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The Influence of Religiously and Scientifically Framed Messages on Agreement with Water Use Restrictions

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Abstract: Recent droughts in 2012 and 2013 have increased attention to water use issues in the United States. Cities, government agencies, and environmental nonprofit organizations use scientifically-framed messages to advocate for water conservation. In addition, some religious organizations use messages based on religious teachings to promote water conservation. Because approximately 70% of the U.S. public reports some religious affiliation, it is important to investigate the influence of religious and scientific messages for promoting water conservation. I report the results of an experiment that examines how scientifically- and religiously-framed messages influence attitudes about water use restrictions. I found that Christians were no more or less likely to agree with a policy calling for water use restrictions than non-Christians and non-religious people. However, a Christian religious message negatively influenced agreement with water use restrictions in the entire sample—and in a Christian subsample. Results suggest that religiously framed messages may not increase environmental concern.

Keywords: water use restrictions; structural equation modeling; messaging; religion; science; drought

1. Introduction

Three percent of all water on earth is fresh water, but two percent is locked in glacial ice. Approximately one percent of water on earth is available for use [1], and over seven billion people need this water to live. At the peak of the 2012 drought in the United States, approximately 81% of the U.S. was classified as abnormally dry by the United States Geological Survey, and 67% of the U.S. was in a moderate to extreme drought. As of August 2013, conditions had improved but nearly 50% of the U.S. still remained in a moderate to extreme drought [2].

Water policy issues have increased in salience in recent years. Municipal water suppliers in drought-stricken areas in Texas, Nebraska, and Oklahoma continue to impose water use restrictions. Meanwhile, cities such as Durham, North Carolina, and New York City have passed water usage laws that will be implemented in the event of future droughts. The media continues to publish stories of lost crops due to water shortages [3,4]. In addition, government agencies such as the U.S. Environmental Protection Agency [5] and the Bureau of Reclamation's WaterSMART Program [6] promote water conservation to protect the environment and to insure adequate water supplies. Farm groups such as the American Farm Bureau Federation promote water conservation for agricultural use [7]. Environmental nonprofit organizations advocate for responsible development, management, and use of water [8]), as well as safe water and sanitation in the U.S. and around the world [9]. Many of these organizations call for the public to conserve water, typically using messages grounded in scientific language to make the case for water conservation.

Although less well-known, some religious organizations use messages based on religious teachings and moral tenets to promote water conservation (e.g., [10–12]). Some evidence suggests that religious people have negative attitudes about science [13–16] and are less influenced by scientific arguments than scientific communicators expect [17,18]. Given that approximately 80% of the U.S. public reports some religious affiliation, it is important to investigate the performance of religious and scientific messages for promoting water conservation. In this study, I report the results of an experiment that examines how messages about water conservation by scientific and religious leaders influence attitudes about policies that restrict water use.

2. Religion, Science and Environmental Concern

Dunlap and Jones ([19], p. 485) define environmental concern as “the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or indicate a willingness to contribute personally to their solution”. People may demonstrate concern for environmental problems in many different ways: using less water or driving less, donating money to environmental organizations, or supporting policy recommendations or taxation programs to protect the environment. Many studies investigate the influence of social, demographic, and political factors, as well as value orientations, on environmental concern. Socio-demographic and political characteristics only explain a small amount of variation in environmental concern, while value orientations typically explain much more. People who report high levels of environmental concern are more likely to be female, younger, highly educated, and identify as liberals and/or Democrats (e.g., [19–21]). Much of the values research suggests that empathy [22], altruism [23–26], and other self-transcendent values (e.g., benevolence, pro-environmental values) [23,24] are important drivers of environmental concern.

A few studies find that proximity to, or experience with, environmental hazards is positively associated with environmental concern (e.g., [27,28]), while others do not (e.g., [29,30]). Spence, Poortinga, Butler and Pigeon [28] report that experience with previous flooding is positively associated with concern about climate change, while Whitmarsh [29] reports no relationship between flood experiences and climate change concern. Similarly, Brody, Zahran, Vedlitz, and Grover [27] find that living in coastal regions is positively associated with concern about climate change, while Zahran, Brody, Grover, and Vedlitz [30] report a negative relationship between living in coastal regions and support for climate change policies. Thus, this group of studies is equivocal about the association of proximity to local environmental problems and environmental concern, even though none of the studies consider drought.

The influence of socio-demographic factors and value orientations on environmental concern is well documented. Socio-demographic factors account for only a small amount of variation in environmental concern, and while value measures do add explanatory power to models, it is important to investigate the influence of other likely predictors of environmental concern. Next, I discuss how religion and science influence environmental concern.

2.1. Religion and Scientific Knowledge

Most studies investigating the relationship between religion and environmental concern use data obtained from a majority Christian, U.S.-based population and therefore consider religious characteristics related to Christian affiliation. Many studies provide evidence that Christian religious affiliation, beliefs, and behaviors are negatively related to environmental concern [31–37]. A few studies report simultaneous positive and negative relationships between Christian affiliation and environmental concern (e.g., [38–40]). Other studies find no relationship between religion and environmental concern (e.g., [41–43]). In addition to religious affiliation, investigators also study the influence of religiosity on environmental concern. In general, church attendance, the most widely used measure of religiosity, is not related to environmental concern (e.g., [33,38,39,41–43]). However, Sherkat and Ellison [44] report a positive relationship, while Kanagy and Nelson [35] report a negative relationship.

Since the mid-1990s some investigators have described a “greening of Christianity” in the United States (e.g., [45,46]). Advocates of a greener Christianity point to the many individual religious organizations (e.g., Franciscan Sisters of Mary, United Methodist Church, and Pax Christi) that have formally adopted the Earth Charter and to the rise of the Evangelical Environmental Network [47] and Southern Baptist Environment and Climate Initiative [48]. However, a recent study using nationally representative data from 2010 finds little evidence that Christians in the U.S. general public are green [31], suggesting that these efforts to evangelize about the environment have not been widely effective. Key factors that may influence the diffusion of a greener Christianity include messenger characteristics (e.g., local church leader versus a national leader), the mode of delivery (e.g., a church bulletin, a sermon, etc.), and the content of the message itself (e.g., passages from the Bible). This experimental study examines how religious content in a message about water may influence support for a fictional policy to conserve water.

Several studies report that accurate scientific knowledge of environmental problems is a key determinant in behavioral intentions to act or participate in developing effective solutions to environmental problems [49–51]. Hamilton, Cutler and Schaefer [52] find that people who know more about science in general are more concerned about species loss and rising sea levels. However, Finger [53] finds that apart from protest actions, knowledge has very limited effects on environmental concern, while Iwata [54] reports that knowledge about the environment and science does not influence environmental attitudes and behavior. In this study, I also examine how scientific content in a message about water may influence people’s support for a policy to conserve water.

2.2. Message Framing

Investigations about the influence of messaging often focus on how information is framed. Because agreement with, or acceptance of, information is a necessary step to motivate action on an issue [55], it is important to understand how different message frames influence opinions and action. Much of the literature on framing environmental messages tests the influence of positive (e.g., benefits of action) and negative (e.g., losses due to inaction) frames. Several studies report that positive frames, which emphasize the social benefits of action, generally produce desirable environmental behaviors and attitudes [56,57]. In general, negative frames that emphasize undesirable environmental consequences because of inaction produce both desirable [58] and undesirable [56,59] environmental behaviors and attitudes. In a study of message framing to determine consumers’ likelihood of buying chemical and pesticide free food, Gifford and Bernard [59] find that frames which emphasize the negative consequences of non-organic agriculture, lead to a boomerang effect that results in lower intention to purchase organic food by people who generally trust food safety procedures.

In addition to positive and negative frames, Gifford and Comeau [60] report that motivational frames describing the benefits of a specific strategy are more effective at engaging people in climate change issues than sacrificial frames. Counterclaims are effective tools in weakening the influence of original claims about climate change [61] and clean energy [62]. Dardis [55] reports that when subjects are primed with information about sources that are potentially to blame for environmental problems, they are more likely to support a fictional environmental policy.

Chaiken and Maheswaran [63] report that receiving information from a credible source has a positive impact on the acceptance of the information. These credible sources may be religious leaders for people for whom religion is salient and secular sources for non-religious people. Matous, Todo and Mojo [64] report that farmers are more likely to adopt conservation practices when there is religious and ethnic agreement between farmers and extension agents providing conservation practice advice. Other evidence supports the notion of an Islamic environmental ethic with religious teachings significantly influencing the adoption of conservation techniques in Egypt [65] and Indonesia [66]. The point is not whether the information is factual; instead according to the elite cues hypothesis, people seek, and act on, information from sources they already trust, including the media and political elites [67]. This suggests that environmental messages using religious terms may be effective in

enhancing environmental concern in people who are religious. However, for the non-religious, these messages may fall on deaf ears because of the boomerang effect observed by Gifford and Bernard [61].

2.3. Water Conservation

This study uses an experimental manipulation to test the influence of messages using religious and scientific framing to determine support for a fictional water use restriction policy. The group of studies described earlier emphasizes concern about general environmental problems, whereas this study focuses on water conservation as a more specific subset of environmental concern. A few studies focus on factors that influence attitudes about water conservation and some findings are consistent with those reported in the wider environmental concern literature. Education [68] and liberal political ideology [69] relate positively to acceptance of water use restrictions. However, contrary to the general environmental concern literature, at least one study reports that age is positively related to acceptance of water use restrictions [69]. Home ownership is also used as a predictor in studies about attitudes about water conservation, and here the evidence is equivocal. Randolph and Troy [70] report no difference in attitudes about water restrictions between home owners and renters, while Gilg and Barr [69] report that home owners are among the most committed to conserving water.

Other studies consider the influence of information seeking on water conservation attitudes [71,72]. People who actively seek out information about water conservation, and then pay attention to that information, are more likely to report intention to conserve water, although the effects are weak [71]. The effects may be weak because the information is presented using framing techniques that do not motivate people to action. However, the effects are stronger in people with pro-environmental values and who have a history of pro-environmental behaviors [72], pointing to the possibility that environmental values moderate the relationship between seeking information and behavioral intentions to conserve water. In fact, Trumbo and O'Keefe [72] suggest that pro-environmental messages might be most effective when they align with preexisting values and behaviors. In addition, people may readily process and act on messages from sources that they already trust, such as religious and scientific leaders (i.e., the elite cues hypothesis). I use religious and scientific messages about water conservation to test the following hypotheses suggested by the preceding discussion.

Following previous studies that report a negative relationship between Christian religious affiliation and environmental concern (e.g., [31–33]), I expect that Christian affiliation will negatively predict agreement with a proposed water use restriction policy (Hypothesis 1). In addition, because of the negative influence of Christianity, I expect that a religiously framed message will decrease support for a proposed water use restriction policy compared to a scientific message (H2). However, for those who report a Christian religious affiliation, the elite cues hypothesis suggests that a religious message about water conservation will increase support for a proposed water use restriction policy (H3). In the next section, I discuss the experimental methodology, the nature of the data that I collected, and the statistical techniques I used to analyze the data.

3. Methods

3.1. Experimental Design

The study is a simple, online messaging experiment with a single manipulation and two conditions. The message emphasizes the importance of water conservation; one condition uses a religious framing, and the other uses a scientific framing. After providing their consent to participate, subjects answered a series of questions about their level of worry about six environmental problems. Subjects then answered three questions about their willingness to change their lifestyle or pay higher taxes or prices to protect the environment. Next, subjects read one of two randomized messages about water conservation and then two paragraphs describing a fictional water use restriction policy. Subjects then answered one question about their level of agreement with the policy. Finally, subjects answered some basic socio-demographic and political identity questions.

3.2. Sample

I recruited subjects for this study via Amazon Mechanical Turk, which allows “requesters” (such as myself) to solicit “workers” to complete “Human Intelligence Tasks” (HIT) such as this experiment. Traditionally, experimental studies are conducted with convenience samples of university students or people who live in close proximity to a campus, which makes results not widely generalizable. Some studies report that the demographics of Amazon Mechanical Turk samples are closer to the U.S. general public than are typical university samples, with significantly lower response error [73,74]. In addition, samples from Amazon Mechanical Turk tend to be more diverse than typical Internet samples [75]. Data collected using Mechanical Turk provides a sample with a greater diversity of people in the general public than most other experiments that have been done. Thus, Amazon Mechanical Turk provides a quick, inexpensive method to collect experimental data from a wide cross-section of the general public.

I recruited subjects in May 2013 using a HIT on Amazon Mechanical Turk that advertised for subjects to answer multiple choice questions about environmental issues in the United States. I set the characteristics to allow the HIT to only be seen by U.S. residents. The sample consists of 608 subjects. I paid each subject \$0.25 to complete the survey, which took an average of 3 min and 32 s. Additional information about the sample is contained in Table 1.

Table 1. Description, coding, mean, and standard deviation of the variables used in the study.

| Variable | Coding | Mean | SD |
|--|--|------------------------------|------|
| Dependent Variable | | | |
| Agreement with proposed water use restriction policy | 1 “strongly disagree” to 5 “strongly agree” | 3.97 | 1.16 |
| Religion Indicators | | Mean | SD |
| Christian | 0 “all others” to 1 “Christian religion” | 0.34 | 0.47 |
| Non-Christian | 0 “all others” to 1 “non-Christian religion” | 0.09 | 0.29 |
| Attendance | 1 “never” to 9 “greater than once per week” | 2.62 | 2.37 |
| Political, Socio-Demographic, and Biophysical Indicators | | Mean | SD |
| Political ideology | 1 “extremely conservative” to 7 “extremely liberal” | 4.89 | 1.49 |
| Female | 0 “male” to 1 “female” | 0.35 | 0.48 |
| White | 0 “non-white” to 1 “white” | 0.83 | 0.38 |
| Age | actual age in years | 29.01 | 8.74 |
| Education | 1 “less than high school” to 5 “more than a 4 year degree” | 3.52 | 0.84 |
| Income | 1 “\$0–\$24,999” to 5 “\$100,000 and up” | 2.46 | 1.26 |
| Homeowner | 0 “renting” to 1 “owned or being bought” | 0.49 | 0.50 |
| Drought location | 0 “does not live in drought zip code” to 1 “lives in drought zip code” | 0.36 | 0.48 |
| Variable | Coding | Standardized Factor Loadings | |
| Environmental Concern Indicators | | | |
| Personal Worry | | | |
| air pollution | 1 “not at all” to 4 “a great deal” | 0.73 | |
| contamination of soil and water by toxic waste | 1 “not at all” to 4 “a great deal” | 0.80 | |
| extinction of plant and animal species | 1 “not at all” to 4 “a great deal” | 0.70 | |
| loss of tropical rain forests | 1 “not at all” to 4 “a great deal” | 0.71 | |
| pollution of drinking water | 1 “not at all” to 4 “a great deal” | 0.72 | |
| pollution of rivers, lakes, and reservoirs | 1 “not at all” to 4 “a great deal” | 0.80 | |
| urban sprawl | 1 “not at all” to 4 “a great deal” | 0.57 | |
| Willingness to Pay or Sacrifice to Protect the Environment | | | |
| pay much higher taxes | 1 “not at all willing” to 5 “very willing” | 0.86 | |
| pay much higher prices | 1 “not at all willing” to 5 “very willing” | 0.91 | |
| accept cuts in your standard of living | 1 “not at all willing” to 5 “very willing” | 0.72 | |

3.3. Dependent Variable

See Table 1 for detailed coding information for all variables. To measure agreement with a proposed water use restriction policy, I included one dependent variable which provided a scenario about water conservation. Two short paragraphs, which described the fictional policy, read:

Whether or not your city has a water use policy, imagine that the legislature in your state is proposing to enact a policy to regulate outdoor use of water on personal property during times of water scarcity, such as we have seen in the United States during the summer of 2012. This policy would require that municipalities reduce water use by 50% during times of drought.

The policy described above could mean mandatory prohibitions on outdoor uses, such as washing cars, watering lawns and gardens, and filling swimming pools so that municipalities can insure safe and reliable water for the entire population. What is your level of agreement with this proposed policy?

Subjects' answers to this question were coded as follows: "strongly disagree" = 1, "moderately disagree" = 2, "neither" = 3, "moderately agree" = 4, and "strongly agree" = 5. Eighty-percent of subjects strongly agreed or moderately agreed with the proposed policy.

3.4. Experimental Conditions

Prior to reading the text above about the proposed water use restriction policy, subjects read a brief experimental message about water conservation. Unlike most messaging experiments, these messages were not created to meet a specific message frame. Instead, they were used just as they were, likely without any framing technique in mind when they were created by the specific authority. Scientists are generally poor communicators when it comes to transmitting knowledge. Further, we can assume that religious leaders will use some appeal to a higher authority when talking about social problems. In their unaltered form, these messages are what the general public might encounter from these authorities. The goal of the study was to determine how these messages influence environmental behavior. Subjects were randomly assigned to one of two experimental conditions: religiously framed message (first below) and scientifically framed message (second below):

Many people are concerned with water as a natural resource. Some people argue that water is a gift from God. We should be concerned about rivers, lakes, oceans, and ground water. We are a part of God's creation and by working to protect the environment we can continue to create life. It is the duty of Christians to protect water.

Many people are concerned with water as a natural resource. Some people argue that 80% of the United States is facing abnormally dry conditions. Much of the southern half of the country is experiencing drought, which will not likely change soon. We can effectively reduce drought problems by creating solutions to conserve water in drought-affected areas.

3.5. Religion Predictors

To examine if Christian affiliation negatively predicts agreement with the proposed water policy, I created religious affiliation dummy variables to identify those who self-identify as Christians ("Christian"), non-Christians ("non-Christian"), and those not belonging to a religion ("reference category"). I also included a measure of religious service attendance ("never" = 1 to "greater than once per week" = 9) as the most widely used measure of religiosity [33,38,42].

3.6. Political, Socio-Demographic, and Biophysical Predictors

I also account for a range of political, socio-demographic, and biophysical characteristics that might also influence support for the proposed water use restriction policy. I measured political ideology as "extremely conservative" = 1 to "extremely liberal" = 7 [20]. I included gender ("female" = 1), race (white = 1), age (actual age in years), educational attainment ("less than high school" = 1 to "more than a 4-year degree" = 5), and annual household income ("0–\$24,999" = 1 to "\$100,000 and up" = 5) as previous studies report their influence on environmental concern [19,20]. I also included home ownership ("owned or being bought" = 1), as suggested by findings from Randolph and Troy [70]

and Gilg and Barr [69]. Finally, although the findings about the effect of proximity to environmental hazards on environmental concern are equivocal [28,30], I recoded subjects' zip codes into a dummy variable to reflect whether or not they lived in a drought location during the time of the survey [2].

3.7. Environmental Concern Indicators

I used a two-factor confirmatory factor analysis (CFA) to construct two latent measures of environmental concern, where the latent measures were allowed to correlate. In each case, items loaded onto one factor. Fit indices provide evidence of acceptable fit for the CFA model (chi-square = 150, df = 41; IFI = 0.97, RMSEA = 0.06 with 90% CI 0.05 to 0.08). In aggregate, the fit indices provide evidence of acceptable fit for the CFA model. Details of the full CFA model are included in the Supplementary Material. The full SEM models used to test the hypotheses incorporate the latent measures and corresponding indicators and the model fits presented for each model (Tables 2 and 3) are perhaps better fit indices. Six items create a “personal worry” measure (CFA factor loadings between 0.57 and 0.80), which taps into how much respondents worry about the following environmental problems: air pollution, contamination of soil and water by toxic waste, extinction of plant and animal species, loss of tropical rain forests, pollution of drinking water, and pollution of rivers, lakes and reservoirs. Three items form a “willingness to pay or sacrifice” measure (CFA factor loadings between 0.72 and 0.91), which indicates how willing respondents are to pay much higher prices to protect the environment, pay much higher taxes to protect the environment, and accept cuts in their standard of living to protect the environment.

3.8. Statistical Analysis

I used structural equation modeling (SEM) to analyze the structural relationships among the predictors, mediators, and outcome variables in the model displayed in Figure 1. All but two variables in the model are observed; “personal worry” and “willingness to pay or sacrifice” are latent measures. I used the maximum likelihood estimation option in AMOS 22.0 (IBM: Armonk, NY, USA) to replace missing values for each latent measure.



Figure 1. Analytical model.

Table 2. Standardized coefficients from structural equation model predicting agreement with proposed water policy, entire sample (N = 608).

| Independent Variables | Willingness to Pay or Sacrifice for the Environment | | | Religious Message | | | Agreement with Proposed Water Policy | | |
|--|--|----------|---------|-------------------|----------|-------|---|----------|---------|
| | Direct | Indirect | Total | Direct | Indirect | Total | Direct | Indirect | Total |
| <i>Religion Indicators</i> | | | | | | | | | |
| Christian | −0.06 | - | −0.06 | 0.07 | 0.00 | 0.07 | 0.06 | −0.02 | 0.04 |
| Non-Christian | 0.04 | - | 0.04 | 0.06 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 |
| Reference: No Religion | | | | | | | | | |
| Attendance | 0.05 | - | 0.05 | −0.02 | 0.00 | −0.02 | 0.04 | 0.01 | 0.05 |
| <i>Political and Socio-Demographic Controls</i> | | | | | | | | | |
| Political ideology | 0.23 * | - | 0.23 * | −0.01 | 0.01 | 0.00 | 0.11 * | 0.04 * | 0.15 * |
| Female | 0.03 | - | 0.03 | 0.03 | 0.00 | 0.04 | 0.03 | 0.00 | 0.03 |
| White | 0.04 | - | 0.04 | 0.05 | 0.00 | 0.05 | 0.10 * | 0.00 | 0.10 * |
| Age | −0.07 * | - | −0.07 * | −0.03 | −0.00 | −0.03 | 0.11 * | −0.01 | 0.10 * |
| Education | 0.07 * | - | 0.07 * | −0.04 | 0.00 | −0.04 | 0.05 | 0.02 * | 0.07 |
| Income | −0.02 | - | −0.02 | −0.01 | 0.00 | −0.01 | 0.01 | 0.00 | 0.01 |
| Homeowner | −0.04 | - | −0.04 | −0.00 | −0.01 | −0.01 | −0.05 | −0.01 | −0.05 |
| Drought location | 0.01 | - | 0.01 | 0.03 | 0.00 | 0.03 | 0.03 | 0.00 | 0.03 |
| <i>Environmental Concern Indicators</i> | | | | | | | | | |
| Personal Worry | 0.55 * | | 0.55 * | 0.01 | 0.03 | 0.04 | 0.10 | 0.09 * | 0.19 * |
| Willingness to Pay | - | - | - | 0.06 | 0.00 | 0.06 | 0.18 * | −0.01 * | 0.17 * |
| <i>Message</i> | | | | | | | | | |
| Religious Message | - | - | - | - | - | - | −0.13 * | - | −0.13 * |
| Reference: Scientific Message | | | | | | | | | |
| Chi-square | 223 (df = 50) | | | | | | | | |
| Goodness-of-Fit Index (GFI) | 0.96 | | | | | | | | |
| Adjusted Goodness-of-Fit Index (AGFI) | 0.90 | | | | | | | | |
| Incremental Fit Index (IFI) | 0.86 | | | | | | | | |
| Root Mean Squared Error of Approximation (RMSEA) | 0.07, $p < 0.001$ | | | | | | | | |

Notes: Missing data were imputed using the built-in maximum likelihood imputation tool of AMOS 22.0; * $p < 0.05$.

Table 3. Standardized coefficients from structural equation model predicting agreement with proposed water policy, Christian subsample (N = 206).

| Independent Variables | Willingness to Pay or Sacrifice For the Environment | | | Religious Message | | | Agreement with Proposed Water Policy | | |
|--|--|----------|---------|-------------------|----------|-------|---|----------|---------|
| | Direct | Indirect | Total | Direct | Indirect | Total | Direct | Indirect | Total |
| <i>Religion Indicators</i> | | | | | | | | | |
| Attendance | 0.02 | - | 0.02 | 0.00 | 0.00 | 0.00 | 0.13 | 0.01 | 0.13 |
| <i>Political and Socio-Demographic Controls</i> | | | | | | | | | |
| Political ideology | 0.21 * | - | 0.21 * | 0.04 | 0.01 | 0.04 | -0.02 | 0.07 * | 0.05 |
| Female | 0.03 | - | 0.03 | 0.13 | 0.00 | 0.13 | -0.08 | -0.01 | -0.09 |
| White | -0.02 | - | -0.02 | 0.02 | 0.00 | 0.02 | 0.09 | -0.01 | 0.08 |
| Age | -0.13 * | - | -0.13 * | -0.11 | -0.01 | -0.12 | 0.21 * | -0.03 | 0.18 * |
| Education | 0.13 * | - | 0.13 * | -0.10 | 0.01 | -0.10 | -0.03 | 0.06 * | 0.02 |
| Income | 0.03 | - | 0.03 | 0.10 | 0.00 | 0.10 | -0.05 | 0.00 | -0.06 |
| Homeowner | 0.00 | - | 0.00 | -0.09 | 0.00 | -0.09 | -0.02 | 0.01 | -0.01 |
| Drought location | 0.05 | - | 0.05 | 0.09 | 0.00 | 0.09 | 0.09 | 0.00 | 0.09 |
| <i>Environmental Concern Indicators</i> | | | | | | | | | |
| Personal Worry | 0.59 * | | 0.59 * | 0.01 | 0.02 | 0.03 | 0.11 | 0.19 * | 0.30 * |
| Willingness to Pay | - | - | - | 0.04 | 0.00 | 0.04 | 0.34 * | -0.01 | 0.33 * |
| <i>Message</i> | | | | | | | | | |
| Religious Message Reference: Scientific Message | - | - | - | - | - | - | -0.14 * | - | -0.14 * |
| Chi-square | 67.8 (df = 38) | | | | | | | | |
| Goodness-of-Fit Index (GFI) | 0.96 | | | | | | | | |
| Adjusted Goodness-of-Fit Index (AGFI) | 0.89 | | | | | | | | |
| Incremental Fit Index (IFI) | 0.92 | | | | | | | | |
| Root Mean Squared Error of Approximation (RMSEA) | 0.05, $p = 0.264$ | | | | | | | | |

Notes: Missing data were imputed using the built-in maximum likelihood imputation tool of AMOS 22.0; * $p < 0.05$.

I modeled the willingness to pay or sacrifice latent measure as a mediator between the religion, political, socio-demographic, biophysical, and environmental worry variables and agreement with the proposed water use restriction policy. Because the dependent variable measures agreement with a policy that requires changes in lifestyle (e.g., use less water for outdoor use, showering, laundry, etc.), the general willingness to pay or sacrifice latent measure likely intervenes between those variables that influence environmental concern (e.g., age, gender, race, religious affiliation) and agreement with the proposed policy. As designed, the experimental condition is also modeled as mediator between the water policy agreement variable and the others in the model.

To test H1 and H2 (which expect Christian affiliation and the religiously framed message to influence agreement with the proposed water use restriction policy, respectively), I ran one SEM with data from the entire sample ($N = 680$). To test H3 (which expects the religiously framed message to influence agreement with the proposed water use restriction policy among Christians), I ran one additional SEM with data from the Christian subsample ($N = 206$). This SEM is otherwise identical to the structural model used to test H1 and H2, with one exception. I removed the two religious affiliation dummy variables. Next, I discuss the results of my hypothesis tests.

4. Results

Table 2 presents the results of the SEM for the entire sample. The first hypothesis (H1) expects that Christian religious affiliation is negatively related to agreement with the water use restriction policy which states that municipalities would be required to reduce water use by 50% in times of drought. The results in Table 2 do not support H1. Christian affiliation does not influence agreement with the proposed water use restriction policy. In other words, self-identified Christians and non-religious subjects have the same level of agreement with the policy. In fact, 83.9% of Christians and 84.5% of non-Christians agree or strongly agree with the proposed water use restriction policy. These results are similar to other studies which report no relationship between religion and environmental concern [41–43]. Finally, non-Christians do not differ in their level of agreement from non-religious people.

The second hypothesis (H2) expects that the religiously framed message will decrease support overall for the proposed water use restriction policy. The results in Table 2 support H2. Subjects exposed to the religiously framed message reported lesser agreement with the proposed water restriction policy than their counterparts exposed to the scientifically framed message. This does not bode well for the promise of a greener Christianity discussed earlier. Although green Christian activism, such as the Evangelical Environmental Network [47] and Southern Baptist Environment and Climate Initiative [48] are notable, there is little evidence that Christians in the U.S. general public have embraced environmentalism [31]. The fact that a religiously framed message here reduced support for the water conservation policy is further evidence that many in the general public still see Christianity and environmentalism as less than complementary. However, my results do provide some evidence that Christians are somewhat supportive of these types of policies. Overall, 84% of all Christians agreed or strongly agreed with the proposed policy, but there was no difference between groups based on religiosity, as measured by church attendance. In fact, 81% of those who never attend, 83% of those who attend at least once a year or more, and 86% of those who attend weekly or more, agree or strongly agree with the proposed policy. However, these differences do not reach statistical significance.

Before discussing the results that pertain to the third hypothesis, I report the performance of the remaining variables in Table 2. Consistent with most environmental concern research, liberals, younger adults, and the highly educated report greater willingness to pay or sacrifice for the environment compared to their respective counterparts [19,20]. As expected, personal worry about environmental problems is the strongest predictor to willingness to pay or sacrifice for the environment. As subjects' worry about environmental problems increases, so too does their willingness to pay or sacrifice to protect the environment. No other predictors in the model explain subjects' willingness to pay or sacrifice. The middle section of Table 2, which presents the effect of predictors on the experimental message to which subjects were randomly assigned, indicates that no variables have a statistically

significant effect—as expected. Briefly, this confirms that the subjects were properly assigned to the two experimental conditions via randomization.

The final column in Table 2 reports the total effects of the predictors on agreement with the proposed water use restriction policy. The two environmental concern indicators (personal worry and willingness to pay or sacrifice) are the strongest predictors of agreement with the proposed water use restriction policy. Personal worry and willingness to pay or sacrifice for the environment positively predict agreement with the proposed water use restriction policy. Also, liberals, whites, and older adults report greater agreement with the proposed water use restriction policy than their respective counterparts. The positive effects of liberal ideology and age are similar to those found by Gilg and Barr [69].

No other predictors in the model explain subjects' agreement with the policy, including living in a drought affected area. This finding is similar to one other study that reports no relationship between flood experiences and climate change concern [29]. Several studies [27–30] report equivocal results for the association between proximity to local environmental hazards (generally flood events) and environmental concern, but none study proximity to, or experience with, drought.

Finally, the results in Table 3 allow for a test of the third hypothesis (H3). Since past research finds that people are more likely to accept information from trusted and credible sources who share similar values [63,67,72], I expected that Christians would find the religiously framed message (grounded in Christianity) to be more credible and persuasive than the scientifically framed message. Thus, H3 expects that the religiously framed message about water conservation would increase support for the proposed water use restriction policy among Christians.

Similar to the result for the entire sample, Christians exposed to the religiously framed message reported lesser agreement with the proposed policy than did Christians exposed to the scientifically framed message.

A few caveats are in order. First, I did not measure how credible or trustworthy respondents viewed the two experimental messages. Second, I did not measure how much respondents thought these messages aligned with their values. Regardless, it seems reasonable to assume that Christians would be more likely to view the religiously framed message as credible, trustworthy, and embodying their values. Thus, these results do not seem to support the findings of past research that people are more likely to accept information from sources they trust and find credible [63,67].

5. Discussion

With the prevalence of drought throughout the United States in the summers of 2012 and 2013, water policy issues have increased in salience. Municipal water suppliers, the media, government agencies, farm groups, and environmental nonprofit organizations, among others, use scientific language to convince the public of the importance of water conservation. At the same time, approximately 80% of U.S. citizens report some religious affiliation, with the vast majority being Christians. With an emerging green Christian movement in the US, it is important to determine how effective environmental messages are from religious sources at motivating people to address environmental issues. This study uses a convenience sample of subjects recruited on Amazon Mechanical Turk to compare the influence of religiously framed and scientifically framed messages on agreement with a fictional proposed water use restriction policy. If Christian religious messages are effective at increasing concern about environmental problems, they may be an important tool for Christian leaders to enhance support for addressing environmental problems in the US. However, this study only uses the message and the context of the message that can be inferred by the research subject. There is no way for the subject to identify the source of the message and therefore, I cannot make any conclusions about the potential influence of a specific religious authority. This was done intentionally. An identifiable source would have influenced reactions in addition to the message. The focus of this research was to only investigate the influence of the message on willingness to support policy.

I found that self-reported Christian affiliation does not influence agreement with the proposed water use restriction policy. In other words, Christians were no more or less likely to agree with a policy calling for water use restrictions than non-Christians and non-religious people. However, a Christian religious message negatively influenced agreement with water use restrictions in the entire sample—and in the Christian subsample. These results suggest that religiously framed messages may not significantly increase environmental concern. I close with suggestions for future experimental research in this area.

First, future experiments should continue to examine the influence of scientific and religious messages on various aspects of environmental concern, but these messages should be designed using different framing techniques. While the messages used in this study are easily accessible to the general public and therefore have high external validity, they do not use any specific framing technique generally reported in the messaging literature (e.g., positive/negative frames or motivational and sacrificial frames). It is possible that some of these framing techniques are more effective in religious people than in non-religious people. If pro-environmental Christian leaders want to effectively increase environmental concern, they need to understand techniques that enhance support to address environmental problems.

Second, future experiments could vary the information that is presented as part of the dependent variable. The proposed policy in this experiment required a 50% reduction in water use. Future studies might vary the reduction amount to determine how support for, or opposition to, the policy differs based on the required reductions. I also provided a range of activities that would be restricted under a proposed policy. Future studies might vary the number and types of restricted activities to determine if specific activities (e.g., filling the swimming pool or washing the car) are more or less important to subjects.

Supplementary Materials: The supplementary materials are available online at www.mdpi.com/2076-0760/5/4/76/S1, Figure S1: Confirmatory factor analysis model, Table S1: Descriptive statistics for CFA model latent variables and indicators.

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