Title: Carbon or cash: Evaluating the effectiveness of environmental and economic messages on attitudes about wind energy in the United States

Abstract:
Public support or opposition to the expansion of wind energy plays a key role in energy policy and the development of the industry. For more than 30 years, scholars have attempted to understand the nature of public opinion about wind energy. Unfortunately, the largely observational and correlational nature of the evidence limits the abilities of scholars to isolate the causal relationships that shape attitudes about wind energy. Recent summaries of the literature illustrate the need for experimental designs to improve our understanding of the public's view on this growing technology. Using an original survey experiment (N=1844) with a national sample, we test the effectiveness of messages about the economic and environmental implications of the expansion of wind energy. Our results indicate that 1) the public is sensitive to messaging about both the environmental and economic effects of wind energy; 2) the messages have both a persuasive (changing attitudes) and priming (changing the weight applied to existing attitudes) effect on the public; and 3) the environmental messages do not have a greater effect on public opinions of wind energy than economic messages. Those interested in promoting positive attitudes about alternative energy need to be aware of both the persuasive and priming influences in messages about wind energy.

Keywords: wind energy, social acceptance, attitudes, support and opposition

1. Introduction

Wind energy plays a vital role in American energy production. In the past 25 years, the amount of energy produced from wind has increased dramatically, now generating over 5% of the nation's electrical power [1]. Maturing technology, favorable energy policies, and decreasing installation costs have led to significant wind energy growth in recent years with ample potential for continued growth in the foreseeable future [2]. With the resolution of technological and engineering issues of deriving electricity from the wind, public support and opposition to future wind development are now a predominate hurdle [3]. The US Department of Energy has called for increased attention to the causes of support and opposition to wind energy by the public as a result [4]. Even with thirty years of research on the topic of wind energy attitudes, there are still

fundamental shortcomings in our knowledge of the public's support for the expansion of wind energy [5].

Previous research has also conflated the terms "acceptance" and support", with an over-emphasis on public acceptance rather than support. Acceptance and support are not the same thing and interchangeable use is cautioned [6,7]. (See [7] for a conceptual diagram differentiation of acceptability, acceptance, and support.) For example, a community might accept that wind energy is important and understand that it would benefit their community, but still be opposed to the development of a new farm because of concerns about noise, land development, health hazards, environmental impacts, etc. Batel et al. [6] suggests most of the existing literature confuses these terms, but we were deliberate in our specific use of support/opposition to gauge attitudes about wind energy.

Understanding the nature of public support and opposition to wind energy is particularly relevant in light of the current uncertainty in the future of the wind industry after the production tax credit (PTC) expires in 2019, the end of the 5-year extension and phase down of the PTC, passed in December 2015 as part of the FY16 Omnibus Appropriations Bill [1]. While the PTC has a bipartisan history, legislative debate has made it more of a source of controversy resulting in lulls and booms in wind development over the years corresponding to PTC expirations and extensions [1]. Despite policy uncertainty at times, the PTC has been essential for industry growth, encouraging much of the industry's development since its initial enactment in 1992. Declining federal support, however, presents a vital need for a better understanding of the drivers of public support for wind energy if sustainable industry growth is to continue [4].

It is important to discern public attitudes on sustainable energy and how people develop these attitudes because they "[yield] important insights in how the design of the technology or the

way the technology is implemented should be adapted, and how the technology should be communicated, such that the acceptance of the technology increases and its implementation is more successful" ([8], p. 526). A recent review of the literature on the public's attitudes about wind energy suggests the main determinants of attitudes about wind energy are related to value-based economic and environmental concerns, health-related risk perceptions, visual aspects, fairness and trust, and distance from the turbines [5]. Broadly, attitudes about energy are driven by a complicated mix of risk perceptions, values, personal identity, and specific concerns related to impacts to an individual's pocketbook and/or society. Location is also a factor (e.g. positive attitudes in the Midwest about wind energy), with scholars reporting that visibility of a wind farm in a community helps to increase public knowledge and support of wind energy, and decreases opposition because of turbine aesthetics [9]. Expectations for a wind energy project, and whether these expectations were met, also influences an individual's positive or negative attitudes towards wind energy [10].

General support for wind energy development is higher than it is for further development of fossil fuel or nuclear energy [11], but the level of support is often associated with the stage of a wind turbine project and in some cases, whether the wind turbine will be within an individual's community (e.g. [12]). Wind energy is a clean energy that does not have some of the negative environmental impacts that traditional fossil fuels do, like oil spills, runoff from coal mines, and air and ocean pollution [13]. Environmentally, wind energy can provide a low carbon output, low production cost option for providing energy to a substantial portion of the world population.

Yet, wind energy also has potential and perceived adverse environmental, economic and health-related consequences. Opposition to wind energy has arisen from fears of ecological impacts, like endangering birds and bats [13], from concerns over the visual impacts on otherwise

pristine scenery, and from worries about health-related impacts from wind turbine noise or ice throw (e.g. [14]). Wind turbine siting can also cause local community opposition because of environmental impacts such as wildlife displacement [15] or the potential for changes in the richness of soil and related concerns about the productiveness of farmland if a wind farm was installed [14]. Depending on an individual's values (e.g. protection of the environment, water conservation, concern for wildlife, land use), attitudes about the environmental impacts of wind turbines can influence support and opposition to wind farms (e.g. [15,16]).

Economically, wind farms can have a variety of impacts on individuals and local communities, in addition to the wind industry's role in electricity markets. During development, wind farms provide both employment opportunities to local communities and boosts to local economies, especially if the community can "provide a wind range of goods and services that can be used during the construction of the wind farms" ([9], p. 2). Individual land owners can also benefit financially from lease payments, as can the local community with cheaper electricity, among other benefits as outlined in [17]. Most of the opposition to wind energy in an economic sense comes from concerns of property value depreciation for land located near wind farms, worries about removal costs for broken or old wind turbines, and concerns about inequity in the distribution of the financial benefits from wind farms [14].

Given the potential impacts of this alternative energy, previous scholars have explored public concern about the economic and environmental impacts of wind energy (e.g. [18,19]). The best summary of the literature on public attitudes toward wind energy is the recent analysis by Rand and Hoen [5]. They indicate the perceived economic and environmental implications of wind energy are central to most people's opinions about the future expansion of wind energy. They call for more experimental evidence to tease out the interrelations between citizens' views about the

role of economic and environmental perceptions in shaping support or opposition for the development of wind energy.

The general summary Rand and Hoen [5] present is based on the literature in published papers and reports focused on the antecedents of attitudes about wind energy. Missing from Rand and Hoen's review, however, was Ansolabehere and Konisky's [20] more general work, which Ansolabehere and Konisky refer to as the Consumer Model, on attitudes about multiple energy sources. Based on nine national surveys, Ansolabehere and Konisky's [20] model of attitudes holds that the two predominant sources of wind energy attitudes are the perceptions of the energy source's environmental harms and costliness. Consistent with Rand and Hoen [5], Ansolabehere and Konisky's [20] findings suggest attitudes about any energy source are driven by perceptions of the economic and environmental harms of the energy source. Their conclusions differ, however, in the relative importance of the perceptions of environmental and economic consequences of energy choices. Ansolabehere and Konisky demonstrate environmental perceptions have a greater effect on overall attitudes than economic perceptions [20]. This mirrors findings by Olson-Hazboun et al., who suggest, with regard to public assessments of renewable energy, environmental concerns take a backseat to economic concerns or concerns about local economic and other impacts [21].

The drivers of wind energy support and opposition are a central concern for the political future of wind energy. While wind energy is a "green" energy source, the common perception in the public's view is wind energy is more expensive than fossil fuels [20]. Given the importance of public opinions about alternative energy [3], knowing if the economic or environmental predictors of wind energy attitudes are of greater importance has serious implications for future development of the technology. If the public is more sensitive to economic harms, then wind energy may need

to undergo continued technological advances to gain the necessary widespread support. If, however, the public is more responsive to the environmental benefits or harms, the relative advantage of wind energy in this domain may be enough for the wind industry to succeed, even without favorable policy mechanisms that have fostered economic competitiveness with other energy sources.

As noted, the current literature is conflicted about whether economic or environmental concerns drive public support. In addition, most of the empirical evidence about the role of economic and environmental predictors of wind energy attitudes is correlational, based on surveys or interviews [5], with Ansolabehere and Konisky's work as a notable exception. While these are useful techniques, they do not allow researchers to tease out causal relationships that could provide important information about the determinants of wind energy attitudes: Do people support wind energy because it is clean? Is wind energy perceived to be more expensive by people because they oppose it for other reasons? Most existing research cannot isolate causal patterns between opinions about the expansion of wind energy and the perceptions of the economic and environmental costs and benefits (again, Ansolabehere and Konisky are the noteworthy exception).

The majority of the extant literature on citizens' attitudes about wind energy focuses solely on exploring the determinants of these attitudes. Our discussion so far has followed in this vein. We argue that informing people about the environmental or economic consequences of wind energy should change their level of support for wind energy. This is likely to be only one of the possible effects of providing information. A second possible effect is what is known as priming, where providing information about a topic makes that topic more accessible in survey respondents' minds [22]. As a result, the experimental stimuli may not only change what the respondents think, but it may change what they think about. Receiving information about the environmental

consequences (either harms or benefits) should, according to priming theory, strengthen the link between the environmental perceptions and the overall support. Similarly, respondents who receive economic stimuli (either harms or benefits) should rely on their perceptions of the economic consequences of wind energy more when constructing their response to the question about their overall level of support [23].

Rand and Hoen [5] call for scholars to conduct more nationally representative samples and to emphasize the causal relationships between antecedents of support for wind energy and the attitudes themselves. Here, we answer this call using an original survey experiment to test how messages about the environmental and economic harms and benefits alter attitudes about wind energy. In particular, we test four hypotheses in this paper: **1) Information presenting the economic harms/benefits of wind energy will change support for wind energy. 2) Information presenting the environmental harms/benefits of wind energy will change support for wind energy. 3) The environmental information will have a greater effect than the economic information. 4) In addition to changing the content of attitudes about environmental and economic harms/benefits, the information will have a priming effect, increasing the weight applied to those attitudes.**

2. Data and Methods

The four hypotheses were tested through an original experiment conducted on a national sample of respondents. The research was reviewed and approved by the Institutional Review Board at Iowa State University. We conducted our experiment with 1844 respondents recruited by Qualtrics. First, respondents answered a pre-test that asked demographics (age, race, gender, education, state of residence, and income), basic political variables (partisanship, ideology, and vote choice in the 2016 presidential election), attitudes about climate change, and location of home

in proximity to a wind farm. Subjects were then presented with one of six experimental treatments (2x2 design with two controls). In the control condition, respondents read a brief article from *Reuters* about the expansion of wind energy in the first quarter of 2017. The two treatment conditions added information about the positive/negative environmental and economic effects of wind energy (see SI Methods 1 for full stimuli). Given the polarizing nature of the issue, none of the conditions mentioned climate change in any way so our treatments would not prime these attitudes in our respondents. After reading their treatment article, respondents were asked their opinion of the increased use of wind energy, their overall levels of support or opposition for wind energy, solar energy, natural gas, and coal (1=strongly oppose to 7=strongly support). Additionally, we asked respondents their attitude about the harmfulness of wind energy on the environment, the economy, and human health (see SI Methods 2 for full questionnaire). Finally, our experiment also included a baseline condition where respondents did not read any article on wind energy.[1] We will refer to this condition as "baseline (no text)" in an effort to distinguish it from the respondents who were in the experimental control (control with text) condition.

To summarize, respondents were placed into one of six conditions:

1) A **baseline** condition (control no text – 794 respondents) that provided no information about wind energy; 2) A **control** condition (with text – 210 respondents) that communicated wind energy has increased, but included no information about economic or environmental benefits or consequences; 3) An **Economic Harms** condition (210 respondents) that added a discussion of the increased costs of energy to the control condition; 4) an **Economic Benefits** condition (210 respondents) that added information about lowering the costs to the control condition; 5) an

[1] The baseline condition exists because of a coding error where the respondents were not shown any of the stimuli. There were also some subjects who received multiple treatments and were therefore completely omitted from all analyses.

Environmental Harms condition (210 respondents) that discussed the negative environmental consequences; and 6) an **Environmental Benefits** condition (211 respondents) that included content about the benefits of wind energy. (See SI Methods 1 for the full text of the conditions.)

The specific question wording for the dependent variables used in the analysis mimics those in the literature [20]. We measure the respondents' perceptions of the environmental harms by asking, "Some ways of generating electricity may be harmful to the environment we live in. How harmful do you think wind energy is?" The economic costs are measured by asking, "We'd like you to think about the costs of producing electricity from different sources. How expensive do you think it is to produce electricity with wind energy?" Finally, the overall attitude about wind energy is measured by the respondent's answer to the question, "Do you support or oppose the increased use of wind energy?"

The survey also included a range of demographic and political variables. Each of these is asked via standard questions and the coding follows norms in the literature. We measure the respondent's age in years, sex (coded as a dichotomous variable where a 1 indicates female), race (coded as a dichotomous variable where a 1 indicates white), education (1= no high school degree, 2 = high school graduate, 3 = some college but no BA, 4 = college graduate), and income (1 = less than $25k, 2 = $25k-$35k, 3 = $35k-$50k, 4 = $50k-$75k, 5 = $75k- $100k, 6 = $100k-$150k, 7 = $150k or more). We measure partisanship on a seven-point scale from strong Democrat to strong Republican and ideology on a seven-point scale from extremely liberal to extremely conservative. We also have two binary measures asking if the respondent lives near a wind farm (1 = yes) and if they have ever seen a wind farm (1 = yes). Finally, we include indicators of living in three of the four Census regions (the West serves as the comparison group).

While we have a national sample, it is not representative. The sample is, however, mostly balanced across the conditions. Table 1 presents the mean and count of respondents for each of these variables across our six conditions. The population sample is approximately 75 percent female. However, the other variables are closer to national averages. This limits our ability to draw generalizations from our sample to the nation. Fortunately, because most of our interest lies in the differences across the conditions, the balance in the distribution of the variables is more important. Table 1 illustrates, for most of the variables, that there are no differences across the randomly assigned conditions (See Table S1 for the actual statistical tests and the balance of these variables). The one variable that is significantly different across the conditions is education. Respondents in the economic harms condition are more educated than respondents in the other conditions. While this is troublesome, the inclusion of education as a control helps alleviate the concern that it might make the results spurious. Additionally, there are some minor differences between geographic regions. The economic harms condition has a slightly higher level of respondents from the Midwest and a smaller level of respondents from the Northeast. Southerners are slightly over represented in the environmental benefits condition. We have re-estimated the models with weights to account for the differences from a nationally representative sample and the substantive conclusions do not change.

The survey was conducted entirely online. We contracted with Qualtrics to solicit participation from one of their vendors, specifying the respondents needed to be American citizens, living in the United States and over 18. Qualtrics did not indicate the incentive they provided for participation and no reminders were sent to respondents. Our survey is a volunteer opt-in survey, which has become a standard tool for survey experiments that study public opinion. Our survey was in the field from July 13, 2017 to July 17, 2017. Callegaro and DiSogra (2008) advise when

reporting these types of surveys, the classic response rate is not the appropriate indicator [24]. Instead, they suggest authors provide the completion and break off rates. Completion is the proportion of respondents who began the survey and completed the entire questionnaire. Incompletes include both those who decided not to complete the survey, and those who were dismissed. We dismissed respondents who were under 18 and who failed an attention check. Our break-off rate was 11.8 percent and the completion rate was 86.3 percent.

Table 1 – Descriptive statistics of pre-treatment covariates by experimental conditon.

Covariate	Baseline	Control	Econ. Harms	Econ Benefits	Env. Harms	Env. Benefits
Age in years	44.43	43.78	43.37	42.69	43.06	43.64
	(794)	(210)	(210)	(210)	(210)	(211)
Sex (female =1)	0.71	0.76	0.77	0.78	0.80	0.73
	(794)	(210)	(210)	(210)	(210)	(211)
Race (white=1)	0.76	0.79	0.77	0.78	0.80	0.79
	(794)	(210)	(210)	(210)	(210)	(210)
Education	2.95	3.05	3.21	3.05	3.00	3.02
	(787)	(209)	(207)	(207)	(208)	(209)
Income	3.01	3.24	3.10	3.19	3.02	3.17
	(753)	(202)	(191)	(197)	(199)	(203)
Partisanship	2.73	2.8	2.79	2.69	2.77	2.79
	(793)	(210)	(210)	(207)	(210)	(211)
Ideology	3.94	3.88	4.00	3.95	4.06	3.85
	(794)	(210)	(210)	(210)	(210)	(211)
Live near wind farm	0.09	0.09	0.10	0.08	0.06	0.08
	(725)	(209)	(209	(209)	(209)	(210)
Seen a wind farm	0.62	0.68	0.67	0.69	0.64	0.63
	(728)	(210)	(210)	(210)	(210)	(211)
Northeast	0.17	0.17	0.10	0.22	0.18	0.13
	(794)	(209)	(0.21)	(210)	(210)	(211)
South	0.41	0.45	0.47	0.38	0.44	0.48
	(794)	(209)	(210)	(210)	(210)	(211)
Midwest	0.18	0.20	0.25	0.20	0.18	0.23
	(794)	(209)	(210)	(210)	(210)	(211)
West	0.16	0.18	0.18	0.21	0.20	0.16
	(794)	(209)	(210)	(210)	(210)	(211)

Note: Mean of each variable in each condition. The number of respondents in the condition is reported in parentheses.

3. Results

3.1 Descriptive stats

Figures 1a through 1c present the frequency distribution of the three dependent variables, environmental harm, economic expense, and overall support. The x-axes for each present the response categories from specific survey questions. The most striking aspect of the figures is the skew evident in the perceptions of the environmental consequences and the overall support for wind energy. Most of our sample thinks wind energy is not harmful to the environment and is supportive of its expansion, an expected result given the extant literature. The respondents are more divided in their perceptions of wind energy's expense. More respondents think it is cheap than expensive, but the distribution is much less skewed than the responses to the other two questions. The skew is likely to limit portions of the study that are hypothesized to increase support or the perceptions of the environmental consequences of wind energy. If respondents who do not receive the experimental treatment messages about wind energy are mostly

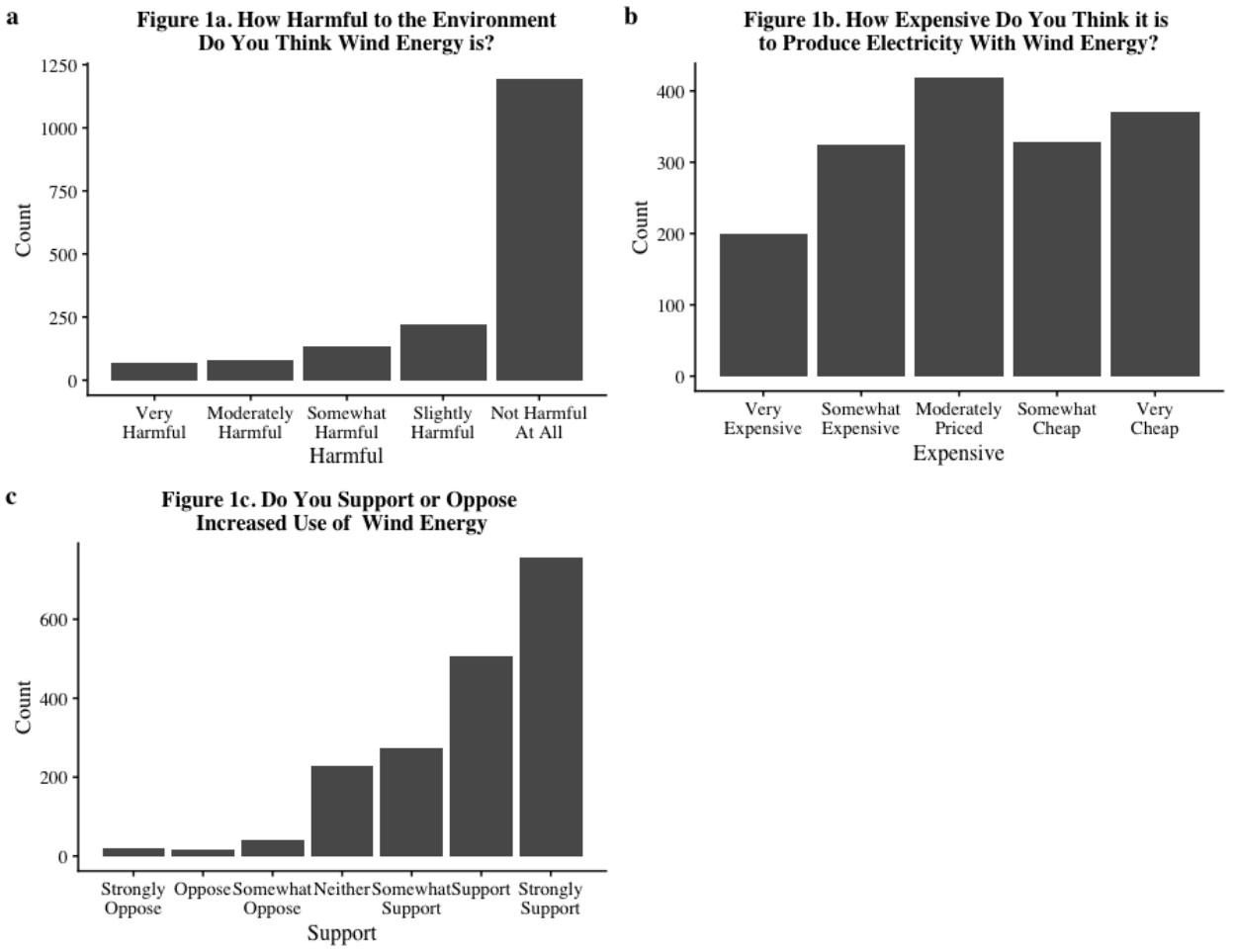

Figure 1. Distribution of respondents' responses to question about the (a) environmental harms from wind energy, (b) economic costs of wind energy, and (c) the overall level of support for wind energy.

clustered in the highest category of the dependent variable, it is unlikely there will be detectable differences from the experimental conditions that we hypothesize to have positive effects. This is likely to create ceiling effects for both the perceptions of the environmental effects and the overall levels of support, resulting in the positive treatment conditions being indistinguishable from the control conditions because the respondents' attitudes could not become noticeably more positive in the scale. We will return to this when we present the models predicting these attitudes.

3.2 Analytic strategy

We test the hypotheses through a series of regressions (see Table S2 and S3 for the results modeled as an ordered logit). For each model, we predict support for wind energy with high values

representing more positive assessments of wind energy. We include a series of indicators for the experimental condition the respondent is in, with the baseline (no text) condition as the omitted category. In particular, we test if the experimental treatments change the perceptions of the economic costs, the environmental costs, and the overall level of support for wind energy. Hypotheses 1 and 2 are captured in the regression coefficients for those conditions. We test hypothesis 3 by comparing the equality of the coefficients.

We test the priming hypothesis (hypothesis 4) by testing if the economic/environmental conditions increase the effect of environmental/economic attitudes on the overall levels of support for wind energy. The specific test is via an interaction between the economic (or environmental) attitude and an indicator of being in one of the economic (or environmental) conditions. A positive coefficient indicates that respondents in the condition have a stronger relationship between perceptions of the economic/environmental concerns and the overall support for wind energy. Note that we are using the dependent variables from the first two columns of Table 2 as independent variables in these models. While the regression design implies a causal ordering, we are not making the causal claim that attitudes about the economy or the environment *cause* a change in the overall level of support for expansion of wind energy. It could be the information in the treatment causes a change in the overall level of support for the expansion, and respondents rationalized their specific attitudes about the economy or the environment. What matters for the priming hypothesis is not the specific ordering of the attitudes, but the strength of the link between them. If the economic conditions prime economic implications of wind energy, then the link between responses to the two survey questions will be stronger regardless of the causal ordering between them.

3.3 Hypotheses 1-3

Figures 2, 3, and 4 present the distribution of respondents' attitudes about the environmental harms from wind energy, the economic costs of wind energy, and the overall levels of support, broken down by treatment condition. For all three variables, higher values represent more positive attitudes about wind energy. The first two plots in each figure present the two control conditions. The upper left are the respondents who did not read any of the stimulus materials, the baseline (control no text) condition. The upper right includes those who are in the control with text condition that presents the respondent with the text about the recent increase in wind energy production, but no environmental or economic arguments. The second row presents the results for the economic conditions and final row includes the respondents in the environmental conditions. In each case, the left panel presents the respondents in the negative conditions and the right presents the respondents in the positive conditions.

While wind energy, as noted in Figure 1, is quite popular regardless of the treatment, there are some differences across the conditions. The presentation of the information in the control with text condition appears to have made attitudes more positive than the respondents in the baseline condition. Information about an increase in wind energy seems to cue respondents to be more positive. There appear to be differences in the other conditions as well, with respondents in the negative environmental or economic conditions reporting fewer positive attitudes.

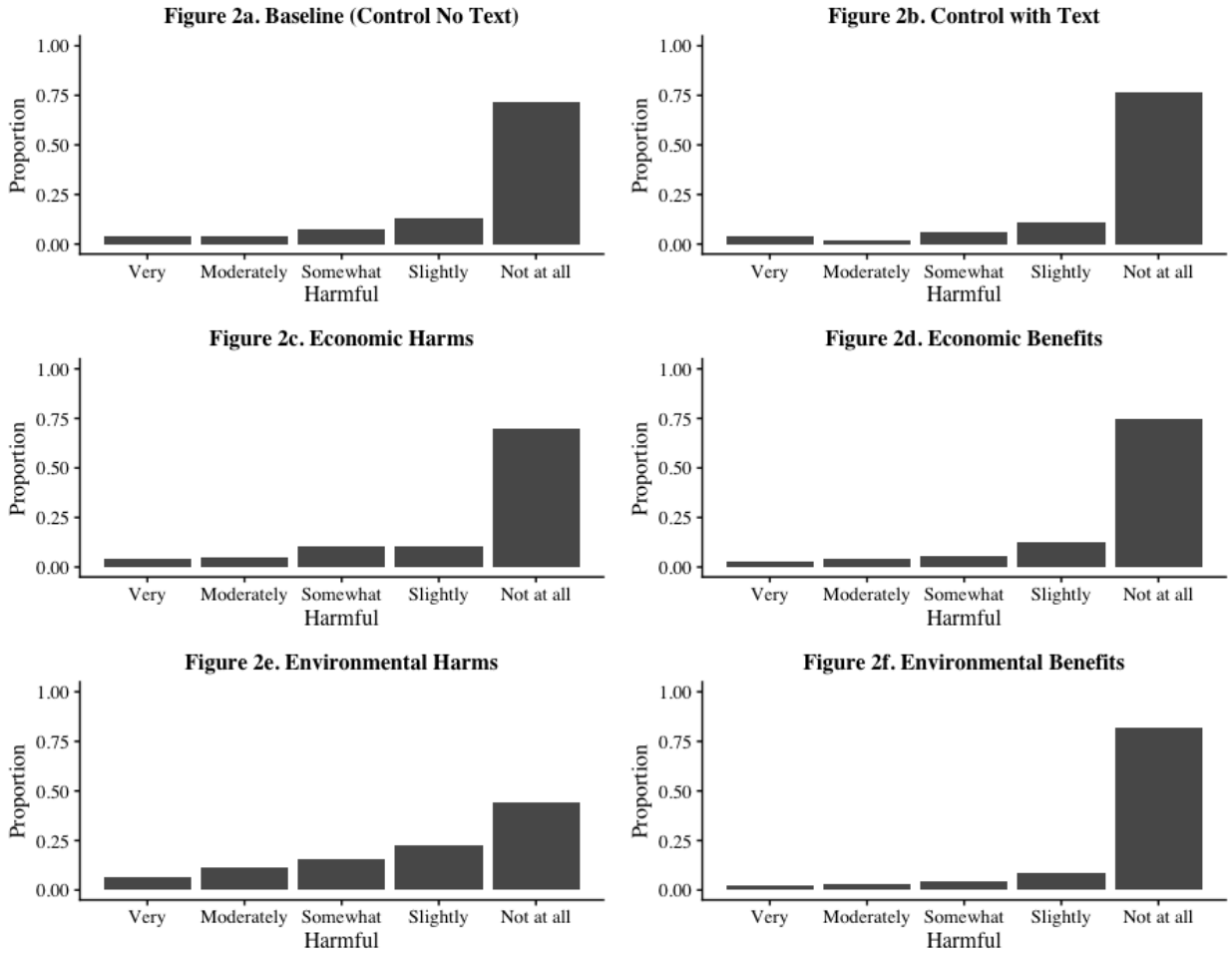

Figure 2. Distribution of respondents' perceptions of environmental harms from wind energy by treatment condition.

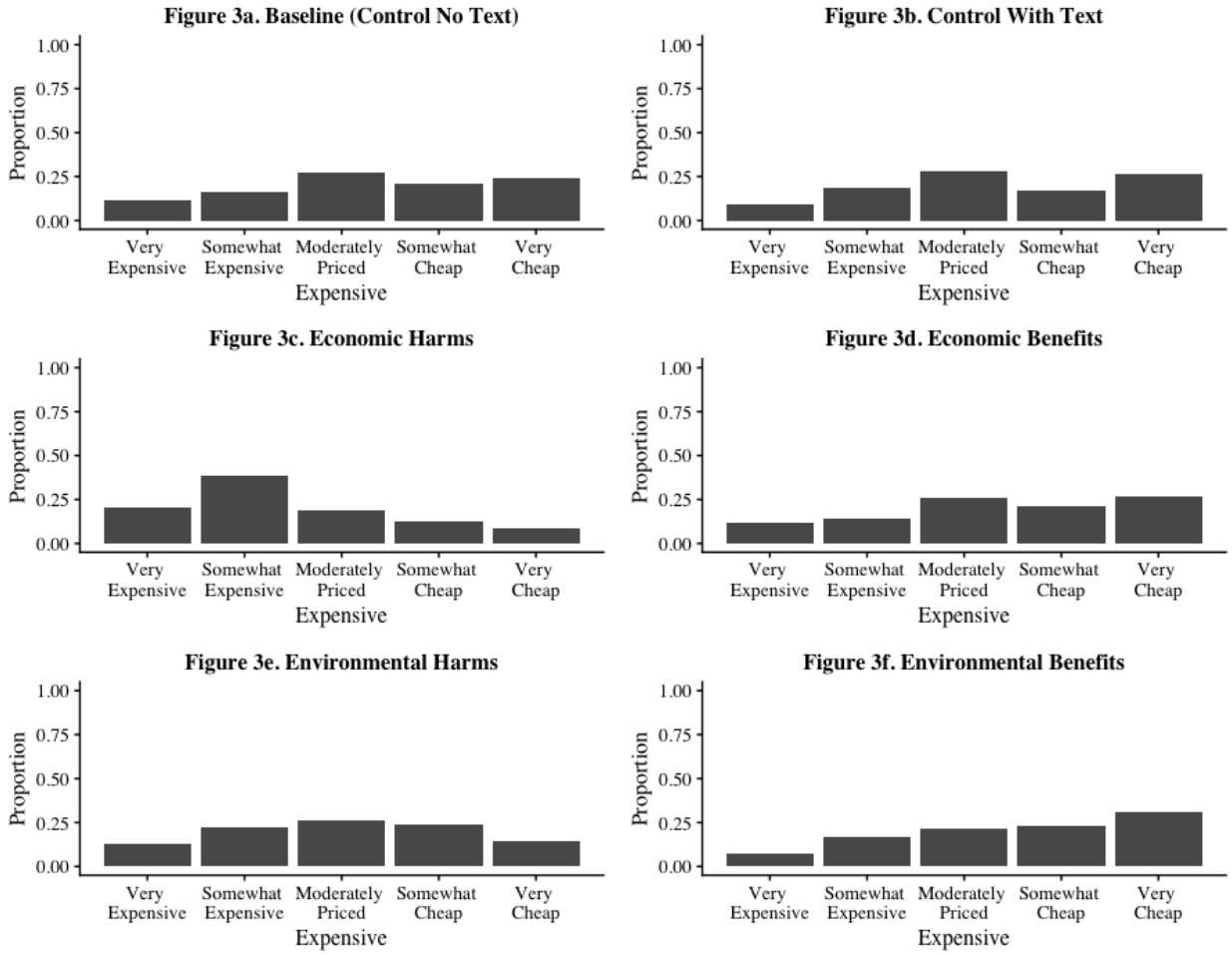

Figure 3. Distribution of respondents' perceptions of economic costs from wind energy by treatment condition.

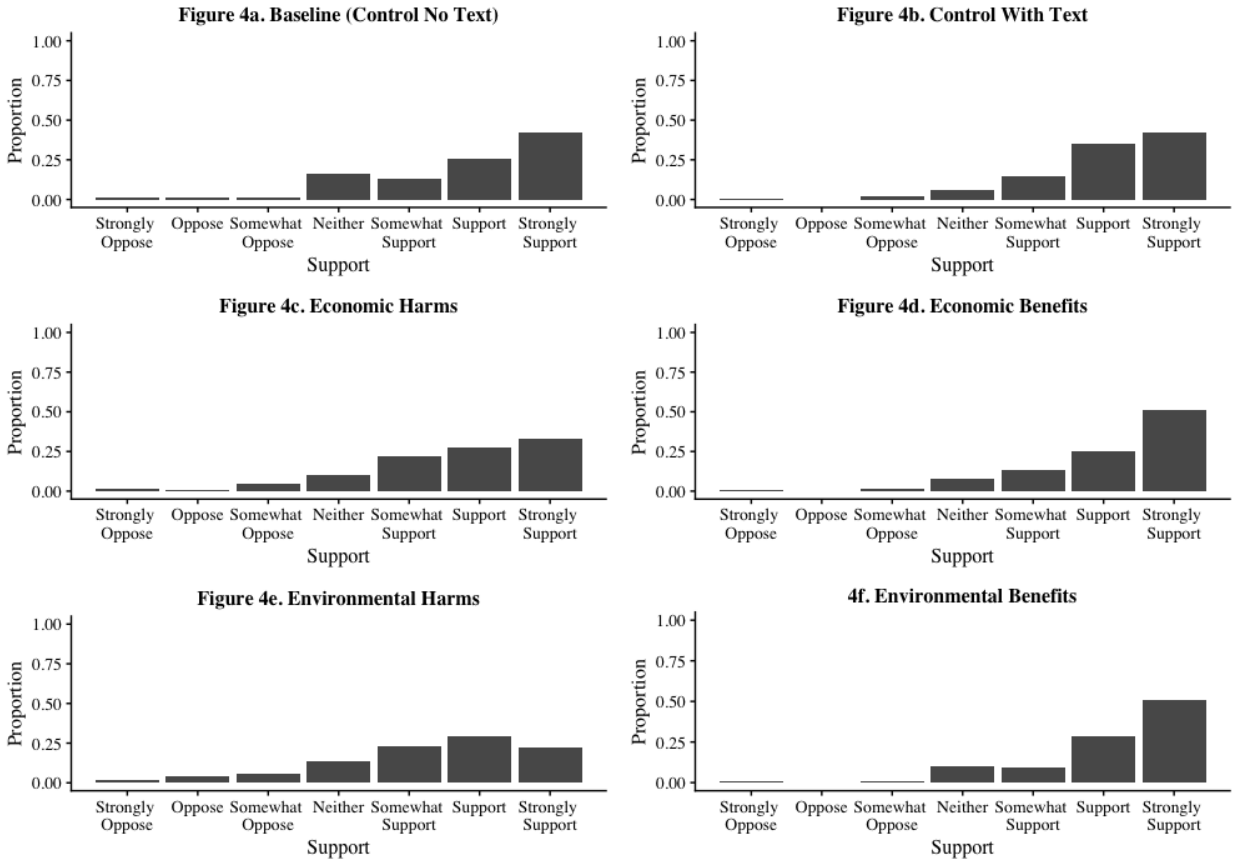

Figure 4. Distribution of respondents' overall levels of support for wind energy by treatment condition.

Table 2 displays the regressions capturing tests for hypotheses 1 and 2. The dependent variable in column 1 is the respondent's perception of the environmental harms, with higher values indicating the perception that wind has less environmental harms. In the second column, the dependent variable is the perception of the economic effects and the third column presents the model predicting overall levels of support, with higher values representing more positive attitudes. In each column, there is general support for hypotheses 1 and 2. As a reminder, the dependent variables in these models are ordinal and models that account for this are an alternative specification. We choose to present the regressions because they make the summary of the average treatment effects clearer. Tables S2 and S3 in the appendix present the same models as ordered logits. The general pattern of the sign and significance of the results is the same in those models.

There were significant differences between the environmental and baseline (no text) conditions (column 1, Table 2) for the model explaining the environmental perceptions of wind energy. Respondents in the environmental harms condition were, on average, six tenths of a point lower on the five-point scale predicting environmental harms. Respondents in the environmental benefits condition were almost a fifth of a point higher. Post hoc tests indicate that respondents in the environmental benefits condition were not significantly more positive than respondents in the control with text condition. Due to the observed positive attitudes about the lack of environmental harms of wind energy, we believe the absence of significant differences between the environmental benefits and control with text is largely a ceiling effect but cannot test this directly. High levels of support for wind energy and respondents' attitudes of no environmental harms in our baseline condition also created a ceiling effect. This limited our ability to detect increased positive attitudes as a result of our treatment. The economic conditions, either positive or negative, did not have a significant effect on perceptions of the environmental implications of wind energy.

The models predicting the economic effects of wind energy are less simple (column 2, Table 2). First, the negative economic condition had a large effect on the dependent variable, with respondents in this condition three quarters of a point lower on the five-point scale (indicating more negative perceptions about the economics of wind energy). The economic benefits condition, however, had no effect on the perceptions of the economics of wind energy. The environmental treatments appear to have spillover effects to attitudes about the price of wind energy. Respondents who were told wind energy was helpful/harmful to the environment also indicated wind energy was cheap/expensive. The magnitude of the effect of the negative economic information was significantly larger than the effect of either of the environmental conditions (environmental harms $F_{(1, 1470)}$, statistic, 18.35, p-value < 0.01; environmental benefits $F_{(1, 1470)}$, statistic, .11.51, p-value

< 0.01). At least when it comes to perceptions of the economic impacts of wind energy, respondents reacted more to the economic information than the environmental information.

Table 2 – Regressions predicting wind energy attitudes

Condition	Perception of wind environmental harms	Perception of wind energy economic harms	Support for increased use of wind energy
Control with text	0.04 (0.08)	0.07 (0.11)	0.18 (0.09)
Economic harms	-0.14 (0.09)	-0.84 (0.11)*	-0.29 (0.10)*
Economic benefits	0.06 (0.09)	0.02 (0.11)	0.28 (0.10)*
Environmental harms	-0.61 (0.09)*	-0.25 (0.11)*	-0.46 (0.09)*
Environmental benefits	0.18 (0.09)*	0.26 (0.11)*	0.30 (0.09)*
Age in years	0.01 (0.001)*	0.01 (0.002)*	0.002 (0.002)
Sex (female =1)	0.03 (0.06)	0.11(0.08)	-0.18 (0.07)*
Race (white=1)	0.25 (0.07)*	-0.003 (0.09)	0.17 (0.08)*
Education	0.02 (0.03)	-0.01 (0.04)	0.04 (0.04)
Income	-0.0003 (0.02)	-0.02 (0.03)	0.01 (0.02)
Partisanship	-0.02 (0.02)	-0.02 (0.02)	-0.06(0.02)*
Ideology	-0.002 (0.02)	-0.02 (0.03)	-0.13 (0.02)*
Live near wind farm	-0.27 (0.09)*	-0.36 (0.12)*	0.09 (0.11)
Seen a wind farm	0.16 (0.06)*	0.01 (0.07)	0.38 (0.06)*
South	0.07 (0.07)	0.06 (0.09)	-0.04 (0.08)
Midwest	0.10 (0.08)	-0.01 (0.11)	-0.02 (0.09)
Northeast	0.11 (0.09)	0.27 (0.11)*	-0.15 (0.10)
Constant	3.80 (0.16)*	3.07 (0.20)*	5.13 (0.18)*
Observations	1,542	1,489	1,665
Adjusted R^2	0.07	0.08	0.13

Note: Linear regression predicting participants' attitudes about wind energy. The baseline (no text) condition is the omitted category. SEs are shown in parenthesis. *p<0.05.

The treatment conditions created differences in the overall level of support for the expansion of wind energy (column 3, Table 2). The first coefficient in the model shows the control with text treatment, which only reported wind energy use expanded in the first quarter of 2017, made respondents more supportive of wind energy compared to the baseline (no text) group that did not read about wind energy. Next, we compare the effects of the treatments (environmental and economic pros and cons) to attitudes in the control with text condition. This allows us to isolate

the effects of the economic and environmental information beyond the effect of the baseline text. While all four effects of the treatments in the third column are statistically significant, the post hoc tests indicate only the two harms conditions are significantly different from the control with text condition. Specifically, the negatively framed articles—describing the environmental and economic harms of wind energy—resulted in attenuated support for the expansion of wind energy.

The demographic and political variables have inconsistent results across the models. Older voters believe wind is better environmentally and economically, but do not differ in their overall levels of support. Female respondents do not differ in their perceptions of the economic or environmental effects of wind energy, but are less supportive of its expansion. White respondents think wind is better environmentally than non-white respondents and are more supportive of wind's expansion. Education and income have no relationship with any of the variables. Party and ideology are only significant predictors of support for expansion. The interpretation of the experience with wind farms is a little tricky. There are really three groups of respondents: those who live near a wind farm, those who do not, but have seen a wind farm, and those who have never seen a wind farm. Those who have never seen a wind farm are less positive than those who have seen one but do not live near one. The difference between living near a wind farm and never having seen one is the sum of the two coefficients (living near one implies that you have seen one). The sum of these coefficients is not statistically significant ($F_{(1,1526)} = 1.35$, $p > 0.05$). Respondents who live near a wind farm, however, do lower the respondent's perception of the environmental benefits. The results for the other two dependent variables are easier. Those who live near a wind farm are less positive about the economic benefits of wind energy. Respondents who have seen a wind farm have higher levels of support for wind energy, but living near one does not have any additional effect on support for the expansion of wind energy.

The test of hypothesis 3 (environmental information will have greater effect than economic information) compares the coefficients capturing the effect of being in the environmental and economic treatments. If the null hypothesis is correct, these coefficients should be equal. The results in column 2 (Table 2) indicate the environmental treatments spilled over to economic perceptions are suggestive, but a direct test of the equality of the coefficients is more precise. The $F_{(1, 1646)}$ statistic from the test of the constraint that the coefficients from the economic costs and environmental costs conditions are equal, is 1.91 (p-value>0.05). While both the environmental and economic costs conditions lowered support relative to the baseline (no text) condition, as expected in hypothesis 3, the environmental effects were not significantly stronger. Additionally, there were no significant differences in the absolute value of the treatment conditions. Respondents did not seem to respond significantly more to the environmental information than the economic information or more to the negative than the positive information.

3.4 Hypothesis 4

The final set of tests capture the priming effect of our treatments, or whether perceptions of environmental or economic costs of wind energy were primed or strengthened by the treatment. The interactions presented in Table 3 (costs*condition) captures these effects. The first column of Table 3 includes only the attitudes about the economic and environmental costs as predictors of overall levels of support for wind energy. The more positive the respondent's attitudes about the environmental and economic effects of wind energy, the more they supported its expansion. The second column of Table 3 adds the indicator of being in either an environmental or economic condition. These indicators capture the difference between respondents in the baseline and *either* the positive or negative conditions, so there are no significant differences in the levels of support for wind energy.

Table 3 – Regressions predicting priming effects on wind energy attitudes

Condition	Attitudes only Model	Attitudes/ condition model	Priming Model
Perceived environmental costs	0.33 (0.02)*	0.33 (0.02)*	0.27 (0.03)*
Perceived economic costs	0.13 (0.03)*	0.13 (0.03)*	0.08 (0.03) *
Environment condition	-	0.02 (0.07)	-1.04 (0.27)*
Economic condition	-	-0.06 (0.07)	-0.60 (0.17)*
Environment costs*Environment condition	-	-	0.23 (0.06)*
Economic costs*Economics condition	-	-	0.20 (0.05)*
Age in years	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Sex (female =1)	-0.17 (0.06) *	-0.17(0.06) *	-0.18 (0.07) *
Race (white=1)	0.13 (0.08)	0.12 (0.07)	0.14 (0.07) *
Education	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)
Income	0.03 (0.02)	0.03 (0.02)	0.02 (0.02)
Partisanship	-0.06 (0.02) *	-0.06 (0.02) *	-0.08 (0.02) *
Ideology	-0.12 (0.02) *	-0.12 (0.02) *	-0.09 (0.03) *
Live near wind farm	0.23 (0.10) *	0.27 (0.13) *	0.24 (0.13)
Seen a wind farm	0.26 (0.06)*	0.16 (0.08) *	0.15 (0.08)
South	-0.07 (0.08)	0.01 (0.10)	-0.003 (0.10)
Midwest	-0.08 (0.09)	0.06 (0.11)	0.04 (0.11)
Northeast	-0.23 (0.10)	-0.23 (0.12)	-0.24 (0.12)*
Constant	3.65 (0.20)*	3.48 (0.27)*	4.43 (0.32)*
Observations	1,437	1,437	1,437
R^2	0.21	0.21	0.22

Note: Linear regression predicting participants' attitudes about wind energy. The Environment Condition is an indicator of being in either of the positive or negative environment conditions. The Economic condition is an indicator of being in either of the positive or negative economic conditions. SEs are shown in parenthesis. *$p<0.05$.

The third column presents the test of the priming hypothesis. The simple test of the priming hypothesis is the significance of the interaction term. This captures if the relationship between the economic/environmental perception of wind energy is different between respondents in the economic/environmental condition and respondents who are not. The significance of the economic costs*economic condition interaction term (0.20 in column 3) suggests being in the economic condition primed respondents to have a stronger link between their perceptions of the economic impacts of wind energy and their overall attitude toward its expansion. Similarly, the significance

of the environment costs*environmental condition interaction term (0.23 in column 3) shows the relationship between environmental perceptions of wind energy and support/opposition to the expansion of wind energy is stronger in the environmental condition.

Graphing the expected relationship between the economic/environmental attitudes and support for the expansion of wind energy makes this clearer. Figure 5 presents the expected support for wind energy, along the y-axis, as the perception of the environmental or economic harms ranges from the minimum to the maximum value (x-axis). The dashed line illustrates the expected support for wind energy for respondents in the control condition and the solid line for respondents in the corresponding treatment condition. The main comparison for these figures is the slope of the lines. If the attitude had no effect in a condition, the line would be horizontal; thus, the stronger the effect, the steeper the slope.

The left panel of Figure 5 summarizes the effect of economic perceptions on support for wind energy and demonstrates a classic priming effect. In both types of conditions, the effect is statistically significant. Economic perceptions always shape overall levels of support. The priming effect is captured by the increase in the slope of the solid line. Respondents who perceive wind energy to be expensive are less supportive in the economic conditions (the far left of the left panel of Figure 5). Respondents who perceive wind energy to be cheap support wind energy more in the economic conditions than respondents who think it is cheap and are in the other conditions. The condition not only changed what respondents think about wind energy, but also changed how they weighed those considerations.

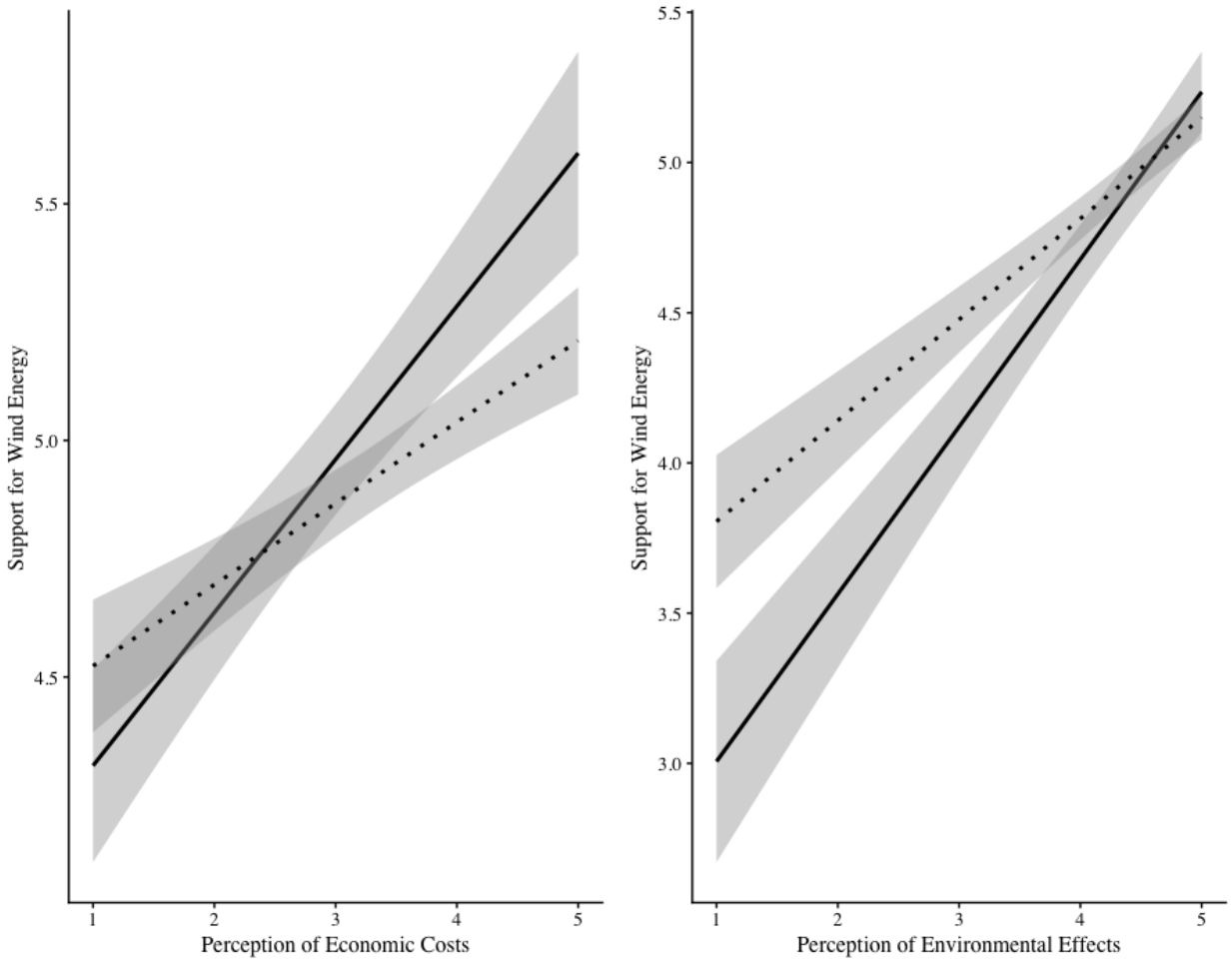

Figure 5. Effect of (a) perceptions of economic costs and (b) environmental effects of wind energy on overall levels of support. Higher values indicate more positive attitudes. The lines summarize the regression model presented in Table 3, with the solid line indicating respondents in the (a) economic or (b) environmental conditions and the dashed line being the respondents not in those conditions. The shadaed regions represent the uncertainty in the estimates based on the standard errors reported in Table 3.

The effect of environmental attitudes shows a more substantial priming effect (a starker difference between the lines), but a different substantive pattern. Respondents who think that wind energy has sizable environmental costs are much less supportive of wind energy when environmental attitudes are primed by the conditions. At the high end of environmental attitudes, there are no real differences. The respondents who believe that there are no environmental costs are equally supportive of the expansion of wind energy whether or not they were in one of the environmental conditions.

Overall, the treatments not only shifted respondents' attitudes about the environmental and economic aspects of wind energy, but also strengthened the connection between these attitudes and their overall attitude about wind energy. The arguments about wind energy, in other words, have both a persuasive and a priming effect as hypothesized.

4. Discussion

In their recent summary, Rand and Hoen [5] argue for the need to move beyond correlational and observational studies of citizens' attitudes about wind energy. Here, we begin to address this call by reporting on the results of an experimental test of the role of economic and environmental concerns about wind energy in shaping public support. Our main findings provide support for the Consumer Model of energy policy attitudes [20]. Citizens care about both the economic and environmental consequences of their energy choices and their responses to the information are mostly equal. Citizens are no more sensitive to messages focusing on the environmental consequences of wind energy than they are information about the economics of wind energy. While our experimental data is limited to support for wind energy, this is somewhat inconsistent with the results from other research [20]. For example, Ansolabehere and Konisky consistently find larger effects from environmental concerns than from economic concerns about sources of energy. Moreover, we demonstrate the mere presence of information can prime voters to rely on different considerations about wind energy. This finding suggests attitudes about wind energy, for most of the American public, may be more susceptible to persuasive communication because attitudes about wind energy are not held as strongly as other environmental topics such as climate change [25]. Thus, most Americans may be open to, and influenced by, new information and outreach efforts related to wind energy.

Our results reveal high levels of public support for wind energy, though we recognize that our single measure cannot capture all of the components of support. Support is a multifaceted concept that can include "agreement with or approval of management actions, intentions to support, encourage or engage in management activities, or actual participation in management efforts" [26, p. 133]. Expressing support for wind energy in a survey is not the same thing as actively supporting wind energy by voting for policies that favor new farms, taxes for renewable energy, new research or development into wind energy, etc. Additional research is necessary to explore these more specific attitudes and concerns, both among members of the public and groups who are directly affected by wind energy development (e.g., landowners, industry representatives, environmental groups). While our sample was national, it may not have adequately captured concerns or specific attitudes among individuals who are directly affected by wind energy development or wind farms.

There are several other clear limitations to this work. First, our results may simply be unique to American politics. The public's response to the development of wind energy may be culturally and politically distinct. As such, we hope that other scholars will explore these patterns in other countries. Second, the choice of information provided in the treatments may limit the generalizability of the results. We consciously avoided any mention of climate change in the treatment conditions due to the polarized nature of climate change in the United States. Climate change, however, plays a key role in the broader debates about energy policy and its absence from the information we provided may create an artificiality of our results. Third, while this is a national sample, it is not a representative one. This does not alter the interpretation of the internal validity based on the randomized experiment; however, it does substantially limit the generalizability of the observational results from the demographics of the respondents. Finally, there are multiple

aspects of wind energy, perceptions about health implications or aesthetics for instance, that are not included in this research.

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SI Methods 1: Experimental Survey Stimuli

1. Control with text:

The U.S. wind industry installed 2,000 megawatts of capacity in the first quarter, nearly four times the amount installed in the same period last year. It was the industry's biggest first quarter since 2009, the American Wind Energy Association said in its first-quarter market report released on Tuesday. Project construction and development activity is also robust. There are 9,025 MW of wind projects under construction and an additional 11,952 MW in advanced development, AWEA said.

About a quarter of the megawatts installed in the first quarter are contracted to buyers outside the utility industry, including the U.S. Army, Amazon.com Inc and Alphabet Inc's Google. Home Depot Inc and Intuit Inc also signed contracts for new wind projects for the first time in the first quarter. The companies that created the utility wind capacity additions since the beginning of 2016 include Xcel Energy Inc, Berkshire Hathaway Inc's MidAmerican Energy, Alliant Energy Corp and DTE Energy Co.

Texas, the country's top state for wind power capacity, was the top location for wind installations in the first quarter, followed by Kansas, New Mexico, North Carolina and Michigan.

2. Economic Harms:

The U.S. wind industry installed 2,000 megawatts of capacity in the first quarter, nearly four times the amount installed in the same period last year. It was the industry's biggest first quarter since 2009, the American Wind Energy Association said in its first-quarter market report released on Tuesday. Project construction and development activity is also robust. There are 9,025 MW of wind projects under construction and an additional 11,952 MW in advanced development, AWEA said.

These gains are largely despite the economic costs of wind energy. Technological innovations have not been able to make wind energy as cheap as natural gas. Wind energy produces energy at a higher cost than natural gas. The initial investment in new wind farms is very costly. All of these expenses get passed on to the consumer as higher energy prices.

About a quarter of the megawatts installed in the first quarter are contracted to buyers outside the utility industry, including the U.S. Army, Amazon.com Inc and Alphabet Inc's Google. Home Depot Inc and Intuit Inc also signed contracts for new wind projects for the first time in the first quarter. The companies that created the utility wind capacity additions since the beginning of 2016 include Xcel Energy Inc, Berkshire Hathaway Inc's MidAmerican Energy, Alliant Energy Corp and DTE Energy Co.

Texas, the country's top state for wind power capacity, was the top location for wind installations in the first quarter, followed by Kansas, New Mexico, North Carolina and Michigan.

3. Economic Benefits:

The U.S. wind industry installed 2,000 megawatts of capacity in the first quarter, nearly four times the amount installed in the same period last year. It was the industry's biggest first quarter since 2009, the American Wind Energy Association said in its first-quarter market report released on Tuesday. Project construction and development activity is also robust. There are 9,025 MW of wind projects under construction and an additional 11,952 MW in advanced development, AWEA said.

These gains are largely due to the economic benefits of wind energy. Thanks to recent technological innovations, wind energy is now the second cheapest source of energy and is competitive with natural gas. Wind energy employs far more workers than the coal industry. Local communities, in particular, benefit from the tax revenues of the wind farms.

About a quarter of the megawatts installed in the first quarter are contracted to buyers outside the utility industry, including the U.S. Army, Amazon.com Inc and Alphabet Inc's Google. Home Depot Inc and Intuit Inc also signed contracts for new wind projects for the first time in the first quarter. The companies that created the utility wind capacity additions since the beginning of 2016 include Xcel Energy Inc, Berkshire Hathaway Inc's MidAmerican Energy, Alliant Energy Corp and DTE Energy Co.

Texas, the country's top state for wind power capacity, was the top location for wind installations in the first quarter, followed by Kansas, New Mexico, North Carolina and Michigan.

4. Environmental Harms:

The U.S. wind industry installed 2,000 megawatts of capacity in the first quarter, nearly four times the amount installed in the same period last year. It was the industry's biggest first quarter since 2009, the American Wind Energy Association said in its first-quarter market report released on Tuesday. Project construction and development activity is also robust. There are 9,025 MW of wind projects under construction and an additional 11,952 MW in advanced development, AWEA said.

These gains are largely despite the environmental costs of wind energy. The construction of wind farms requires large open areas and the expansion may cause potential deforestation. Wind farms have been known to endanger birds and bats and disrupt their migratory patterns. The production of wind turbines requires the extraction of rare earth minerals, a process that has serious environmental consequences.

About a quarter of the megawatts installed in the first quarter are contracted to buyers outside the utility industry, including the U.S. Army, Amazon.com Inc and Alphabet Inc's Google. Home Depot Inc and Intuit Inc also signed contracts for new wind projects for the first time in the first quarter. The companies that created the utility wind capacity additions since the beginning of 2016 include Xcel Energy Inc, Berkshire Hathaway Inc's MidAmerican Energy, Alliant Energy Corp and DTE Energy Co.

Texas, the country's top state for wind power capacity, was the top location for wind installations in the first quarter, followed by Kansas, New Mexico, North Carolina and Michigan.

5. Environmental Benefits:

The U.S. wind industry installed 2,000 megawatts of capacity in the first quarter, nearly four times the amount installed in the same period last year. It was the industry's biggest first quarter since 2009, the American Wind Energy Association said in its first-quarter market report released on Tuesday. Project construction and development activity is also robust. There are 9,025 MW of wind projects under construction and an additional 11,952 MW in advanced development, AWEA said.

These gains are largely due to the environmental benefits of wind energy.
Unlike energy derived from fossil fuels, wind energy does not produce any air pollution. It is a renewable resource, which will never run out and does not have the same environmental impacts like mining coal or extracting natural gas through hydraulic fracturing, otherwise known as fracking.

About a quarter of the megawatts installed in the first quarter are contracted to buyers outside the utility industry, including the U.S. Army, Amazon.com Inc and Alphabet Inc's Google. Home Depot Inc and Intuit Inc also signed contracts for new wind projects for the first time in the first quarter. The companies that created the utility wind capacity additions since the beginning of 2016 include Xcel Energy Inc, Berkshire Hathaway Inc's MidAmerican Energy, Alliant Energy Corp and DTE Energy Co.

Texas, the country's top state for wind power capacity, was the top location for wind installations in the first quarter, followed by Kansas, New Mexico, North Carolina and Michigan.

SI Methods 2: Full Survey Details

Survey Instructions: Thank you for agreeing to participate in this study! We are studying people's thoughts about wind energy. We are going to begin by asking a series of questions, so we can get to know a little about you. None of this information can be used to identify you, and this entire study will be anonymous. Then we are going to ask you to read a news article and then answer a few questions about it. This study should take no more than 10-15 minutes. Feel free to skip any questions you do not wish to answer and you can stop the survey at any time. If you have any questions, please contact the principal investigator at <DELETED TO MAINTAIN ANONYMITY>. Thank you for your participation!

Q5 What is your age in years?

Condition: What is your age in years? Is Less Than 18. Skip To: End of Block.

Q7 Please choose one or more races that you consider yourself to be:

- ❑ White (1)
- ❑ Black or African-American (2)
- ❑ Latino (8)
- ❑ Asian-American (4)
- ❑ American Indian or Alaska Native (3)
- ❑ Native Hawaiian or other Pacific Islander (5)
- ❑ Other (6)
- ❑ Refuse to answer (7)

Display This Question:

If Please choose one or more races that you consider yourself to be: Other Is Selected

Q9 If you selected Other on the previous question, please specify:

Q11 What is your gender

- ❍ Male (1)
- ❍ Female (2)
- ❍ Other (3)
- ❍ Prefer not to answer (4)

Q13 What is the highest level of school that you have completed or the highest degree you have received?

- ❍ Less than High school (1)
- ❍ High school graduate - high school diploma or equivalent (for example: GED) (2)
- ❍ Some college but no degree (3)
- ❍ Associate degree in college - Occupational/vocational program (4)
- ❍ Associate degree in college - Academic program (5)
- ❍ Bachelor's degree (For example: BA, AB, BS) (6)
- ❍ Master's degree (For example: MA, MS, MEng, MEd, MSW, MBA) (7)
- ❍ Professional School Degree (For example: MD, DDS, DVM, LLB, JD) (8)
- ❍ Doctorate degree (For example: PhD, EdD) (9)
- ❍ Other (10)
- ❍ Refuse to answer (11)

Q15 What was the total income in 2016 for all family members living in your household?

- ❍ Less than $25,000 (1)
- ❍ $25,000 to $34,999 (2)
- ❍ $35,000 to $49,999 (3)
- ❍ $50,000 to $74,999 (4)
- ❍ $75,000 to $99,999 (5)
- ❍ $100,000 to $149,999 (6)
- ❍ $150,000 or more (7)
- ❍ Refuse to answer (8)

Q17 Generally speaking, do you usually think of yourself as a Democrat, a Republican, an independent, or what?

- ❍ Democrat (1)
- ❍ Republican (2)
- ❍ Independent (3)
- ❍ Other (4)

Display This Question:

If Generally speaking, do you usually think of yourself as a Democrat, a Republican, an independent,... Democrat Is Selected

Q19 Would you call yourself a strong Democrat or a not very strong Democrat

- ❍ Strong (1)
- ❍ Not very strong (2)

Display This Question:
If Generally speaking, do you usually think of yourself as a Democrat, a Republican, an independent,... Republican Is Selected

Q21 Would you call yourself a strong Republican or a not very strong Republican
- ❍ Strong (1)
- ❍ Not very strong (2)

Display This Question:
If Generally speaking, do you usually think of yourself as a Democrat, a Republican, an independent,... Independent Is Selected

Q23 Do you think of yourself as closer to the Republican Party or to the Democratic Party?
- ❍ Closer to Republican (1)
- ❍ Neither (2)
- ❍ Closer to Democratic (3)

Display This Question:
If Generally speaking, do you usually think of yourself as a Democrat, a Republican, an independent,... Other Is Selected

Q25 Do you think of yourself as closer to the Republican Party or to the Democratic Party?
- ❍ Closer to Republican (1)
- ❍ Neither (2)
- ❍ Closer to Democratic (3)

Q27 We hear a lot of talk these days about liberals and conservatives. Here is a seven-point scale on which the political views that people might hold are arranged from extremely liberal to extremely conservative. Where would you place yourself on this scale?
- ❍ Extremely liberal (1)
- ❍ Liberal (2)
- ❍ Slightly liberal (3)
- ❍ Moderate; middle of the road (4)
- ❍ Slightly conservative (5)
- ❍ Conservative (6)
- ❍ Extremely conservative (7)

Q29 Who did you vote for in the 2016 presidential elections?
- ❍ Donald Trump (1)
- ❍ Hillary Clinton (2)
- ❍ Other (3)
- ❍ Did not vote (4)

Display This Question:
If Who did you vote for in the 2016 presidential elections? Other Is Selected

Q31 If your choice had been limited to Donald Trump and Hillary Clinton, who would you have voted for?
- ❍ Donald Trump (1)
- ❍ Hillary Clinton (2)

Display This Question:
If Who did you vote for in the 2016 presidential elections? Did not vote Is Selected

Q33 Which candidate did you prefer even though you did not vote?
- ❍ Donald Trump (1)
- ❍ Hillary Clinton (2)

Q35 Please select "A moderate amount" for this question
- ❍ A lot (1)
- ❍ A moderate amount (2)
- ❍ A little (3)

Condition: A moderate amount Is Not Selected. Skip To: End of Block.

Q56 Which of the following do you think best describes your view about climate change?
- ❍ Climate change has been established as a serious problem and immediate action is necessary (1)
- ❍ There is enough evidence that climate change is taking place and some action should be taken (2)
- ❍ We don't know enough about climate change and more research is necessary before we take any action (3)
- ❍ Concern about climate change is exaggerated. No action is necessary (4)
- ❍ Climate change is not occurring. This is not a real issue (5)

Q25 In which state do you currently reside?

- ❍ Alabama (1)
- ❍ Alaska (2)
- ❍ Arizona (3)
- ❍ Arkansas (4)
- ❍ California (5)
- ❍ Colorado (6)
- ❍ Connecticut (7)
- ❍ Delaware (8)
- ❍ District of Columbia (9)
- ❍ Florida (10)
- ❍ Georgia (11)
- ❍ Hawaii (12)
- ❍ Idaho (13)
- ❍ Illinois (14)
- ❍ Indiana (15)
- ❍ Iowa (16)
- ❍ Kansas (17)
- ❍ Kentucky (18)
- ❍ Louisiana (19)
- ❍ Maine (20)
- ❍ Maryland (21)
- ❍ Massachusetts (22)
- ❍ Michigan (23)
- ❍ Minnesota (24)
- ❍ Mississippi (25)
- ❍ Missouri (26)
- ❍ Montana (27)
- ❍ Nebraska (28)
- ❍ Nevada (29)
- ❍ New Hampshire (30)
- ❍ New Jersey (31)
- ❍ New Mexico (32)
- ❍ New York (33)
- ❍ North Carolina (34)
- ❍ North Dakota (35)
- ❍ Ohio (36)
- ❍ Oklahoma (37)
- ❍ Oregon (38)
- ❍ Pennsylvania (39)
- ❍ Puerto Rico (40)

- ❍ Rhode Island (41)
- ❍ South Carolina (42)
- ❍ South Dakota (43)
- ❍ Tennessee (44)
- ❍ Texas (45)
- ❍ Utah (46)
- ❍ Vermont (47)
- ❍ Virginia (48)
- ❍ Washington (49)
- ❍ West Virginia (50)
- ❍ Wisconsin (51)
- ❍ Wyoming (52)
- ❍ I do not reside in the United States (53)

Q37 What is you zip code?

Q30 Do you live near a wind farm?
- ❍ Yes (1)
- ❍ No (2)

Q39 Have you ever seen a wind turbine or farm in person?
- ❍ Yes (1)
- ❍ No (2)

Q54 Please read the following article about wind energy and then respond to the following questions.

See treatments in SI Methods 1: Experimental Survey Stimuli

Q32 What is your opinion of the increase in wind energy use during the first quarter of 2017?
- ❍ Like a great deal (1)
- ❍ Like a moderate amount (2)
- ❍ Like a little (3)
- ❍ Neither like nor dislike (4)
- ❍ Dislike a little (5)
- ❍ Dislike a moderate amount (6)
- ❍ Dislike a great deal (7)

Q31 Do you support or oppose the increased use of wind energy?
- ❍ Strongly support (1)
- ❍ Support (2)
- ❍ Somewhat support (3)
- ❍ Neither support nor oppose (4)
- ❍ Somewhat oppose (5)
- ❍ Oppose (6)
- ❍ Strongly oppose (7)

Q36 Do you support or oppose the increased use of solar energy?
- ❍ Strongly support (1)
- ❍ Support (2)
- ❍ Somewhat support (3)
- ❍ Neither support nor oppose (4)
- ❍ Somewhat oppose (5)
- ❍ Oppose (6)
- ❍ Strongly oppose (7)

Q37 Do you support or oppose the increased use of natural gas energy?
- ❍ Strongly support (1)
- ❍ Support (2)
- ❍ Somewhat support (3)
- ❍ Neither support nor oppose (4)
- ❍ Somewhat oppose (5)
- ❍ Oppose (6)
- ❍ Strongly oppose (7)

Q38 Do you support or oppose the increased use of coal energy?
- ❍ Strongly support (1)
- ❍ Support (2)
- ❍ Somewhat support (3)
- ❍ Neither support nor oppose (4)
- ❍ Somewhat oppose (5)
- ❍ Oppose (6)
- ❍ Strongly oppose (7)

Q35 Some ways of generating electricity may be harmful to the environment we live in. How harmful do you think each of these power sources is?

	Very Harmful (1)	Moderately Harmful (2)	Somewhat Harmful (3)	Slightly Harmful (4)	Not Harmful At All (5)	Not Sure (6)
Wind (1)	❍	❍	❍	❍	❍	❍
Natural Gas (2)	❍	❍	❍	❍	❍	❍
Solar (3)	❍	❍	❍	❍	❍	❍
Coal (4)	❍	❍	❍	❍	❍	❍
Nuclear (5)	❍	❍	❍	❍	❍	❍

Q43 We'd like you to think about the costs of producing electricity from different sources. How expensive do you think it is to produce electricity with each of the following fuels?

	Very Expensive (1)	Somewhat Expensive (2)	Moderately Priced (3)	Somewhat Cheap (4)	Very Cheap (5)	Not Sure (6)
Wind (1)	❍	❍	❍	❍	❍	❍
Natural Gas (2)	❍	❍	❍	❍	❍	❍
Solar (3)	❍	❍	❍	❍	❍	❍
Coal (4)	❍	❍	❍	❍	❍	❍
Nuclear (5)	❍	❍	❍	❍	❍	❍

Q48 How do you feel each of the following energy sources impact the health of the people who live near the production facility?

	Extremely Harmful (1)	Harmful (2)	Slightly Harmful (3)	Not Harmful At All (4)	Not Sure (5)
Wind (1)	❍	❍	❍	❍	❍
Natural Gas (2)	❍	❍	❍	❍	❍
Solar (3)	❍	❍	❍	❍	❍
Coal (4)	❍	❍	❍	❍	❍
Nuclear (5)	❍	❍	❍	❍	❍

Q41 One negative some people have for wind energy is that the turbines are thought to be ugly. How would you rate the appearance of wind turbines?

- ❍ Extremely negative (1)
- ❍ Moderately negative (2)
- ❍ Slightly negative (3)
- ❍ Neither positive nor negative (4)
- ❍ Slightly positive (5)
- ❍ Moderately positive (6)
- ❍ Extremely positive (7)

Q42 One positive some people have for wind energy is that the turbines are thought to be attractive. How would you rate the appearance of wind turbines?

- ❍ Extremely positive (1)
- ❍ Moderately positive (2)
- ❍ Slightly positive (3)
- ❍ Neither positive nor negative (4)
- ❍ Slightly negative (5)
- ❍ Moderately negative (6)
- ❍ Extremely negative (7)

Q44 Have you heard of Wind Turbine Syndrome?

- ❍ Yes (1)
- ❍ No (2)

Q46 Have you or anyone you know suffered from Wind Turbine Syndrome?

- ❍ Yes (1)
- ❍ Maybe (2)
- ❍ No (4)

Q45 There are some who claim that being near a wind farm causes "Wind Turbine Syndrome". This is supposedly a condition that disturbs sleep, and results in headaches, nervousness, nausea, and irritability. These claims persist despite the fact that there is no scientific or medical evidence that it exists.

Q47 How likely do you think it is that Wind Turbine Syndrome is a legitimate medical condition?

- ❍ Extremely likely (1)
- ❍ Moderately likely (2)
- ❍ Slightly likely (3)
- ❍ Neither likely nor unlikely (4)
- ❍ Slightly unlikely (5)
- ❍ Moderately unlikely (6)
- ❍ Extremely unlikely (7)

SI Tables

Table S1 – Balance test of pre-treatment covariates by experimental conditon

Covariate	F-Statistic	p-value
Age in years	0.50	0.77
Sex (female =1)	1.93	0.09
Race (white=1)	0.54	0.75
Education	3.33	0.01
Income	0.87	0.50
Partisanship	0.11	0.99
Ideology	0.48	0.79
Live near wind farm	0.52	0.76
Seen a wind farm	1.03	0.40
Northeast	2.71 (210)	0.02
South	1.76	0.12
Midwest	1.38	0.23
West	0.67	0.65

Note: The entry in each cell is the F-statistic and p-value from an ANOVA testing the null hypothesis that the mean of the covariate is the same across the six conditions.

Table S2 – Ordered logits predicting wind energy attitudes

Condition	Perception of wind environmental harms	Perception of wind energy economic harms	Support for increased use of wind energy
Control with text	0.16 (0.19)	0.08 (0.15)	0.18 (0.15)
Economic costs	-0.24 (0.19)	-1.19 (0.16)*	-0.51 (0.15)*
Economic benefits	0.20 (0.20)	0.04 (0.16)	0.52 (0.16)*
Environmental costs	-1.18 (0.16)*	-0.37 (0.15) *	-0.73 (0.15)*
Environmental benefits	0.55 (0.21) *	0.37 (0.15)*	0.52 (0.16)*
Age in years	0.01 (0.004)*	0.01 (0.003)*	0.004 (0.003)
Sex (female =1)	0.08 (0.13)	0.12 (0.11)	-0.34 (0.11) *
Race (white=1)	0.41 (0.15)*	-0.01 (0.12)	0.30 (0.12) *
Education	-0.04 (0.07)	-0.01 (0.06)	0.10 (0.06)
Income	-0.01 (0.04)	-0.03 (0.03)	0.01 (0.03)
Partisanship	-0.04 (0.04)	-0.02 (0.03)	-0.10 (0.03) *
Ideology	-0.03 (0.04)	-0.02 (0.04)	-0.22 (0.04) *
Live near wind farm	-0.53 (0.19) *	-0.50 (0.17) *	0.27 (0.17)
Seen a wind farm	0.26 (0.013)*	0.03 (0.010)	0.65 (0.10) *
South	0.09 (0.07)	0.07 (0.13)	-0.11 (0.13)
Midwest	0.11 (0.18)	-0.02 (0.15)	-0.07 (0.15)
Northeast	0.08 (0.19)	0.38 (0.16) *	-0.34 (0.16)
Cut 1	-2.63 (0.36)	-2.04 (0.30)	-5.46 (0.40)
Cut 2	-1.71 (0.35)	-0.71 (0.29)	-4.60 (0.34)
Cut 3	-0.93 (0.34)	0.42 (0.29)	-3.83 (0.31)
Cut 4	-0.10 (0.34)	1.40 (0.29)	-2.23 (0.29)
Cut 5	-	-	-1.29 (0.28)
Cut 6	-	-	0.03 (0.28)
Observations	1,541	1,488	1,664

Note: Ordered logit predicting participants' attitudes about wind energy. The baseline condition is the omitted category. SEs are shown in parenthesis. *$p<0.05$.

Table S3 – Ordered logit predicting priming effects on wind energy attitudes

Condition	Model 1	Model 2	Model 3
Perceived environmental costs	0.52 (0.05)*	0.51 (0.05)*	0.42 (0.06)*
Perceived economic costs	0.16 (0.04)*	0.16 (0.04)*	0.07 (0.04)
Environment condition	-	0.03 (0.12)	-1.76 (0.46)*
Economic condition	-	-0.15 (0.12)	-1.11 (0.28)*
Environment costs*Environment condition	-	-	0.37 (0.10)*
Economic costs*Economics condition	-	-	0.39 (0.09)*
Age in years	0.01 (0.004)*	0.01 (0.003)*	0.004 (0.003)
Sex (female =1)	0.08 (0.13)	0.12 (0.11)	-0.34 (0.11)*
Race (white=1)	0.41 (0.15)*	-0.01 (0.12)	0.30 (0.12)*
Education	-0.04 (0.07)	-0.01 (0.06)	0.10 (0.06)
Income	-0.01 (0.04)	-0.03 (0.03)	0.01 (0.03)
Partisanship	-0.04 (0.04)	-0.02 (0.03)	-0.10 (0.03)*
Ideology	-0.03 (0.04)	-0.02 (0.04)	-0.22 (0.04)*
Live near wind farm	-0.53 (0.19)*	-0.50 (0.17)*	0.27 (0.17)
Seen a wind farm	0.26 (0.01)*	0.03 (0.01)	0.65 (0.10)*
South	0.09 (0.07)	0.07 (0.13)	-0.11 (0.13)
Midwest	0.11 (0.18)	-0.02 (0.15)	-0.07 (0.15)
Northeast	0.08 (0.19)	0.38 (0.16)*	-0.34 (0.16)
Cut 1	-2.05 (0.31)	-2.08 (0.32)	-2.84 (0.35)
Cut 2	-1.26 (0.25)	-1.30 (0.26)	-2.04 (0.30)
Cut 3	-0.51 (0.23)	-0.56 (0.23)	-1.28 (0.27)
Cut 4	0.76 (0.21)	0.73 (0.22)	0.02 (0.25)
Cut 5	1.81 (0.21)	1.77 (0.22)	1.08 (0.26)
Cut 6	3.12 (0.22)	3.08 (0.23)	2.41 (0.26)
Observations	1580	1580	1580

Note: Ordered logit predicting participants' attitudes about wind energy. The Environment Condition is an indicator of being in either of the positive or negative environment conditions. The Economic condition is an indicator of being in either of the positive or negative economic conditions. SEs are shown in parenthesis. *$p<0.05$.