An Affinity-to-Commons Model of Public Support for Environmental Energy Policy

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Abstract: As atmospheric CO₂ continues to rise above 450 PPM, policymakers struggle with uncertainty concerning predictors of citizen support for environmental energy policies (EEPs) and preferences for their design, topics which have received limited attention in empirical literature. We present an original model of policy support based on citizens' affinity-to-commons: pathways by which individuals enjoy natural public goods that in turn shape preferences between alternative policy mechanisms. We evaluate this model using a survey of southern California electricity customers, with results indicating the model's utility in predicting public support of EEP. Stronger community ties are associated with preferences for "pull"-type subsidies, whereas stronger connections to natural commons are linked to support for both "pull" and "push"-type sanctions. Findings have implications for coalition building as advocates may engender support for green energy policy by framing sanctions as protecting natural commons, and framing subsidies either in this same way and/or as producing benefits for communities.

Keywords: public preferences; connection to nature; subsidies; sanctions; common resources

1. Introduction

Greenhouse gas (GHG) emissions from energy consumption fluctuate with the carbon intensity of the world's energy mix, the efficiency with which the global economy transforms energy into economic value, global GDP per capita, and population growth (Kaya and Yokobori, 1997; Hoffert et al., 1998; Ekins, 2004). In the face of mounting evidence that GHG emissions create thermal forcing on the Earth's climate system (Intergovernmental Panel on Climate Change IPCC, 2014; Van der Linden et al., 2015; Carlton et al., 2015; Chong and Ahmad.,

2015), policymakers around the world are increasingly focusing attention on environmental energy policies (EEP) as key tools with which to mitigate climate change (Gollier and Tirole, 2015; Bodansky et al., 2015; Liu et al., 2013). EEP works to improve public welfare by pricing environmental externalities – water, air, and carbon pollution – arising from energy markets. Markets respond to EEP interventions by improving the efficiency with which they consume energy (Lindén et al., 2006; Bye and Bruvoll, 2008; Gillingham et al., 2009; Reddy, 2013) and, when policy interventions target carbon emissions, by reducing the carbon intensity of fuel stocks (United States Energy Information Administration [EIA], 2016). EEPs thus represent a set of core emission-reduction strategies and policy efforts to protect environmental public goods like clean air and a stable climate (Loftus et al., 2015; Vig and Kraft, 2015).

Around the world, EEP initiatives employ a variety of mechanisms to accomplish their goals. Mechanisms describe the nuts and bolts operation of policy interventions, including the rules that target specific sectors of society for change and apply incentives via “push”-type sanctions and “pull”-type subsidies. As examples, in Ireland the government levies a per-ton, CO₂-equivalent carbon tax on fossil fuels, and then uses the revenue to service national debts (Callan et al., 2009; Rosenthal, 2012); in Germany, the national Feed-in-Tariff levies a per-kWh surcharge on households and businesses to fund long-term, subsidized supply contracts for renewable energy producers (Laird and Stefes, 2009; Lewis and Wiser, 2007; Wüstenhagen and Bilharz, 2006). In the United States (U.S.), a federal Energy Star program awards tax credits for up to 30% of initial purchase costs for energy efficient appliances and constructions, and subsidizes investments in solar installations, geothermal heat pumps, and residential wind turbines (Jacobsen, 2014). Such diversity of tools gives policymakers flexibility in targeting

multiple sectors to improve efficiencies and reduce carbon intensities. With this flexibility comes the challenge of structuring policies in ways that generate public support.

1.1 Contributions

Policymakers can benefit from an improved understanding of public preferences for EEP inasmuch as such understanding can aid them in building initial coalitions supporting new policy interventions and in sustaining those coalitions over time (Sabatier, 2006). Towards this goal, our work contributes to policy science in several respects. First, the current study proposes and tests a new theoretical model that links preferences for various policy mechanisms to what we call individuals' affinity to commons. Second, we use this model to examine fine-grained policy preferences among major formulations of EEP design, including local tax shifts, green subsidies, and public energy taxes. Finally, our study is the first to examine such preferences in the U.S., and in particular, in Southern California, a key constituency in a state recognized broadly as a leader in policy innovation and sustainable development (Fredriksson and Millimet, 2002; Mazmanian et al., 2013).

1.2 Studying Public Support for Environmental Energy Policy (EEP)

Despite the importance of EEP to addressing one of the world's most pressing problems of rising GHG emissions, understanding of individual-level support for EEP remains limited. With the exception of a handful of papers discussed below, most research into public support for EEP has occurred tangentially through studying predictors of environmental concern and residential pro-environmental behaviors.

Within this literature, a wealth of studies has examined the impact of political ideology on support for environmental policy (Clawson et al., 1998; Daniels et al., 2012; McCright et al., 2014). The evidence describes a shift in U.S. politics starting in the 1970s as conservatives

increasingly argued for limited government intervention and expanded rights to exploit environmental resources in pursuit of economic opportunity (Buttel and Flinn, 1978; Van Liere and Dunlap, 1980; Jacques et al., 2008; Layzer, 2012). Several studies show that individuals who identify as conservative tend to oppose environmental policy efforts (Dunlap et al., 2001; Thompson, 2005) and question common justifications for environmental interventions (McCright and Dunlap, 2000; 2003; 2011).

Scholars have investigated other socio-demographic factors that might influence citizen support for environmental policy, but these inquiries have yielded more varied findings. For example, some find older age positively predicts environmental concern (Buttel, 1979; Samdahl and Robertson, 1989) while others find younger respondents more consistently exhibit pro-environmental attitudes (Van Liere and Dunlap, 1980; Jones and Dunlap, 1992). Still others find no significant impacts of age on environmental concern (Wandel and Bugge, 1997) or willingness to pay for environmental goods (Franzen and Vogl, 2013).

Studies of income, gender and education yield similarly mixed results. While Samdahl and Robertson (1989) find higher incomes negatively influence support for environmental regulation, Clark et al. (2003) and Franzen and Vogl (2013) find higher income and female gender correlate with higher pro-environmental policy support and willingness to pay for environmental goods. Gender impacts also vary substantially among nations. In a broad cross-national survey of gender and environmental action, Hunter et al. (2004) find that women in Australia, New Zealand and the Netherlands are more likely than men to participate in environmental organizations while Polish women are significantly less likely than male counterparts to do the same.

Last, researchers have long observed more educated citizens exhibit higher levels of environmental concern (Klineberg et al., 1998) and willingness to pay (Franzen and Vogl, 2013). However, a recent examination by Liu et al. (2014) of three major U.S. surveys from 2004, 2007, and 2008 finds education has little effect in explaining environmental concern. For similarly mixed results on education effects in China, see Xiao et al. (2013).

Taken together, these findings raise the question of whether any socio-demographic factor may be expected to exhibit consistent impacts across national and/or cultural contexts - a topic beyond the scope of this paper. They also point to the diversity of dependent variables under study in the environmental public opinion literature generally, and the related challenge of relying on existing literature to anticipate patterns in EEP support specifically.

Nevertheless, a handful of valuable studies have focused on EEP support in particular as their dependent variable. In a foundational study on the psychological foundations of EEP support in the Netherlands, Steg et al. (2006) investigate respondents' support for EEP with a battery of 16 policy-specific questions. Building on this work, De Groot and Schuitema (2012) examine how the coerciveness and targeted behaviors of environmental interventions interact with political norms to shape policy acceptability. They find evidence that people prefer low-cost interventions, support pull-type subsidies over push-type sanctions, and deem sanctions more acceptable when a majority of their countrymen support a given measure. Together, these studies indicate public support is shaped at two levels: the policy level (e.g., costs and its operating mechanisms), and the individual level, where influences of policy may be moderated by psycho-social characteristics.

Several gaps thus persist in the nascent literature on EEP support. First, there remains limited understanding of socio-demographic predictors of EEP support, despite well-published

work on related but distinct concepts of environmental concern, willingness to pay, and support for pro-environmental regulation broadly defined (Steg and Vlek, 2009). Second, while the handful of studies that focus on EEP have distinguished preferences for push- and pull-type policies, they neither offer nor test models regarding psychosocial factors that shape such preferences. As a result, a theoretical model illustrating the link between specific policy formulations and varying degrees and sources of citizen support has been absent in the literature. In the next section we develop and describe such a model.

2. The Affinity-to-Commons Model

We have developed an Affinity-to-Commons model, which theorizes strong links between key “commons-oriented” characteristics and support for specific EEP interventions. In doing so, the model draws upon insights from the Value-Belief-Norm (VBN) theory, socioecological systems, and institutional economics.

2.1 Theoretical Underpinnings

VBN theory, developed by Stern and colleagues (1999), posits that pro-environmental behavior builds upon a linked chain of psychological factors. Biospheric personal values (more so than social-altruistic or egoistic values) foster the establishment of an environmental worldview that can heighten people’s awareness of the environmental consequences of their actions and ascription of personal responsibility for mitigating environmental damages. These beliefs form the foundation of a personal obligation to support environmental protection, which increases engagement in pro-environmental behaviors (Stern et al., 1999). VBN theory has been widely supported in predicting a range of pro-environmental behaviors (Fairst et al., 2007; Steg et al., 2005). In relation to energy policy support in particular, Steg et al. (2005) finds the VBN

model to predict support for a range of energy policy interventions. Taken together, the VBN literature suggests individuals' personal connection to the natural environment may shape energy policy support through a complex chain of psychological factors.

Diverging from VBN, Socioecological systems theory (SES) focuses more on social systems and in particular examines the integration of social and environmental systems (Berkes and Folke, 1998; Berkes et al., 2000) in the production and consumption of environmental public goods (Young et al., 2006). Major works reveal how diverse segments of the population interact with ecological resources in ways that shape incentives for collective action (Janssen and Ostrom, 2006; Buchholz et al., 2007). SES theory highlights people are not only individually connected to the natural world, but also integrated within communities which in turn draw upon environmental public goods such as vital ecosystems and clean watersheds. SES theory informs the Affinity-to-Commons model to describe channels linking the individual to natural commons at both a personal and community level.

Institutional economics (IE) provides two additional insights to complete the foundation of our model. First, IE suggests that policy support represents an individual's contribution to collective social action to produce and/or preserve a given public good (Lubell et al., 2006; 2007; Hoffman and High-Pippert, 2010). Second, IE elucidates how rule-based forms of social organization (Moe 1984; Ostrom 1990; Williamson, 2000), and socially-embedded incentives shape behaviors that protect or exploit various public goods and common-pool resources (Vatn, 2005; Ostrom, 2008). As an example, Ostrom's work on fisheries reveals how group-level (vs. individual-level) access rights improve management outcomes by encouraging norms of trust and reciprocity and reducing over-exploitation (Congleton, 2007). IE thus highlights the importance of collective relationships to environmental outcomes. The Affinity-to-Commons

model combines these ideas to anticipate people support policies in order to contribute to the preservation of environmental public goods: clean air, clean water, a stable climate – which they enjoy, exploit and produce both as individuals and in groups.

2.2 Connection to Community

The Affinity-to-Commons model posits that two commons-oriented characteristics - Connection to Community and Connection to Nature - drive EEP support and shape preferences for EEP mechanisms. Connection to Community (CC) describes the social phenomenon of a person's connection to her/his neighbors and co-residents of a community. Such connections may be at least partially captured through measurements of relationships marked by trust and reciprocity (Walker et al., 2010). People high in CC may more readily experience co-benefits arising from fellow community members' enjoyment of natural commons. Indeed, multiple studies have demonstrated that strong community ties predict support for collective action to support environmental public goods (SGuin et al., 1998; Agrawal and Gibson 2001; Lubell, 2002; Ostrom, 2008) including public parks and green spaces initiatives (Chavis and Wandersman, 1990), subsidized conservation easements (Merenlender et al., 2004; Farmer et al., 2011) and community clean-up programs (Schultz et al., 1995).

Several dynamics may shape the influence of CC on policy support and preferences for EEP mechanisms. First, psychological distance may play an important role in moderating the influence of connection to community on EEP support. Psychological distance describes the perceived proximity of a given problem to a group of people, and may be defined along several dimensions – spatial, social, or temporal (Trope and Liberman, 2010). For example, members of an inland, mountain community may perceive ocean pollution to be a distant or irrelevant problem and may have low motivation to respond, whereas local aquifer contamination from

mining runoff may be considered more proximate and spur more action. Consistent with social identity theory (Tajfel and Turner, 1979), psychological distance may also impact the landscape of inter-community conflicts over policy choices; specifically, people may be less willing to incur costs for policies that benefit outsiders (Hart and Nisbet, 2012).

Second, the influence of CC on EEP support may vary as a function of social identity, which describes the level to which individuals self-identify as belonging to a given social group or community. For instance, individuals who identify more strongly with a particular community (physical neighborhood or otherwise) may be more motivated to protect it than those who identify less strongly, and to prefer policies that maximize community benefits while minimizing costs to the community. Synthesizing these ideas, we anticipate that higher-CC individuals will prefer policies that benefit their communities via subsidies (both economic and environmental); higher-CC individuals are not expected to show a preference for sanctions, which may (or may be perceived to) effectively punish co-community members.

2.3 Connection to Nature

The Affinity-to-Commons model also anticipates that EEP preferences are shaped by individuals' Connection to Nature (CN), which captures an individual's sense of belonging to and identification with the natural environment (Mayer and Frantz, 2004). CN may be measured through reported feelings of "oneness with" or of "being a part of" the natural world (Davis et al., 2009). While a wealth of evidence indicates that high CN predicts a variety of pro-environmental behaviors (Dutcher et al., 2007; Hoot and Freidman, 2011; Lokhorst et al., 2014), we are particularly interested in how CN shapes support for EEP as well as specific EEP preferences.

Various processes may be at work in the linkage between CN and EEP support. Studies of environmental self-identity suggest that engaging in pro-environmental behaviors such as supporting environmental policy may provide higher-CN individuals with identity affirmation and resonate with internal desires for consistency between attitudes and actions (Truelove et al., 2016). Identity dynamics may also be particularly salient when considering psychologically distant environmental threats, such as global climate change. In particular, cognitive dissonance arising from inconsistencies between environmental self-identity and environmentally-destructive behaviors is one of several pathways that may shape the link between environmental self-identity and taking action on psychologically distant environmental problems like global climate change (Leary et al., 2011).

Additionally, it is well established that people are loss-averse, placing higher value on objects with which they identify or experience ownership (Kahneman et al., 1990; Thaler, 2012). If higher-CN individuals experience a sense of heightened ownership of the natural environment, they may also experience greater loss aversion linked to environmental degradation. Accordingly, higher-CN people may more readily support any type of policy that prevents degradation of valued objects (i.e., the environment /the self). Synthesizing these considerations, the Affinity-to-Commons model anticipates higher-CN individuals will prefer policies that protect natural commons through both sanctions and subsidies.

3. First Stage Hypotheses

We propose a set of hypotheses (Table 1) with which to test the Affinity-to-Commons model. The first of these anticipates policy support arising from stronger connections to commons at both the individual and community levels:

H1: Higher CC will predict higher levels of EEP support;

H2: Higher CN will predict higher levels of EEP support.

Turning to the impact of CC on support for specific mechanisms, informed by social identity theory, we argue that stronger connection to community will condition respondents to favor policies that use subsidies to maximize benefits of EEP interventions:

H3: Higher CC will predict support for policies employing subsidies.

We also propose that individuals with strong personal connections to nature will tend to support any policy that protects natural commons, including those that sanction environmental degradation as well as those that subsidize the protection of natural commons:

H4: Higher CN will predict support for policies employing sanctions and subsidies.

INSERT TABLE 1

4. Methodology

4.1 Procedures

We test the hypotheses with data from a telephone survey of randomly selected Los Angeles County residential electricity customers conducted in 2013. Trained interviewers using a

structured interview protocol placed calls from 8am to 8pm local time. To minimize selection bias, in the verbal recruitment invitation, interviewers emphasized the collaboration between the university and utility, and briefly mentioned the goal of studying perceptions of energy use. If respondents agreed to participate, eligibility was determined before reading a brief IRB-approved information sheet and proceeding with survey questions. The average call length was 26 minutes during which participants could terminate the call at any time. Respondents received no incentives for participation.

4.2 Measures

The survey tool was developed for a larger study. In sequential order, questions assessed household characteristics, the acceptability of various energy policies, affinity to environmental and then social commons, and demographic characteristics. Table 2 presents descriptive statistics on demographic and affinity-to-commons variables.

INSERT TABLE 2

4.2.1 Affinity to Commons

We assess two commons-oriented characteristics: connection to local community (CC) and connection to the natural world (CN). Regarding CC, two questions were used: one question assessed feelings of trust for neighbors and a second assessed history of providing neighbors with aid. Responses range along a 5-point Likert scale ranging from 1=strongly disagree to 5 = strongly agree; items were summed to produce the final CC scale score. For Connection to Nature (CN), we employ a five-question version of a well-established measure of an individuals' sense of affinity and connection with the natural environment, the Connectedness to Nature Scale

provided by scale authors Mayer and Frantz (2004). Responses were given on a 7-point Likert scale from 1=strongly disagree to 7 = strongly agree, with item scores summed to produce the final CN scale score. Survey questions and descriptive statistics are provided in Appendix A.

4.2.2 EEP Support

We assess our primary dependent variable (DV), EEP Support, using 12 survey questions obtained from Steg et al. (2006), which investigated household EEP support in the Netherlands. Our survey excluded four items concerning organic foods from the original battery of 16 due to limited relevance to our study goals. The retained 12 items are listed in the center column of Table 3. Respondent support for each item is measured along a 5-point Likert scale ranging from 1=not at all acceptable to 5 = very acceptable. Appendix B provides descriptive statistics. The sum of respondents' scores in support of the 12 survey items gives the final variable, EEP Support.

The 12 survey items range from eco-taxes funding research and development to renewable energy subsidies paid out of general funds. We follow Steg et al. (2006) in categorizing these items as varying along four “mechanism dimensions”, organized as: 1) Push vs. Pull; 2) Focused vs. Diffuse Fiscal Impact; 3) Efficiency vs. Curtailment; and 4) Direct vs. Indirect Intervention¹. Following this work, we coded each item as pertaining to one “side” of each dimension, as indicated by the filled circles in the left-hand column of Table 3. We use the first of these dimensions to test our propositions regarding citizen preferences for sanctions vs. subsidies (H3 and H4). Although the remaining three mechanism dimensions are not foci of this paper, they are presented in Table 3 in order to more accurately represent the original measure,

¹ For additional detail on the matrix construction and supporting literature, see Steg et al. (2005), p. 419.

as well as to provide a foundation for possible future work involving these dimensions.

INSERT TABLE 3

4.2.3 Mechanism Scores

We compute two additional DVs called Mechanism Scores. Each is computed as the average of the survey items corresponding to a given mechanism dimension for Push and Pull. Specifically, a respondent's Push score equals the average score for the six items falling on the Push side of the Push/Pull dimension of the corresponding left-hand column of Table 3 (i.e., items "A" – "F"), whereas the Pull score is the average score for the six items categorized as falling on the Pull side (i.e., "G" – "L"). See Table 4 for descriptive statistics.

INSERT TABLE 4

4.2.4. Demographics

Additional survey questions assessed age, gender, educational attainment, and annual household income. The gender variable is coded 1 for female (0 for male). Age was assessed via year of birth, and ranged from 19 to 99 years. Respondents also indicated their political orientation on a 7-point Likert scale ranging from 1=very liberal to 7 = very conservative. Income and education were first assessed on Likert scales ranging from 1-5 and 1-6 (See Table 2 for scale points), and then recoded as binary variables. Observations at or below the approximate LA County median levels for income (\$50,000) and education (less than high school diploma) were coded as "0", observations above respective medians were coded as "1".

4.3 Participants

Individuals were eligible to participate in the original study if they were adult residential customers of a Los Angeles county utility. Customer status was determined based on utility data, with age determined based on response to a screening question. The original sample comprised 1,000 participants. Of these, 608 records are retained for the sample on the basis of having complete data relating to the variables of interest. To investigate potential bias from attrition, we examine mean differences and t-statistics between two groups: the study sample (x_{sample}) and the omitted records (x_{omits}) - reported in Appendix C.

Compared to omitted records, our final sample included respondents reporting higher levels of support for 5 of 12 survey items ($2.75 < x_{\text{sample}} < 3.21$, $2.51 < x_{\text{omits}} < 2.97$; $-2.81 < t < -2.44$, $0.005 < p < 0.015$), education ($x_{\text{sample}} = 4.44$, $x_{\text{omits}} = 4.07$; $t = -3.76$; $p = 0.00$), and income ($x_{\text{sample}} = 2.82$, $x_{\text{omits}} = 2.46$; $t = -3.23$, $p = 0.00$); retained respondents also identified as more politically liberal ($x_{\text{sample}} = 3.50$, $x_{\text{omits}} = 4.94$; $t = 10.31$; $p = 0.00$). No significant differences are observed for CN or CC. The final sample roughly matches 2010 census characteristics for Los Angeles County, with the exception of under-representing Latinos and having a higher percentage of high school and college graduates. Approximately 53% of respondents are female and the average age of the sample is 42 years. See Table 2 for additional sample characteristics.

5. First Stage Results

We regress EEP Support and each of the two Mechanism Scores on the same set of independent variables (IVs): the two commons-oriented variables (CC & CN) and five demographic variables (age, gender, political ideology, education, income). Table 5 reports

results for these first-stage models using unstandardized and standardized betas, the latter of which enables direct comparison of effect sizes across IVs.

INSERT TABLE 5

5.1 EEP Support

Results support H1 and H2 regarding commons-oriented characteristics, CC and CN, as drivers of EEP support. Model I is significant ($F=21.12$, $p < 0.001$) and explains 19.7% of the variance in EEP support. A one standard deviation (1-sd) change in CC is associated with a 0.08-sd change in EEP Support ($p < 0.03$). Further, a 1-sd change CN is associated with a 0.27-sd change in EEP Support ($p < 0.01$). Given that survey responses for EEP Support range from 12 to 60 with a mean of 33.93 and standard deviation of 11.64, estimated effects translate respectively into 0.93 and 3.14 shifts in respondents' EEP Support scores. Regarding demographics, older age and conservative ideology emerge as strong negative predictors of EEP Support, exhibiting similar though smaller magnitude estimated effects as found for CN.

5.2 Mechanism Scores

Models II and III regress the Mechanism Scores of Push and Pull on the same set of IVs. Both models are significant ($p < 0.001$) and explain variances of 16.0% (Push) and 17.7 % (Pull). Results support both H3 and H4: CC significantly predicts support for policies that employ subsidies (but not sanctions), whereas CN significantly predicts support for both Push- and Pull-type policies. Effect sizes are similar in magnitude to those reported above for EEP support: a 1-sd change in CC is associated with a 0.10-sd change in Pull score ($p < 0.01$), whereas a 1-sd

change in CN is associated with a 0.22-sd change in Push score ($p < 0.01$) and a 0.28-sd change in Pull score ($p < 0.01$).

5.3 Synthesis

The results lend preliminary support to the theorized relationships between community and natural connection and EEP support as well as the several underlying EEP mechanisms. However, we note several reasons for further investigation. First, we observe discrepancies within the original policy matrix (Steg et al., 2006). Specifically, several items contain both a sanction and a subsidy, yet are coded as Push items (e.g. items A and C). Second, in shifting from 16 to 12 items, the underlying structure of the measure may have been impacted. Third, it is possible that our sample of Los Angeles residents differed from the Netherlands sample in the original study in ways that might impact the generalizability of the original factor structure. These observations invite a reconceptualization of the original policy matrix. Therefore, we apply factor analysis to investigate the structure of the EEP scale and explore whether an alternative set of underlying policy characteristics might better delineate our respondents' preferences.

6. Second Stage Factor Analysis

We follow Costello and Osborne (2011) in executing a factor analysis of the 12 survey items using maximum likelihood methods with varimax rotation. Table 6 reports eigenvalues, factor loadings, and uniqueness. Factors are extracted based on Cattell's Scree test which, being less impacted by the number of variables (Zwick and Velicer, 1986), can be more accurate than traditional K1 methods (Fabrigar and Wegener, 2011). The Scree plot indicates a three-factor solution (see Appendix D) as inter-factor differences in eigenvalues fall off markedly from the

fourth factor on. We include only strongly loading items (minimum loading of 0.50) in the resulting Policy Factors, described as Local Tax-Shift, Green Subsidy, and Public Energy Tax.

INSERT TABLE 6

6.1 Local Tax-Shift

The four policies loading on Factor 1 combine sanction-type disincentives on inefficient processes with subsidies for efficiency-improving technologies. These items are neither purely Push- nor Pull-type policies, but rather simultaneously punish inefficient energy consumption while supporting energy efficient technologies. We conceptualize factor 1 as a Local Tax-Shift, reflecting the combined effect of sanctions and subsidies that target a single industrial sector for change. We construct the new DV as the average score of the four underlying items.

6.2 Green Subsidy

Factor 2 comprises three policies that share a core subsidy-type mechanism, representing a purely “Pull” Policy Factor. The constituent policies benefit green technologies (renewable energy and high-efficiency appliances) while distributing costs broadly across society. We construct the new variable, Green Subsidy, as the average score of these three underlying Pull items.

6.3 Public Energy Tax

Finally, the three policies loading onto Factor 3 share a coupling of energy taxes and national debt reduction. These items represent what is closest to pure sanctions. We therefore identify factor three as Public Energy Tax, defined by the average score of these three underlying Push items.

6.4 Factor Analysis Summary and Relative Preferences

The factor solution reveals patterns consistent with the original policy matrix conceived in Steg et al. (2006). See the right column of Table 3 for an illustration of our revised Policy Factor Matrix. Policies loading on the Local Tax-Shift (LTS) factor combine Push- and Pull-type mechanisms, use only Focused (vs. Diffuse) Fiscal Impacts and Efficiency (vs. Curtailment)-based mechanisms, and use both Direct vs. Indirect mechanisms. Policies loading on the Green Subsidy (GS) factor employ Pull mechanisms and Diffuse Fiscal Impacts, and vary along the remaining Efficiency vs. Curtailment and Direct vs. Indirect dimensions. Public Energy Tax (PET) policies employ sanctions and use Diffuse Fiscal Impacts, and vary along the remaining two dimensions.

These new Policy Factors allow for the creation of a final set of DVs, Policy Factor Relative Preferences. Three new variables –LTS *less* GS, LTS *less* PET, and GS *less* PET – were created, calculated as simple differences between each policy factor. Table 4 reports descriptive statistics and notes on variable construction.

7. Second Stage Hypotheses

Having identified the new set of policy dimensions, we expand on our initial hypotheses using Policy Factors and Policy Factor Relative Preferences as outcomes. As the Affinity to Commons model predicts positive associations between CC and subsidies, which are found in LTS and most purely in GS policies, we anticipate the following:

H5: Higher CC will predict support for Local Tax-Shift and Green Subsidy.

The model also predicts an association between CN and support for both sanctions and subsidies, which are found across the three Policy Factors:

H6: Higher CN will predict support for Local Tax-Shift, Green Subsidy, and Public Energy Tax.

Regarding relative preferences, the model anticipates higher-CC respondents will favor subsidy-based policies. As GS uses pure subsidies, while PET employs pure sanctions and LTS uses subsidies in tandem with sanctions, we anticipate the following relative preferences:

H7: Higher CC will predict positive support for GS *less* PET and for GS *less* LTS.

Last, the model anticipates that higher-CN individuals will support both subsidy- and sanction-type interventions. LTS policies combine sanctions and subsidies, while GS and PET employ only one or another. As such, high-CN individuals may favor LTS as an all-inclusive tool:

H8: Higher CN will predict support for LTS *less* GS and for LTS *less* PET.

8. Second Stage Results

To test the second stage hypotheses, we regress the Policy Factors and Policy Factor Relative Preferences on the original set of IVs, reporting results in Table 5.

8.1 Policy Factors

All three models (IV-VI) emerge significant ($8.91 < F < 16.60$, $p < 0.001$). The results support H5 predicting significant positive associations between CC and both LTS and GS. A 1-sd increase in CC translates to a 0.08-sd increase in LTS ($p < 0.04$) and a 0.09-sd increase in GS ($p < 0.02$). Results also show support for H6: a 1-sd increase in CN translates to a 0.26-sd increase in support for LTS ($p < 0.01$), a 0.22-sd increase for GS ($p < 0.01$), and a 0.14-sd increase for PET ($p < 0.01$).

8.2 Policy Factor Relative Preferences

Models VII-IX regress Policy Factor Relative Preference scores on the IVs. Findings partially support the hypothesized relationship (H8) between CN and relative preference for LTS. CN exhibits the predicted positive effect on preferences for LTS *less* PET: a 1-sd increase in CN translates to a 0.11-sd increase in preference for LTS *less* PET ($p < 0.02$); however, no significant effect of CN on LTS *less* GS was observed. The CC-based relative preferences anticipated by H7 were not significant.

9. Discussion

Our results provide preliminary support for the Affinity-to-Commons model, which draws upon insights from VBN theory (Stern et al., 1999), socioecological systems theory (Berkes et al., 2000), and institutional economics (Janssen and Ostrom, 2006) to re-envision a framework for public support of environmental energy policies (EEPs). The new model posits that commons-oriented characteristics, namely Connection to Nature and Connection to Community, are primary channels by which citizens enjoy environmental commons goods. This model provides insight into citizen support for EEP based on characteristics at the levels of both the individual and the specific policy.

In line with respective findings from Walker et al. (2010) and Mayer and Franz (2004), we found that both higher CC and CN are strong predictors of general EEP support. Both commons-oriented characteristics also positively influenced preferences for distinct policy mechanisms, with results supporting hypothesized positive relationships between higher CC and support for Pull-type policies and between higher CN and those of both Push- and Pull-type.

Findings regarding demographic predictors of policy support echoed a diverse literature. Both older age and conservative ideology proved consistent negative predictors of EEP support. Older respondents exhibited lower support for general EEP and all specific EEP mechanisms, roughly consistent with findings of Van Liere and Dunlap (1980) and Jones and Dunlap (1992). Similarly, political conservatives showed lower levels of support for EEP, in line with prior research demonstrating conservative opposition to environmental policy in the U.S. (McCright and Dunlap, 2011; Daniels et al., 2012). In contrast to recent work on citizen support for renewable energy policies (Clark et al., 2003), we found no consistent patterns in the influence of income, education, or gender on EEP support.

Although our first stage hypotheses were supported, we also identified several potential issues underlying the original policy matrix that invited further investigation. Hence, we applied factor analysis to explore whether an alternative set of underlying policy characteristics might better delineate our respondents' preferences. Three new underlying Policy Factors were identified: Local Tax-Shift, Green Subsidy, and Public Energy Taxes.

The new factors are wholly distinct from previous categorizations, yet their underlying structure resonates with mechanism dimensions described in Steg et al. (2006). We believe our retooled matrix delineates EEP in ways that may be more readily perceived by the public as characterizing recognizable families of Pull-based policies, such as Green Subsidy, and Push-

based policies such as Public Energy Tax. By describing EEP interventions along these lines, we may aid in framing public outreach efforts and communicating policy functions in ways that connect with public opinion.

We found additional support for the Affinity-to-Commons model using the three new Policy Factors as outcomes. Specifically, we observed strong and significant, positive associations between CN and all three Policy Factors, with strongest effects observed in support for Local Tax-Shift policies. High-CN respondents thus exhibited broad-based support for EEP, and most strongly supported policies combining Push- and Pull- type interventions. Although unmeasured in the current study, one potential explanation for this may be a combination of environmental self-identify and loss aversion shaping preferences for such all-inclusive strategies to prevent degradation to a valued object (i.e., the environment / the self).

Meanwhile, respondents who were more connected to their communities and thus might more readily share in co-benefits or draw motivation from community-oriented social identities exhibited stronger support for policies marked by subsidies. We found CC to positively predict support for Green Subsidy and Local Tax-Shift, the two Policy Factors containing subsidy-type mechanisms, with a stronger relationship for Green Subsidy which employs purely Pull-type mechanisms. These findings align well with the model's theoretical underpinnings.

Finally, second-stage findings for relative preferences were more mixed. On one hand, higher-CN individuals exhibited preferences for Local Tax-Shift over Public Energy Tax. This finding holds well with the model, which anticipates that high CN individuals will prefer both subsidies and sanctions, which were combined within the Local Tax-Shift factor. However, CN did not distinguish between preferences for Local Tax-Shift over Green Subsidy, perhaps because CN more strongly impacts support for subsidies vs. sanctions (as evidenced in relative

effect sizes in Tables 5), which may have compressed the opportunity to distinguish between preferences for two policies that contain subsidies. Alternatively, relative to Public Energy Tax, Green Subsidy may appeal to other untested preferences of high-CN people. Meanwhile, although CC predicted support for Green Subsidy, it had no influence on preferences for Green Subsidy *relative to* Public Energy Tax. This might stem from the absence of CC-based influence on support for sanctions as shown in Stage 1. Alternatively, as the Policy Factors varied along more than just the Push/Pull axis, it may be that alternative mechanism dimensions also swayed preferences.

Summarizing, the findings provide considerable preliminary support for the Affinity-to-Commons model. Both commons-oriented variables, CC and CN, are strong, consistent, and positive predictors of EEP support. Moreover, both are associated with hypothesized preferences for Push- and Pull- type mechanisms. Finally, second stage findings support our hypothesis (H8) in revealing CN-based preferences favoring policies that combine sanctions with subsidies as opposed to more traditional, single-mechanism interventions.

9.1 Limitations

These findings should be viewed in light of several limitations. First, given that findings are based on self-report, social desirability may have played a role in shaping respondents' answers. Second, our sample is not entirely representative of Los Angeles county citizens, underrepresenting Hispanics and over-representing highly-educated respondents. However preliminary analyses revealed no main effects of race or education on the primary DVs. Third, our measure of Connection to Community could be improved. While the questions in the survey assess reciprocal relationships of trust and reliance between neighbors, they are limited in capturing broader community connection. Alternate conceptualizations of community, and

additional indicators of involvement in communities beyond the immediate physical neighborhood would improve the measure. Related, while our model recognizes the potential role of psychological distance in moderating linkages between commons-oriented characteristics and support for policy interventions, this construct was not measured. Nor did we assess individuals' self-identification with various social groups (social identities), both of which could further improve the measurement of connection to community and yield new findings.

9.2 Strengths

This study offers several strengths of note. First, it provides support for an original model of EEP support that accounts for both individual-level (e.g., commons-oriented characteristics) and policy-level (e.g., mechanisms) characteristics. Moreover, our factor analysis identifies both strengths and limitations of an established policy dimension matrix in Steg et al. (2006) and offers a refinement of that matrix along the lines of three distinct policy forms that better suited our sample and may generalize to other samples. Subsequent analysis highlights the central importance of CN in driving support specifically for Local Tax-Shifts. Through the formulation and testing of the Affinity-to Commons-model, the work thus takes a first step towards examinations of public support for EEP mechanisms that vary in structure and the distribution of costs and benefits.

9.3 Future Directions

The results encourage research in at least two new directions, which could help to address the methodological limitations described above as well as extend the model theoretically. First, although CC exhibited many of the theorized effects, its influence on relative preferences in the second stage analyses were muted. The relative weakness of CC compared to CN in exhibiting predicted impacts raises the question of whether CC was appropriately and thoroughly measured.

Future work should thus address the measurement of CC as described in limitations above. Related, we have considered several underlying psychological variables that could influence linkages between commons-oriented characteristics and EEP preferences, including psychological distance, social identity, environmental self-identity, and loss aversion. Future research should provide for assessment of these constructs to enable clearer tests of possible mediators and moderators of the underlying affinity to commons effects observed in this study.

Second, while our findings provide evidence that affinity to commons effects operate at the nature and community levels, and that these channels condition policy support in specific ways, we see avenues for new theorizing that takes account of respondents' connection to commons at additional levels. Specifically, individuals may perceive connections to commons at the regional, state, national, and/or global levels. Affinities to commons at such wider socio-political scales may also involve additional psychosocial pathways such as intergroup competition, and may foster preferences for policy mechanisms with broader, national-scale impacts and costs.

Third, CC and CN may shape preferences among policy dimensions other than Push vs. Pull. Although beyond the scope of the current paper, additional examination of policy preferences along other dimensions, such as Diffuse vs. Focused Fiscal Impacts, might aid in further refining the theory.

10. Conclusion and Policy Implications

In this paper, we developed and tested a model of citizen support for EEP that takes into account the connections people experience to natural commons at both the individual and the community level. Comprising only a partial map of factors driving citizen policy preferences for

what is a complex phenomenon, we used a parsimonious set of factors to test our theory.

Connection to nature is a strong predictor of EEP support, including policies with both sanction and subsidy components. In contrast, while connection to community also predicted overall EEP support, deeper examination revealed this support to operate through preferences for subsidy-based policies.

Based on these findings, policymakers might engender greater public support for green subsidies by appealing to both people's community interests and their personal connection to natural commons. This might be accomplished by framing environmental subsidies as tools for both protecting vulnerable natural resources and producing community benefits like healthier green spaces and increased employment. This may be a particularly powerful strategy where subsidized sectors have strong ties to local communities and are likely to respond to subsidies by creating new jobs. Meanwhile, all EEP interventions may draw support from constituencies' connection to nature. This insight invites framing of eco-taxes and subsidies alike as protecting natural commons like biodiversity and a more stable climate. The research also points to challenges in engendering policy support among communities which may exhibit lower levels of both CC and CN. Future research can help to address this gap by investigating ways of increasing CC and CN, as well as identifying pockets of high CC and/or high CN populations.

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An Affinity-to-Commons Model of Public Support for Environmental Energy Policy

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Table 1: Hypotheses and Variables for Testing		
Hypothesis	IV	DV
H1 Higher Connection to Community (CC) will predict higher levels of EEP support;	CC	EEP Support
H2 Higher Connection to Nature (CN) will predict higher levels of EEP support.	CN	EEP Support
H3 Higher CC will predict support for policies employing subsidies;	CC	PULL
H4 Higher CN will predict support for policies employing sanctions and subsidies;	CN	PUSH, PULL
H5 Higher CC will predict support for Local Tax-Shift (LTS) and Green Subsidy (GS);	CC	LTS, GS
H6 Higher CN will predict support for LTS, GS, and Public Energy Tax (PET);	CN	LTS, GS, PET
H7 Higher CC will predict support for GS <i>less</i> PET and GS <i>less</i> LTS	CC	GS <i>less</i> PET (-) LTS <i>less</i> GS*
H8 Higher CN will predict support for LTS <i>less</i> GS and LTS <i>less</i> PET	CN	LTS <i>less</i> GS, LTS <i>less</i> PET
Note: GS <i>less</i> PET = Green Subsidy - Public Energy Tax; LTS <i>over</i> GS = Local Tax-Shift – Green Subsidy. * We test H7 regarding GS <i>less</i> LTS with the reverse sign (-) of the existing DV, LTS <i>less</i> GS		

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Table 2: Sample Statistics			
Continuous Variable		Mean (SD)	Range
EEP SUPPORT		33.92 (11.63)	12 - 60
CONNECTION TO COMMUNITY		6.91 (2.07)	2 - 10
CONNECTION TO NATURE		28.31 (5.75)	5 - 35
AGE		45.63 (16.97)	19 - 99
Categorical Variable		Percentage	
GENDER	Male	47.0%	
	Female	53.0%	
POLITICAL IDEOLOGY	Very liberal	13.0%	
	Liberal	23.8%	
	Somewhat liberal	17.4%	
	Moderate	20.4%	
	Somewhat conservative	8.6%	
	Conservative	11.8%	
	Very conservative	4.9%	
EDUCATION	Less than high school	4.1%	
	High school / GED	10.5%	
	Technical or trade school	1.8%	
	Some college or associates degree	26.3%	
	4-year college graduate	32.9%	
	Graduate or professional degree	24.3%	
INCOME	Under \$25,000	23.5%	
	\$25,000 - \$50,000	25.7%	
	\$50,001 - \$75,000	17.6%	
	\$75,001 - \$100,000	11.4%	
	More than \$100,000	21.9%	
Note: n=608			

Table 3: EEP Survey Items and Policy Mechanism Matrixes								
Mechanism Dimension Matrix (adapted from Steg et al. 2006)				Survey Question: "Please tell me if this policy measure aimed at making households more energy efficient is: Very acceptable (5), Acceptable (4), Moderately acceptable (3), Slightly acceptable (2), or Not at all acceptable (1)"	Stage 2 Factor Analysis Matrix (Current Study)			
PUSH VS. PULL	FOCUSED VS. DIFFUSE	EFFICIENCY VS. CURTAILMENT	DIRECT VS. INDIRECT		LOCAL TAX SHIFT	GREEN SUBSIDY	PUBLIC ECO-TAX	
⊙	⊙	⊙	⊙	A: Increase prices of appliances that are not energy efficient by 10%. Revenues are used to stimulate the further development of energy-efficient appliances.	⊙			
⊙		⊙	⊙	B: Increase prices of appliances that are not energy efficient by 10%. Revenues are used to reduce national debts.			⊙	
⊙	⊙	⊙		C: Increase prices of appliances that have not been produced in an energy-efficient way by 10%. Revenues are used to develop techniques that reduce energy use for the production of appliances.	⊙			
⊙		⊙		D: Increase prices of appliances that have not been produced in an energy-efficient way by 10%. Revenues are used to reduce national debts.			⊙	
⊙	⊙		⊙	E: Increase prices of regular electricity by 10%. Revenues are used to generate more green electricity, e.g. by building windmills.				
⊙			⊙	F: Increase prices of regular electricity by 10%. Revenues are used to reduce national debts.			⊙	
	⊙	⊙	⊙	G: Subsidize energy-efficient appliances so as to make them 10% cheaper. Subsidies are funded from energy taxes charged on appliances that are not energy efficient.	⊙			
		⊙	⊙	H: Subsidize energy-efficient appliances so as to make them 10% cheaper. Subsidies are paid from general public funds.		⊙		
	⊙	⊙	⊙	I: Subsidize appliances that are produced in an energy-efficient way so as to make them 10% cheaper. Subsidies are funded from energy taxes charged on appliances that are not energy efficient.	⊙			
		⊙		J: Subsidize appliances that are produced in an energy-efficient way so as to make them 10% cheaper. Subsidies are paid from general public funds.		⊙		
	⊙		⊙	K: Decrease prices of green electricity by 10%. Subsidies are paid from an ecotax charged on regular energy.				
			⊙	L: Decrease prices of green electricity by 10%. Subsidies are paid from general public funds.		⊙		
Note: Filled circles identify the mechanisms active within each policy item. Reference letters (A-L) for policy items are used in building subsequent variables (see Table 4).								

Table 4: Variable Construction and Descriptive Statistics	
Dependent Variable	Mean (SD)
PUSH = average [A,B,C,D,E,F]	2.62 (1.05)
PULL = average [G,H,I,J,K,L]	3.04 (1.06)
Local Tax-Shift = average [A,C,G,I]	3.13 (1.14)
Green Subsidy = average [H,J,L]	2.94 (1.27)
Public Energy Tax = average [B,D,F]	2.28 (1.27)
Local Tax-Shift <i>less</i> Green Subsidy	0.18 (1.11)
Green Subsidy <i>less</i> Public Energy Tax	0.66 (1.30)
Local Tax-Shift <i>less</i> Public Energy Tax	0.84 (1.15)
Notes: n=608. “ <i>Less</i> ” denotes a simple difference (-) between existing scores.	

Table 5: First Stage Results: EEP Support and Mechanism Scores

Predictor	(I) EEP Support	(II) PUSH	(III) PULL	(IV) Local Tax-Shift	(V) Green Subsidy	(VI) Public Energy Tax	(VII) LTS <i>less</i> PET	(VIII) GS <i>less</i> PET	(IX) LTS <i>less</i> GS
<i>CONNECTION TO COMMUNITY</i>	0.471** 0.083 (0.207)	0.029 0.056 (0.019)	0.050*** 0.097 (0.019)	0.043** 0.079 (0.020)	0.055** 0.092 (0.023)	0.022 0.038 (0.023)	0.020 0.037 (0.022)	0.032 0.051 (0.025)	-0.011 -0.021 (0.021)
<i>CONNECTION TO NATURE</i>	0.548*** 0.270 (0.076)	0.040*** 0.218 (0.007)	0.051*** 0.278 (0.007)	0.052*** 0.263 (0.007)	0.047*** 0.222 (0.008)	0.030*** 0.144 (0.008)	0.021** 0.107 (0.008)	0.016* 0.073 (0.009)	0.005 0.025 (0.008)
<i>AGE</i>	-0.169*** -0.247 (0.025)	-0.015*** -0.241 (0.002)	-0.013*** -0.211 (0.002)	-0.013*** -0.193 (0.002)	-0.010*** -0.146 (0.002)	-0.016*** -0.222 (0.002)	0.003 0.044 (0.002)	0.005* 0.071 (0.003)	-0.002 -0.037 (0.002)
<i>POLITICAL IDEOLOGY</i>	-1.020*** -0.151 (0.259)	-0.091*** -0.149 (0.024)	-0.079*** -0.128 (0.023)	-0.090*** -0.137 (0.025)	-0.074*** -0.105 (0.028)	-0.054* -0.076 (0.029)	-0.036 -0.054 (0.028)	-0.020 -0.027 (0.032)	-0.015 -0.024 (0.027)
<i>FEMALE</i>	-0.655 -0.028 (0.857)	-0.085 -0.040 (0.079)	-0.025 -0.012 (0.079)	-0.119 -0.052 (0.085)	0.061 0.024 (0.095)	-0.109 -0.044 (0.095)	-0.009 -0.004 (0.093)	0.170 0.065 (0.105)	-0.180** -0.081 (0.090)
<i>EDUCATION</i>	1.474 0.063 (1.093)	0.069 0.032 (0.101)	0.177* 0.083 (0.100)	0.070 0.030 (0.109)	0.152 0.062 (0.121)	0.176 0.072 (0.122)	-0.106 -0.046 (0.118)	-0.024 -0.009 (0.135)	-0.082 -0.037 (0.115)
<i>INCOME</i>	-0.964 -0.040 (1.106)	-0.040 -0.018 (0.102)	-0.121 -0.056 (0.102)	0.008 0.003 (0.110)	-0.139 0.056 (0.122)	-0.204* 0.082 (0.123)	0.213* 0.091 (0.120)	0.064 0.024 (0.136)	0.148 0.065 (0.117)
Observations	608	608	608	608	608	608	608	608	608
F-test (7, 600)	21.12	16.37	18.47	16.60	10.52	8.91	2.36	1.84	1.19
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.077	0.307
R ²	0.197	0.160	0.177	0.162	0.109	0.094	0.027	0.021	0.013

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. Standardized coefficients reported in **BOLD**. Standard errors in parentheses.

Table 6: Varimax Rotated Factor Loadings and Unique Variances				
Survey Policy Item	Factor 1: Local Tax- Shift	Factor 2: Green Subsidy	Factor 3: Public Energy Tax	Uniqueness
A: Direct Eco-Tax Funding R&D	0.61	0.26	0.32	0.45
B: Direct Eco-Tax Paying Debts	0.24	0.18	0.72	0.38
C: Indirect Eco-Tax Funding R&D	0.64	0.26	0.24	0.47
D: Indirect Eco-Tax Paying Debts	0.19	0.22	0.74	0.37
E: Direct Energy Tax Funding R&D	0.43	0.29	0.31	0.63
F: Direct Energy Tax Paying Debts	0.21	0.15	0.66	0.49
G: Direct Subsidy Paid by Eco-Tax	0.64	0.30	0.21	0.46
H: Direct Subsidy Paid by General Funds	0.23	0.75	0.21	0.35
I: Indirect Subsidy Paid by Eco-Tax	0.61	0.31	0.24	0.47
J: Indirect Subsidy Paid by General Funds	0.22	0.74	0.17	0.38
K: Direct Subsidy Paid by Eco-Tax	0.47	0.40	0.27	0.55
L: Direct subsidy Paid by General Funds	0.28	0.66	0.18	0.44
Eigenvalues:	5.15	0.85	0.56	