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Electricity curtailment behaviors in Greek households: Different behaviors, different predictors

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HIGHLIGHTS

- We study the self-reported energy (electricity) curtailment behaviors of Greek households ($N=285$).
- We find that the curtailment behaviors are distinct and should be studied/analyzed separately.
- 'Age', 'Gender' and 'Perceived Behavioral Control' are statistically significant predictors of most behaviors.
- The demographic/structural and the psychological predictors contribute significantly explain the variance of the behaviors.
- The cluster of moral predictors does not contribute statistically significantly to the explained variance.

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ABSTRACT

This paper argues that electricity 'curtailment' behaviors (i.e. frequent and/or low cost or free energy saving behaviors) in households are distinct from one another and they thus should be analyzed and promoted. We test this claim with data from telephone interviews with Greek households in the capital city of Athens ($N=285$), analyzing the impact of a number of demographical/structural, psychological (based on the Theory of Planned Behavior) and moral (based on norms' activation) predictors though hierarchical binary logistic regression modeling. We find that that each electricity curtailment behavior depends on a different mix of predictors with 'Age', 'Gender' and 'Perceived Behavioral Control' being statistically significant for most behaviors. Overall, the psychological and the demographical/structural clusters of variables substantially contribute to the explained variance of electricity curtailment behaviors. The moral cluster's contribution is not statistically significant since moral concerns are largely interwoven in the psychological constructs.

1. Introduction

The academic literature on what drives households' energy-saving behavior has increased significantly over the past years. Latest research, alongside the usual demographic/house variables (e.g. Sardianou, 2007), have tested the role of information & feedback (e.g. Abrahamse et al., 2007; Ek and Soederholm, 2010), environmental attitudes and concern (e.g. Martinsson et al., 2011), values and psychological factors (Abrahamse and Steg, 2009; Webb et al., 2013). All this research has one thing in common: it treats the dependent variable, i.e. 'energy conservation', as a holistic behavior which is thus measured as a single scale and/or factor. Such an approach is rooted on an important theoretical tradition in environmental psychology which argues that pro-environmental behavior is, and should be treated as, an aggregate, uni-dimensional construct (cf. Kaiser, 1998). The opposite view maintains that pro-environmental behavior consists of distinct types (cf. Stern, 2000), a claim which implies that the various energy-saving behaviors should be studied individually.

The theoretical debate concerning the *uni-* vs. *multi*-dimensional character of energy-saving behavior is by no means settled. While previous research did show that the performances of various environmental behaviors correlate to quite some extent (e.g. Kaiser and Wilson, 2004), this does not preclude the possibility that they are nevertheless dependent on different causes. As a matter of fact, the handful of available studies which studied household energy-saving behaviors in a semi-aggregate fashion did reveal such differences. Thus, Karlin et al. (2012) found distinct profiles for energy (electricity, in particular) '*curtailment*' (i.e. the 'frequent and/or low cost (or free) energy saving behaviors', e.g. turn-off lights when leaving room) and energy '*efficiency*' (i.e. the

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'infrequent structural changes and/or those requiring investments or purchases' – e.g. add insulation in home) clusters of behaviors (see also Barr et al. (2005) for similar findings). Furthermore, Urban and Scazny (2012) report that even *within* the energy (/electricity)-curtailment cluster the various behaviors depend on different predictors. These results reaffirm Black et al.'(1985) findings of almost thirty years ago: the clusters of energy-saving behaviors have different predictors while the internal consistency of these clusters, as measured by the Cronbach's α, is rather low (Black et al. (1985): 9).

Taking our cue from the aforementioned research, in this paper we study in detail a number of households' different energy- (more particularly, electricity-) curtailment behaviors. Our research aims to address two questions: first, are the various electricity-curtailment behaviors dependent on different predictors? And second, which predictors are relevant for each specific behavior? Answering these questions is of theoretical interest since it relates to the uni- vs. multi-dimensional debate concerning the nature of energy-related behavior. Also, it will offer further clues to a largely under-researched topic, since, to our knowledge, Urban and Scazny's (2012) study is the only one examining energy/electricity-curtailment behaviors in a discrete fashion. That said, we should note that our explanatory schema differs from Urban and Scazny's (2012) since we include in our analysis psychological and value-based predictors: although 'the majority of energy behavior studies in this last decade has been dominated by the psychology research' (Lopes et al., 2012:4096), there are no studies which employed such an approach for *discrete* energy behaviors. Thus, in this paper we attempt to address this theoretical lacuna by including predictors originating from the VBN (values-belief-norms) theory and the Theory of Planned Behavior (TPB) (see Literature Review). Finally, our research is also of relevance and importance to policy making. According to recent reports, households are ultimately responsible for almost a quarter of the European Union's total greenhouse gases emissions EEA (2012) while, and despite the introduction of more efficient appliances (JRC, 2012), their electricity consumption continues to rise. Thus, understanding what drives households' particular electricity-curtailment behaviors would allow us to develop tailor-made interventions for reducing electricity consumption.

Our paper develops as follows. In the next, Literature review, section we discuss the findings of previous research concerning the influence of demographic and structural as well as psychological and moral factors on electricity-curtailment behaviors and present the hypotheses which we are going to test with our data. The data originates from telephone interviews with Greek multi-person households in the capital city of Athens ($N=285$), conducted in early 2012. We find that the performances of the various electricity-curtailment behaviors do not cluster together, a result which underscores that they should be studied and analyzed separately. We also find that each electricity-curtailment behavior depends on different predictors yet, overall, the psychological and the demographical/structural clusters of variables substantially contribute to the explained variance of electricity curtailment behaviors. On the other hand, the moral cluster's contribution was found to be not statistically significant, a fact which is due to the moral variables' substantial correlation with the psychological ones. In the concluding section of the paper we discuss our findings and their policy implications regarding the promotion of electricity-curtailment behaviors.

2. Previous research and guiding hypotheses

2.1. Demographic and structural factors influencing energy curtailment behaviors

Available research concerning the effect of demographic and structural predictors on energy curtailment behavior (as an aggregate concept) has returned contradictory results. Reported effects of 'Age', 'Gender' and 'Income' vary between negative, insignificant and positive ones while the 'level of education' and the 'number of persons in the household' were found to have either a positive or a negative effect (cf. Karlin et al. (2012) as well as Urban and Scazny (2012) for two recent literature reviews). This polyphony is likely due to the fact that the various studies have used multi-item scales, each one of them including different variables, for measuring the *aggregate* energy curtailment behavior: as research on environmental concern has demonstrated, the influence of predictors is contingent on how the dependent variable is measured and/or operationalized (cf. Marquart-Pyatt, 2007; Van Liere and Dunlap, 1981). The varied influence of the demographic predictors resurfaces when we study energy behaviors in a *discrete* fashion. Thus Urban and Scazny's (2012) study of five electricity-curtailment behaviors[1] across 9 OECD countries showed that the various demographic/structural predictors are not equally relevant for all behaviors: while 'gender' and 'age' impacted on some behaviors,[2] 'education' and 'number of persons in household' proved statistically non significant for all, and 'income' for the vast majority of all, behaviors.

As far as structural predictors are concerned, the house's actual size seems of relevance when studying electricity-curtailment. One may plausible argue that certain behaviors would be more difficult to perform in bigger houses: for example, ensuring that lights are turned off in an empty room or not letting electric devices on stand-by may be conditioned by size of the house (thus the number of rooms) and, consequentially, by the number of electric devices which exist in these rooms. Nevertheless, the house's physical size had been rarely used as an explanatory factor in energy conservation studies (cf. Guerin et al., 2000:59). While Black et al. (1985), in their study of clusters of energy-curtailment behaviors, found no direct effect for house's size (pp. 15–17), there exist no studies examining its possible influence on discrete curtailment behaviors.

Thus, and due to scarcity of relevant research findings, our examination of the impact of demographic-structural predictors on discrete curtailment behaviors will be exploratory, and the only hypothesis which we could put forward is that,

Hypothesis 1. (**H1**): Each discrete electricity curtailment behavior will depend on different demographic and structural predictors.

2.2. Psychological and moral factors influencing energy curtailment behaviors

Similarly to other pro-environmental behaviors, 'the majority of energy behavior studies in this last decade has been dominated by the psychology research' (Lopes, Antunes, and Martins, 2012:4096), and the bulk of these studies is guided by two of the most influential psychological theories: the Values-Beliefs-Norms (VBN) one (Stern, 2000) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). The VBN theory argues that pro-environmental behavior stems from an individual's "moral values" which shape his/hers "beliefs" about the condition of the natural environment. While assessing an existing situation, an individual may come to believe that the current conditions (will) have detrimental effects on the environment ("awareness of consequences") and that s/he should and/or could undertake certain actions in order to avert those consequences ("ascription of responsibility to self"). This in effect creates a "personal norm" for undertaking

[1] These behaviors were: 'Switching off lights when leaving a room'; 'turning down AC or heating when leaving a room'; 'economic use of the washing machine and dishwasher'; 'turning off unused appliances'; and, 'turning off standby mode in household appliances'.

[2] In particular, elderly people were more likely to turn off unused appliances as well as not leaving them to standby mode while males were less likely to turn off the standby mode as well as to use economically the washing machine/dishwasher.