



The link between environmental attitudes and energy consumption behavior



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ABSTRACT

This paper examines the connection between household environmental attitudes and real energy consumption behavior using a data set of electricity use by 612 households in Wyoming, USA, along with survey on their opinions, perceptions, and attitudes to several environmental issues. The statistical analysis suggests that attitudes about environmental issues are associated with lower energy consumption. Environmentally concerned households tend to be more conservative on energy use. Contrary to the rather mixed results reported by previous studies, these results suggest that the link between household environmental attitudes and patterns of energy consumption is relatively strong.

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1. Introduction

This paper aims to clarify the conflicting and mixed results from the literature about the link between household attitudes on environmental issues with energy consumption behavior. While individuals may express concern for the environment; it is an open question whether their actions, here measured as energy consumption, are consistent with those concerns. In other words, does the revealed commitment to the environment and conservation effectively translate into action to conserve resources? In order to measure this translation, this study uses a primary dataset obtained by face-to-face interviews with 612 households. By including narrow and broad questions as well as opposing questions, the survey aims to identify several proxies for the household's attitudes toward environmental issues (Garcia-Valinas, Macintyre, and Torgler, 2012). This study matches actual electricity use of 612 households with their opinions, perceptions, and attitudes to several environmental

issues and shows that environmentally concerned households tend to be more conservative in their use of energy. This result suggests that the connection between household environmental attitudes and real energy consumption behavior is relatively strong.

Attitude toward the environment refers to the level of environmental concern. Here we derive attitudes toward green electricity from values, value orientations, beliefs, and environmental concern evaluations (Ajzen, 1991; Hansla et al., 2008). We include external conditions, such as income, house size, education, religious beliefs together with environmental attitudes. Environmental attitudes are psychological variables. Thus our approach combines external economic variables with internal psychological variables. Focusing on only one variable type would bias the results (Hornik et al., 1995; Clark, Kotchen, and Moore, 2003). Unlike many other studies, electricity use is not self-reported nor an experimental data, but instead is actual electricity usage measured in kilowatt hours (kWh) for each household in the survey. Olsen (1981) and Gatersleben, Steg, and Vlek (2002) discuss the problems about self-reported behavior.

These electricity use data and the survey data permit a test of the hypothesis that household attitudes about the environment affect energy consumption behavior. In theoretical social psychology, the existence of attitude-behavior link has been modeled. Henion (1976) postulates that ecologically concerned consumers possess certain psychological characteristics to a significantly higher degree than other consumers. According to Schwartz

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(1970) model, environmentally friendly behavior first requires some awareness that the actors' potential acts may have consequences for the welfare of others. Secondly, actors must accept some responsibility for these acts and their consequences (Van Liere and Dunlap, 1978; Dunlap et al., 2000). Conversely, individuals can neutralize a moral norm by denying the harmful consequences of their actions on others' welfare. Balderjahn (1988) hypothesizes that ecologically concerned households are active in mitigating the perceived environmental pollution. Environmental concern is a broad concept, however, according to Van Liere and Dunlap (1981), is best represented by concern about pollution and the use of natural resources. Our paper approaches these issues from an empirical point of view and directly measures the impacts of attitudes on energy consumption behavior. Attitudes put people into a frame of mind of liking or disliking an object, moving toward or away from it (Kotler, 1996). In our approach, attitudes are related to values and beliefs, and attitudes predict behavior (Luzar and Cosse, 1998). From an economic perspective, environmental attitudes may reflect preferences manifested by observable consumption behavior. Our household survey measures these environmental attitudes. In addition, this study uses billing records from the local utility company to measure electricity consumption for each of these households. Analysis of the survey data and regression analysis using it and the billing data provide a means to test whether attitudes on the environment are associated with energy consumption behavior.

The link between energy consumption and environmental perspectives matters because human behaviors contribute to environmental problems (DuNann Winter and Koger, 2004; Vlek and Steg, 2007; Abrahamse et al., 2007; Steg and Vlek, 2009; Gillingham, Newell, and Palmer, 2009). Correcting environmental problems, therefore, critically depends upon understanding these economic behaviors. Since many environmental problems are related to human behavior, individual action in the market place can remedy environmental problems (Anderson and Leal, 1997; Paavola, 2001; Gardner and Stern, 2002). If the majority of people are concerned about the environment, this collective concern could be manifested by individual action to conserve energy. The results from this study provide evidence that such individual action may be occurring.

We define individual pro-environmental behavior as the existence of significant impact of environmental attitudes on consumption behavior. Environmentalism, defined as the propensity to take actions with pro-environmental intent, is determined by attitudinal factors such as values, beliefs and norms and all of these together form the environmental behavior (Stern, 1999, 2000). Here we investigate the link between environmentalism and energy consumption behavior. Behavior is a joint product of personal attitudinal variables and contextual factors (Guagnano, Stern, and Dietz, 1995). Contextual variables include interpersonal influences, regulations, interventions, institutional factors, incentives, constraints, knowledge and skills (Stern, 2000). These contextual variables are irrelevant in our approach, because our empirical test does not depend on capabilities or contexts.

This study minimizes the contextual factors and isolates the direction of causation from attitudinal variables to actual energy consumption behavior. Measuring actual energy use allows examination of pure (non-induced) environmental behavior, established without intervention. As a consequence, this study detects the environmental intent as well as impact arising from environmental attitudes. Our empirical focus is the connection of daily, routine economic decisions with private-sphere environmentalism (i.e. individual and household level consumption pattern that has environmental impact). If environmental attitudes affect these decisions, they may also influence decisions to participate in

environmental protectionism or high cost decisions such as improving house insulation. Such decisions are determined together by attitudes and contextual factors. Determining whether environmental attitudes affect residential electricity use, therefore, is a first step in assessing consumer willingness to invest in energy efficiency improvements.

2. Methodology and results

The survey was conducted in February and March of 2010 as part of a broader research effort with the Jackson Hole Energy Sustainability Project in Wyoming. The Survey constitutes a stratified random sample of Teton county households. The data were gathered by in house interviews with the households that lasted about 20 min. The main purpose of this survey was to collect primary data about the households' attitudes toward environmental issues. This study uses these data, combined with billing data, to determine whether these stated environmental preferences are reflected in households' energy consumption behavior. Data is the result of merging two types of sources: (i) face-to-face interviews with consumers and (ii) records of consumption levels from the utility provider. The study uses three types of variables. The first type includes psychological variables. These variables are obtained from the questionnaire about the environmental attitudes of respondents. The questionnaire is conducted with an adult of the household and these attitudes reflect the individual action of the respondent. However, it is reasonable to assume that these attitudes may reflect the collective action of the entire household. The second type of variables is the household characteristics and it includes income, house size, type of heating, education, frequency of attending religious activities, and political orientation. Third variable is the real energy consumption by those consumers who take part on the survey.

The empirical model posits that household electricity consumption measured in kilowatt hours (Kwh) depends upon household characteristics and environmental attitudes. Specifically, the dependent variable is the log of actual annual electricity consumption in kWh of the households in the sample. The major advantage of this study is the use of real electricity consumption data for each household, directly obtained from utility bills. Hence, our results do not suffer from approximation issues associated with self-reported consumption. Household characteristics include type of house heating, and home size. Environmental attitudes are measured from the responses to the questions posed to households that are summarized in Table 1.

The main type of heating is electricity in slightly more than half of the houses. The average home size and income level are relatively high. As expected, the survey responses show that on average the households display positive attitudes about environmental protection. In econometric estimation, we determine whether the agreement level about the environmental issues is associated with the electrical energy use.

The pro-environmental and anti-environmental questions in the survey have five categories: strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. Thus, these questions are scaled from 1 to 5, the answer 1 shows strong disagreement with the proposed statement and the answer 5 shows that the respondent strongly agrees with the view. The answers in this scale show the increasing level of agreement of the household.

If the respondent refuses to answer, this household is removed from the sample because environmental attitudes are unavailable. There were around 15 households with incomplete responses out of a sample of 612. "Home size" has seven categories in an increasing order, in the first category the home size falls into less than

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