Burning Down the House: Wildfire Evacuations Prompt Increased Policy Support for Wildfire Mitigation Policies in Pima County, Arizona

Haotian Cheng[1,*] , Elizabeth Baldwin[2] , Alex Ponce[2] , Aaron Lien[1] , Adam Douglas Henry[2] , Elise Gornish[1] , José R. Soto[1]

1 School of Natural Resources and the Environment, University of Arizona, Tucson, AZ 85721
2 School of Government and Public Policy, University of Arizona, Tucson, AZ 85721
*Corresponding author: Email: haotiancheng@arizona.edu

Abstract

While environmental disasters like wildfires have grown in frequency and impose significant recovery costs, policy makers often under-invest in cost-effective disaster mitigation policies. Disasters sometimes act as "focusing events" can capture public attention and increase public support for disaster mitigation, yet not all disasters have a meaningful effect on public attitudes, and the mechanisms behind attitude changes remain underexplored. Drawing on the Values-Beliefs-Norms framework, we propose that disasters influence support for mitigation policies by altering underlying beliefs and preferences if and when those disasters directly threaten something that people value. Using a choice experiment post-wildfire online survey in Pima County, Arizona, we assess how wildfire exposure affects support for local wildfire risk reduction and referendum design preferences. Results show that those who personally knew evacuees are more likely to vote "yes," are less sensitive to program costs, and favor policies that prioritize homes over ecological goals.

Keywords: Focusing Events, Environmental Disasters; Natural Experiment; Choice Experiment; Policy Preferences

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Introduction

Despite relatively high levels of citizen concern about environmental issues, environmental policy is often characterized by policy *inaction* rather than policy action, particularly when it comes to environmental policies to prevent or mitigate environmental disasters. Floods and wildfires have become increasingly common and severe, but remain difficult to predict and prepare for, and many jurisdictions fail to adopt policies that would prevent environmental disasters or reduce post-disaster recovery costs. One reason for under-investment in disaster mitigation is that policy makers face perverse incentives: the public tends to support post-disaster recovery spending over pre-disaster preparedness investment (Healy and Malhotra, 2009; Bechtel and Mannino, 2021). With natural disaster damages in the U.S. escalating rapidly, it is critical that U.S. policy makers find strategies to overcome these perverse incentives and ensure that cost-effective preventative measures are taken to mitigate the costs of environmental disasters.

In this paper, we explore how exposure to environmental disaster affects the public's willingness to support disaster mitigation policies. More specifically, we ask whether direct exposure to wildfire affects a) people's willingness to vote "yes" on a hypothetical referendum to reduce wildfire risk; and b) their preferences for the goals and design features of such a referendum.

Conventional wisdom as well as policy theory suggests that environmental disasters might act as "focusing events" that focus public and policy makers' attention on disaster-related risks, and thus have the potential to lead to policy changes (e.g., Birkland, 1997; DeLeo et al., 2021). Given this, the current uptick in environmental disasters could potentially prompt new policies. However, empirical results are mixed: while some disasters are found to have prompted

policy change (Birkland 1997), others have no significant impact on citizens' policy attitudes or policy makers' actual policy decisions (Bishop, 2013; Boudet et al., 2020; Giordano et al., 2021; Hui et al., 2021). The increased attention due to focusing events – by itself – is not enough to prompt new disaster mitigation policies.

These mixed results may reflect that both disasters and peoples' experiences of them are heterogeneous. For example, citizen support for post-disaster policy change may depend on the nature and context of the disaster, individuals' underlying attitudes, variation in the way that different individuals experienced the disaster, or the details of post-disaster policy proposals (Siddiqi et al., 2023; Eiser et al., 2012; Whitmarsh, 2008). In this study, we use choice experimental methods and leverage a natural experiment to assess how variation in natural disaster exposure and policy design elements affect citizens' willingness to vote "yes" on a disaster-risk reducing policy referendum.

Our study focuses on Pima County, Arizona, where the region's traditionally "fire-proof" Sonoran Desert faces growing wildfire risk due to the spread of an invasive and fire-adapted grass known as buffelgrass (Wilder et al., 2021). While citizens are generally aware of and concerned about the spread of buffelgrass and its effects on fire risk (Plecki et al., 2021), public officials have yet to take significant preventive action, and buffelgrass spread remains relatively unchecked (Lien et al., 2021). Buffelgrass has become particularly entrenched in an area of Pima County known as the "foothills," where upscale housing developments abut uncontrolled buffelgrass patches in the public lands to the north of Tucson. During the summer of 2020, a wildfire (the Bighorn Fire) burned for over 6 weeks, consuming 120,000 acres and prompting the evacuation of over 200 homes, concentrated in and around the "foothills" area.

In the aftermath of the fire, we conducted a survey experiment to assess whether and how the Bighorn Fire had affected residents' support for a hypothetical referendum that would fund buffelgrass removal in Pima County. Our approach embeds a choice experiment within a natural experiment. Choice experiments are commonly used by environmental economists to assess individuals' "willingness to pay" for environmental amenities. Unlike most public opinion surveys conducted by political scientists, choice experiments recognize that citizens' willingness to support environmental initiatives is heterogeneous across individuals and contingent on individual preferences and expectations about what the policy will cost and what it is likely to achieve. Our choice experiment describes a hypothetical referendum that would levy a small fee on residents' utility bills to fund buffelgrass removal. Survey respondents were given five different hypothetical referenda, each varying along dimensions such as monthly cost to households, who should administer the program, and whether the program would prioritize protecting homes, saguaro cacti, or scenic landscapes from fire risk – specific combinations of policy attributes based on experimental design (more on this below). We expect that respondents' willingness to support the hypothetical referendum will vary based on these attributes.

To assess how exposure to the Bighorn Fire affected respondents' willingness to support the referendum, we leverage the Bighorn Fire as a natural experiment by defining a group of "fire-affected" as Pima County residents who had a friend or family member who was evacuated during the fire and comparing their responses to those who were neither evacuated nor had a close acquaintance who was evacuated. Finally, drawing on the "values, beliefs, and norms" framework (Steg, 2016; Stern et al., 1995), we hypothesize that when environmental disasters directly threaten something that individuals' value, this will shift their policy beliefs and

preferences. We thus expect that people whose close acquaintances faced evacuation will express greater overall support for policy action, as well as preferences for policy designs that prioritize protecting homes.

Literature Review

In this section, we provide a brief review of the factors that are theorized to shape peoples' support for disaster mitigation policies, including disaster exposure, policy attributes, and individual characteristics.

Disaster Exposure

Thomas Birkland (1997) first proposed that earthquakes, oil spills, hurricanes, and other sudden, unpredictable "focusing events" can draw the various attention and attitudes of citizens and policy makers on policies, pointing to policy changes in the wake of the highly visible Exxon Valdez spill (Birkland, 1997). Similarly, citizen and media attention around China's 2013 "airpocalypse" put pressure on public officials to take action (Schwabe, 2016). Subsequent studies show that disaster can prompt environmental policy change. For example, Hazlett and Mildenberger (2020) found that in California, census block groups exposed to wildfires were more likely to vote for pro-environmental ballot initiatives than those that did not experience wildfires. Post-disaster political change is not automatic, however, and is more likely to yield adaptive than preventive policy change (Cohen, 2021; Giordano et al., 2021). In a review of 15 studies on the subject, Giordono et al. (2021) conclude that extreme weather events alone are not sufficient to motivate local jurisdictions to adopt climate change mitigation policies, and that policy change is more likely following severe events.

Another strand of this literature focuses not on policy change itself, but on the causal relationship between disaster exposure and citizens' environmental attitudes and policy preferences. Here, studies are limited, because the unpredictable nature of disasters poses challenges to using pre-post survey methods or other research designs that support causal inference. These studies come to mixed conclusions. In a multi-country survey following the Fukushima disaster, Latre et al. (2017) found that support for nuclear energy was lower among respondents closer to Japan. Rudman et al. (2013) found that individuals with personal experience with Hurricanes Irene and Sandy were more likely to support for politicians who support climate change mitigation. And Hui et al. (2021) find that exposure to wildfire smoke had limited effect on Californian's policy preferences, although it lessened Republicans' resistance to use of public funds to protect homes from wildfires. Bishop et al. (2014) surveyed citizens about their support for environmental regulations on the oil industry before and after the Deepwater Horizon oil spill, finding that oil-dependent communities showed *decreased* support for environmental regulation after the spill.

Why do disasters have such divergent impacts on peoples' policy attitudes? Disasters are not all equal – they vary in severity, impact, and likelihood of recurrence. Other literature suggests that even within disaster-affected communities, peoples' individual experiences are heterogeneous (Whitmarsh, 2008). Siddiqi et al. (2023) found that people who reported more disaster-related harm were more likely engage in actions to help their communities. These studies point to the idea that heterogeneity in the way that communities and individuals experience disasters may affect citizens' preferences for policy responses, but this heterogeneity has not yet been explored in experimental settings.

Policy attributes

Political opinion research typically asks respondents to report their agreement with a battery of statements about environmental issues. This kind of research is based on an assumption, explicit or implicit, that within individuals, preferences are relatively fixed - e.g., not contingent on attributes of the policy itself. But while individual attributes clearly affect general support for environmental policy, attributes of the policy itself may also matter. For any given policy, there are design elements that individuals may consider in their evaluation of whether the policy should be supported. In study of Swiss residents, perceived effectiveness, intrusiveness, and fairness all shaped residents' policy support (Huber et al., 2019).

To assess individuals' heterogeneous responses to variation in policy design, environmental economists have long used choice experimental methods. Choice experiments present the subject with several hypothetical policy questions whose attributes vary randomly, and then ask respondents whether they would support each hypothetical policy (Cheng et al., 2024). Cost is one policy feature that will affect individuals' policy support. For example, in a study done to assess willingness to pay for a U.S. national clean energy standard, the dollar amount of willingness to pay was determined to be at $162 per year in higher electricity bills in support of a national clean energy standard requiring 80% renewable energy by 2035 (Aldy et al., 2012). But citizens may also have preferences about other attributes, such as who administers a policy, its benefits to the community, or its specific programmatic priorities. In this study, we use choice experimental methods to understand the interplay between policy attributes and citizen support, and to examine how exposure to natural disaster affects this interplay.

Individual level attributes

There are a number of individual level attributes that potentially affect policy preferences. Party affiliation and political ideology are consistently identified as determinants of support for environmental policies across a range of issues. For example, Eliott et al. (1997) demonstrated affiliation with the Democratic Party and liberal ideologies are strong determinants for supporting increased environmental spending at the U.S. federal level. In contrast, support for the Republican Party has a negative correlation with support for environmental ballot measures (Salka, 2003).

While political attitudes are a dominant driver of support, other demographic factors matter. In a study of U.S. counties across states over a 10-year period, survey respondents in urban counties consistently showed greater support for environmental protection ballot measures compared to rural counties, although this difference could be at least partially due to urban and rural divides in political affiliation, education levels, income, age, and resource dependence (Salka, 2003). Previous engagement in pro-environmental behaviors is also correlated with greater policy support. In a survey of residents in the Netherlands, findings show a consistent positive correlation between pro-environmental behaviors and policy support (Sharpe et al., 2021). Some research concluded that individuals with higher income are more likely to support environmental policies (Frabzeb and Vogl, 2012; Sun et al., 2016; Shao et al., 2021). Halkos and Matsiori (2012) concluded that education level is positively correlated with environmental policy support.

Towards synthetic theory: Values, beliefs, and norms

While research demonstrates the potential for disaster to increase post-disaster support for environmental policies, there is considerable cross-case variation in whether disasters actually

lead to policy attitudes change in practice. The literature has not yet fully explored the reasons for this variation, either theoretically or empirically (Giordono et al., 2021) concluded that extreme weather events have the potential to prompt change in affected jurisdictions, but also found that the underlying mechanisms driving that change were underspecified and undertested in the literature.

Theoretically-grounded research about these underlying mechanisms would help us better understand which events are most likely to spur action; how heterogeneous voters and policy actors respond to events; and even shed light on questions about which jurisdictions – local, state, national – are most likely to respond effectively to disaster. Such knowledge would be invaluable to help to close the gap between public support for environmental protection and political action (Pivo et al., 2020). Thus far, the literature has explored a wide range of theoretical and conceptual explanations of causal mechanisms that explain post-disaster policy attitudes change (or lack thereof) (Giordano et al., 2021). However, these explanations often omit the possibility that we explore in this paper – that post-disaster changes in an individual's beliefs can act as a casual mechanism of policy attitudes change. By emphasizing the role of post-disaster belief shifts as a causal mechanism of policy attitudes change, our research underscores the intricate interplay between personal experiences, perceptions, and policy preferences. When individuals directly experience the impact of disasters, it can lead to profound changes in their beliefs about likelihood of disaster recurrence, the efficacy of government action, the urgency of addressing vulnerabilities, and the importance of prioritizing disaster preparedness and resilience building measures. Moreover, our analysis accounts for the dynamic nature of post-disaster belief changes, recognizing that they unfold over time and are shaped by ongoing interactions with information, social networks, and institutional responses. As

individuals' process and reinterpret their experiences, their policy attitudes may evolve, leading to nuanced shifts in support for specific policy measures or approaches to disaster governance.

One major perspective relevant to the connection between environmental shocks and support for policy is the Values-Beliefs-Norms (VBN) theory (Steg, 2016; Stern et al., 1995). VBN seeks to explain environmentally-relevant behaviors (such as spending on environmental technologies or support for environmental regulation) through dependencies between three major theoretical concepts. At the deepest level, a person is viewed as holding certain *values* attributed to different outcomes, such as the relative weight given to environmental protection and/or economic prosperity, or to the relative importance of having a home safe from the threat of natural disaster.

At the next level, a person is viewed as having *beliefs* regarding threats to valued objects. A person may hold myriad beliefs, ranging from a belief that valued objects are not under threat (e.g., I value the saguaro cactus species, but populations are healthy and not in need of extra protections) to any number of beliefs about different sources and severity of threats (e.g., I value the saguaro cactus *and* it is under dire threat from wildfire as well as development). Whereas norms are slow to change, beliefs are more responsive, particularly when individuals experience a dramatic event like a natural disaster. People often hold inaccurate beliefs around the likelihood of risk (e.g., Wachinger et al., 2012). When a fire threatens somethings that a person values, it may be more likely to re-shape the person's beliefs about the likelihood of the fire recurring, or the responsibility of local governments to take action to avert such disasters in the future.

At the level most proximate to behavior, VBN argues that holding a belief that valued objects are threatened activates *norms* of behavior to protect these objects. The scope of

behaviors are wide and may include financial choices (e.g., spending on pollution-mitigating technology or donating money to particular organizations) as well as political choices (e.g., support for policies or political candidates). Overall, VBN theory provides a critical perspective for explaining an individual's environmentally-relevant behavior as a result of their values and beliefs and what conditions might prompt a change in those behaviors (Henry and Dietz, 2012). While individual values are relatively stable, the relation between values, beliefs, and norms suggests pathways by which individuals may use information to update their beliefs and consequently learn behaviors that better support environmental sustainability (Henry 2009; Social Learning Group 2001; McNie, 2007; van Kerkhoff and Lebel, 2006).

Based on the literature reviewed above, we test two hypotheses.

H1: When exposure to environmental disaster directly threatens something that individuals' value, those individuals will be more likely to support disaster-preventing policies.

Hypothesis 1 is in line with the currently literature on focusing events, and following Siddiqi et al. (2023) we recognize that disaster impacts are heterogenous across communities. We also bring in VBN theory to suggest that important heterogeneity focuses on whether the disaster threatens something that individuals' value. Thus, we expect that individuals in the same community who did not experience threat to something of value will experience no change in policy support.

H2: Exposure to environmental disaster changes peoples' beliefs about how governments should respond to disasters.

In Hypothesis 2, we home in on the possibility that disasters shape policy attitudes by changing their policy beliefs. The extant literature on focusing events suggests that the effect of disasters may vary based on individuals' prior underlying policy beliefs – for example,

Democrats and Republicans may have different policy attitude changes following disaster (Hazlett and Mildenberger, 2020). But this literature has yet to examine whether disaster itself re-shapes those underlying beliefs. Here, we draw on VBN theory to suggest that direct experience with disaster may change peoples' beliefs, such as the cost that they are willing to pay for preventive action, or the relative importance of protecting property vs protecting nature during a disaster. Rather than rely on subjective measures of individual policy belief, however, our experimental set-up described below uses choice experimental methods from environmental economics to elicit those policy beliefs indirectly.

Research Design, Methods, and Data

Study Context

Buffelgrass, introduced to Arizona in the 1930s, is rapidly spreading throughout the Sonoran Desert, substantially increasing fire risk in an area traditionally considered "fireproof" (Wilder et al., 2021). The Bighorn Fire of 2020, ignited by a lightning strike in the Catalina Mountains, burned nearly 120,000 acres, prompting evacuation orders in several of Pima County's wealthier neighborhoods near Mt. Lemmon and Sabino Canyon (https://inciweb.nwcg.gov/incident/6741/). While buffelgrass was not the primary fuel for this wildfire, its presence affected fire management and highlighted the potential for increased severity and impacts on homes, infrastructure, and saguaro habitats. Without intervention, buffelgrass could exacerbate future wildfires, further endangering communities, saguaros, and the delicate desert ecosystem.

Survey Methods and Data

The survey instrument was developed using the online platform, Qualtrics, following the Dillman method (Dillman et al., 2014). In addition to the hypothetical referendum questions

described below, the survey included a section eliciting demographic information; another on respondents' knowledge of buffelgrass and its relationship to fire risk; and a series of questions probing whether and how respondents were affected by the Bighorn Fire. The questionnaire was pre-tested by 18 people that included Pima county residents, survey design experts, and subject-matter experts. This survey was approved by our university's Human Subjects Protection Program.

Data were collected in January 2021 using an online panel of adult respondents assembled by Qualtrics from a panel of Pima County residents, targeting a sample that was demographically representative of Pima County as a whole but that over-sampled people from zip codes where evacuations had occurred, to increase the likelihood that our survey included people who were affected by the fire. The questionnaire included a filtering question to identify respondents who lived or owned land in Pima County. Qualtrics elicited responses from 2,169 participants. 548 people completed the survey, resulting in a 23% response rate. An additional 49 were dropped from the analysis because they refused to answer a question about political ideology.

Natural Experimental Methods

A natural experiment refers to a situation where researchers can observe the effects of an independent variable like a naturally occurring event on peoples' behavior without any manipulation by researchers themselves, such that the event affects a treatment and control group that approximates random selection (Dunning, 2012). To leverage the Bighorn Fire as a natural experiment, we asked respondents whether they had personally been evacuated due to the fire, as well as whether they had a friend or family member who had been evacuated. Of the 499

respondents, 26 had personally been evacuated, and 100 had a friend or family member who was evacuated.

Demographic analysis of these sub-groups suggests that personal evacuation does not approximate random selection: it was limited to a handful of neighborhoods whose residents were, on average, wealthier and more conservative than the full sample, suggesting significant differences between those who "opted in" to the possible treatment of fire exposure by choosing to live in those neighborhoods. However, the 100 respondents with close acquaintance who had been evacuated were demographically similar to the full sample (see Table 2), suggesting that the fire affected this group of people in a way that approximated random distribution. We chose this sub-group as a "treatment" group and created a binary "fire treatment" dummy variable, equal to 1 for respondents with a family member or friend who was evacuated. Because the 26 personal evacuees were not affected randomly nor could be considered as part of the control group, we dropped them from the analysis.

Choice Experiment Survey Design

Choice experiments are commonly used by environmental economists as a tool to assess individuals' willingness to support or pay for hypothetical goods that do not feature in existing markets – such as environmental amenities (Koemle and Yu, 2020). Since researchers have only limited ability to observe the way that individuals "value" environmental and other non-market goods (McFadden, 1974), researchers must resort to indirect ways of eliciting these preferences. In such contexts, choice experiments are used to estimate individuals' valuation of non-market amenities based on their stated preferences.

The choice experimental methods we use here are based on the underlying idea that individuals gain utility from non-market goods based on the individual attributes of the good, rather than on the good itself (Lancaster, 1996). When the attributes of a good vary, the utility that individuals derive will also vary, allowing researchers to assess how individuals' valuation of the non-market good change when the attributes of that good are varied. In a choice experiment survey, respondents are thus asked to select among bundles of goods with variation on the same set of attributes. In environmental economics studies, such methods can be used to assess heterogeneity in individuals' valuation of non-market goods and services. Here, we use these methods to assess heterogeneity in individuals' valuation of policy options to address buffelgrass.

Respondents were provided with information about five hypothetical county-level referenda that would fund buffelgrass removal in the study area. A county-level referendum is a plausible policy response to the buffelgrass problem because Pima County has been active in addressing buffelgrass and has a history of putting similar environmental and land-use questions on the ballot. To identify potential "policy attributes" that policy makers might plausibly consider when designing such a referendum, we consulted practitioners who have worked on the buffelgrass issue and how have raised policy proposals for addressing the problem. Over the past several years, for example, practitioners have identified different potential priorities for buffelgrass removal programs; explored different administrative options (Lien et al., 2021); raised equity concerns about taxing low-income residents to pay for programs that might disproportionately benefit people in wealthier neighborhoods; attempted to estimate how much such a program could realistically reduce fire risk; and attempted to assess how much such a program would cost.

Based on this input from practitioners, we identified five potential attributes that could vary across referenda: program priorities; administration; exemption for low-income households; expected risk reduction; and program cost (Figure 1). Based again on conversations with practitioners, we identified subcategories or levels for each attribute that could vary across hypothetical programs, summarized in Table 1.

<Table 1>

Using the attributes and levels from Table 1, one could design a survey instrument with a total of 96 possible combinations of different levels – each of which representing a unique hypothetical referenda question. However, such a survey would cause exhaustion in most participants. Instead, a particular subset of these 96 potential referenda questions was selected using an orthogonal main effects design in order to minimize the number of questions while guaranteeing the estimation of at least the main effects of all attribute levels (Cheng et al., 2021). We used SAS ADX (SAS, 9.4) interface to design a choice experiment with 10 hypothetical referenda questions, which were subsequently presented to participants in a 2-blocked strategy (i.e., randomizing participants into one of 2 blocks, each containing 5 questions).

Respondents were thus each presented with one block of 5 hypotheticals, with attribute levels that varied randomly. After each hypothetical referendum, the respondent was asked if they would vote “yes” to that referendum. The number of observations available for the choice experiment modeling (i.e., unique responses to each of the 10 unique hypothetical referenda questions) were ~1,247 (i.e., each respondent answering 5 design questions; 473 respondents; 5 x 473 = 2,365 total observations).

Analytical Methods

We use a random effect logit (REL) model where the dependent variable is 1 if the respondent said that they would vote yes to the hypothetical referendum, and 0 otherwise. Since we presented each individual with five hypothetical referenda, we use a REL specification to adjust for potentially unobserved individual-specific heterogeneity (Coast et al., 2006; Cheng et al., 2023). The probability function of the REL follows:

$$\text{Probability}\ (Y_{it} = 1) = {\exp\ (U_{it})}\Big/{1 + \exp\ (U_{it})} \quad (2)$$

where U_{it} is the utility for respondent *i* of binary choice task *t*, and Y_{it} is the outcome variable, which takes on a value of 1 if the respondent voted yes. The utility is linear in arguments with systematic and random components:

$$U_{it} = \beta_1 + \beta_2\gamma_i + \alpha_i + \varepsilon_{it} \quad (2)$$

where $\beta_1$is a vector of estimated parameters, β_2 is a vector of estimated parameters for fire treatment, $\gamma_i$is a binary variable equal to 1 when the respondent had friends or family evacuated (fire-affected group), $\alpha_i$is individual-specific error, and ε_{it} is the overall error term. We use this model to test whether fire-affected individuals are more likely to vote "yes."

Following Green (2004), we also use the binary REL model to estimate whether fire exposure changes peoples' response to variation in policy design.[1] To do so, we spilt our sample to the 'control group' and the 'treatment group' and estimate the model for the two groups separately. The utility function is:

[1] Random effects models are appropriate when individual unobserved heterogeneity is uncorrelated with the independent variables.

$$U_{it} = \beta_3{}' x_{it} + \delta_i + \varepsilon_{it} \quad (3)$$

where $\beta_3$is a vector of estimated parameters, x_{it} is the attributes of the choice matrix, $\delta_i$is individual-specific error, and ε_{it} is the overall error term. The model is estimated with statistical software Stata 14.2, using the Gauss – Hermite quadrature routine and simulated maximum likelihood.

Results

Table 2 compares our full sample and fire-affected group with the broader population of Pima County residents. Our sample is demographically similar to the broader population, although women were over-represented in our sample. Table 3 presents summary statistics for all variables, and shows that 55% of the time, respondents reported that they would vote "yes" to one of the hypothetical referenda that they were given – a modest level of support among all respondents.[2]

<Table 2>

<Table 3>

Table 4 presents the first REL model result. The estimated coefficient of the REL model can be interpreted as the odds ratio. The *fire-affected* variable was positive and significant, suggesting that respondents whose family and friends were evacuated were 79% more likely to vote yes for the referendums. Respondents having the annual household income the '$35k~$49.99k', '$50k~74.99k' and '$75K+' classes were 107%, 113%, and 229% more likely to vote yes for

[2] To examine potential interrelationships between demographic variables (e.g., education and politics) we examined correlations and conducted exploratory factor analysis. We found no significant correlation between demographic variables.

the referendums, compared with whose household income was below $25k. Respondents who were awareness buffelgrass risk before were 87% more likely to vote yes for the referendums and who considered themselves liberal were 143% more likely to vote yes for the referendums rather than moderate respondents. The results also indicate that respondents who had graduate degree were 128% less likely to vote yes for the referendums compared to the respondents who did not had a college degree.

<Table 4>

Table 5 presents the second REL model results for the 'control group' and 'treatment group', which allows us to compare the effect of policy design attributes on willingness to vote yes across these two groups. For coefficients on variables that represent attribute levels, interpretation of coefficients is relative and must be compared to the baseline, e.g., the attribute level that was omitted from the analysis. For example, in the control group, the positive sign on 'saguaros' suggests that, *ceterus paribus*, people are 48 percent more likely to vote yes for a hypothetical program that prioritizes buffelgrass control near saguaros, relative to the baseline group of programs that prioritize buffelgrass control near landscapes. Conversely, respondents in the fire-affected group are 95% more likely to vote for a program that priorizes homes.

Respondents in the control group were also sensitive to the program's expected risk reduction: people in the control group are 34 percent more likely to vote yes when the fire risk reduction is expected to decrease from 'medium to low' compared with the level 'high to medium'. For the fire-affected group, however, differences in expected risk reduction had no effect on policy support.

People in both groups sensitive to cost, but the control group was much more cost-sensitive compared to the fire-affected group. As the cost of the referendum increases by $1.00 per household, people are 201 percent less likely to vote yes - a result that is statistically significant at the 0.01 level. In the fire-affected group, a $1.00 increase in cost reduced likelihood of voting yes by just over 100 percent.

The effect of education on the likelihood of voting "yes" differed across the two groups. In the control group, compared to those with no college degree, bachelor's degree holders were slightly less likely to vote "yes," although this effect was not significant; graduate degree holders were significantly less likely to vote "yes." In the fire-affected group, however, bachelor's degree holders were almost 200% more likely to vote "yes," and holding a graduate degree had no significant impact on support. In both groups, higher incomes were generally correlated with greater policy support.

Finally, in the control group, those who self-identify as political liberals were 200% more likely to vote "yes" than conservatives. In the fire-affected group, political ideology had no effect on policy support. Buffelgrass risk awareness was significantly and positively correlated with voting "yes" in both groups, although this effect was larger in the fire-affected group than the control group.

<Table 5>

Discussion and conclusions

A growing body of literature suggests that natural disasters can potentially shift public support in favor of disaster-prevention policies. At the same time, this literature also shows that not all disasters produce this effect, and the literature as a whole lacks theoretical explanations for why

some disasters produce changes in policy attitudes while others do not. In this paper, we draw on the values-beliefs-norms framework to present two hypotheses: first, that disasters increase support for preventive policy action when people experience a direct threat to something they value; and second, that the underlying mechanism at play occurs when disasters change peoples' underlying policy beliefs.

Our study provides support for both hypotheses. When people had close acquaintances whose homes were threatened from the Bighorn Fire, they were considerably more likely to support funding policies to reduce wildfire risk, confirming the first hypothesis. Turning now to the second hypotheses, we see considerable evidence that "fire-affected" individuals expressed different policy beliefs than those whose family and friends were not evacuated. Fire-affected respondents were less sensitive to program costs and more supportive of programs that prioritize protecting homes – both suggesting that the direct threat of fire can change peoples' underlying beliefs about what kinds of policy actions governments ought to take to prevent disaster. Perhaps even more telling, underlying political ideology affected support in the control group, but not the fire-affected group, suggesting that conservatives who might normally oppose fire-mitigation policies had changed these beliefs after their direct experience with the fires.

Our results also show interesting effects of education across the two groups. The negative significant sign of graduate degree in our first model and in the second model 'control group' might suggest some skepticism of the referendum among those with more education, either because they know more about the challenges of buffelgrass control or for some other reason which is similar to the conclusion from Schuck and Vreese, (2015). But this effect disappears among the fire-affected group, suggesting that any skepticism disappears for those who are most directly affected by a disaster.

We do however note some limitations. First, it may be relevant to point to the particular context of wildfire in Pima County. Historically, wildfire was not a major concern for Pima County residents, but in recent years the threat has increased, particularly in the foothills areas where residents were evacuated. Without buffelgrass mitigation, those neighborhoods' fire risk will only continue to increase. We thus find support for the "direct threat to something of value" hypothesis, but qualify it by noting that this effect might not hold for disasters that are less likely to recur absent policy action.

Second, our study used an online survey launched by a sampling company, Qualtrics, which may inadvertently exclude individuals without internet access, potentially skewing results towards a more tech-savvy and younger demographic. It also relies on self-reported data, which could be less reliable than more objective measures of evacuation. Finally, the literature has begun to recognize considerable heterogeneity in the way that people experience disasters, including harm to daily activities, property, finances, and physical and mental health (Siddiqi et al., 2023). Our study counts evacuation as the sole measure of personal experience with wildfire, omitting potentially interesting additional nuance that could be explored in future work.

We do, however, draw attention to heterogeneity in policy design itself. Public opinion polling around environmental policy often frames policy choices in binary terms, but in practice, there can be considerable variation in the ways that policies are designed. To date, much of the literature on focusing events has assessed whether disasters open new windows of opportunity for policy attitudes change; it may be equally fruitful to consider how disaster-responsive policy design choices affect the likelihood of post-disaster policy attitudes change.

We also highlight that people may be sensitive to the household-level costs of environmental policies in ways that have been largely ignored by public opinion research on

environmental policies. When political scientists survey individuals about their support for national-level policies to address air pollution, climate change, and similar issues, individuals' experience of the costs of those policies is attenuated, because those costs are borne indirectly by taxpayers and consumers. Perhaps as a result, few public opinion studies have examined the way that individuals' perception of their *personal* costs might affect their support for environmental policy. Here, by studying a local referendum that would be funded by local households, we are able to directly assess how the household-level costs of a policy affect peoples' willingness to support that policy. We find that these household-level costs have a significant effect on peoples' willingness to vote yes, although this sensitivity is considerably diminished among those who perceive that their friends and family might be the direct beneficiaries of the policy.

Our study also makes a methodological contribution by showing how survey experimental methods more commonly used by economists can produce novel political insights. Economists have long identified perceived costs and benefits as key factors that might shape public support for environmental issues, but most "willingness to pay" studies assess the way that citizens value non-market environmental amenities in a way that is artificially divorced from the political processes by which jurisdictions decide whether or not to protect those amenities through environmental policies. Conversely, environmental politics scholars often study citizens' willingness to support environmental policies, but rarely consider individual-level costs as a key factor that might affect their support. In this study, we use methods from environmental economics to shed new light on important questions about environmental politics.

Moreover, by exploiting variation in individuals' experience of the fire, we are able to leverage a natural experiment to assess the causal impacts of the Bighorn Fire *ex post*. Given the unpredictability of environmental disasters, our approach highlights one way that scholars may

be able to isolate the causal impact of focusing events, where pre-post survey designs are nearly impossible to use. Future research on the effects of focusing events would do well to use methods that allow analysts to probe these heterogeneous effects (i.e. how people think about different types of disasters) and use them to improve causal inference about the effects of disasters on citizens' environmental attitudes.

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Table 1. Attributes and Levels Used To Create Choice Experiment Questions

Attribute	Definition	Levels
Prioritization	What areas should the program prioritize for removal of buffelgrass?	Near saguaros
		Near landscapes
		Near homes
Administration	Who should manage and distribute funds generated by the utility tax?	Government agency
		Nonprofit organization
Income exempt	Should certain groups be exempted from paying the tax?	All households pay
		Low income households exempt
Risk reduction	How much is the program expected to reduce fire risk?	Risk reduced from high to medium
		Risk reduced from medium to low
Cost	At what amount should the per month utility tax be set?	$0.50
		$1.00
		$1.50
		$2.00

Table 2. Characteristics of full sample and fire-affected "treatment group" sample versus US Census demographic profile of Pima County, AZ.

Variable	Full sample	Fire-Affected Sample "Treatment" Group	Pima County residents
Gender			
Male	40%	32%	49%
Female	60%	68%	51%
Age			
Age (18-29)	31%	44%	^
Age (30-44)	28%	30%	^
Age (45-64)	22%	16%	^
Age (65+)	18%	10%	26%
Race			
Hispanic	30%	35%	37%
White	55%	49%	51%
Black	03%	04%	04%
Other	12%	12%	08%
Education			
No Bachelor's Degree	59%	62%	66%
Bachelor's Degree	23%	19%	^^
Graduate	14%	16%	^^
Household Income			
Income (<$25k)	22%	18%	20%
Income ($25k~$34.999k)	14%	15%	10%
Income ($35k~$49.999k)	18%	23%	14%
Income ($50k~$74.999k)	20%	25%	19%
Income ($75k+)	26%	19%	39%
Political Ideology			
Conservative	30%	28%	N/A
Liberal	31%	31%	N/A
Moderate	39%	41%	N/A
N	473	100	-

^ The U.S. census provides data on the percent of county residents under 18 and over 65. Residents 18-65 make up 74% of the population over 18.
^^ The U.S. census combines county residents with bachelors' and graduate degrees into a single category, which includes 34% of Pima County residents.

Table 3. Summary Statistics

Variable	# of Respondents	Mean Value	Min Value	Max Value	Standard Deviation
Treatment Effects					
Fire-affected treatment group	473	0.20	0.00	1.00	0.40
Respondent Attributes					
Gender					
Male	473	0.40	0.00	1.00	0.49
Female	473	0.60	0.00	1.00	0.49
Age					
Age1 (18-29)	473	0.31	0.00	1.00	0.45
Age2 (30-44)	473	0.28	0.00	1.00	0.45
Age3 (45-64)	473	0.22	0.00	1.00	0.42
Age4 (65+)	473	0.18	0.00	1.00	0.40
Race					
Hispanic	473	0.30	0.00	1.00	0.45
White	473	0.55	0.00	1.00	0.58
Other	473	0.15	0.00	1.00	0.18
Education					
No bachelor's degree	473	0.59	0.00	1.00	0.49
Bachelor's degree	473	0.23	0.00	1.00	0.43
Graduate degree	473	0.14	0.00	1.00	0.35
Household Income					
Income1 (<25k)	473	0.22	0.00	1.00	0.42
Income2 ($25k~$34.999k)	473	0.14	0.00	1.00	0.35
Income3 ($35k~$49.999k)	473	0.19	0.00	1.00	0.38
Income4 ($50k~$74.999k)	473	0.20	0.00	1.00	0.40
Income5 ($75k+)	473	0.26	0.00	1.00	0.44
Political Ideology					
Moderate	473	0.39	0.00	1.00	0.49
Conservative	473	0.30	0.00	1.00	0.46
Liberal	473	0.31	0.00	1.00	0.46
Buffelgrass Risk Awareness	473		0.00	1.00	
Would Vote Yes on a Hypostatical Referendum	473	0.55	0.00	1.00	0.50

Table 4 Effect of fire on the likelihood of voting 'yes'

Variable	Coefficient (odd ratio) (standard error)
Fire-affected	0.79*
	(0.41)
Male	-0.07
	(0.62)
Age (reference case: Age1, 18-29)	
Age2 (30-44)	0.28
	(0.50)
Age3 (45-64)	-0.27
	(0.54)
Age4 (65+)	-0.07
	(0.62)
Race (reference case: Black and Other)	
Hispanic	-0.22
	(0.59)
White	0.73
	(0.56)
Education (reference case: No Bachelor's Degree)	
Bachelor's degree	0.27
	(0.44)
Graduate degree	-1.62***
	(0.61)
Household Income (reference case: Income1, <$25k)	
Income2 ($25k~$34.999k)	0.43
	(0.60)
Income3 ($35k~$49.999k)	1.07*
	(0.57)
Income4 ($50k~$74.999k)	1.13**
	(0.55)
Income5 ($75k+)	2.29***
	(0.57)
Political Ideology (reference case: moderate)	
Conservative	-0.41
	(0.43)
Liberal	1.43***
	(0.43)
Buffelgrass Risk Awareness	0.87**
	(0.37)
N	473

Table 5. Effect of policy design on the likelihood of voting 'yes'

Variable	Control Group Coefficient (odd ratio) (standard error)	Treatment Group Coefficient (odd ratio) (standard error)
Referenda Attributes		
Prioritize saguaros	0.48**	0.07
	(0.21)	(0.38)
Prioritize homes	0.10	0.95**
	(0.22)	(0.39)
Government administers	-0.17	0.22
	(0.19)	(0.34)
All pay	-0.03	-0.33
	(0.19)	(0.34)
High to medium	0.34**	-0.23
	(0.17)	(0.31)
Cost	-2.01***	-1.07***
	(0.20)	(0.33)
Respondent Attributes		
Male	-0.06	-0.30
	(0.51)	(0.80)
Age2 (30-44)	0.92	-1.34
	(0.74)	(0.97)
Age3 (45-64)	-0.58	1.17
	(0.77)	(1.23)
Age4 (65+)	-0.20	0.33
	(0.84)	(1.59)
Hispanic	-0.83	0.61
	(0.87)	(1.19)
White	1.09	0.11
	(0.81)	(1.20)
Bachelor's degree	-0.06	1.92*
	(0.60)	(1.09)
Graduate degree	-2.18**	-1.47
	(0.89)	(1.23)
Income2 ($25k~$34.999k)	0.51	0.72
	(0.85)	(1.37)
Income3 ($35k~$49.999k)	1.64	1.04
	(0.82)**	(1.30)

Income4 ($50k~$74.999k)	1.91	0.03
	(0.78)**	(1.25)
Income5 ($75k+)	3.02	3.00**
	(0.79)***	(1.49)
Conservative	-0.85	0.77
	(0.62)	(0.95)
Liberal	2.00***	0.94
	(0.61)	(0.96)
Buffelgrass Risk Awareness	1.08	1.65*
	(0.53)**	(0.83)
N	373	100

Pima County Buffelgrass Removal Program

Prioritization: **Protection of homes**
Risk Reduction: Fire risk reduced from **high to medium**
Administration: **Government agency**
Income Exemption: **None** – all households would pay this new tax
Utility Tax: **$1.00 per month** for your household

Would you vote for or against this program?

- I would vote **Yes** to this referendum.
- I support the goal of this referendum, but I'm not prepared to pay $1.00/moth and thus would **vote No**.
- I support the goal of this referendum, but I can not afford $1.00/month and thus would **vote No.**
- I support the goal of the initiative, but I would **vote No** for the following reason (please use the space below to explain):

- I would **vote No to** this referendum.

Figure1. An example choice experiment question