

Willing to Pay or Eager to Earn? Experimental Evidence on Determinants of Opinions on Renewables Policy

December 2018

Nina Kelsey
Ethan Porter

DRAFT – PLEASE DO NOT CIRCULATE

1. Introduction

What shapes individual preferences and perceptions of interests regarding renewable energy policy? Existing research and survey work typically finds that majorities of the public support renewables and renewable energy policy, but shallowly: when asked to quantify their support in terms of a “monthly bill premium,” consumers generally say they are willing to pay a little more for renewable power.¹ This approach to quantifying preferences reveals a bias in the framing of existing research, however: researchers have typically worked from a baseline assumption that renewable energy policy is primarily thought of in terms of costs. More generally, insufficient research examines how individuals arrive at their beliefs about the overall value of renewable energy and climate policy, and how and why these opinions change over time. Objectively, renewable energy has both potential costs and potential benefits attached to it. It seems likely that individuals perceive some mix of both, and that perceptions of the value of climate and renewable energy policy are based on complex and potentially fluid understandings of multi-valent value assessments. Since public perceptions of renewable energy policy are a major determinant of the political feasibility of such policy, a better understanding of how these perceptions are formed and re-formed is called for.

This project tests whether experimental treatments that increase the salience of local economic benefits - such as increased employment and expanded tax base - from local investments in renewable energy (RE) industries appear to affect the value respondents assign a) directly, to RE development itself, and b) indirectly, to policy that supports RE development. In other words, can treatments that make potential local economic benefits of renewable energy more salient to individuals change their perceptions of personal or community interests in RE? And if so, does this translate into changes in individual perceptions of their material interests with regard to renewable energy policy?

Our interest in these questions stem partly from an interest in the possibility of feedback effects between policy and its impact, public perceptions, and voting behavior. There is a growing understanding that feedback processes between policy and interest groups can influence the political landscape for subsequent policymaking, harking back to theoretical work on policy feedback processes generally,² but more recently elaborated to help explain outcomes in renewable energy and climate policy more specifically.³ Early policy moves can act to change

¹ Farhar and Houston, “Willingness to Pay for Electricity from Renewable Energy.”

² Pierson, “Increasing Returns, Path Dependence, and the Study of Politics.”

³ Unruh, “Understanding Carbon Lock-In”; Kelsey and Zysman, “The Green Spiral”; Meckling et al., “Winning Coalitions for Climate Policy”; Pahle et al., “What Stands in the Way Becomes the Way: Sequencing in Climate Policy to Ratchet up Stringency over Time.”

the interests of relevant interest groups; these changes in interests in turn act to change the political landscape that determines the political feasibility of subsequent policy moves. Scholars have identified a variety of specific examples of such feedback processes in renewables policy; however, most of these are described within industry interest groups and at the firm level, where they tend to be most easily observed.⁴

One overarching question motivating this project is: do feedback effects between policy and interests, analogous to those seen at the firm and industry level, exist at the individual voter level? Is there evidence that the impacts of renewable energy policy can change individual (perceptions of) interests in ways that change citizens political attitudes and hence their support for subsequent policy? This is a complex question concerning a multi-step process. This project investigates two possible links in that process: first, whether perceived economic impacts of policy change perceptions of economic interests among individuals; and second, whether that is linked to changes in those individuals' support for relevant policy instruments.

To explore these questions, we carry out a large-N, multi-wave survey experiment, assessing respondents' attitudes and expectations about renewable energy and relevant policies before, immediately after, and one week after a receiving one of two treatments; a placebo treatment; or no treatment. Both treatments are intended to inform respondents about potential local economic benefits of renewable energy; in one we simply present expert commentary, while the other treatment presents commentary on economic benefits in the guise of a fictitious press release, a format intended to localize and personalize the information presented.

As we discuss below, our core finding is that although treatment produces statistically significant, though small, positive effects on individuals' perceptions of local interests with regard to renewable energy, this does not appear to translate into changes in support for renewable energy or climate policies.

The paper is divided into four sections. First, we begin by discussing the existing literature and this project's contribution to it. Second, we outline the methodology used in this project. Third, we discuss the results we obtained. Fourth, we conclude with a discussion of the implications of our findings and questions raised for future research.

2. Existing Literature & Our Contribution

Research into public attitudes regarding renewable energy and renewable energy policy has tended to fall into two categories:

National and cross-national public opinion research has examined general beliefs about renewable energy and its overall desirability. This research fairly uniformly finds high levels of approval.⁵ In the abstract, individuals like renewable energy. However, this literature on mass

⁴ Biber, "Cultivating a Green Political Landscape: Lessons for Climate Change Policy from the Defeat of California's Proposition 23"; Kelsey, "The Green Spiral: Policy-Industry Feedback and the Success of International Environmental Negotiation"; Kelsey et al., "The United States: Local Green Spirals, National Ambiguity."

⁵ Farhar and Houston, "Willingness to Pay for Electricity from Renewable Energy"; Bohn and Lant, "Welcoming the Wind? Determinants of Wind Power Development among U.S. States"; Rand and Hoen, "Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?"

public opinion regarding renewables has tended to be fairly simplistic, gauging overall attitudes without shedding much light on complex nuance such as how attitudes are formed, what drives them, complexities and tensions in how individuals think about renewables and balance different drivers and narratives, and so on.

A symptom of this scarcity in the literature is a tendency to frame questions about renewables support using a simplistic “cost” framework. For instance, some research attempts to quantify strength of support by asking individuals how much more they would be willing to pay on their monthly energy bill for renewable electricity, typically finding that respondents have some, but not much, willingness to pay more.⁶ This framing implicitly assumes a framing of renewable energy as a expensive if perhaps desirable environmental benefit that comes only at an economic cost.

But more complex recent attitudinal work suggests that individuals have more complex understandings of renewable energy that may not be first and foremost about costs or environmental benefits. For instance, large-scale polling by Ansolabehere & Konisky⁷ find that in fact on average respondents believe not only that renewables are better for the environment, but also that they are less, not more, expensive than many other generation sources. And some of the more localized work discussed below anecdotally reinforces the idea that costs are not a foremost framing for RE for many respondents, suggesting that support for renewables may in some cases be entirely divorced from narratives about environmental benefits and their value in terms of willingness to pay, and rely instead on narratives about economic benefits.⁸ These findings generally suggest an ongoing basic need for more complex examinations of individual attitudes at the national/cross-national level.

Meanwhile, *localized and case study* research on wind energy finds that the picture looks different at the local level. An extremely varied set of literature examines the factors that determine whether individuals support local investment in renewable energy generation. This type of literature is almost invariably focused on wind farm development, as much of it began as a response to the concern over local political resistance to wind farms,⁹ an area of ongoing concern given that wind farms remain one of the more visually salient forms of renewable infrastructure and new wind projects still face varying levels of resistance. This research finds a disconnect between general opinions about renewable energy and specific opinions about whether *local* renewable energy development is desirable. Even people who like renewable energy in the abstract do not necessarily like it in the form of a concrete local manifestation. Early interpretations of this phenomenon often related it to the concept of NIMBYism, the idea that people may like something in principle but balk at specific local instances, preferring not to have it in “my backyard.” However, even early literature pointed at additional factors at work,¹⁰ and the wealth of subsequent literature shows that NIMBYism is too simplistic a framework for

⁶ Farhar and Houston, “Willingness to Pay for Electricity from Renewable Energy.”

⁷ Ansolabehere and Konisky, *Cheap and Clean: How Americans Think about Energy in the Age of Global Warming*.

⁸ Jepson, Brannstrom, and Persons, “‘We Don’t Take the Pledge’: Environmentalism and Environmental Skepticism at the Epicenter of US Wind Energy Development.”

⁹ Bosley and Bosley, “Public Acceptability of California’s Wind Energy Developments: Three Studies”; Rand and Hoen, “Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?”

¹⁰ e.g. Bosley and Bosley, “Public Acceptability of California’s Wind Energy Developments: Three Studies” found that perceptions of wind developers as unreliable “tax scammers” drove early resistance in California.

understanding attitudes about local renewable development.¹¹ Rather, scholars have found a wide variety of factors that potentially influence opinions about local wind investment. These include party and political ideology; environmental attitudes and concerns; perceptions of costs and potential benefits, including economic benefits; ownership structure; aesthetic considerations and noise/annoyance concerns; proximity and visual impact; and perceptions of voice and fairness in political processes and siting decisions.¹²

Several interesting findings stand out with regard to attitudes toward renewable energy: a) under some circumstances individuals local to wind can display “inverse NIMBYism,” displaying more enthusiasm about wind than those further away;¹³ b) process matters – some evidence shows that localities in which individuals and local communities perceive themselves as having had a voice in the development decision-making show higher levels of wind infrastructure acceptance;¹⁴ and c) perceptions of economic impacts matter – more so than general attitudes about renewable energy or and interacts with process – and in general the interactions between environmental and economic discourses in forming individual and community attitudes around wind generation assets are varied and complicated.¹⁵

Taken together, existing literature has several deficiencies. First, it lacks sophisticated investigation of attitude formation carried out at the national level; much of this type of investigation has previously been carried out in locally focused case study work, and recent review articles identify the lack of broader studies as an important lack.¹⁶ Second, the most sophisticated investigations of preference formation in this area have focused pretty exclusively on wind farms specifically; but the renewable energy ecosystem is much broader than wind farms alone, encompassing other forms of renewables as well as multiple steps in renewable supply chains with distinct economic interests, ranging from equipment manufacturing to service jobs and land use rents. Focusing myopically on the specific political battles of wind farm siting misses important parts of the ecosystem of interests implicated by renewable energy. Third, although attitudes about renewable energy at both the national and local levels have been studied somewhat extensively, most studies focus on one or the other: asking either how mass publics as a whole think about national or regional policies, or how local individuals think about specific local infrastructure developments. These two things are distinct, but they are not unrelated;

¹¹ van der Horst, “NIMBY or Not? Exploring the Relevance of Location and the Politics of Voiced Opinions in Renewable Energy Siting Controversies”; Warren et al., “‘Green on Green’: Public Perceptions of Wind Power in Scotland and Ireland.”

¹² Rand and Hoen, “Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?” provides a particularly good overview of existing work; see also Olson-Hazboun, Krannich, and Robertson, “Public Views on Renewable Energy in the Rocky Mountain Region of the United States: Distinct Attitudes, Exposure, and Other Key Predictors of Wind Energy.”

¹³ Warren et al., “‘Green on Green’: Public Perceptions of Wind Power in Scotland and Ireland.”

¹⁴ Bosley and Bosley, “Public Acceptability of California’s Wind Energy Developments: Three Studies”; Olson-Hazboun, Krannich, and Robertson, “Public Views on Renewable Energy in the Rocky Mountain Region of the United States: Distinct Attitudes, Exposure, and Other Key Predictors of Wind Energy.”

¹⁵ Jepson, Brannstrom, and Persons, “‘We Don’t Take the Pledge’: Environmentalism and Environmental Skepticism at the Epicenter of US Wind Energy Development”; Olson-Hazboun, Krannich, and Robertson, “Public Views on Renewable Energy in the Rocky Mountain Region of the United States: Distinct Attitudes, Exposure, and Other Key Predictors of Wind Energy”; Hamilton et al., “A Change in the Wind? US Public Views on Renewable Energy and Climate Compared.”

¹⁶ Rand and Hoen, “Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?”

individuals' perceptions of (potential) local renewable energy projects almost certainly influence how they think about regional and national policies that might support more such developments. How, in practice, do attitudes at the local and regional/national levels interact? Are there feedback dynamics between the two as there are between firm-level attitudes and renewables policy?

This project seeks to investigate the plausibility of feedback dynamics and attitudinal change in the relationship between renewable energy policy, renewable energy deployment, and individual support for renewables and renewables policy. Can increasing the salience of potential local economic benefits from renewable energy – a proxy for real-world processes in which individuals become aware of actual economic benefits in their community – lead to changes in individuals' attitudes about renewable energy, and does this in turn lead to changes in their levels of support for policy relevant to renewables?

Investigating this question addresses deficiencies of the existing literature in several ways. It provides a large-N, national-level test of the types of individual-level dynamics that have primarily been studied in individual cases; while we do not assemble a representative sample, our respondents are drawn from across the US rather than a narrow site or set of sites. In keeping with this broader approach, our project seeks to explore preference formation around renewables generally, rather than focusing on attitudes toward wind generation facilities specifically. We also go beyond simple survey and correlational work, using experimental techniques to explore how preferences may change and form, rather than gathering static data on possible drivers of preferences to correlate with existing attitudes. And rather than working either at the local or the national level in isolation, it seeks to examine the link between attitudes about *local community and individual* impacts of RE and RE policy on the one hand, and on attitudes about *state and national-level* policy on the other.

3. Methodology

A sample of 1,256 respondents recruited via Amazon's Mechanical Turk (MTurk) platform completed three study waves, each conducted approximately one week apart: an initial wave that collected demographic and baseline attitudinal data; a second wave in which respondents were randomly assigned to one of four groups, receiving one of two treatments, a placebo treatment, or no treatment, after which attitudes were again measure; and a final third wave in which attitudes were assessed after a week to see if any long-term effects of treatment were observed. Subjects were paid on the following schedule: Wave 1 - \$0.50; wave 2 - \$1.00; wave 3 – \$.75.

Survey. We obtained several types of data from respondents:

3.1. Demographic data: we obtained respondents' age, gender, race and ethnicity, educational level, income level, state, and zip code.

3.2. We asked respondents several types of questions exploring their attitudes, beliefs, and experiences.

3.2.1. Respondents may already have contacts with renewable energy in their personal networks. We asked respondents whether they, personally, worked in renewable energy such as wind, solar, hydroelectric, or biomass; in energy efficiency equipment or services; or in none of the above. We also asked them whether they had family or friends working in either or neither of those two industries. These questions allowed us to gauge whether some respondents may be more likely to have a pre-existing sense of personal interest in green industries, something that might influence their attitudes on relevant topics. To measure this, we asked them two questions:

Do you, personally, work in either of the following industries (choose all that apply): (Renewable energy such as wind, solar, hydroelectric, or biomass; Energy efficiency equipment or services; None of the above)

Thinking about your family and friends, do any of them work in either of the following industries (please check all that apply): (Renewable energy such as wind, solar, hydroelectric, or biomass; Energy efficiency equipment or services; None of the above)

3.2.2. We assessed political attitudes generally, including political party; political ideology; attitude toward current President Trump using a feeling thermometer; a set of questions gauging political knowledge in the form of respondents' ability to correctly identify the office held by several prominent political figures and the party currently in control of Congress; and a set of questions recording recent political activity.

3.2.3. Since renewable energy policy and climate policy are often rhetorically associated in practice, we gauged respondents' beliefs about climate change using a question adapted from Pew polling, which asked respondents to choose between four statements ("The Earth is getting warmer mostly because of human activity such as burning fossil fuels;" "The Earth is getting warmer mostly because of natural patterns in the Earth's environment;" "There is no solid evidence that the Earth is getting warmer;" and "Not sure."). Aside from this question and three questions on policy in our assessment of dependent variables that touched on policies relevant to carbon emissions reduction (see below), we did not assess environmental attitudes more broadly; as some prior research has shown, renewable energy is a topic that respondents may identify with multiple narratives, not all of them mutually compatible.¹⁷ Our focus in this research was to assess respondents' perceptions of their economic interests regarding renewable energy and policies that support renewable energy as well as carbon emissions reduction, as well as whether those perceptions could be manipulated by treatment. Asking respondents a battery of questions on environmental attitudes more generally ran the risk of priming them to think of narratives around renewable energy that might be either synergistic or conflictual with our topics of interest, but in either case would potentially distort results of the experiment. As a result, we minimized such questions within the survey.

3.3. Measurement of dependent variables:

3.3.1. In all three waves, we asked respondents the following three questions to directly assess their perceptions of personal and local economic interests in renewable energy: do they believe

¹⁷ Jepson, Brannstrom, and Persons, "We Don't Take the Pledge": Environmentality and Environmental Skepticism at the Epicenter of US Wind Energy Development."

increasing amounts of renewable energy are likely to mean more or less wealth for themselves, their personal networks, and their communities?

If more of your community's electricity came from renewable energy like wind and solar, how do you think this would affect your personal financial situation? In other words, would it make you personally richer or poorer overall? (Much poorer; somewhat poorer; neither richer nor poorer; somewhat richer; much richer)

If more of your community's electricity came from renewable energy like wind and solar, how do you think this would affect your community's economic situation? In other words, would it make the people in your community richer or poorer overall? (Much poorer; somewhat poorer; neither richer nor poorer; somewhat richer; much richer)

If more of your community's electricity came from renewable energy like wind and solar, how do you think this would affect your family and friends who are in your community? In other words, would it make your family and friends in your community richer or poorer overall? (Much poorer; somewhat poorer; neither richer nor poorer; somewhat richer; much richer)

Hypothesis: between Waves 1 and 2, members of the treatment groups will show larger increases perceptions that increases in renewable electricity will tend to make themselves/their friends and family/their communities richer than will members of the placebo and control groups.

3.3.2. We asked respondents the following three questions to directly assess their level of support for policies expected to support renewable energy development. One of these policies – a renewable portfolio standard – is explicitly a renewable support standard. The other two – a carbon tax and a cap-and-trade system – are commonly proposed carbon reduction policies that also tend to support low-carbon and renewable energy.

Some states have adopted something called a renewable energy portfolio standard. Renewable energy portfolio standards require that utility companies purchase a certain amount of the electricity they sell from renewable sources--like wind or solar. On a scale of 1 to 100 - where 100 indicates strong support and 0 indicates strong opposition, and 50 indicates that you neither favor nor oppose - do you favor, oppose, or neither favor nor oppose renewable energy portfolio standards?

Some people have proposed the creation of a carbon tax; that is, a tax on activities that produce carbon dioxide. Scientists believe that carbon dioxide emissions cause global warming. Creating a carbon tax would motivate people and businesses to find the cheapest, easiest ways to reduce carbon emissions--and therefore reduce global warming. On a scale of 1 to 100 - where 100 indicates strong support and 0 indicates strong opposition, and 50 indicates that you neither favor nor oppose - do you favor, oppose, or neither favor nor oppose a carbon tax?

Some people have proposed a cap and trade system. In a cap and trade system, companies would each be given permits to produce a set amount of carbon dioxide. Companies that produce less than their set amount of carbon dioxide would be able to sell the remainder of their permits, while companies that need to produce more would be able to buy those extra permits. Scientists believe that carbon dioxide emissions cause global warming. Creating a cap and trade system would motivate companies to find the cheapest, easiest ways to reduce carbon emissions--and therefore reduce global warming. On a scale of 1 to 100 - where 100 indicates strong support and 0 indicates strong opposition, and 50 indicates that you neither favor nor oppose - do you favor, oppose, or neither favor nor oppose a cap and trade system?

If our treatment is capable of eliciting effects analogous to feedback linking renewable energy's economic benefits and individual support for renewable energy policy, we would expect increased salience of renewable energy's economic benefits to be linked to more favorable attitudes toward renewable energy policy.

Hypothesis: members of the treatment groups will show larger increases in support scores for renewables support policy between Waves 1 and 2, especially for renewable portfolio standards, than members of the placebo and control groups.

3.3.3. While attitudes specifically about policies matter, particularly to potential voting behavior, there are other less direct mechanisms by which feedback effects between renewable energy support and individual attitudes might play out. For instance, if respondents respond to perceived economic benefits of renewable energy by altering how they speak or think about renewables in the context of their community networks, they contribute to general community-level narratives and rhetoric around renewable energy and its value that could underpin diffuse shifts in community attitudes. Our goal with this last set of two questions was to develop two questions that presented respondents with plausible, relatively low-stakes real-life situations in which they might have the opportunity to exert influence on the subject of renewable energy, and measure their likelihood to behave in a pro-renewable energy manner. We note that this set of questions in particular was quite experimental; we believe there is a great deal of room for different framings to attempt to measure likely small-scale behavioral changes.

How strongly do you agree or disagree with the following statement: "If I had a friend who thought renewable energy was a bad idea, I would try to change their mind." (Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree)

How strongly do you agree or disagree with the following statement: "I would be pleased to see my child or my friend's children working in renewable energy someday." (Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree)

If treatment is successful in increasing individual perceptions that renewable energy delivers local economic benefits, and hence that renewable energy is in the economic best interests of themselves and/or their communities, we would expect that individuals might become more willing to pursue those perceived interests through pro-renewables behavior within their networks, one possible route for feedback dynamics.

Hypothesis: between Waves 1 and 2, members of the treatment groups will show larger increases in reported likelihood to engage in pro-renewables behavior than will members of the placebo and control groups.

3.3.4. Finally, as a final method of measuring potential behavioral change in response to treatment, in wave 2 following treatment, we offered all respondents the option to display a small behavior – clicking on a link that would take them to information on a grassroots program promoting wind energy. Respondents saw the following text, and we recorded whether or not they clicked:

The American Wind Energy Association's Power of Wind program is a grassroots association that provides information and opportunities for citizens to get involved in promoting local

*wind power. If you would like to learn more about the Power of Wind program, click this link:
<https://www.powerofwind.org/>*

As above, if treatment is successful in increasing individual perceptions that renewable energy delivers local economic benefits, and hence that renewable energy is in the economic best interests of themselves and/or their communities, we would expect that individuals might become more willing to pursue those perceived interests by showing interest in pro-renewables actions.

While the other dependent variables were measured in Waves 1, 2, and 3, this variable was measured only in Wave 2, meaning we cannot assess it longitudinally across waves but can only compare treated to untreated groups.

Hypothesis: relative to members of the placebo and control group, members of the treatment groups will be more likely to click through the link provided.

Treatments

To test our ability to manipulate this set of dependent variables, we developed two experimental treatments that provided two different approaches to testing whether subjects' perceived interests in renewable energy can be changed by an intervention designed to raise the salience of perceived local economic benefits of renewable energy. Texts of the treatments are included in Appendix 1; here we briefly summarize the approaches taken.

Expert Treatment: expert information; generalized/generic focus

The Expert treatment presented subjects with largely generic information about the potential economic benefits of renewable energy, including skilled job creation, local investment in manufacturing facilities, local tax receipts, and supplementary revenue streams for landowners such as ranchers. In an attempt to make the link between this general information and local interests as explicit as possible, we included a note dependent on respondents' reported state that quantified a hypothetical number of jobs renewable energy development might plausibly generate within the respondent's state in the near future. This number was equal to 0.45% of the state's population, which is the highest percentage of jobs currently linked to green industry in any individual US state.

Local Treatment: press release simulating localized manufacturing facility development

The Expert treatment informed subjects of the potential for local economic benefits in a largely generic or abstract sense. By contrast, we developed the Local treatment as an attempt to as closely as possible approximate the kind of information a resident might receive regarding a real-world local renewable energy project – specifically a wind turbine manufacturing facility. The Local treatment presented subjects with a fictional press release based on real press releases and designed to look like a press release issued by an actual company with plans to build a manufacturing facility in subject's reported state. Our hope in this treatment was that the more tailored, localized, “real-world” format of the treatment might have higher verisimilitude and effective salience to subjects.

We note two things about the Local treatment. First, we do not anticipate that most MTurk workers – who often take many surveys and are likely fairly sophisticated respondents – were in

fact “fooled” into believing the treatment to be a real press release. The potential advantages of this treatment relative to the Expert treatment were therefore expected to be more rhetorical than truly deceptive.

Second, this treatment referred to a turbine manufacturing facility rather than a wind farm because we anticipated that a manufacturing facility would be less likely to encounter the type of very specific and complex mix of attitudinal drivers surrounding large-scale, highly visible landscape-altering infrastructure like wind farms, the most common target of local social acceptance research related to renewables. While understanding public attitudes toward this sort of installation is important, it is already well-studied and is also on the extreme end of a spectrum: large-scale, visible wind generation facilities might reasonably be described as a *most challenging* scenario from the perspective of local acceptance and the formation of positive/supportive attitudes.

However, many of the economic benefits of a robust renewable energy industry are not associated with such infrastructure but rather with other routes such as manufacturing of RE equipment or installation and maintenance of rooftop solar. Our hope was that a treatment referring to a manufacturing facility would allow us to focus respondents’ attention specifically on a concrete route by which a robust renewable energy industry in the US could generate local economic benefits. This captures a different facet of the debate than that captured by the copious studies of acceptance of wind generation facilities, one relevant even to communities and individuals with no direct contact with wind turbines *in situ*.

Analytical Methodology.

We analyze the responses of all subjects who completed all three waves of the study. This analysis is premised on the reasonable but unverifiable assumption that there are only two types of subjects, Always-Takers and Never-Takers. (For a discussion of this assumption and its advantages, consult Green and Gerber, Chapter 7.¹⁸ To do so, we estimate a set of OLS models, with and without covariates. When estimating with covariates, we include all the covariates mentioned in Section 3.1. Specifically, we include age, education, race, sex, household income, party identification, and the aforementioned measures of whether a respondent works, or knows someone who works, in the renewable energy sector. In the models with covariates, we also include subjects’ pre-treatment responses to the dependent variables described in Section 3.3. For example, when we measured effects on subjects’ attitudes toward a carbon tax, we accounted for their pre-treatment attitudes toward a carbon tax. The models with covariates are measured with robust-standard errors.

4. Results

Results from the second wave appear in Tables 1 and 2. The first table presents results without covariates, while the second includes covariates. In both tables, models 1-3 show effects on individual policy items. Model 4 in both tables shows effects on subjects’ mean responses to all policy items, aggregating from the previous three items. Models 5-7 estimate effects on subjects’ perceived self-interest, while Model 8 shows effects on aggregate self-interest perception, again

¹⁸ Gerber and Green, *Field Experiments: Design, Analysis, and Interpretation*.

by averaging from the previous three items. Model 9 estimates effects on whether subjects would be willing to try persuade a friend to change their mind about renewable energy, while Model 10 estimates effects on whether subjects would be pleased to see their child, or a friend’s child, enter the renewable energy sector.

In both models, we observed no effects on attitudes toward renewable energy policies attributable to our treatments of interests. Subjects randomly assigned to either the *local* or the *expert* condition did not become more supportive of renewable energy portfolio, a carbon tax or cap-and-trade as a result. The reader will notice that the *placebo* assignment actually appeared to depress enthusiasm for these policies (see Discussion for some speculation on what might account for this).

The picture changes when we look at self-interest. Across models, we observe the *Expert* treatment able to increase subjects’ perceptions that renewable energy is in their interest. In Table 1, we observe this *Expert* effect on subjects’ perceptions about their community’s financial interest ($\beta = .20$; $p < .01$) and their family’s financial interest ($\beta = .12$; $p < .1$), as well as the resulting index ($\beta = .11$; $p < .1$). In Table 2, the inclusion of covariates provides for more precise estimates. Once again, we observe the *Expert* condition increasing subjects’ belief that renewable energy is in their community’s interest ($\beta = .16$; $p < .01$) and their family’s financial interest ($\beta = .12$; $p < .05$). We also observe a more precise estimate of the effect on the aggregate interest index ($\beta = .11$; $p < .05$). In Table 2, we also find significant effects generated by the *Local* condition, also on questions related to interest. When accounting for our wealth of covariate data, being exposed to the *Local* condition increased subjects’ belief that renewable energy was in their family’s financial interest ($\beta = .09$; $p < .1$), and also increased their response on the interest index ($\beta = .09$; $p < .05$).

Note that in no condition did subjects become more willing to say that renewable energy advantaged their personal self-interest. Nonetheless, the self-interest items scale together quite well; in wave 1, prior to treatment, the three items had an α of .86. So too did our feeling thermometer items; in wave 1, responses to those had an α of .83.

	<i>Wave 2 Results (OLS Without Covariates)</i>									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Renewable Portfolio FT W2	Carbon Tax FT W2	Cap and Trade FT W2	Policy Attitudes Index W2	Personal Financial Interest W2	Community Financial Interest W2	Family Financial Interest W2	Interest Index W2	Persuade Friends W2	Child Occupation W2
Local	0.06 (2.04)	0.11 (2.37)	1.58 (2.23)	0.58 (1.95)	-0.04 (0.06)	0.09 (0.07)	0.02 (0.06)	0.02 (0.06)	-0.08 (0.09)	-0.01 (0.07)
Expert	-1.36 (2.04)	0.37 (2.37)	-1.80 (2.24)	-0.93 (1.95)	0.01 (0.06)	0.20*** (0.07)	0.12* (0.06)	0.11* (0.06)	0.04 (0.09)	-0.03 (0.07)
Placebo	-2.56 (2.05)	-1.26 (2.38)	-4.42** (2.25)	-2.75 (1.96)	-0.13** (0.06)	-0.03 (0.07)	-0.04 (0.06)	-0.06 (0.06)	-0.06 (0.09)	-0.08 (0.07)
Constant	75.40*** (1.50)	67.18*** (1.74)	67.26*** (1.64)	69.95*** (1.43)	3.30*** (0.05)	3.37*** (0.05)	3.30*** (0.05)	3.32*** (0.04)	3.81*** (0.06)	4.33*** (0.05)
Observations	1256	1256	1256	1256	1256	1256	1256	1256	1256	1256
R-squared	0.002	0.000	0.007	0.003	0.005	0.011	0.006	0.008	0.002	0.001
Robust standard errors in parentheses										
*** p<0.01, ** p<0.05, * p<0.1										

Table 1

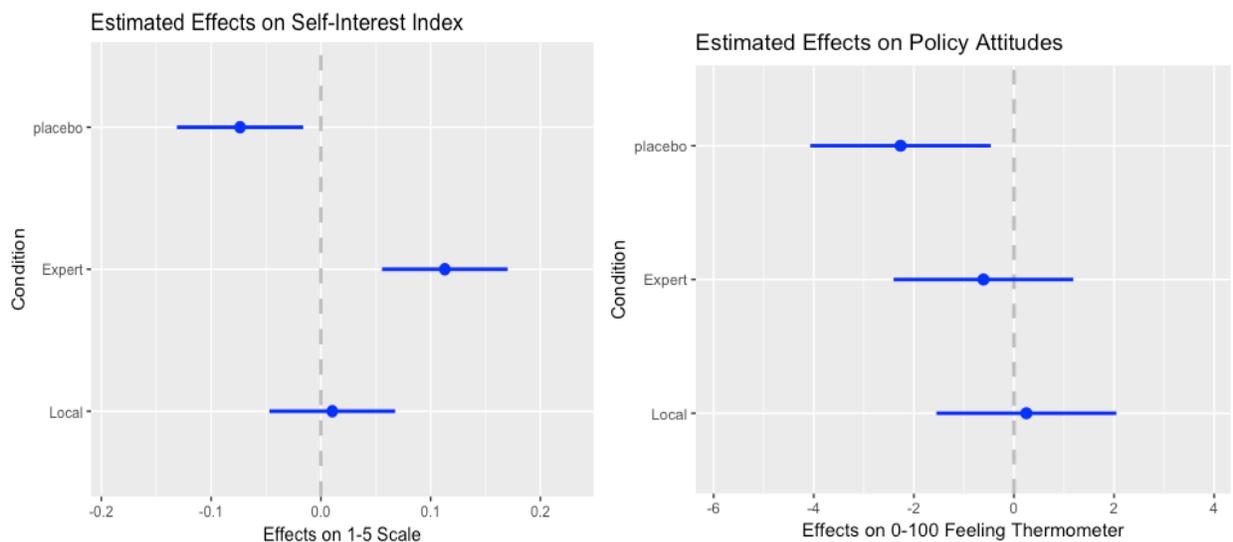
<i>Wave 2 Results (OLS With Covariates)</i>										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Renewable Portfolio FT W2	Carbon Tax FT W2	Cap and Trade FT W2	Policy Attitudes Index W2	Personal Financial Interest W2	Community Financial Interest W2	Family Financial Interest W2	Interest Index W2	Persuade Friends W2	Child Occupation W2
Local	0.08 (1.52)	0.51 (1.60)	0.22 (1.53)	0.29 (1.09)	-0.01 (0.05)	0.07 (0.06)	0.09* (0.05)	0.09** (0.05)	-0.09 (0.07)	-0.01 (0.05)
Expert	-0.83 (1.49)	-0.07 (1.64)	-2.55 (1.69)	-1.26 (1.13)	0.00 (0.05)	0.16*** (0.06)	0.12** (0.05)	0.11** (0.05)	-0.00 (0.07)	-0.02 (0.05)
Placebo	-1.48 (1.45)	-1.03 (1.57)	-3.93** (1.72)	-2.10* (1.10)	-0.11** (0.05)	-0.02 (0.06)	0.01 (0.05)	-0.02 (0.05)	-0.06 (0.07)	-0.06 (0.05)
Constant	27.03*** (5.79)	24.74*** (6.39)	31.25*** (5.16)	21.11*** (3.83)	2.09*** (0.25)	1.94*** (0.28)	1.32*** (0.22)	1.70*** (0.18)	1.65*** (0.27)	2.04*** (0.26)
Observations	1246	1246	1246	1246	1246	1246	1246	1246	1246	1246
R-squared	0.522	0.595	0.531	0.713	0.378	0.341	0.367	0.422	0.463	0.417

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2

We caution that the effects are small. As the reader may recall, these effects are observed on a five-point scale. Yet quite plainly, immediately after treatment, subjects viewed renewable energy in the financial interest of their friends and community. However, subjects did not change their views on policy matters at the same time. Subjects changed their mind about whether renewable energy was in their interest without changing their minds on proximate policies.

Figures 1 and 2 illustrate this dynamic. Both reflect treatment effects immediately after treatment, with the above set of covariates included (but not displayed). In Figure 1, we see that the *Expert* condition was able to move the index of self-interest. But to the right of that, in Figure 2, we see that this same condition, as well as all other conditions, was unable to generate positive effects on feelings about related policy issues.



Figures 1 and 2

Did the effects last? Tables 3 and 4, structured identically to Tables 1 and 2, suggest an answer. When we take available covariates into account—including subjects’ responses to self-interest measures before treatment---we find that only the *Local* condition was able to durably increase perceptions of self-interest, as reflected in model 8 in Table 4 ($\beta = .10$; $p < .05$). Interestingly, we find that support for a carbon tax declined across multiple conditions over this time period. Although we cannot say so conclusively, it seems likely that our data reflect a decline in support for these policies across our sample.

		<i>Wave 3 Results (OLS Without Covariates)</i>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Renewable Portfolio FT W3	Carbon Tax FT W3	Cap and Trade FT W3	Policy Attitudes Index W3	Personal Financial Interest W3	Community Financial Interest W3	Family Financial Interest W3	Interest Index W3	Persuade Friends W3	Child Occupation W3
Local	0.38 (1.99)	-2.64 (2.34)	1.68 (2.21)	-0.19 (1.95)	0.02 (0.06)	0.05 (0.07)	0.01 (0.06)	0.03 (0.06)	0.01 (0.09)	-0.04 (0.06)
Expert	-0.49 (2.00)	-2.12 (2.34)	-0.01 (2.21)	-0.87 (1.95)	0.02 (0.06)	0.09 (0.07)	0.08 (0.06)	0.06 (0.06)	0.01 (0.09)	0.00 (0.06)
Placebo	-2.03 (2.01)	-4.05* (2.36)	0.56 (2.23)	-1.84 (1.96)	-0.05 (0.06)	-0.01 (0.07)	-0.05 (0.06)	-0.04 (0.06)	-0.05 (0.09)	-0.04 (0.06)
Constant	74.73*** (1.47)	69.89*** (1.72)	66.54*** (1.63)	70.39*** (1.43)	3.27*** (0.05)	3.38*** (0.05)	3.33*** (0.05)	3.33*** (0.04)	3.80*** (0.07)	4.33*** (0.05)
Observations	1256	1256	1256	1256	1256	1256	1256	1256	1256	1256
R-squared	0.001	0.002	0.001	0.001	0.001	0.003	0.004	0.003	0.001	0.001
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1										

Table 3

		<i>Wave 3 Results (OLS With Covariates)</i>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Renewable Portfolio FT W3	Carbon Tax FT W3	Cap and Trade FT W3	Policy Attitudes Index W3	Personal Financial Interest W3	Community Financial Interest W3	Family Financial Interest W3	Interest Index W3	Persuade Friends W3	Child Occupation W3
Local	0.76 (1.41)	-2.66* (1.43)	0.21 (1.62)	-0.55 (1.06)	0.05 (0.05)	0.03 (0.06)	0.08 (0.05)	0.10** (0.05)	0.01 (0.07)	-0.05 (0.05)
Expert	-0.29 (1.47)	-2.64* (1.54)	-1.00 (1.69)	-1.41 (1.16)	0.00 (0.06)	0.03 (0.06)	0.07 (0.05)	0.05 (0.05)	-0.04 (0.07)	-0.01 (0.05)
Placebo	-0.76 (1.46)	-3.93*** (1.48)	1.32 (1.68)	-1.09 (1.11)	-0.04 (0.06)	-0.02 (0.06)	-0.02 (0.06)	-0.01 (0.05)	-0.05 (0.07)	-0.04 (0.05)
Constant	28.52*** (4.93)	24.51*** (4.76)	24.92*** (5.10)	19.64*** (3.60)	1.57*** (0.25)	1.31*** (0.24)	1.46*** (0.23)	1.44*** (0.20)	1.79*** (0.27)	1.74*** (0.21)
Observations	1246	1246	1246	1246	1246	1246	1246	1246	1246	1246
R-squared	0.537	0.613	0.532	0.706	0.359	0.355	0.362	0.395	0.468	0.434
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1										

Table 4

5. Discussion and Conclusions

The most important findings of this project were that we were able to generate a small but statistically significant treatment effect on respondents' perceptions of their local economic interests. Respondents in the Expert treatment group – the generic informational treatment – showed a statistically significant increase in perceptions of economic value of renewables to “family and friends” and to “local community,” though not to themselves. This is intuitively satisfying: although renewables are increasingly prevalent, they are still only a fraction of a single industry. Most respondents do not personally work in renewables industries. Hence, it makes sense that an informational treatment on the economic benefits of renewables investment would have greater impacts on perceptions of local but not individual interests. Beyond this, we do not see effects of treatment on policy attitudes or our behavioral measures (both discussed in greater detail below); and effects extinguish quickly – we do not see significant remaining impacts in Wave 3, after a week.

Several caveats and additional findings are worth discussing:

5.1. *No significant effect on attitudes toward policy.* As noted above, effects on respondents' perceptions of material interests did not translate into significant effects, even small ones, on respondents' levels of support for renewable portfolio standards, cap and trade, or a carbon tax.

There are several possible interpretations of this outcome, which would require further testing to sort out. It is possible that changes to individuals' perceptions of community economic interests with regard to renewable energy genuinely do not translate to attitudes toward renewables policy, perhaps because those attitudes are formed by other drivers; because respondents form policy attitudes entirely based on their individual interests rather than based on perceptions of community or network interests; or because any linkage between perceived interests and policy attitudes functions through a heuristic that this instrument did not capture. For instance, given that renewable energy is generally popular at baseline – many people already like it – we might theorize that those prone to translate positive feelings for renewables into positive attitudes for renewables support policy have already done so, and making them like renewables marginally *more* does not create a qualitative step-change in overall attitudes toward policy.

Alternately, it may be that feedback dynamics can occur in the real world, but our treatment instrument was simply not strong enough to elicit second-order effects supporting a full feedback dynamic. Simply providing information is a relatively weak treatment relative to the real-world dynamic we were trying to simulate, that of actual local renewable energy investment the genuine impacts it might generate within a community or an individual's local network. It is possible that a stronger treatment with greater external validity would find effects on both perceptions of interests and attitudes toward relevant policies.

5.2. *No behavioral impacts.* Similarly, we did not see statistically significant impacts on the questions measuring behavioral effects. This finding may be due to either of the explanations discussed above with regard to impacts on policy attitudes. Alternately, it may be that our measurement instruments for behavioral effects were ineffective. As discussed in methodology, our two behavioral questions were somewhat exploratory. Meanwhile, the rate of click-throughs

on the link provided were so low overall that we likely did not have the statistical power to perceive an effect if there was one.

5.3. *Variations between the Local and Expert treatments.* Our treatments were not equally effective; our Local treatment, the fictitious press release, generated less substantial effects (significant only for family/network interests), although it presented, in a different format, similar information to that presented in the Expert treatment. There are two possible interpretations for this. One is that, as discussed above, most subjects were probably not deceived into thinking the press release was real; and that an abstract but believable generic treatment was more effective than a more localized but perceptibly fictitious treatment, any hypothetical rhetorical advantages notwithstanding. A second possibility is that a press release framing was intrinsically problematic for some other reason – for instance, perhaps the press release framing triggered counter-productive reactions, such as skepticism about statements from corporate executives.

Having noted this point, it is worth saying that the Local treatment yielded the only long-term significant effect. It is possible that the Local treatment had a more nuanced impact: convincing fewer people, but having a more lasting impact on those that it did convince.

Future Research

In sum, then, we observed first-order effects (subjects' perceptions of their personal interests changed) but not second-order effects (this did not translate into changes in policy position. Future research should probe this distinction further: is it true that there is a disconnect between individuals' perceptions of local material interests and their feelings about policies (and if so, why)? Or is this an artifact of the experimental design? Would a stronger or different treatment uncover second-order effects as well? Would a representative sample not drawn from MTurk yield different results? Do possible feedback effects play out differently depending on the issue area and policy involved? Ultimately the process of feedback between policy impacts, opinion, and voting behavior at the individual and community level is likely to be complex; researching such a dynamic – if it exists as theorized – requires sophisticated work to replicate or trace such effects as they might play out in a population.

Bibliography

- Ansolabehere, Stephen, and David M. Konisky. *Cheap and Clean: How Americans Think about Energy in the Age of Global Warming*. Cambridge, MA: The MIT Press, 2014.
- Biber, Eric. "Cultivating a Green Political Landscape: Lessons for Climate Change Policy from the Defeat of California's Proposition 23." *Vanderbilt Law Review* 66, no. 2 (March 2013): 399–462.
- Bohn, Christiane, and Christopher Lant. "Welcoming the Wind? Determinants of Wind Power Development among U.S. States." *The Professional Geographer* 61, no. 1 (2009): 87–100.
- Bosley, P., and K. Bosley. "Public Acceptability of California's Wind Energy Developments: Three Studies." *Wind Engineering* 12, no. 5 (1988): 311–18.
- Farhar, Barbara C., and Ashley H. Houston. "Willingness to Pay for Electricity from Renewable Energy." National Renewable Energy Laboratory, September 1996. <https://www.osti.gov/servlets/purl/399985>.
- Gerber, Alan, and Donald Green. *Field Experiments: Design, Analysis, and Interpretation*. New York, NY: W.W. Norton and Company, 2012.
- Hamilton, Lawrence C., Erin Bell, Joel Hartter, and Jonathan D. Salemo. "A Change in the Wind? US Public Views on Renewable Energy and Climate Compared." *Energy, Sustainability and Society* 8, no. 11 (2018).
- Horst, Dan van der. "NIMBY or Not? Exploring the Relevance of Location and the Politics of Voiced Opinions in Renewable Energy Siting Controversies." *Energy Policy* 35 (2007): 2705–14.
- Jepson, Wendy, Christian Brannstrom, and Nicole Persons. "'We Don't Take the Pledge': Environmentalism and Environmental Skepticism at the Epicenter of US Wind Energy Development." *Geoforum* 43 (2012): 851–63.
- Kelsey, Nina, Alice Madden, Juliana Mandell, and Sean Randolph. "The United States: Local Green Spirals, National Ambiguity." In *Can Green Sustain Growth?: From the Religion to the Reality of Sustainable Prosperity*, 125–49. Innovation and Technology in the World Economy. Stanford, CA: Stanford University Press, 2014.
- Kelsey, Nina, and John Zysman. "The Green Spiral." In *Can Green Sustain Growth?: From the Religion to the Reality of Sustainable Prosperity*, 328. Innovation and Technology in the World Economy. Stanford, CA: Stanford University Press, 2014.
- Kelsey, Sarah Manina. "The Green Spiral: Policy-Industry Feedback and the Success of International Environmental Negotiation." Dissertation, University of California at Berkeley, 2014.
- Meckling, Jonas, Nina Kelsey, Eric Biber, and John Zysman. "Winning Coalitions for Climate Policy." *Science* 349, no. 6253 (September 11, 2015): 1170–71.
- Olson-Hazboun, Shawn K., Richard S. Krannich, and Peter G. Robertson. "Public Views on Renewable Energy in the Rocky Mountain Region of the United States: Distinct Attitudes, Exposure, and Other Key Predictors of Wind Energy." *Energy Research and Social Science* 21 (2016): 167–79.
- Pahle, Michael, Dallas Burtraw, Christian Flachsland, Nina Kelsey, Eric Biber, Jonas Meckling, Ottmar Edenhofer, and John Zysman. "What Stands in the Way Becomes the Way: Sequencing in Climate Policy to Ratchet up Stringency over Time." Resources for the

- Future, June 2017. <http://www.rff.org/research/publications/what-stands-way-becomes-way-sequencing-climate-policy-ratchet-stringency-over>.
- Pierson, Paul. "Increasing Returns, Path Dependence, and the Study of Politics." *The American Political Science Review* 94, no. 2 (June 2000): 251–67.
- Rand, Joseph, and Ben Hoen. "Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?" *Energy Research and Social Science* 29 (July 2017): 135–48.
- Unruh, Gregory C. "Understanding Carbon Lock-In." *Energy Policy* 28 (2000): 817–30.
- Warren, Charles R., Carolyn Lumsden, Simone O'Dowd, and Richard V. Birnie. "'Green on Green': Public Perceptions of Wind Power in Scotland and Ireland." *Journal of Environmental Planning and Management* 48, no. 6 (2005): 853–75.