

Exploring domestic energy-saving: The role of environmental concern and background variables

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ABSTRACT

The main purpose of this paper is to investigate whether residents' environmental concern has any effect on their energy-saving curtailments and efficiency investments. The novelty of the present work lies in the fact that it seeks to investigate this topic in a multi-country setting, exploiting data from nine OECD countries (Australia, Canada, Czech Republic, France, Italy, South Korea, Netherlands, Norway and Sweden), and also in that it employs a latent variable model which allows us to examine the conditions necessary for the results to be comparable across different countries. Novel in this paper is also the focus on the role of environmental concern as a factor of several curtailments and efficiency investments. Our results suggest that people with higher environmental concern are on average more likely to perform energy-saving curtailments and also are more likely to have some energy-efficiency retrofits installed in dwellings. Most of the socio-economic and demographic variables have mixed effects on efficiency investments and curtailments. However, some interesting patterns emerged with respect to the age of respondents, household income, education and gender of respondents, and also the size of household.

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1. Introduction

Nowadays, OECD member countries, with only about 18% of the world's population, account for about 54% of its consumption of electricity and 24% of heat, with the household sector being the key player in energy consumption. In the OECD, residential energy contributes about 20% of total energy use, whereas residential electricity and heat represent both about one third of the grand total.

Although the increasing trend in final consumption of residential energy in the OECD – with about 8% growth in the 1980s and 16% growth in the 1990s – has slowed down during the last decade, residential energy consumption still grew and in 2009 was about 2% larger than in the year 2000. Electricity consumption in the OECD residential sector has increased by 16% since 2000 until now.

Residential energy use varies widely among OECD countries (see Fig. 1), reflecting climatic conditions, wealth, consumption habits and behavioral patterns. The residential sectors in Norway, Canada, USA and Sweden have almost double or more electricity use per capita than is the average in OECD countries (2.4 MW h per capita a year in 2009), energy use in France and Australia is

about the average, households in Korea, Hungary and Italy use about half of the average, while countries such as Turkey, Chile or Mexico use about 20% of what is the average energy consumption in OECD countries. The rate of growth in electricity consumption varies widely among OECD countries as well (see Fig. 1); Belgium, Slovakia, Estonia and Sweden decreased residential electricity use between 2000 and 2009, while, electricity use increased by less than 10% in the same period in the Czech Republic, Canada, Australia, Italy, USA and the UK, and by more than 10% in such countries as in Portugal, Chile, Korea, Spain and Turkey (see Figure 1 for details). The multi-country survey exploited in this study covers OECD countries with different consumption levels, different rates of growth and different geographical regions.

Increasing energy use not only has economic consequences, and an effect on energy security, but also generates damage. As shown by, for example, Weinzettel et al. (2012), energy consumption leads to large negative externalities, especially adverse health effects and large effects due to climate change. Further, Máca et al. (in press) have found that the level of external costs internalization by economic instruments is fairly low for existing fossil-fired power plants and even if the subsidization of renewable electricity was also accounted for, the level of internalization would remain rather low, between 9 to 55%, especially for non-gas fossil-based electricity generating technologies.

Households can minimize adverse environmental effects related to their energy consumption particularly by reducing

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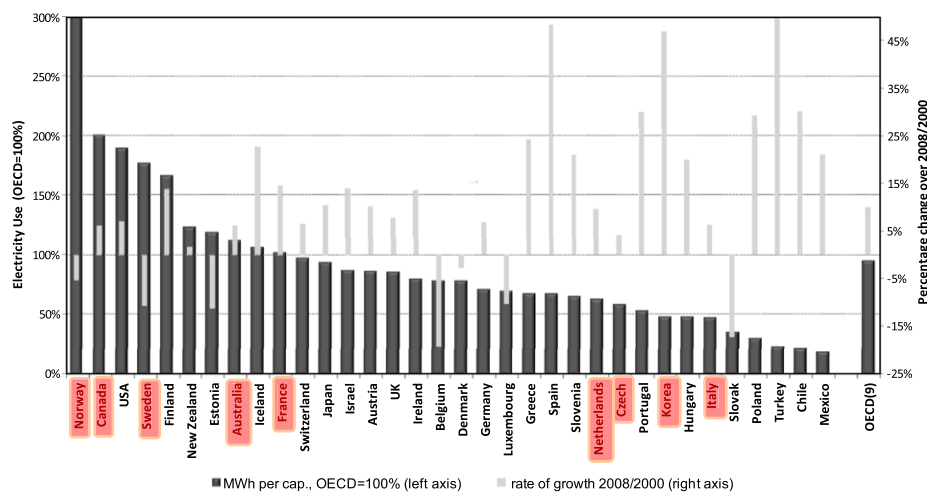


Fig. 1. Electricity use and rate of growth in electricity use p.c. in OECD countries in 2009 (IEA/OECD, 2011). Note: highlighted are the countries covered in the present study.

the use of energy-consuming household appliances (this type of energy-saving activity is referred to as “curtailments”) or by increasing the energy efficiency of their stock of appliances (by making “efficiency investments”). It has been argued that energy curtailments and efficiency investments are fast, convenient and relatively cheap ways to achieve significant reduction in adverse environmental effects of modern societies in the short and medium term horizons, especially with respect to greenhouse gas emissions (Dietz et al., 2009; Gardner and Stern, 2008; Vandenberg et al., 2008).

However, motivation that leads individuals and households to adopt energy-saving activities is very complex (Steg, 2008). As a rule, economic factors (e.g., saving money on energy bills, paying less for energy-efficiency appliances) are most often cited motivations for curtailments and energy investments, while environmental motives are mentioned as less important together with convenience, health-related motivation, habits, availability of products or their easier identification through labels (OECD, 2011; Whitmarsh, 2009). It is therefore not surprising that certain studies do not find any effect of environmental concern on some energy curtailments (Carlsson-Kanyama et al., 2005; Whitmarsh and O'Neill, 2010) and also no effect on some efficiency investments (Achtmeit, 2011; Whitmarsh and O'Neill, 2010).

In any case, environmental motivation behind energy-saving may be interesting from a policy perspective for several reasons. First, environmental concern seems to be a very solid motive for energy saving because it is independent of the attractiveness and cost effectiveness of the energy saving behavior (Steg, 2008) and because it is a “situation invariant orientation pattern” (Bamberg, 2003, p. 22). Because of this, environmental concern can actually lower some of the unintended negative consequences of improved energy efficiency, such as the rebound effect because it orients consumers towards energy-saving regardless of decreasing marginal costs of energies and also independently on whether particular type of energy-saving pays back. Second, environmental motivation may be interesting also because of the cross-situational influences of pro-environmental motivation (Whitmarsh, 2009), which may result in a spill-over of environmentally-friendly behavior from one specific area to a different one (Diekmann and Preisendörfer, 1998; Thøgersen, 2004; Thøgersen et al., 2006). This means that increasing environmental motivation for one type of energy-saving is likely to spill-over to different types of energy-saving because they can also deliver environmental benefits.

The purpose of this article is to investigate whether there is any systematic effect of environmental concern on energy saving

curtailments and energy-efficiency investments in the residential sector. Specifically, this study seeks to examine this question from a multi-country perspective, when controlling for background confounding variables, thus testing the generalizability of the answer to the first research question across nine OECD countries and also its sensitivity to confounding effects of socio-demographic variables.

The novelty of the present work lies in the fact that it seeks to investigate this topic in a multi-country setting and also in that it employs a latent variable model which allows us to examine the conditions necessary for the results to be comparable across different countries and therefore it does not take the comparability of the latent construct as a hidden assumption. Novel in this paper is also the focus on the role of environmental concern as a factor of several curtailments and efficiency investments measured simultaneously.

This paper proceeds as follows. First, we introduce the concept of energy saving activities as consisting of curtailments and efficiency investments and review pertinent literature which deals with the effects of environmental concern and background variables on curtailments and efficiency investments. Second, the data and method used in this study are introduced. Third, the main results of this study are presented. The final section provides a discussion of the results, their policy relevance and also puts forward some suggestions for future research.

2. Energy-saving behavior

Energy saving includes a wide range of activities from very simple habitual actions (e.g., turning off lights when leaving a room) to very sophisticated and costly energy-efficiency measures (for example, the installation of thermal insulation in walls and roofs). The literature in the field makes a distinction between two types of residential energy-saving activities: efficiency investments and curtailments. Jansson et al. (2009) argue that efficiency investments are different from curtailment behavior in that they involve the acquisition of new technologies and products, with the side effect of increasing consumers' comfort. In addition, they also argue that efficiency investments are high-involvement activities, in that they incur considerable monetary costs and also require time and planning activity necessary for their selection and implementation, and also that decisions to introduce efficiency measures are usually not driven by moral motivation. As a matter of fact, internal motivational factors play a minor role when the action depends on external conditions

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