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Analysis

Does Pricing Nature Reduce Monetary Support for Conservation?: Evidence From Donation Behavior in an Online Experiment

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ABSTRACT

Ecosystem services valuation attempts to determine the monetary value of the benefits provided by the natural world. Prior research has shown that making monetary value salient fosters self-interested behavior in experimental settings (Vohs, Mead, and Goode, 2006), reduces the intrinsic value ascribed to pro-social activities such as volunteering (Pfeffer and DeVoe, 2009), and reduces the efficacy of environmentally relevant interventions (Steinhorst, Klockner, and Matthies, 2015). These findings raise concern that ecosystem service valuation information might adversely impact individual's pro-environmental behaviors. This study uses an experimental framework to determine whether ordinary citizens' exposure to valuation information, such as one might encounter in a news article or fundraising materials, might influence an individual's contribution to a natural resource conservation fund. The study is implemented with 250 participants from across the United States. We find that participants who receive a "natural resource description plus valuation" treatment donate a statistically significant lower dollar amount of their experimental earnings on average than those who read the narrative alone. Based upon this evidence, we assert that ecosystem service valuation information has the potential to negatively impact financial support for the exact resources the information is designed to promote.

1. Introduction

The natural world passively provides the human world with services such as pollination, groundwater filtration, flood control, air quality maintenance, climate regulation, recreation, and aesthetic enjoyment. The practice of ecosystem services valuation monetizes the value of these benefits. Such methods of 'pricing nature' are aimed at ensuring that the value of environmental resources are included in decision-making processes typically dominated by economic concerns.

Although the economic valuation of natural resources is often relied upon to communicate the importance of natural resources to policy makers and the public, the practice remains controversial (Schroter et al., 2014). Critiques arise not only due to concerns about the proper methods for obtaining accurate figures (Diamond and Hausman, 1994; Hausman, 2012; Zhang and Li, 2005; Kenter et al., 2015; Klain et al., 2014; Carson et al., 2001; Portney, 1994), but also because the exercise seeks to put a price tag on resources which some deem to be incompatible with monetary value (Foster, 1997; Grove-White, 1997; Pearce, 1998; Matulis, 2014). A common concern amongst these critics is that the use of monetary value in the context of the natural world may lead to commodification of nature (Gómez-Baggethun and Ruiz-Pérez, 2011; Spash, 2015; Hahn et al., 2015) or that use of monetary incentives has the potential to crowd-out environmental norms of behavior (Neuteleers and Engelen, 2015; Rode et al., 2014; Frey et al., 1996).

Motivation crowding theory (Frey and Jegen, 2001) provides a theoretical backdrop for the concerns expressed by those regarding economic valuation of natural resources as problematic. The theory has been and continues to be applied within many domains. For example, motivation crowding was explored in Gneezy and Rustichini's (2000) study comparing the incidence of late pick-ups of children from day care facilities under a monetary fine condition and a social norm condition. Rather than acting to decrease the frequency of late pick-up, implementation of the fine was found instead to increase the behavior. Falk and Szech (2013) found that participants in a laboratory experiment were more likely to trade a mouse's life for money when the transaction was performed through the use of a market. Both authors interpret their findings as a crowding out of social norms by the introduction of market mechanisms. Research has also demonstrated deleterious effects of motivation crowding on environmental norms of behavior. Frey et al.

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(1996) found that offering monetary compensation for the siting of a noxious facility reduced public acceptance of the facility. The explanation for such an effect is that receiving monetary compensation reduces an individual's ability to receive satisfaction from acting altruistically.

Some of the work related to motivation crowding in the environmental domain asserts that activation of self-interest can sometimes play a role. Steinhorst et al. (2015) found that underscoring cost savings (self-interest condition) in an electricity use study created significantly less positive spillover in pro-environmental behavior than did an appeal to environmental values. Calling attention to self-interested decision-making is thought to degrade societal norms important to the promotion of the public good. Research suggests that monetization exercises prompting individuals to act as consumers, in which self-interest is the norm, rather than as citizens, create conditions for the encouragement of competitive rather than cooperative behavior (Ovaskainen and Kniivila, 2005).

Although we find the possibility of crowding out compelling in the context of economic valuation, we assert that there may be an alternative explanation. We suggest that economic valuation may serve simply as a monetary prime, especially when the information is encountered by individuals unfamiliar with economic valuation of the non-market value of natural resources. If individuals are unaccustomed to processing such economic valuation information, the dollar values provided are likely to act primarily as monetary priming. Priming occurs when exposure to a particular prompt provokes a later response due to a non-conscious memory from the first event. Priming with money has been shown to reduce other-regarding behavior in an experimental setting (Pfeffer and DeVoe, 2009; Reutner and Wänke, 2013), implying that priming effects could adversely affect pro-environmental behaviors even in the absence of tension arising from the monetization or commodification of environmental resources.

Prior research has shown that making economic value salient reduces the intrinsic value ascribed to such things as leisure time (DeVoe and House, 2012) and volunteering (Pfeffer and DeVoe, 2009). Whillans and Dunn (2015) provide evidence that these effects can occur in the context of environmentally relevant behavior as well. The researchers determined that hourly workers are less likely to engage in pro-environmental behavior because hourly payment creates a "time is money" frame. Even when economic value is not explicitly addressed, priming with money in an experimental setting can cause participants to be less other-regarding (Bauer et al., 2012; Reutner and Wänke, 2013; Zhou et al., 2009; Vohs, 2015; Caruso et al., 2013; Vohs et al., 2006). Self-interest activation and the triggering of financial norms have been identified as potential sources of these decreases in pro-social behavior (Stern, 2000; Whillans and Dunn, 2015).

Considering the potential adverse effects of monetary priming on pro-social behavior, we conduct an economic experiment designed to examine the effects of exposure to monetization information on a specific pro-social behavior, donations to conservation organizations. We focus specifically on the effect such information has on a layperson, an individual unfamiliar with the use of economic valuation of natural resources. Participants in our study are United States residents, randomly assigned to receive either a control (no economic valuation information) or a treatment (economic valuation information) resource description. We offer participants the opportunity to donate any amount from their experimental compensation to one or all of three nationally-recognized conservation organizations, the Sierra Club, the Nature Conservancy, and the United States National Park Service.[1] Based upon our review of the literature, we expect that those in the experimental condition (valuation information) will donate fewer dollars on average than those in the control group. Although we do not explicitly alter any underlying incentive system to simulate crowding-out conditions, we expect that donation behavior will nonetheless diminish simply as a result of monetary priming.

2. Methods

2.1. Overview

This experiment was conducted in August 2014 and approved by the Institutional Review Board at the PI's home institution. All experimental work for this project was conducted online through the use of Amazon Mechanical Turk (MTurk) and Qualtrics (Provo, UT). Participants were randomly assigned to either a control condition (no valuation information) or a treatment condition (valuation information) to ensure that no systematic difference exists between participants in the two groups. In the control condition, participants receive a qualitative description of the abundant natural resources inherent to the United States' public lands and the benefits the lands provide. The treatment includes similarly worded text as well as monetary values associated with many of the natural features described.

After reading the text, participants were given the opportunity to donate any portion of their experimental earnings to a conservation organization before completing a survey.

After making their donation decision, participants completed an attitudinal and demographic survey. Much of the survey was designed as part of a separate research program. The survey portion of interest to this work queried participants about their market attitudes, environmental attitudes, financial stress, attitudes toward national parks and visitation history, willingness to be taxed to support national parks, and finally, a few demographic questions.

2.2. Participant Recruitment

United States residents of at least 18 years of age were recruited through the use of Amazon Mechanical Turk (MTurk), an online labor market in which hirers post small work tasks, Human Intelligence Tasks (HITs). Workers find tasks they like on a voluntary basis, accomplish them, and are paid from the hirer's account automatically upon completion. Companies use this to out-source various online tasks to the global online market. Behavioral researchers currently use this technology in order to reach a much more representative sample than a single regional university in a single country. MTurk provides other benefits as well (Mason and Suri, 2011), including speed, a high number of respondents, no duplication, and automated and tracked payments. Prior research has demonstrated that MTurk is comparable to in-person experiments for behavioral research (Crump et al., 2013) and a number of priming experiments have been successfully implemented using the platform (Vohs, 2015). Participants were offered $20.20 for their participation.[2] The study was estimated to take participants no >30 min to complete.

2.3. Experimental Procedure

After accepting the work through the MTurk site, participants were directed to an online survey hosted by Qualtrics. The first page of the survey explained the basic expectations of the study and allowed individuals the opportunity to exit if they did not wish to participate. Only participants providing informed consent are included in our sample.

[1] The target natural resource organizations did not sponsor this research, nor do the researchers have any relationship with the organizations. Organizations were chosen to provide a variety of options to participants.

[2] A two-part payment approach was chosen to provide for variability in participant behavior within the experiment. The MTurk site requires requesters to list an amount of compensation in association with a task when first creating the HIT. The study was advertised as paying $0.20, yet made it clear in the visible short description that the true payoff was $20.20. This approach was necessary to allow for participants to donate a portion of their earnings. Participants are told that the $20.20 is theirs simply for participating in the study. They are not made aware of the opportunity to donate until the donation is solicited.

Table 1
Natural resource description excerpts by experimental condition.

Control
Beyond supporting wildlife, the nation's mountains, prairies, forests, coasts, deserts, lakes, estuaries, and rivers also provide essential ecosystem services that benefit all Americans. Public lands contain important watersheds that supply drinking water to millions[a].
Treatment
Beyond supporting wildlife, the nation's mountains, prairies, forests, coasts, deserts, lakes, estuaries, and rivers also provide cost-saving and essential ecosystem services that benefit all Americans. Public lands contain important watersheds that filter and supply drinking water to millions[a]. New York City saved as much as $8 billion on new waste water treatment by investing $1.5 billion in the purchase of land around the reservoirs upstate. This land purifies the water supply for free[a].

[a] Information and excerpts from public materials provided online by WWF, The Value of Wetlands, http://wwf.panda.org/about_our_earth/about_freshwater/intro/value/.

Upon agreeing to participate, individuals next received a narrative description of the natural resource characteristics of and the benefits provided by the United States' vast public lands. Participants were randomly assigned to receive either the control or treatment versions of the narrative. The control text consists of the standard description. The treatment includes similar text as well as additional information related to the economic valuation of the natural resources. This additional economic valuation information serves as the study's experimental manipulation. The variable *treatment* is used as the primary explanatory variable in our analyses. Participants are assigned a value of 0 for this variable if they received the control text, while those who received the treatment text are assigned a value of 1 for this variable. Table 1 provides an example of the differences between the control and treatment narratives.

Effort was made to keep the texts as similar as possible while also ensuring that the valuation information felt natural within the treatment text. The information and amounts used are based upon and excerpted from a variety of publically available websites and reports in order to replicate the materials that an individual would encounter in fundraising materials and news sources. For a full version of the control and treatment resource descriptions, please see Appendix A. Attention to the resource description was monitored through the use of a page timer, invisible to the participant. Participants who spent <15 s on the resource description page were automatically rejected from the study.[3] For more information on quality control measures used to guard against data contamination in the study, please see Appendix C.

After the participants demonstrated that they were finished reading the resource description they were presented with the following message:

We are offering you a total of $20.20 in compensation for your participation today. Before you move on to the survey portion of the study, we are allowing you the chance to donate a portion of your earnings to the Sierra Club, The Nature Conservancy, and/or the United States National Park Service. All money donated by you today will go directly to the group or groups of your choice.

Please indicate the amount of money you would like to donate, if any, to each of the groups and how much money you would like to keep. The total cannot exceed $20. Once you submit these amounts, they cannot be changed.

The primary dependent variables of this work are derived based upon participant's answers to this question. When the participant was finished making their donation decision, they were directed to answer multiple sets of attitudinal and demographic questions.

Upon adequate completion of the study, the participant received a confirmation code to enter into a box on the MTurk site to confirm their satisfactory participation. This code allowed only those completing the study to be compensated for their participation. Participants were paid their experimental earnings ($20.20) less the amount they chose to contribute to the natural resource organizations.

2.4. Manipulation Check

Previous research suggests that priming with money works through self-interest activation. To evaluate self-interest activation, we use a multi-question scale measuring feelings of obligation to unknown others and moral causes established by Goff and Noblet (2017) using questions developed or inspired by Einolf (2010). We expect that participants receiving the treatment narrative will become less concerned about the well-being of others. The questions used to measure feelings of obligation to unknown others are reported in Table 2. Participants were asked to report how obligated they would feel to engage in each of the six behaviors on a scale from 0 to 100, with 0 indicating no obligation and 100 indicating a lot of obligation. An individual's obligation score is calculated as an average of their responses to these questions.

2.5. Willingness to be Taxed

Participants are asked to report how many additional dollars, between $0 and $100, they would be willing to be taxed per year to protect the natural resources on public lands. Although we expect to find a positive relationship between donation behavior and willingness to be taxed under conditions of self-interest activation, we recognize the possibility that some people may consider taxation a more appropriate method for financially supporting public lands. The inclusion of this willingness to be taxed question helps us to understand whether providing ecosystem services information, often expressed within the resource narratives as cost-savings to municipalities and public entities, might cause participants to shift support from private donation to taxation, viewing these two as substitutes and the latter as more appropriate given the circumstances. This allows us to rule out substitution as the cause of any decrease in donation amount as a result of the treatment.

2.6. Control Variables

Control variables for this study include ecological worldview, prior donation behavior, park visitation history, attitudes toward national parks, willingness to forgo personal financial gain for the good of others, age, gender, educational attainment, employment status, and financial stress. Ecological worldview is measured using half of a two-factor scale developed by Cordano et al. (2003) as an abbreviated New Ecological Paradigm Scale (Dunlap, 2008; Dunlap et al., 2000). This variable is of particular importance to the current study because its measurement aids in understanding whether exposure to the valuation information has any effect on underlying environmental attitudes. A decrease in participants' scores on this scale may be indicative of crowding out rather than self-interest activation induced via money priming. Descriptions of all control variables can be found in Appendix B, Tables B1–B3.

3. Results

Two hundred and fifty participants were recruited from across the United States.[4] Participants in our sample are more likely to be young, male and educated than is the general public. The sample is 63% male, with an average age of 31 years ($SD = 9.43$). Nearly half of participants have at least a bachelor's degree (48%) and 11% possess a graduate degree. No statistically significant difference is found between the control

[3] Informal pre-testing demonstrated that the narrative would take at minimum 1 min to read without reading for content or understanding. As participants were asked to carefully read the description, 15 s is a very generous cut-off.

[4] In the course of recruiting 250 participants to successfully complete the survey experiment, 67 potential participants were rejected due to the quality control measures described in Appendix C. This means that in all, 317 participants began the survey while the HIT was available on MTurk.

Table 2
Measuring obligation to unknown others and/or moral causes.

How much obligation would you feel …
1. to volunteer for a local soup kitchen, food pantry, or homeless shelter?
2. to vote for a law that would help others in your local community worse off than you but would increase your taxes?
3. to pay more for your health care so that everyone in the nation had access to health care?
4. to volunteer time in support of a global social cause that is important to you?
5. to stop buying a product if you found out that the company was not paying a fair wage to its workers in a poor, developing country?
6. to support government-sponsored international disaster relief even if it would mean spending less money on your own nation's citizens?

and treatment groups on basic demographics including gender identification, age, educational attainment and employment status, or on national park visitation or attitudes.

We begin our analysis in Section 3.1 with the results of a manipulation check using participants' scores on the scale of feelings of obligation to distant others. In Section 3.2, we present average treatment effects as determined by between-subjects two-sample *t*-tests and Wilcoxon two-sample tests. We follow this with two-sample tests of proportions to examine differences in the proportion of participants donating a non-zero amount across the treatment and control groups. In Section 3.3, we report on the results of a Tobit model explaining donation amount as a function of the treatment and a set of control variables. In Section 3.4, we assess participants' willingness to be taxed to support public lands and parks. Based upon the large prior literature connecting priming with money to reductions in pro-social behaviors, we employ one-tail tests in determining the statistical significance of the effect of our treatment on donation behavior. Due to the need for a high index of suspicion, the use of relatively small sample sizes per treatment, and the exploratory nature of this work, we use an alpha of 0.1 as the cutoff for statistical significance, but report exact *p*-values throughout. We also include effect sizes to ensure that practical significance is considered.

3.1. Evidence for Construct Validity of the Experimental Treatment

In order to determine the construct validity of the experimental treatment, we assess obligation scores and compare the scores across experimental groups. If the treatment is being taken up by participants we expect that those receiving the treatment would be likely to report lower feelings of obligation than those in the control as a result of self-interest activation.

Results from our multi-question scale measuring obligation to others ($\alpha = 0.81$) support self-interest activation as a result of the treatment. Those receiving the treatment score lower on average on our measure of obligation to unknown others ($M = 50.63$, $SD = 19.64$) than those receiving the control narrative, ($M = 54.87$, $SD = 18.64$), $t(248) = 1.75$, $p = 0.08$, $d = 0.22$. This is bolstered by the fact that the treatment did not universally affect feelings of obligation; it merely affected obligations to those with greater psychological distance. Obligation to close friends and family was unaffected by the treatment, $t(239) = 0.62$, $p = 0.54$, $d = 0.08$. This test was performed assuming unequal variances (Levene's test: $F(1, 248) = 3.01$, $p = 0.08$). These results suggest that, on average, the treatment activated self-interest as demonstrated by a reduction in feelings of obligation to unknown others.

3.2. Assessing Average Treatment Effects

On average, participants in the control group donated \$2.20 ($SD = 3.34$) and participants in the treatment group donated \$1.53 ($SD = 2.57$). This difference was found to be statistically significant, $t(230) = 1.76$, $p = 0.04$, one-tailed, $d = 0.22$, 90% CI [0.04, 1.29], assuming unequal variances across control and treatment (Levene's test: $F(1, 248) = 4.15$, $p = 0.04$). As donation amount was not normally distributed ($Wn = 0.68$, $p < 0.0001$), non-parametric testing was also performed using the Wilcoxon two-sample test. This test also suggests that there is a statistically significant difference between donation amounts in the control and treatment groups, $Z = 1.66$, $p = 0.05$. Note that all tests of significance in respect to the treatment effect are performed as one-tailed tests due to preexisting hypotheses regarding directionality of the effect as supported by review of the literature.

We also test whether the proportion of participants donating a non-zero amount is the same across treatment groups. The percentage of participants donating was ten percentage points higher in the control group than in the treatment group (48.4% vs. 38.1%, $p = 0.05$, one-tailed, $h = 0.21$, 90% CI [0.0004, 0.21]).

To determine whether it is the propensity to donate, the size of the donation, or both driving our results, a third test of differences in donation behavior was conducted by comparing donations in the treatment and control groups only for those who chose to donate. Restricting our sample to only those who donated, we find that those in the control group donated a total of \$4.54 on average ($SD = 3.53$), while those in the treatment group donated only \$4.01 on average ($SD = 2.72$). However, this difference was not found to be statistically significant in an independent samples *t*-test using unequal variance (Levene's test: $F(1, 106) = 2.99$, $p = 0.09$), $t(105) = 0.87$, $p = 0.19$, one-tailed, $d = 0.16$. Although it is not statistically significant, effect size suggests that it is nearing the threshold for a small degree of practical significance.

In the next two sections, we further break down the analysis by natural resource organization and gender identity. Although there are no significant differences in the demographic composition of the control and treatment groups, we investigate differences in reaction to the treatment across these sub-groups. Participant donation by experimental group and conservation organization are summarized in Table 3 along with the relevant test statistics.

3.2.1. Analysis by Natural Resource Organization

When analyzing donation behavior by natural resource organization, significant treatment effect differences are found. Participants in the treatment group gave half as much to the Nature Conservancy ($M = \$0.42$, $SD = 0.96$) as those in the control group ($M = \$0.84$, $SD = 1.59$), $t(201) = 2.55$, $p = 0.006$, one-tailed, $d = 0.32$. This test assumed unequal variances (Levene's test: $F(1, 248) = 12.98$, $p = 0.0004$). A similar effect was found for the Sierra Club. Participants receiving the control narrative gave \$0.53 on average ($SD = 1.07$), while those receiving the treatment gave only \$0.31 ($SD = 0.74$), $t(218) = 1.87$, $p = 0.031$, one-tailed, $d = 0.24$. Levene's test ($F(1, 247) = 7.85$, $p = 0.005$) demonstrated that equal variances across the control and treatment could not be assumed. No significant effect was found for the United States National Park Service average donation amount across conditions (control: $M = \$0.82$, $SD = 1.64$; treatment: $M = \$0.80$, $SD = 1.63$), $t(248) = 0.10$, $p = 0.46$, one-tailed, $d = 0.01$.

We also analyze donation behavior through an assessment of the proportion of participants in each group donating a non-zero amount. We find that proportion of participants donating is affected by the presence of the valuation information for the Sierra Club and The Nature Conservancy, but that no significant difference in propensity to donate exists for the USNPS. This finding is similar to that described for donation amount. These results are summarized in Table 3.

Finally, we examine differences in average donation to each of the resource organizations across experimental groups, restricting our sample to those who donated a non-zero amount. A statistically significant difference between the treatment group ($M = \$1.10$, $SD = 1.29$) and the control group ($M = \$1.74$, $SD = 1.91$), $t(103) = 2.07$, $p = 0.021$, one-tailed, $d = 0.34$, is found only for donations to the Nature Conservancy. This analysis was conducted assuming unequal variances across experimental groups due to results of a Levene's test, $F(1, 77) = 3.74$, $p = 0.06$.

Table 3
Mean donation and proportion donating by organization and experimental condition.

	$\bar{x}_C$	$\bar{x}_T$	t	$\bar{p}_C$	$\bar{p}_T$	z
All organizations	$2.20	$1.53	1.76**	0.484	0.381	1.64**
	(0.30)	(0.23)		(0.045)	(0.043)	
Nature Conservancy	$0.84	$0.42	2.55***	0.379	0.254	2.13**
	(0.14)	(0.09)		(0.044)	(0.039)	
Sierra Club	$0.53	$0.31	1.87**	0.315	0.214	1.80**
	(0.10)	(0.07)		(0.042)	(0.037)	
USNPS	$0.82	$0.80	0.10	0.395	0.333	1.02
	(0.15)	(0.15)		(0.044)	(0.042)	

Standard errors are reported in parentheses.
** Statistically significant at $\alpha = 0.05$, one-tailed.
*** Statistically significant at $\alpha = 0.01$, one-tailed.

3.2.2. Analysis by Gender Identity

We had no a priori expectations regarding the relationship between gender and treatment effect. However, research demonstrates that females are more selfless, at least in the context of controlled laboratory experiments (Eckel and Grossman, 1998) and may consider environmental behavior a stronger part of personal identity than men (Costa Pinto et al., 2014; Yates et al., 2015). As it is suggested that underlying attitudes can affect the results of priming studies (Vohs, 2015), we also assess the treatment effect separately across gender identity. While males are significantly influenced by the dollar sign priming, $t(121) = 2.35$, $p = 0.01$, one-tailed, $d = 0.37$, the behavior of participants identifying as female appears to, overall, be unaffected, $t(90) = 0.11$, $p = 0.46$, one-tailed, $d = 0.02$. Equal variances across experimental groups could not be assumed for male participants (Levene's test: $F(1, 156) = 10.95$, $p = 0.001$). This pattern is also observed when using proportion of subjects donating as the dependent variable. For those identifying as non-female, 46.9% in the control group donate some non-zero amount while only 33.8% of those receiving the experimental treatment donate ($p = 0.05$, one-tailed, $h = 0.27$). For those identifying as female, 51.2% of those in the control group donate, while 44.9% of those in the treatment group donate. Although a difference is observed, it is not found to be statistically significant ($p = 0.27$, one-tailed, $h = 0.13$). Gender differences in responding to a prime have been previously noted in the environmental literature. Costa Pinto et al. (2014) noted that men increased sustainable consumption when social identity was salient, where women exhibited more sustainable consumption behavior when personal identity was primed.

However, these overall results by gender identity obscure important differences at the level of the natural resource organization. We find that males in the treatment group donate fewer dollars than males in the control group for all resource organizations. Females, however, respond differently to the treatment across organization. Treatment group participants identifying as female donate fewer dollars to the Nature Conservancy than their control group peers ($0.60 versus $1.22, $t(90) = 1.78$, $p = 0.04$, one-tailed, $d = 0.37$), but no statistically significant difference is found for donations to the Sierra Club. Analyzing donations to the USNPS by female participants, we find evidence that the treatment acts to increase rather than decrease donations to this organization, $t(90) = -2.06$, $p = 0.04$, $d = -0.43$. This suggests that the mean donation is *lower* for the control group than for the treatment group for female participants and that the difference is of moderate practical significance. Table 4 summarizes treatment effects by gender identity as well as natural resource organization.

Similar results are found through analysis of proportion donating a non-zero amount. These results are provided in Table 5.

For males, propensity to donate is lower in the treatment group for donations to the Nature Conservancy and the USNPS. For females, propensity to donate is lower in the treatment groups for donations to the Nature Conservancy and the Sierra Club, but not for the USNPS. For this latter group, our study comes close to finding a significant positive difference in proportion of the treatment group participants donating a non-zero amount to the USNPS. This reinforces the findings from our analysis of donation amounts.

Table 4
Mean donation by organization, experimental condition and gender identity.

	$\bar{x}_{C,\ male}$	$\bar{x}_{T,\ male}$	t	$\bar{x}_{C,\ female}$	$\bar{x}_{T,\ female}$	t
All organizations	$2.16	$1.11	2.35**	$2.27	$2.19	0.11
	(0.40)	(0.21)		(0.45)	(0.48)	
Nature Conservancy	$0.64	$0.30	2.07**	$1.22	$0.60	1.78**
	(0.14)	(0.08)		(0.31)	(0.17)	
Sierra Club	$0.52	$0.27	1.76**	$0.55	$0.38	0.86
	(0.12)	(0.07)		(0.15)	(0.13)	
USNPS	$0.99	$0.54	1.80**	$0.50	$1.21	−2.16[1]
	(0.21)	(0.13)		(0.13)	(0.31)	

Standard errors are reported in parentheses.
**statistically significant at $\alpha = 0.05$, one-tailed, ***statistically significant at $\alpha = 0.01$, one-tailed, [1]statistically significant at $\alpha = 0.05$, two-tailed, but analysis was conducted as upper-tail test ($p = 0.9788$, one-tailed (upper)).

3.3. Tobit Model of Donation Amount

As additional support for the effects isolated in Section 3.2, we also use a Tobit model with censoring at $0 and $20 to confirm the relationship between donation amount and the effect of the treatment. Four models are constructed, differing only by the dependent variable of interest (all organizations, Sierra Club, Nature Conservancy, and the USNPS). All models include an exhaustive set of control variables, including an interaction term for treatment condition and gender motivated by the effect of gender on treatment take-up previously discussed. Table 6 presents the model results in respect to the treatment, the interaction term, and female gender identity. For a full table of results including all control variables, see Table B.5 in Appendix B. In all four models, the coefficient on the *treatment* variable, an indicator variable equal to 1 for participants who receive the treatment narrative, is negative and statistically significant.

3.4. Treatment Effect for Taxes

Although we expect that the amount an individual donates is positively correlated with their willingness to be taxed, we also acknowledge that one explanation for a reduction in donations in this study could be that participants treat donation and taxation as substitutes. It is possible that participants might perceive taxation as a more appropriate way to raise money for national parks and public lands than private donation. In order to determine whether individuals who received the treatment and chose not to donate went on to report a higher willingness to be taxed, we create an OLS model of willingness to be taxed. The model includes a treatment indicator variable and an interaction between treatment and whether or not the individual donated a non-zero amount. We find that the coefficients on the treatment and the interaction term are not statistically significant ($p = 0.84$ and $p = 0.18$) (see Table B.6 in Appendix B for full results). Additional analysis confirms the results of the OLS model. Using a between subjects two-sample *t*-test, we assess willingness to be taxed for those participants who chose not to donate. We find no statistically significant difference in willingness to be taxed for those in the treatment ($M = $36.53, $SD = 30.91$) and those in the control ($M = $38.50, $SD = 29.62$), $t(137) = 0.38$, $p = 0.70$, $d = 0.06$, so substitution is not a likely reason for the decrease we see in donations in the treatment group.

4. Discussion

We find that participants who receive a treatment narrative donate fewer dollars to the natural resource organizations on average than those within the control group. We find a similar result through analysis of the proportion of each group donating any non-zero amount to any of

Table 5
Proportion donating a non-zero amount by organization, experimental condition and gender identity.

	$\bar{p}_{C,\ male}$	$\bar{p}_{T,\ male}$	z	$\bar{p}_{C,\ female}$	$\bar{p}_{T,\ female}$	z
All organizations	0.47	0.34	1.68**	0.51	0.45	0.60
	(0.06)	(0.05)		(0.08)	(0.07)	
Nature conservancy	0.33	0.23	1.39*	0.47	0.29	1.78**
	(0.05)	(0.05)		(0.08)	(0.06)	
Sierra club	0.30	0.21	1.28	0.35	0.22	1.32*
	(0.05)	(0.05)		(0.07)	(0.06)	
USNPS	0.42	0.27	1.94**	0.35	0.43	−0.78
	(0.05)	(0.05)		(0.07)	(0.07)	

Standard errors are reported in parentheses.
* Statistically significant at $\alpha = 0.10$, one-tailed.
** Statistically significant at $\alpha = 0.05$, one-tailed.

the three resource organizations. The findings are bolstered by the results of a Tobit model of donation amount. Together, these outcomes provide general evidence to support the hypothesis that exposure to valuation information has the potential to adversely impact the environmentally relevant donation behavior of non-specialists. Furthermore, differences on average in feelings of moral obligation between the control and the treatment groups suggest that this effect could be a result of self-interest activation, rather than a distaste for affixing price tags to natural resources.

In our study, variation in the treatment effect by natural resource organization was found. Specifically, the experimental treatment affected donation amount and propensity to donate for donations to the Sierra Club and the Nature Conservancy. No statistically significant difference was found for the United States National Park Service. The reason for the lack of a statistically significant difference was isolated by repeating the analysis by gender identity. Males in the treatment group were found to donate fewer dollars to the USNPS than males in the control. The effect was the opposite for females; women receiving the treatment narrative donated more to the USNPS than did those receiving the control narrative. This caused an overall null change at the level of the organization.

4.1. Preservation: Private or Public

Because communicating ecosystem services values often involves reporting the estimated cost savings enjoyed by municipalities or other government entities, we consider the possibility that ascription of responsibility (AR) could contribute to participants' propensity to donate, where donation is considered to be a pro-social and pro-environmental behavior (Kaiser and Shimoda, 1999; Van Liere and Dunlap, 1978). First, individuals may be influenced to ascribe responsibility for paying for the protection of natural resources to those who they see as directly benefiting from the resources. Those in the treatment group may be more likely to ascribe responsibility to public entities, such as city and federal governments, if they believe that conservation "pays" for itself through the reported cost savings. If this is the case, we should see that participants in the treatment are less willing to donate than those in the control. Indeed, we find that participants in the treatment do donate fewer dollars and donate at a lower rate; thus, ascription of responsibility is an alternative explanation for the effect we find.

Participants may also not be willing to donate if they ascribe responsibility to all citizens, instead preferring that the funds be raised through taxation. In this case, we would expect to see that participants substitute donations with increases in willingness to pay in taxes. We do not find increased willingness to be taxed in those who chose not to donate as a function of experimental group, suggesting that the reduction we find in donation as a result of the treatment cannot be explained by a substitution effect. Instead, this finding suggests that individuals act consistently across the two pro-social behaviors. This positive spillover effect between one pro-social or pro-environmental behavior and another has been found in prior work (Dickerson et al., 1992; Thøgersen, 2004; Thøgersen and Noblet, 2012), while others have found evidence instead of a licensing effect (Tiefenbeck et al., 2013) or a cleansing effect (Brañas-Garza et al., 2013; Sachdeva et al., 2009). No evidence of moral balancing is observed in the present study.

The private versus public distinction arises also in the analysis of donations to the United States National Park Service. Participants identifying as female reacted differently to the treatment than did their male counterparts, donating more to the USNPS as result of the valuation information. This finding suggests that, at least for our female participants, exposure to the monetary value of the natural resources caused increases in desire to support this governmental organization, while reducing support for the two private organizations (Sierra Club and The Nature Conservancy). A preference to donate to the USNPS fits with our hypothesis that the treatment may cause individuals to ascribe responsibility to government bodies, but we are unsure of why this effect would be found only for female participants. We see further investigation into the variation in reaction to our prime based upon resource organization and gender identity as fruitful areas for future research.

Table 6
Tobit models to confirm results of between subjects tests of mean donation.

	Tobit estimates of the effect of the treatment on donation behavior Censoring at $0 and $20 Dependent variable: donation amount ($)			
	All organizations	Sierra club	Nature conservancy	USNPS
Treatment	−2.15**	−0.879**	−1.10**	−1.21**
	(1.03)	(0.519)	(0.599)	(0.657)
(Treatment) ∗ (Female)	2.45	0.337	−0.140	3.02***
	(1.67)	(0.832)	(0.952)	(1.09)
Female	0.273	0.264	1.05	−0.947
	(1.17)	(0.566)	(0.650)	(0.769)
No. of Obs.	246	245	246	246
LR Chi-Sq.	25.6*	29.4**	37.2**	23.2*

Standard errors are reported in parentheses.
*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively.

4.2. Economic Valuation Information Activates Self-interest

The findings of our study mirror the previously discussed work in psychology and economics which have shown that viewing dollar signs, calculating wages or handling money can cause individuals to become increasingly self-interested and less other-regarding. Participants' obligation to unknown others scores suggest that the valuation information in the treatment condition is sufficient to activate self-interest. Due to probabilistic equivalence and similarities across sociodemographic factors, there is no reason to believe there was any difference in moral obligation prior to study commencement. However, individuals reading the economic valuation text reported less obligation to engage in behaviors such as volunteering at a soup kitchen or volunteering in support of global social causes.

These higher financial stress scores in the treatment group are coupled with lower scores on our index of feelings of obligation to others, demonstrating that the prime reduced other-regarding feelings and increased self-interest. We followed up the analysis of mean scores with a mediation analysis using scores on the obligation to unknown others scale as mediator between the treatment and subsequent donation amount. The analysis provides some support for partial mediation (11.5%), bias-corrected bootstrap 90% CI for $\beta_{indirect}$ [−0.2268, −0.0044]. This suggests that self-interest activation plays at least a minor role in the effect of the treatment.

Also important to the interpretation of our findings is that despite the effect on donation behavior, exposure to the valuation information does not appear to alter attitudes toward the natural world. As a whole, participants' pro-ecological worldview, as measured by *balance*,

were not different between the control ($M = 72.13$, $SD = 17.78$) and the treatment group ($M = 72.15$, $SD = 18.39$), $t(248) = -0.008$, $p = 0.99$, $d = -0.00098$. This suggests that although their attitudes toward the natural world were not altered, their donation behavior was. This supports our hypothesis that the monetary value in the text is acting as a prime, rather than crowding out pro-environmental norms. If environmental norms were being replaced with market norms as a result of the treatment, we would have expected to see a lower score on our measure of ecological worldview within the treatment group.

4.3. Implications

In an experimental setting, our participants were less likely to donate to natural resource organizations and donated fewer dollars on average when they read about the dollar value of the United States' ecosystem services. But the implications of these findings are currently unclear for a number of reasons, including generalizability to expert decision-makers, generalizability to other environmentally relevant behaviors, uncertainty about the duration of the treatment effect, and uncertainty about the potential effects of specific experimental design features.

First, participants in the experiment were by design ordinary citizens likely unaccustomed to processing economic valuation information. Our hypothesis was that without a frame of reference for comprehending the valuation information, individuals would be subject only to the non-conscious effects of reminders of money. This means that the results are likely not generalizable to a population who regularly creates or evaluates economic valuation information. As such, the potential for decreases in pro-social or environmental behavior may be limited to those who are not accustomed to receiving information about the dollar value of natural resources. Future studies should repeat this work with expert participants who should be skilled at interpreting economic valuation information.

The current work focused on only one environmentally relevant behavior, donation to conservation organizations. It is possible that our findings are not applicable to other behaviors such as volunteering or engaging in political activity for the purposes of improving environmental outcomes. It is suggested that future work broaden the scope of this research to include these other types of behaviors.

The true implications of our findings are uncertain also because there is no indication of how long the treatment effect lasts. In our study, the economic valuation information was introduced immediately prior to the donation ask, providing very little time delay between the monetary values and the pro-social behavior of interest. In contrast, perhaps the delay between the prime and the taxation question is to blame for the lack of an effect on willingness to be taxed. Future work should seek to determine how long the treatment effect lasts by varying the spacing between the monetary values and the request for donation or other environmental behavior.

A further roadblock to understanding the full implications of the current work is that only one set of dollar amounts is used in this study. The results of this experiment may be sensitive to the particular dollar amounts presented or perhaps, as suggested by a reviewer, the dollar amounts seemed unusual to participants or made their wealth seem miniscule in comparison. Future work should randomize the dollar amounts received by individuals in the treatment group to provide a test of sensitivity to the particular dollar values. Additionally, if the numbers reported in the study differ in important ways from those previously known to participants, this may affect donation behavior. If the dollar values differ significantly from participants' firmly held beliefs that natural resources are “priceless” then participants may reject the valuation information altogether, though this is unlikely considering the results reported within.

Beyond the inclusion of the dollar values in the treatment text, there may important subtle differences in the content of the experimental texts that could affect participant behavior. Although the two narratives were written to be as similar as possible, while still sounding natural given their content, we cannot rule out that the accumulation of small differences may make the treatment text less compelling.

Finally, we cannot be certain that the results we received through the use of Amazon Mechanical Turk (MTurk) are generalizable to alternative settings. It is possible that different results may be found when studying in-person donation behavior, donation requests coming directly from the resource organization, and cash rather than online transactions. We suggest that future studies investigate the effects of such alternative experimental designs.

5. Conclusion

The expectations of our research differed from that which might follow from standard economic theory in which price is thought to encode valuable information about a good or service. Within this framework, the large dollar values provided to participants within the experimental treatment group would be expected to cause increases in dollars donated to the natural resource organizations. Price often serves as a signal of quality and, thus, a high price might be assumed to be associated with a good of exceptional value. However, given the literature on self-interest activation due to priming and framing effects, we expected that the dollar amounts would instead serve to trigger financial values and self-interest (Stern, 2000; Pfeffer & DeVoe, 2009). We anticipated that participants receiving the valuation information would donate fewer dollars on average to the natural resource organizations than those in the control group.

Through our study of United States residents, this research provides evidence for a negative effect of valuation information on the donation behavior of individuals in the context of natural resource conservation. The potential that a money priming effect was mediated by self-interest activation to produce the experimental results must be considered, particularly in light of the differences in measures of feelings of moral obligation and the results of mediation analysis. Our findings also support that crowding-out is not a necessary condition to create decreases in donations; monetary priming is sufficient. This is supported by the null change in environmental attitudes in response to the treatment.

Our results also reject that participants substitute private donations with increased willingness to be taxed, increasing the robustness of our findings. The effect found implicates exposure to ecosystem services valuation information in reductions in donations to support the ecosystems. Although we assert that it is possible that this effect exists only for individuals with infrequent exposure to valuation information, essentially, those for whom valuation information lacks the appropriate context, we call for restraint in the dissemination of valuation figures. Given our results, this restraint appears to be especially warranted for fundraising conducted online for private, natural resource conservation organizations.

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Appendices

Appendices A - C can be found online at http://dx.doi.org/10.1016/j.ecolecon.2017.05.027.

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