



Analysis

The role of risk and trust attitudes in explaining residential energy demand: Evidence from the United Kingdom

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ABSTRACT

Recent research into the determinants of household energy consumption has aimed to incorporate findings from economics, sociology and psychology in order to obtain a more comprehensive understanding of the factors determining energy demand. The current paper contributes to this nascent stream of literature by studying the relationship between risk attitudes, trust propensity and energy consumption at the household level. Drawing on the British Household Panel Survey, a well-known data set in the context of energy studies, I show that trust is negatively correlated with household energy demand, while higher risk tolerance leads to increases in residential energy use. Potential explanations for these findings are investigated, suggesting that risk preferences may be related with overall appliance stock and the size of the rebound effect.

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1. Introduction

In their role as consumers of energy products and services, households account for a substantial share of energy consumption in many societies. In the United Kingdom, for instance, about 30% of all energy consumption and CO₂ emissions can be attributed directly to household behaviour (DECC, 2014a,b). Therefore, improving energy efficiency and reducing energy demand by private households are among the primary targets of public policies aiming at energy conservation (DECC, 2013; OECD, 2002). Similarly, a growing number of private initiatives and environmental groups have launched popular campaigns in an effort to raise awareness on the environmental consequences of energy use and to offer strategies for its reduction at the level of the individual.¹ All these programmes maintain that behavioural change is a crucial component to any long-term strategy for curbing energy demand and greenhouse gas emission in the

domestic sector. This claim is supported by recent findings reporting that changes in household behaviour could lead to up to 20% reductions in greenhouse gas emissions without necessitating new regulatory measures or compromising the welfare of households (Dietz et al., 2009; Stern, 2014).

Clearly, a thorough understanding of antecedents and determinants of household energy demand is an important pre-requisite for any such programme. For this reason, research into correlates and causes of household energy consumption (synonymously called: “residential energy use” in this paper) has gained momentum in recent years and has attracted attention from scholars in economics, psychology and sociology alike. The joint interest from various fields has led to an increasing number of studies aiming to incorporate insights from other disciplines (Lange et al., 2014; Sapci and Considine, 2014; Abrahamse and Steg, 2009; Gatersleben et al., 2002), thus gradually overcoming the disciplinary lock-in of energy studies that has repeatedly been criticized (Stern, 2014; van den Bergh, 2008; Wilson and Dowlatabadi, 2007). For example, recent economic studies have started to investigate the relationship between pro-environmental attitudes and household energy use (Lange et al., 2014; Sapci and Considine, 2014), thereby drawing on a long debate in environmental psychology (Abrahamse and Steg, 2009; Gatersleben et al., 2002; Becker et al., 1981; Seligman et al., 1979).

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¹ An example for such an initiative in the UK is the Energy Saving Trust, which consults households and businesses on energy saving possibilities and potentials (Energy Saving Trust, 2014). Most of these programmes offer hands-on advice on reducing household energy consumption, including simple behavioural adaptations such as lowering thermostat settings or unplugging electronic appliances.

The present contribution extends this nascent literature by investigating the role of risk and trust attitudes in explaining energy demand. Both characteristics are known to be important determinants for (economic) decision making and have been found to influence a broad number of outcomes, ranging from earnings and educational attainment to health and subjective well-being (Becker et al., 2012; Dohmen et al., 2008, 2011; Shaw, 1996). More importantly, there is evidence suggesting that both traits are related to environmentally relevant behaviours. For example, more trusting individuals have been found to be more likely to buy green products (Gupta and Ogden, 2009), recycle (Sonderskov, 2011), use public transportation (van Lange et al., 1998), conserve water (van Vugt and Samuelson, 1999), or support pro-environmental policies that entail welfare reductions like environmental taxes or cuts in living standards (Irwin and Berigan, 2013). These results are underscored by a host of findings from institutional and developmental economics suggesting that trust plays a key role in sustainably managing and protecting natural resources at a regional level (see, e.g., the recent collection by Ostrom and Ahn (2003), and the review by Pretty and Ward (2001)). This stream of literature has highlighted the importance of trust as a means to facilitate collective action and solve problems involving social dilemmas like environmental protection or climate change mitigation (Ostrom, 2009). At a macro level, Carattini et al. (2015) have shown that countries with a higher share of trusting citizens have lower per capita energy use and subsequently emit significantly less greenhouse gases per capita.

To motivate the relevance of trust theoretically, consider that it is commonly understood as an expression of a form of social capital or a set of norms that allows individuals to “create regular expectations of regular and honest behavior” of others (Fukuyama, 1995, p. 153). It thus provides a general expectation that a random stranger has a *priori* benign intentions and will therefore cooperate rather than free-ride in an interaction context. This propensity to trust in unknown others has been identified as a key driver of voluntary cooperation in public good dilemmas. Individuals who express high levels of trust in strangers are also those that contribute most to public goods, even in the absence of possibilities to control or punish others' behaviour (Gächter et al., 2004; Glaeser et al., 2000). In this sense, trust can be understood as an indicator for an individual's belief that others can be expected to comply even in the face of free-riding opportunities and therefore as a measure for her willingness to cooperate (conditionally). Pro-environmental behaviours such as conserving water or reducing energy demand in an effort to mitigate climate change are a case in point. While under most circumstances individuals cannot directly observe the energy consumption of others, they can be conjectured to hold beliefs about how likely others are to contribute to a public good such as avoiding climate change. Consequently, the level of trust should affect the willingness to cut back one's energy demand and thus reduce the actual energy consumed.²

Risk attitudes, on the other hand, have been argued to substantially affect investment in energy-efficient consumer durables. As the future benefits from these investments depend on a number of unknown developments - including changes in energy requirements, variations in energy prices, and the reliability and maintainability of the technology - uncertainties concerning these developments are likely to impede the adoption of these technologies (Qiu et al., 2014; Baker, 2012; Christie et al., 2011; Hassett and Metcalf, 1993; Shama, 1983). Conducting a choice experiment in Switzerland, Farsi (2010) finds that risk considerations are important determinants of consumer choice over energy-efficient home improvements, and that

risk attitudes differ substantially between energy-efficient and conventional options. Qiu et al. (2014) empirically quantify this effect. In a sample of homeowners from Arizona and California they find that more risk averse individuals are less likely to have installed energy-efficient home improvements such as attic insulation or duct sealing. Risk-averse individuals are also less likely to own energy-efficient appliances such as refrigerators and tumble dryers.³

All in all, there is therefore good reason to believe that risk attitudes and trust are associated with household energy demand. Yet, to the best of my knowledge, this relationship has not been studied so far. In order to motivate the relevance of studying the associations between risk, trust and residential energy demand, the paper proceeds as follows: Section 2 gives an introduction to the data set used in this analysis and discusses relevant measurement issues. Regression analyses quantifying the association between risk attitudes, trust propensity and residential energy demand are presented in Section 3. Finally, Section 4 provides a discussion of results and implications for policies aimed at behavioural change.

2. Data and Descriptives

To investigate the relationship between risk attitudes, trust and residential energy expenditures, this study uses data from the British Household Panel Survey (BHPS), a longitudinal survey of individuals and their families living in the United Kingdom (for detailed information on the study, see also Taylor et al. (2010), on whom this description relies). Its objective was to trace economic and social changes in a representative sample of roughly 5000 British households, amounting to about 20,000 individuals. Data collection was carried out annually between 1991 and 2008 by the Economic and Social Research Council's UK Longitudinal Studies Centre (ESRC) in cooperation with the Institute of Social and Economic Research at the University of Essex. All household members aged 16 or older were interviewed in each round. I rely primarily on the 2008 wave (wave r) of the data set, which included a set of items constructed to evaluate the respondent's psychological profile with respect to risk-taking. The same data set has been used in previous research on household energy demand (Lange et al., 2014; Meier and Rehdanz, 2010).

2.1. Dependent Measure

The main dependent variable used in this study is the natural logarithm of monthly residential energy expenditures in British Pounds Sterling in the year preceding the interview. It is constructed as the sum of household expenditures on gas, oil, electricity and solid fuels. Prior to summation, expenditures for each energy source were adjusted for price differences using the ratio of the energy source price relative to overall energy prices based on the consumer price indices for 2008. The variable therefore measures direct rather than embodied or indirect energy use. After adjustment, monthly energy expenditures average at £94.4, which is somewhat higher than the value of £75.6 reported in the Family Spending Survey from the same year (ONS, 2009). This is likely due to the fact that individuals from Scotland, Northern Ireland, and Wales, i.e. the coldest regions in the United Kingdom, were over-sampled in the BHPS.

Fig. 1 presents the energy expenditure composition of an average household in the BHPS. More than half of this household's energy expenditures is devoted to electricity, while gas expenditures still make up over one third. Subsequently, expenditures on oil and solid fuel make up a small share of total energy expenditures. They account for 10.7% and 2.1%, respectively. Standard errors are

² For a more comprehensive model linking trust with energy use and greenhouse gas emissions see Carattini et al. (2015).

³ The sole exception in their study is air conditioning, for which they did not identify a significant relationship between risk attitudes and ownership of an energy-efficient version.

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