditions, $n = 297$. Non-significant paths are in gray. The indirect path, condition \rightarrow gratitude \rightarrow obligation \rightarrow pro-environmental measures, was significant; point estimate = 0.221, $p < .001$. The fit of this path model was good, RMSEA = .00, 95% CIs = [0.000, 0.044], $p = .957$. In this study, gratitude was assessed by a single item asking participants to indicate how “thankful” they felt. RMSEA = root mean square error of approximation; CI = confidence interval. * $p < .05$. *** $p < .001$.

Discussion

Study 3 revealed that having participants reflect on past generations’ sacrifices—compared to having them reflect on past generations’ taste in music—produced a (barely significant) increase in the sense of obligation felt towards future generations. An almost identical pattern (though with clearer differentiation from the control condition) was observed on a measure of gratitude itself. Mediation evidence was once again consistent with the effect of condition (sacrifices vs. control) on obligation being statistically mediated by gratitude. However, a very similar increase in felt obligation towards future generations was caused by having participants reflect generally on the things they are grateful for—which need not have any link to past generations. These results therefore suggest that there is no extra boost in gratitude (or obligation) caused by reflecting on past generations’ sacrifices as compared with a more generic gratitude induction. We did, however, find evidence for some negative effects of reflecting on past generations’ sacrifices—doing so also leads to a sense of unworthiness and triviality, with unworthiness, in turn, negatively predicting pro-environmental attitudes and motivations.

These potential downsides to considering a past generation’s sacrifices were not considered in the original intergenerational reciprocity studies (e.g., Bang et al., 2017; Wade-Benzoni, 2002), perhaps because in those studies the sacrifice performed by past generations was not especially onerous, and because participants were in a position immediately to “reciprocate” it (or “pay it forward”) to the next (experimental) generation. In the present study, however, many of the participants reflected on extremely onerous, society-wide sacrifices, such as those performed during WWII (as revealed by the text of participants’ responses). Sacrifices of this magnitude are greater than those typically made in contemporary society, which may have led participants to make unfavorable comparisons to their own

behavior. From a practical perspective, it is important to uncover the downsides of reflecting on past generations’ sacrifices. Rhetorical appeals that draw parallels between the sacrifices made during WWII and those required now to combat climate change (e.g., McKibben, 2016) may have some positive effects, but may not be entirely beneficial.

Study 4

In our final study, to achieve more control over what participants reflected upon, half the participants were asked to reflect on a specified set of sacrifices made by past generations (those made during WWII), rather than to generate the sacrifices themselves. We also investigated potential mediating and suppressor variables in more detail, by including assessments of gratitude and unworthiness, as in Study 4, as well as relevant measures of upward social comparison (i.e., the sense that members of past generations were better people than members of current generations) and downward social comparison (i.e., the sense that current generations have an easier life and face less hardships).

Method

We recruited 400 participants through AMT (213 men, 183 women, four other; $M_{age} = 35.09$ years, $SD = 11.54$). The analyses were preregistered (see osf.io/34jhs for pre-registration document) except where noted.

Materials and procedure

Experimental conditions. Participants were randomly assigned to a sacrifices or a control condition. In the sacrifices condition, they were asked to reflect specifically on the sacrifices made by past generations of Americans during WWII (we chose war because it was a frequently mentioned response in prior studies and because of its link to current rhetorical appeals surrounding climate change).

Table 4. Descriptive Statistics and Zero-Order Correlations for Potential Mediating and Dependent Variable (Obligation) Measures in Study 4.

Measure ^a	Condition, <i>M</i> (<i>SD</i>)		Correlations						
	Control (<i>n</i> = 201)	Sacrifice (<i>n</i> = 199)	2	3	4	5	6	7	
1 Gratitude	5.15 _a (1.46)	5.75 _b (1.32)	.843***	.360***	.569***	.441***	.399***	.326***	
2 Inspiration	5.16 _a (1.42)	5.73 _b (1.27)		.334***	.538***	.435***	.392***	.307***	
3 Unworthiness	3.11 _a (1.51)	3.43 _b (1.67)			.361***	.639***	.064	.015	
4 Downward comparison	4.72 _a (1.44)	5.34 _b (1.41)				.434***	.230***	.199***	
5 Upward comparison	4.02 _a (1.38)	4.27 _a (1.53)					.102*	.076	
6 Obligation	5.56 _a (1.34)	5.60 _a (1.42)						.738***	
7 Willingness to sacrifice	5.34 _a (1.37)	5.16 _a (1.52)						—	

Note. Within each row, different subscripts indicate significant differences between conditions, at $p < .001$, except unworthiness which was $p = .046$. For the correlations, * $p < .05$, *** $p < .001$.

Participants were given 2 min to read and respond to a short summary of how American society responded to WWII, which included descriptions of men “fighting the enemy on foreign shores,” and women “contributing to the production of munitions and war equipment.” The passage emphasized that everyone, “faced hardship because of the war, and had to make sacrifices for the sake of the nation, freedom, and future prosperity.” In the control condition, participants read about “the music enjoyed by past generations, and how it differs from music enjoyed by members of later generations, including yourself.” The text was of similar length and style across the two conditions. After reading the passage, so as to ensure their engagement with the material, participants in both conditions responded to two questions: “What feelings do you have about the past generations described in this message? Please elaborate below” and “Were there any parts of the above paragraph that felt particularly relevant to you and your life? If so, please elaborate below.” On the next page, participants answered a manipulation check (“past generations made sacrifices that have greatly benefited current generations”) on a 7-point response scale (1 = *strongly disagree*, 7 = *strongly agree*).

Mediation measures. Five sets of potential mediators were presented in a random order on the following page. These sets were gratitude (three items, for example, “I am grateful for the sacrifices made by past generations,” $\alpha = .887$), inspiration (three items, for example, “I feel inspired by the sacrifices made by past generations,” $\alpha = .934$), unworthiness (four items, for example, “When thinking about past generations’ sacrifices, I feel guilty about my own lack of sacrifices,” $\alpha = .926$), downward comparison (three items, for example, “I have faced much less hardship in my life than past generations did,” $\alpha = .886$), and upward comparison (three items, for example, “Many people in past generations were better people than I am,” $\alpha = .828$). The items within each of these sets were also presented in a random order.

Obligation and pro-environmental motivation measures. A sense of obligation towards future generations (the primary dependent variable) was assessed on the next page (three items, for example, “I have a personal duty not to harm future generations,” $\alpha = .916$). On the final page, we asked participants how willing they were to “take various actions in the future.” Three items pertained to pro-environmental motivations (e.g., “I am willing to give up things that I like doing if they harm the natural environment of future generations,” $\alpha = .928$). These three items were presented in a random order intermingled with three filler items, which pertained to other social systems or other aspects of future generations’ well-being (e.g., “I am willing to give up things that I like doing if they harm the health of future generations,” $\alpha = .924$).¹⁰ Finally, participants provided demographic information, were debriefed, and thanked.

Results

The manipulation was successful, as participants felt that past generations had made greater sacrifices in the sacrifices condition ($M = 6.21$, $SD = 1.11$) than in the control condition, $M = 5.55$, $SD = 1.26$, $t(398) = 5.530$, $p < .001$, $d = 0.56$. Descriptive statistics and correlations among all measures are presented in Table 4.

Participants reported significantly more gratitude, inspiration, unworthiness, and downward comparison in the sacrifices condition than in the control condition. However, the differences between conditions for upward comparison and obligation were not significant, upward comparison: $t(398) = 1.759$, $p = .079$; obligation: $t(398) = 0.295$, $p = .768$. The lack of an effect for obligation was unexpected. Nonetheless, we still ran the planned mediation analysis, first testing each mediator separately before running the parallel mediation analysis illustrated in Figure 8. This parallel mediation analysis diverged slightly from the pre-registered plan in that we included unworthiness as a

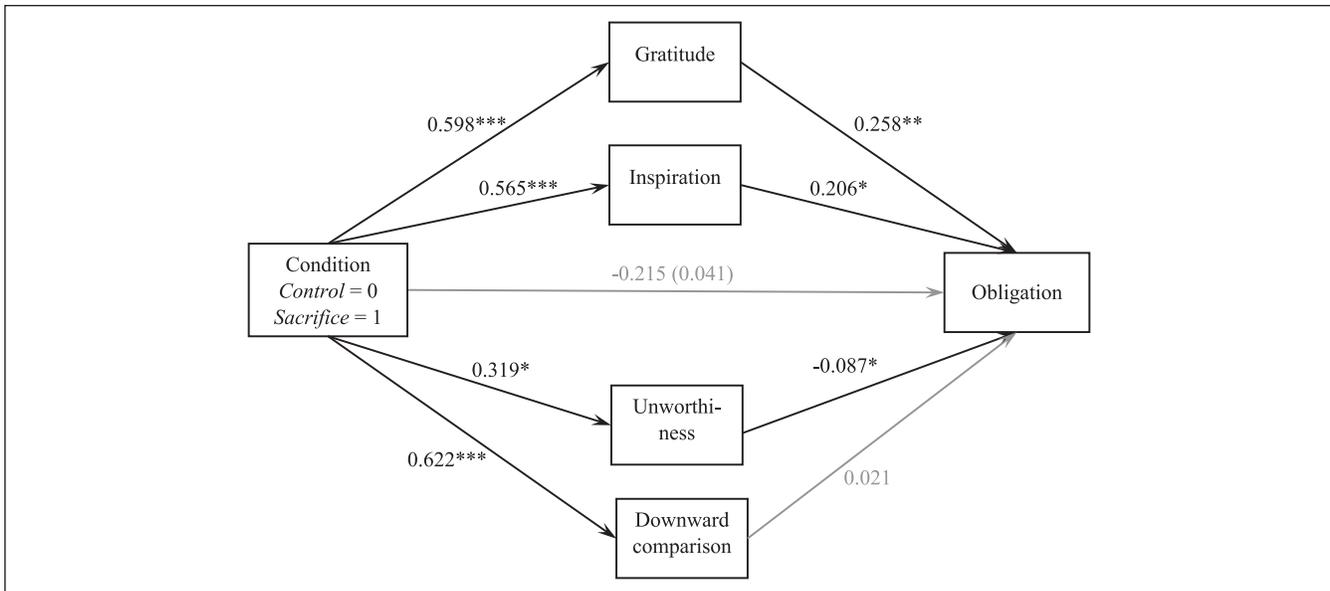


Figure 8. Summary of mediation model, Study 4, $n = 400$; the total effect (in brackets) was not significant, nor was the direct effect: effect estimate = -0.215 , $p = .098$. The indirect effect via gratitude was significant, indirect effect = 0.154 , 95% CIs = $[0.044, 0.318]$. Please see the main text for other indirect effects. CI = confidence interval.

* $p < .05$. *** $p < .001$.

potential mediator (for consistency with Study 3) even though the indirect effect of condition on obligation via unworthiness on its own was marginal (indirect effect = 0.017 , 95% CIs = $[-0.008, 0.077]$).

Consistent with previous studies, there was an indirect effect of condition on obligation via gratitude (indirect effect = 0.154 , 95% CIs = $[0.044, 0.318]$). There was also an indirect effect via inspiration (indirect effect = 0.116 , 95% CIs = $[0.026, 0.258]$). The indirect effect via unworthiness was marginally significant and negative (indirect effect = -0.028 , 95% CIs = $[-0.091, -0.000]$). The indirect effect via downward comparison was not significant (indirect effect = 0.013 , 95% CIs = $[-0.055, 0.085]$). There is therefore suggestive evidence that the measure of unworthiness accounts for some (though not all) of the suppressing effect that reflecting on past sacrifices has on the sense of obligation towards future generations (consistent with Study 3).¹¹

Exploratory path analysis. We also preregistered analyses of an additional outcome measure: willingness to sacrifice for the environment. Participants did not report significantly greater willingness to sacrifice for the environment in the sacrifices condition ($M = 5.34$, $SD = 1.37$) than in the control condition, $M = 5.16$, $SD = 1.52$; $t(398) = 1.234$, $p = .218$. Nor did they report significantly greater willingness to sacrifice in general in this condition, sacrifice: $M = 5.19$, $SD = 1.41$; control: $M = 5.00$, $SD = 1.50$; $t(398) = 1.287$,

$p = .199$. However, willingness to sacrifice for the environment was positively correlated with obligation towards future generations, $r(398) = .728$, $p < .001$, consistent with previous studies. Therefore, we undertook additional, exploratory path analyses to test the pathway from condition, through gratitude, then obligation, to willingness to sacrifice for the environment, as in previous studies. To make these exploratory tests consistent with those conducted in Study 3, we also included potential suppressor paths. The serial mediation model we conducted is illustrated in Figure 9. The indirect path from condition \rightarrow gratitude \rightarrow obligation \rightarrow environmental attitudes was again significant, point estimate = 0.182 , $p < .001$. However, the indirect path from condition \rightarrow unworthiness \rightarrow pro-environmental measures was not, indirect effect = -0.017 , $p = .195$.¹²

Discussion

In this study, reflecting on a specific sacrifice (WWII) made by previous generations did not increase the sense of obligation towards future generations overall; unlike the prior studies, this effect was not remotely significant. This may have been because participants were constrained to think only of one specific type of sacrifice (WWII efforts) in this study, whereas in previous studies they could freely choose which kind of sacrifice to reflect on. However, just as in Study 3, we found evidence for an indirect effect on the sense of obligation towards future generations (and pro-environmental

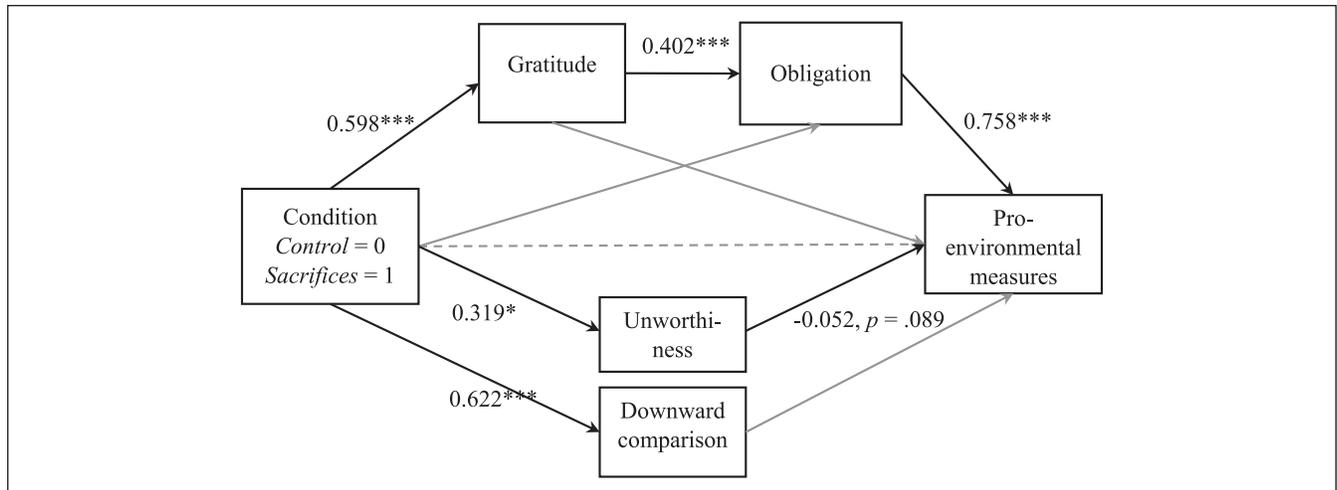


Figure 9. Summary of path model, Study 4; $n = 400$. Non-significant paths are in gray. The total effect of condition on willingness to sacrifice was not significant, nor was the direct effect. The indirect path from condition \rightarrow gratitude \rightarrow obligation \rightarrow willingness to sacrifice was significant, point estimate = 0.182, $p < .001$. The fit of this path model was quite poor, RMSEA = .324, 95% CIs = [0.288, 0.362]. RMSEA = root mean square error of approximation; CI = confidence interval.

* $p < .01$. *** $p < .001$.

outcomes) via the experience of gratitude. We also found evidence consistent with an independent mediating pathway, via a sense of inspiration. There were also some negative effects of reflecting on past generations' sacrifices. Consistent with Study 3, reflecting on the sacrifices of past generations caused participants to feel unworthy of those sacrifices. It also caused downward social comparison relative to those previous generations (a novel finding). This sense of unworthiness appeared marginally to suppress the effects of reflecting on past generations' sacrifices on the environmental outcome measures and a sense of obligation towards future generations.

Summarizing the Results: Within-Paper Meta-Analyses

The key question in the present studies was whether reflecting on sacrifices made by members of past generations can increase a sense of obligation towards future generations. While we found consistent evidence of this effect, its size varied somewhat across the studies. The effect was larger in Study 1 and the replication of Study 1, than in the other studies; Studies 1 and its replication also had smaller sample sizes than the later studies. To summarize the overall effect, we performed a mini-meta analysis on the six experimental studies we conducted: Studies 1 to 4 in the main manuscript, as well as the replication of Study 1, and one additional study in which we included two variations on the sacrifices writing task (summarized in the Supplemental Materials as Supplemental Study S2). The results of the fixed-effects meta-analysis are summarized in Figure 10 (Goh, Hall, & Rosenthal, 2016). The meta-analytic effect size was Cohen's $d = .250$, 95% CIs [0.153, 0.348], $Z = 5.015$, $p < .001$; a

small-medium effect. The excel spreadsheet used to conduct this analysis is provided on the OSF: osf.io/fb3zc.

In all studies we also included pro-environmental attitude or motivation measures. These were primarily measures of personal willingness to sacrifice for the environment (Replication of Study 1, Studies 2-4, Supplemental Studies S1 and S2) but we also examined more generic pro-environmental attitudes and beliefs in some studies as well (Studies 1 and 2). And in all studies—except the replication of Study 1—we failed to find a direct effect of the sacrifices manipulation on these outcome measures. However, we nonetheless conducted a mini-meta-analysis of the effect of the sacrifices manipulation on these pro-environmental measures. This mini-meta-analysis includes all the experimental studies we conducted as part of this project: Studies 1 to 4 in the main manuscript, the replication of Study 1, an additional study in which we included two variations on the sacrifices writing task (summarized in Supplemental Materials as Study S2), and a final additional study in which we did not include an “obligation” measure, but which included pro-environmental measures (summarized in Supplemental Materials as Study S1). The result of this fixed-effects meta-analysis is summarized in Figure 11. The meta-analytic effect size was Cohen's $d = 0.100$, 95% CIs = [0.011, 0.190], $Z = 2.193$, $p = .028$; a very small but significant effect. The excel spreadsheet used to conduct this analysis is provided on the OSF: osf.io/sfyhn

General Discussion

The problem of climate change raises questions for psychologists about how best to motivate moral concern for future generations. A fundamental problem is how to encourage people to sacrifice time and resources for future individuals with

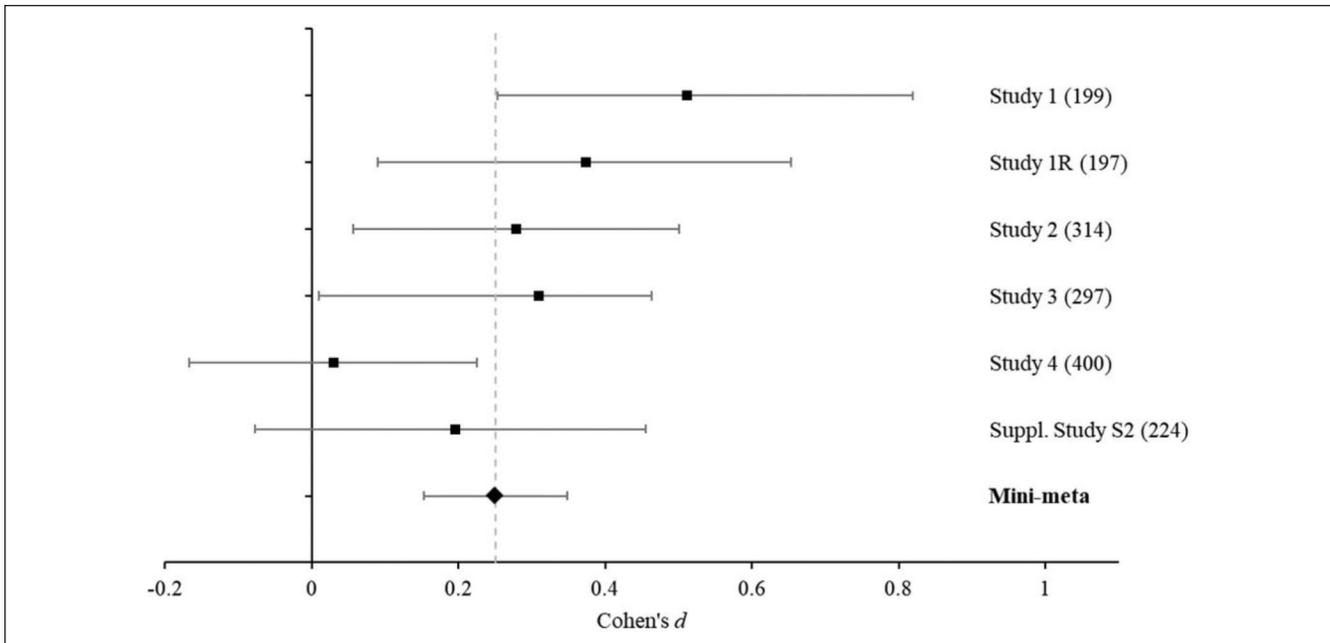


Figure 10. Meta-analytic summary of the effect of the experimental manipulation (control vs. sacrifices) on a sense of obligation toward future generations. The x-axis indicates Cohen's *d* in each study, and error bars represent 95% confidence intervals. The diamond and dotted line represent the overall meta-analytic effect size. The number in brackets after each study label indicates the *N* for these analyses. In Studies 2 and 3, only the control and past sacrifices conditions were compared. Full details about Study 1R (the replication of Study 1) and Supplemental Study S2 are reported in the Supplemental Materials. The spreadsheet used to create this figure is available at osf.io/dex8q.

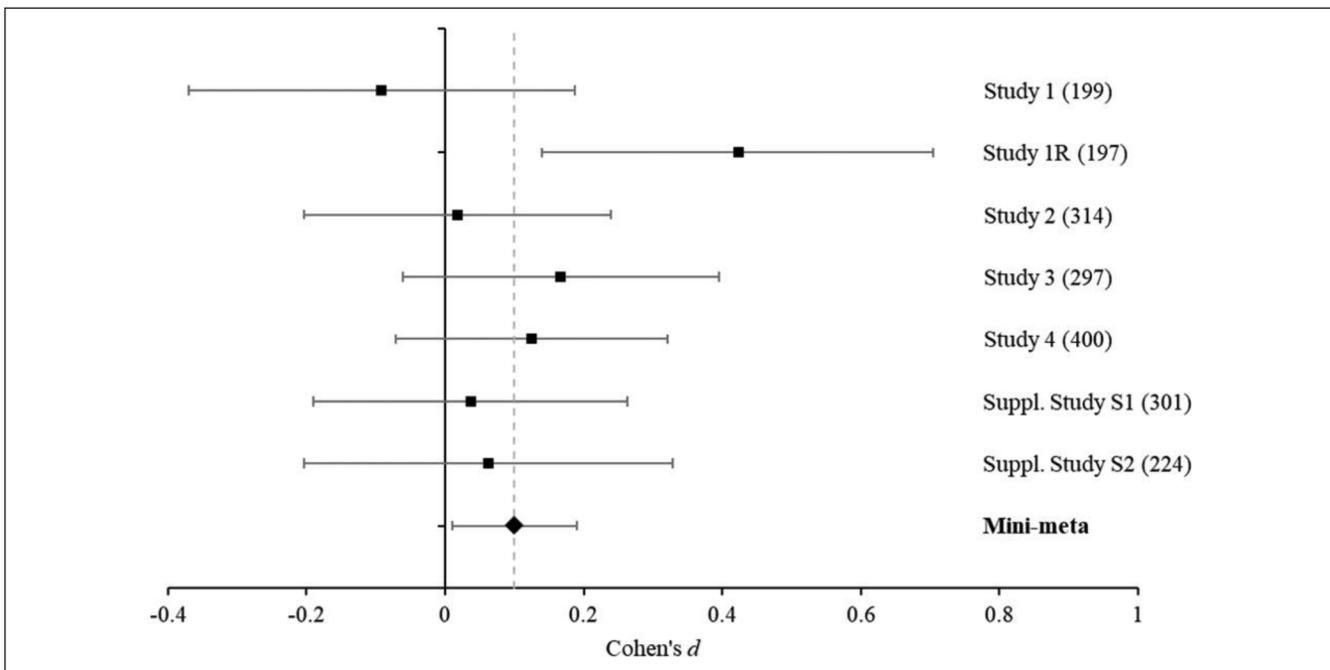


Figure 11. Meta-analytic summary of the effect of the experimental manipulation (control vs. sacrifices) on pro-environmental measures. The x-axis indicates Cohen's *d* in each study, and error bars represent 95% confidence intervals. The diamond and dotted line represent the overall meta-analytic effect size. The number in brackets after each study label indicates the *N* for these analyses. In Studies 2, 3, and S1, only the control and past sacrifices conditions were compared. Full details about Study 1R (the replication of Study 1) and Supplemental Studies S1 and S2 are reported in the Supplemental Materials. The spreadsheet used to create this figure is available at <https://osf.io/qjgn4/>.

whom they may never meet or interact; in essence, how to generate a sense of moral obligation towards future people.

The novel question we raise in this article was whether asking people simply to reflect on the actual sacrifices of past generations may be sufficient to prompt a greater sense of obligation towards future generations. Overall, the results of our studies provide some encouragement for this idea. Reflecting on past generations' sacrifices significantly increased a sense of moral obligation towards future generations, relative to control conditions, in four out of six experimental studies. The meta-analytic summary suggests that the effect of the sacrifices manipulation (relative to control) on a sense of moral obligation was small-to-medium. A Cohen's d of 0.25 means that when choosing a person at random from the experimental group, there is a 57% chance that their sense of moral obligation will be higher than that of a person chosen at random from the control group (the "probability of superiority," Ruscio & Mullen, 2012). For comparison, the relationship between political orientation and environmental concern was around $d = 0.70$ in the present studies, which translates into a probability of superiority of 69%.

Our results are less sanguine as to whether this sense of obligation would translate to pro-environmental behavior. In all the experimental studies reported here, we measured a pro-environmental attitude or motivation variable that was more proximal to environmental behavior than the obligation measure: perceptions of the importance of environmental issues (Study 1), willingness to sacrifice for the environment (replication of Study 1, Study 3, Study 4), and willingness to give up income for an environmental reason (Study 2). In only one of these studies did we find a direct effect of condition (i.e., reflecting on sacrifices vs. control) on such measures (the replication of Study 1), notwithstanding their robust correlation with the sense of obligation to future generations. The meta-analytic summary we conducted suggests that there was a very small overall effect of the sacrifices manipulation (relative to control) on our environmental attitude and motivation measures. An effect of this sort, though very small, could conceivably have a meaningful effect when aggregated over many people, or if it were cumulative across repeat instantiations (which is unknown from our studies). However, its small size presents a significant practical limitation to pursuing further similar studies of this phenomenon: Detecting the effect (Cohen's $d = 0.10$) with a power of 80% in a between-subjects study (with $\alpha = .05$) would require a sample size of over 3,000 participants. And, although we did not measure pro-environmental behaviors directly, the lack of any sizable effect on pro-environmental attitudes and motivations suggests that there would not be a significant effect on behavior either. Thus, while our research suggests that it is possible to increase a sense of obligation towards future generations, it does not greatly encourage the idea that reflecting on past generations' sacrifices will spur environmental action.

Despite the discouraging effects on pro-environmental attitudes or motivations, it is worth keeping in mind that our

manipulations were very brief, and they were also recall-based, which may limit their overall effectiveness. Meta-analytic research has indicated that recall-based gratitude inductions are significantly weaker than in vivo inductions, in which participants actually experience something that makes them grateful (Ma, Tunney, & Ferguson, 2017). It is not readily apparent whether in vivo methods could be used to induce reflection on past generations' sacrifices, since our reflection task is an inherently recollective procedure. Nevertheless, it may well be possible to strengthen the manipulation in various other ways, that is, through more vivid presentation modalities, which might have concomitant effects on dependent variables of interest.

Mediators and Suppressors

In each study, we found consistent support for the indirect pathway from reflecting on sacrifices to increased obligation via a sense of gratitude. This is consistent with the suggestion by Markowitz (2012) that gratitude links the past and the present and triggers a pro-social desire to "reciprocate"—in this case, paying it forward to future generations. We also found support for an additional positive mediator in Study 4—being inspired by prior generations' sacrifices—which positively predicted a sense of obligation to future generations. This result suggests that reflecting on past generations' sacrifices may also activate prosocial norms that in turn influence perceptions of obligation. We did not measure this possibility directly, however, so it would need further study to be confirmed (see Wade-Benzoni, 2002, for prior support for this idea).

However, even though reflecting on past generations' sacrifices can sometimes increase a sense of obligation towards future generations, it also initiates psychological processes that partially suppress this effect. In particular, it appears to increase the feeling of being unworthy of past generations' sacrifices. Theoretically, this suggests that considering the moral example of others may not have uniformly positive effects, even if it is capable of eliciting gratitude and inspiration (cf. Klein & O'Brien, 2017; Monin, Sawyer, & Marquez, 2008). Practically, this finding suggests caution in relying on rhetorical appeals to the monumental sacrifices of past generations when trying to inspire efforts to address climate change (e.g., McKibben, 2016); such appeals may have positive effects, but the very extremity of the sacrifices they invoke may also curb their motivational effectiveness. Furthermore, as we found in Study 3, the overall levels of gratitude and obligation produced by reflecting on sacrifices were no greater than those produced by a more generic gratitude induction.

In Study 2, we included an additional condition in which participants reflected on ways in which past generations *failed* to sacrifice. This condition indirectly increased a sense of obligation to future generations (though not directly). This result cannot be explained by gratitude, as gratitude was

lower in this condition relative to a control condition. Instead, we tentatively interpret it as indicating that participants may have been attempting to compensate for prior generations' lack of sacrifice. A complementary interpretation is that participants felt a sense of regret for past generations' lack of sacrifice, which in turn generated a sense of obligation to future obligations. Regret reflects the appraisal that, in hindsight, "another course of action would have been (even) better" (Schwarz, 2000, pp. 435-436), and research in environmental economics on "retrospective assessment" suggests that deliberately cultivating a sense of regret for past generations' decisions may enhance the imperative to provision for future generations (Anderson et al., 2012). Accordingly, regret would be a useful measure to include in future research.¹³

An important caveat to our results concerns the susceptibility of the current studies to an explanation via demand effects. One might worry that there was a certain transparency in the design of our studies, such that participants could readily intuit what they were "supposed" to say, having been first prompted to reflect on past generations' sacrifices. We concur that this limitation cannot fully be rebutted without having asked participants directly for their impression of the expected responses. However, there are features of our data that limit the overall appeal of a demand-based explanation. Perhaps the most convincing factor is that we did not find an effect of our manipulation on measures that had the most semantic and conceptual similarity to the experimental prompt (e.g., "We as a group should be ready to endure hardships now in order to improve the environment for the future," Study 3). These measures made a direct reference to sacrifices and hardships, and so the link to the prior experimental manipulation should have been clearer for these measures than for the obligation measures. However, the fact that responses were not elevated for these arguably most transparent items suggests that demand may not have been principally responsible for the observed effects on our main obligation measures.

Conclusion

How and why moral concern for future generations arises is a topic that warrants increased attention. The present studies document one means of elevating a sense of obligation towards future generations, but they also show that this does not greatly affect pro-environmental attitudes and motivations. Given the relevance of such obligations for activating public responses on a range of issues, including but not limited to, climate change, an important goal is to achieve a better collective understanding of the nature of moral concern for future generations, as well as more effective means of eliciting it.

Authors' Note

Additional supplemental materials found on the OSF: <https://osf.io/a32cs/>.

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Notes

1. Markowitz directly replicated Wade-Benzoni's Study 2 methods (on gasoline prices), but found no effect of the original gas tax framing manipulation, notwithstanding the use of a much larger sample size than in the original experiment ($N = 505$ across three conditions vs. $N = 69$ across four conditions). Markowitz also included a control condition and found that behavior was (nonsignificantly) more generous in the control condition as compared with either of the two experimental conditions. And, in a subsequent study with a similar design ($N = 305$), participants in the control condition indicated a willingness to provide (nonsignificantly) higher donations to the National Parks Service than participants in either experimental condition.
2. We also conducted a correlational pilot study to investigate the relationship between sacrifices, gratitude, and obligation; see Supplemental Materials.
3. See Supplemental Materials for full wording and exploratory factor analysis of all items, as well as ratings of these policies in terms of how future-oriented their intended benefits were perceived to be.
4. For all studies, we repeated our main analyses while including demographic variables (i.e., in this study, age, political orientation, gender, and strength of religiosity) as covariates. These analyses were not preregistered. Unless otherwise noted, the same results hold. More information about these analyses is provided in the Supplemental Materials.
5. In this study we also asked participants to complete a six-item measure of perceived control over environmentally relevant behavior (Gifford & Comeau, 2011). There was no effect of condition on this variable (see Supplemental Materials for further information).
6. Willingness to give up income may of course be predicted by many additional variables, including participants' actual income. Unfortunately, we did not assess participants' income and therefore cannot test the role that this variable plays in predicting willingness, nor whether it interacts with our sacrifices manipulation.
7. The full list of emotions and descriptive statistics for them are provided in the Supplemental Materials.
8. After reverse-scoring the first item, this three-item scale had poor reliability ($\alpha = .527$). We therefore created a scale only from the second two items ($\alpha = .877$).

9. We also fitted this same model, adding age, gender, political orientation, and strength of religiosity as predictors of obligation and the pro-environmental measures. In this path model, the indirect effect from condition → gratitude → obligation → pro-environmental measures was still significant, indirect effect = 0.183, $p < .001$. However, the path from condition → unworthiness → pro-environmental measures was no longer significant, indirect effect = -0.065 , $p = .092$. The fit of this model was not as good, RMSEA = .11, 95% CIs = [0.076, 0.144]. Both these models are available at <https://osf.io/2bm7w/>.
10. We preregistered that “the aim of the filler items is to mask the reference to the environment somewhat, however, we may also observe a relationship between obligation and the filler items (i.e., although we are primarily interested in sacrifices for the environment, we don’t expect that the relationship between a sense of obligation towards future generations and a willingness to sacrifice for them is limited to the environmental domain).”
11. When including age, gender, political orientation, and strength of religiosity as covariates, the indirect effect via unworthiness was not significant, indirect effect = -0.020 , 95% CIs = $[-0.078, 0.003]$. The other effects remained unchanged.
12. These results also held when including age, gender, political orientation, and strength of religiosity as covariates. Code for replicating the results both with and without covariates is provided on the OSF: osf.io/423wa.
13. We thank an anonymous reviewer for this suggestion, and a different anonymous reviewer for pointing us towards the “retrospective assessment” literature.

Supplemental Material

Supplemental material is available online with this article.

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