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Exploring additional determinants of energy-saving behaviour: The influence of individuals' participation in cultural activities

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ABSTRACT

Consumer behaviour towards energy saving has attracted growing attention in several national policy measures, and has been discussed in a large number of interdisciplinary studies. In this paper, we argue that cultural capital, specifically individuals' participation in cultural activities, is significantly related to pro-environmental behaviour and is therefore a relevant, additional driver of electricity-saving behaviours. We apply a Heckman two-step selection strategy approach to microdata gathered from the latest sample of the annual "Aspects of daily life" survey for the year 2014, conducted by the Italian National Institute of Statistics. Our results, besides confirming the role of the socio-demographic determinants already investigated in the extant literature, also provide evidence that individuals who participate in some cultural activities show a higher probability of adopting electricity saving behaviours at home. Furthermore, the sign of such a relationship is differentiated depending on the characteristics of the cultural activity. Some policy implications are derived from the analysis.

1. Introduction

Consumer behaviour towards energy saving has attracted growing attention in several national policy measures, and has been discussed in a large number of interdisciplinary studies (Gillingham et al., 2009; OECD, 2008; World Energy Council, 2016).

Behaviour-based savings have been progressively recognised as a major issue in energy use in buildings, an essential resource for improving the sustainability of energy systems and the deployment of energy efficient technologies, as well as for energy resources development (Laitner et al., 2009; Lopes et al., 2012; OECD/IEA, 2016). At the household level, an efficient use of electricity combined with improvements in efficiency of large new appliances may fundamentally contribute to offsetting the rise in energy consumption due to increasing equipment ownership (ODYSSEE-MURE, 2015a). Notably, lifestyle and behavioural aspects are deemed to be one of the major barriers to effective energy use reduction in the residential sector, and policy-makers increasingly point out individual consumers' responsibility in climate change policies (Lucas et al., 2008; Steg, 2008; Steg and Vlek, 2009). The potential scale of behaviour-based savings can be significant (Ehrhardt-Martinez, 2010; Laitner et al., 2009). Moreover, those savings can often be achieved with little or even negative costs and faster than energy conservation measures requiring large-scale policy or infrastructure changes (Carrie Armel et al., 2013; Dietz et al., 2009).

Despite the fact that a number of policies have been enacted to achieve cost-efficient decreases in energy consumption, energy savings due to behaviour are far from fulfilling their potential (Gynther et al., 2012; ODYSSEE-MURE, 2013). Therefore, to improve the effectiveness of government measures and to successfully achieve large-scale reductions in energy consumption and carbon emissions, it is important to improve our understanding of the determining factors that have a bearing on individuals' domestic energy-saving behaviours, with particular reference to electricity.

There are few empirical research studies investigating how different habits and/or lifestyles may affect domestic electricity saving behaviours and practices, although studies in this field using microdata are rapidly increasing (Belaïd and Garcia, 2016; Ek and Söderholm, 2010; Ford et al., 2016; Gaffney et al., 2015; Wang et al., 2011; Yue et al., 2013). Traditionally, the literature on the drivers of energy demand focuses on a narrow set of variables that often include price characteristics, location, building, type of dwelling, climate, home appliances types and efficiencies, etc.. Moreover, socio-demographic factors, and, in particular, gender, age and socioeconomic status, as well as educational background, social norms, interactions, etc. are usually

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included to explain lifestyle aspects other than technological ones (Boudet et al., 2016; Jackson, 2005; Karatasou et al., 2013; Karlin et al., 2012; Wilson and Dowlatabadi, 2007). While emphasising high complexity and great heterogeneity both at the individual and the context-specific level (Chatterton, 2011; Newman and Fernandes, 2015; Stephenson et al., 2010), a growing body of studies supports the conclusion that individuals' environmental concerns and habits have a significant role in shaping their domestic energy saving behaviours (Abrahamse and Steg, 2009; Ek and Söderholm Patrik, 2010; Gadenne et al., 2011; Han et al., 2013; Karlin et al., 2012; Maréchal, 2010; Martinsson et al., 2011; Urban and Ščasný, 2012). However, models seeking to explore energy saving behaviours often share the narrow assumption of rationally-informed agents, driven by self-interest, whereas the social and environmental psychology perspective emphasises that energy consumption decisions are frequently habitual and guided by automated cognitive processes (Karatasou et al., 2013; Wilson and Dowlatabadi, 2007). This implies that people do not consider the remote environmental impacts of their actions, that domestic energy consumption tends to be automated, that goal-based behaviours are repeated generating a sort of lock-in effect, additionally reinforced by misperceptions and selective attention to information (Lopes et al., 2012; Maréchal, 2010; Steg and Vlek, 2009).

In the light of these arguments, our study investigates whether a correlation exists between cultural capital and individuals' different behaviours around electricity saving. We argue that cultural capital, specifically individuals' participation in cultural activities, is related to environmentally oriented habits and beliefs, as well as to pro-environmental behaviour, and is therefore a relevant, additional antecedent of electricity-saving behaviours. The underlying hypothesis is that by taking into account cultural consumption habits, some limits encountered in the literature on energy behaviours can be partially overcome, especially those related to the individual/social dichotomy, the bounded rationality and the lock-in effects in energy-saving behaviours. From an energy policy perspective, improving our understanding of individuals' domestic electricity saving behaviour provides insights on possibly new dimensions of policy intervention.

The present paper is also one of the few studies focusing on micro-data at the individual-level to investigate the likelihood of adopting behaviours aimed at not wasting electricity. Using data from the annual survey "Aspects of daily life 2014" of the Italian National Institute of Statistics, a Heckman two-step probit model is adopted, which allows self-selection problems to be appropriately taken into account.

Besides, most previous studies have not focused on countries with already high efficiency levels of energy use (Belaïd and Garcia, 2016; Hori et al., 2013; Martinsson et al., 2011; Wang et al., 2011). The understanding of additional electricity saving possibilities is particularly relevant in countries, such as Italy, that already exhibit relatively high performance in terms of energy efficiency, since marginal savings in energy consumption can be more difficult to attain (for instance, mechanisms based on financial compensation would involve too low an incentive). Indeed, Italy exhibits a low energy intensity, defined as the ratio of gross inland energy consumption and GDP, amounting to 98 toe/M€ in 2014, well below EU-28 average of 122 toe/M€. Nonetheless, energy efficiency is a key element of energy policy at the national level. The 2014 National Energy Efficiency Action Plan (MISE, 2014) outlines an energy savings potential of 20% by 2020 and sets an ambitious energy efficiency objective of 20 MTOE of primary energy, equivalent to 15.5 MTOE of final energy and to emissions of some 55 million tonnes of CO2 per year (ENEA, Italian National Agency for New Technologies, 2015). In 2015, Italian households were responsible for electricity demand of about 66.187 GW h, amounting to a share of 22% of total electricity consumption in the country, even though final energy consumption by households has been declining by 2% in the last ten years. As observed, Italy ranks as a top country at EU level in terms of energy efficiency. In 2016, the American Council for an Energy-Efficient Economy (ACEEE) ranked Italy second, after Germany and equal to Japan, in terms of national effort to improve energy efficiency levels (Kallakuri et al., 2016). According to the ODYSSEE Database, the electricity consumption per dwelling amounted to about 1717 kW h in 2014, well below the European average of 2266 kW h per dwelling. In addition, in 2014 the electricity consumption per capita amounted to 4631 kW h, which is considerably below the EU-28 average of 5338 kW h, the 6350 kW h of Germany, and 6303 kW h of France (European Commission, 2016). Finally, it is worth noting that Italy is also one of the leading countries in the deployment of smart-metering systems that potentially allow for more interactive management and/or reduction measures of energy demand at the household level (Ehrhardt-Martinez, 2010; Karlin et al., 2015).

The results of our work provide evidence that a statistically significant relation exists between some forms of cultural consumption and the probability of individuals adopting electricity saving behaviour, laying down empirical grounds for some general policy remarks. However, caution must be taken when interpreting these results and deriving possible policy implications. Although our research provides original insights, it suffers from some data limitations. Therefore, the evidence provided in our work must be considered as preliminary, and further research on this topic is needed to derive more detailed policy implications and to design specific policy measures.

The remainder of this paper is organised as follows. In Section 2, the literature background is presented, in which the role of cultural capital in shaping individuals' pro-environmental behaviour is discussed. Building on that conceptual background, Sections 3 and 4 present the empirical strategy and the available data. Section 5 discusses the results and their implications. Section 6 draws conclusions, provides some preliminary policy implications and discusses the limitations of the research and its possible future development.

2. Literature background

In general, people are aware and concerned about the problems related to domestic energy use (Abrahamse, 2007), although there is still a lack of clarity about the causal processes involved (e.g., Bord et al., 2000). Steg (2008) and Newman and Fernandes (2015) argue that pro-energy saving behaviours are still very complex and they are difficult to understand. As a matter of fact, the literature review provided by Urban and Ščasný (2012) has revealed that several socio-demographic (e.g., the age of respondents, their gender and education, household size, presence of children in the household), economic variables (e.g., household income, ownership of the dwelling, size of the apartment) and structural variables (e.g., energy metering, prices of energy, available energy sources) are likely to become confounding variables in influencing energy behaviour in households. According to Belaïd and Garcia (2016), even the respondents' working conditions and the type of dwelling affect electricity saving behaviour: individuals who spend more time at home (retired people and home-maker), and those living in highly energy-consumption buildings (such as rural dwellings) tend to behave in a more energy-saving manner.

Most studies on energy behaviour in the last decade have been dominated by psychology research. Steg and Vlek (2009) systematised factors underlying households' pro-environmental behaviour, identifying motivational factors, contextual factors and habitual behaviour. The motivational factors consider that individuals weigh the pros and cons, making rational choices to maximise their benefits considering perceived costs and benefits, moral and normative concerns and affection. The contextual factors are related to the influence of social norms, of the valuation of environmental beliefs, environmental concerns and the moral obligation to act pro-environmentally. Habitual behaviour makes use of affective and symbolic factors to explain environmental behaviour. Other scholars maintain that past behaviour or experience of individuals in some energy saving measures may affect their intention to engage in more energy saving behaviours (Dianshu et al., 2010; Zografakis et al., 2010).

This stream of literature seems to fail to examine the contextual influence by focusing, traditionally, on a merely individual perspective (Lopes et al., 2012). On the opposite perspective, sociological approaches generally argue that energy behaviours result from the social context and that such behaviours are part of a complex relationship between social norms and relations, technology, infrastructure and institutions. In that sense, social interactions within households may influence the patterns of energy use over time (Richardson et al., 2010; Yu et al., 2011). Ek and Söderholm (2010) have found that social interactions attach great importance to electricity saving behaviour. Other people's attitudes and behaviours in electricity saving influence individuals' willingness to carry out electricity saving activities.

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) and the Norm Activation model (NAM) (Schwartz, 1977) represent two approaches adopted in the energy-use literature stream devoted to overcoming the individual/social dichotomy (Abrahamse and Steg, 2009; De Groot and Steg, 2007; Harland et al., 1999; Nordlund and Garvill, 2002; Stern et al., 1995; Stern and Dietz, 1994). According to TPB, the agent's behaviour is based on the intention to perform the behaviour and on the level of perceived behavioural control. Those who have positive attitudes toward energy saving, believe that others will support them if they engage in this activity, and believe that they can easily engage in it, are more likely to report greater intentions to perform the behaviour. The NAM model assumes that people show energy saving behaviour when they feel a moral obligation to act in accordance with their own individual value system. This depends on the extent to which people are aware of the problems caused by their behaviours, and the extent to which they ascribe responsibility to themselves in facing the problems.

In line with these two models, several authors have also reported indirect evidence for an underlying pro-environmental motivation for curtailments by showing that these are influenced by pro-environmental beliefs and values (Ibtissem, 2010; Jansson et al., 2009; Whitmarsh and O'Neill, 2010) and by concern related to specific environmental problems (Whitmarsh and O'Neill, 2010).

However, some scholars highlight there is a significant problem with using either of these models of behaviour; both models assume that agents act in a rationally-informed manner, driven by self-interest while, more and more, behaviour is frequently habitual and guided by automated cognitive processes rather than being processed within a pure rational process (Maréchal, 2010; Steg and Vlek, 2009). In the light of this theoretical and empirical literature, habits play a relevant role in predicting energy-saving behaviours by moving from a Veblenian evolutionary economics (Maréchal, 2010). Habits seem to play a crucial role because they integrate individual as well as structural and institutional concerns in the evaluation process.

The importance of habits in influencing energy consumption behaviours, such as curtailment behaviours, faces a peculiar decision-making process that could swing away from cognitive effort toward automaticity: low degree of involvement, low perceived complexity and high degree of constraint (Jackson, 2005). This occurs because domestic energy consumption is not visible (Abrahamse et al., 2005), implying that people do not consider the remote environmental impacts of their actions (Maréchal, 2010). This suggests that everyday energy-related behaviours do not require much intentional effort, and habits in domestic energy consumption tend to be repeated automated goal-based behaviours, generating a sort of lock-in effect. Moreover, this characteristic often involves misperceptions and selective attention to information that reinforces habitual behaviours (Lopes et al., 2012; Steg and Vlek, 2009).

According to the previous background literature, we believe there is room to go further on the domestic energy-saving issue by moving from a cultural economics stand point, focused specifically on pro-environmental behaviour (Crociata et al., 2015) to greater emphasis on cultural capital and agents' behaviour (Crociata et al., 2014; Grossi et al., 2012, 2011; Sacco et al., 2012). Following the approach of Throsby (2005, 1999), we distinguish between tangible – such as material artefacts, artworks, historical buildings, books – and intangible forms of cultural capital, ideas, practices, beliefs, traditions, which maintain significance and relevance for a certain social group.

We operationalise cultural capital in line with the literature that considers attendance or participation in cultural activities, such as visiting museums, galleries or historic sites, as well as attending live music, theatre performance, arts or other cultural events (DiMaggio and Mukhtar, 2004; DiMaggio and Ostrower, 1990; Lizardo, 2006; López-Sintas and Katz-Gerro, 2005). In this light, cultural participation increases the stock of intangible cultural capital through the social reinforcement of activities and practices with cultural significance, and contributes to the increase of tangible forms in terms of demand for new cultural goods. This means that the consuming process is also possibly an educative process and that the accumulation of perceptive and cognitive data gives rise to, formally, a sort of 'progressive learning' that allows for greater levels of appreciation of the cultural goods consumed. McCain (1995) argues that this process is a form of iterative "learning-by-consuming" that influences consumer tastes. Moreover, according to Crociata and Mattoscio (2016) the educational dimension (and process) of cultural consumption also finds a theoretical fit within the context of environmental education (EE) and education for sustainable development (ESD) approaches and settings (e.g. Læssøe, 2010; Van Poeck and Vandenabeele, 2012) that are mainly based on participation and learning processes.

The participation in cultural events is a form of human capital accumulation at the individual level but at the same time this participation functions as a platform for educational processes, social regeneration, networking and cohesion within and beyond the people engaged (e.g., Everingham, 2003). The underlying hypothesis is that cultural capital (via cultural consumption) can overcome some limits (above mentioned) encountered in the literature such as the individual/social dichotomy, the bounded rationality of individuals and the lock-in effects of energy-saving behaviours.

In that sense, it can be regarded as a non-conservative factor that counters social inertia because individuals and cultural institutions mutually constitute and condition each other. According to Crociata et al. (2014), culture fosters awareness of a multitude of socially relevant issues, and consequently might motivate individuals to become involved in activities related to taking more responsibility for the pro-environmental dimension of short-term and longer-term practices, behaviours and habits, preventing lock-in effects. For instance, Hutter (1996) argues that culture can play an important role in shaping a collective identity within a community, thereby solidifying binding social ties and contributing to the enforcement of social norms. These characteristics of cultural participation are in line with the socially-situated theories of cognition (Schwarz, 2007; Smith and Semin, 2007, 2004) that have conceptualised identity as adaptive and embedded within social contexts.

The importance of the cultural economics standpoint is that cultural participation is seen as an investment in experiences that combine (possible) monetary costs and cognitive costs (Purhonen et al., 2011). The cognitive costs are related to the effort that people face during the cultural participation that is related to the sharpening of cognitive attitudes towards the unconventional and the unexpected, and to the harnessing of proactive responses to problematic situations related to low information.[1] In that sense, the open mind and curiosity that come with sustained cultural participation allow questioning of existing conventions and meanings, inquiring about one's place in the world and in society, and of re-framing one's knowledge and belief systems in new coordinates (e.g., Boyd, 2009). In that sense, cultural

[1] Within cultural consumption processes, Trimarchi (1993) highlights a sort of "impossible information" that prevents the consumer from adopting a correct preventive evaluation mechanism, which assimilates the cultural goods to trust goods.

Table 1
Data and variables definitions.

Variables	Definition
Dependent variables	
elect_saving	How often the respondent adopts behaviours aimed at not wasting electricity. 1 = Habitually or sometimes. Reference group: rarely or never.
env_concern2	Respondent's environmental concern (see Appendix A)
Sociodemographic variables	
male	Gender of the respondent.
age35_44	Age of the respondent. 1 = age between 35 and 44. Reference group age: 18–34.
age45_54	Age of the respondent. 1 = age between 45 and 54.
age55_64	Age of the respondent. 1 = age between 55 and 64.
age64_	Age of the respondent. 1 = age > 64.
ncomp	Number of family components.
bachelor_degree	Education level of the respondent. 1 = University degree or postgraduate education
child	Presence in the house of at least one child aged below 18.
ill	Presence of chronic illnesses or long-term health problems.
tenant	House tenure status. 1 = Tenant in rented dwelling.
sit_econ_good	Availability of economic resources for the needs of the family. 1 = Excellent or adequate. Reference group: scarce or totally inadequate.
house_type	Type of dwelling. 1 = Rural.
eq_intensity	Domestic appliances (washing machine, dishwasher, air conditioner). 1 = one out of the three types of appliances; 2 = two out of the three types of appliances; 3 = all types available.
retired	Professional condition. 1 = retired.
homemaker	Professional condition. 1 = homemaker.
munic_low	Municipalities with less than 10,000 inhabitants. Reference group: metropolitan areas.
munic_high	Municipalities with more than 10,000 inhabitants.
area_center	Central Italy. Reference group: Northern Italy.
area_south	Southern Italy and Islands.
Participation in cultural activities	
archeo	Archaeological sites attendance over the last 12 months. 0 = never; 1 = 1–3 times; 2 = 4–6 times; 3 = 7–12 times; 4 = more than 12 times.
books	Number of books read over the last 12 months. 0 = none; 1 = 1–3 books; 2 = 4–6 books; 3 = 7–12 books; 4 = more than 12 books.
cinema	Cinema attendance over the last 12 months. 0 = never; 1 = 1–3 times; 2 = 4–6 times; 3 = 7–12 times; 4 = more than 12 times.
newspaper	Frequency of reading newspapers during the week. 0 = never; 1 = 1–2 days; 2 = 3–4 days; 3 = 5–6 days; 4 = every day.
opera_classic	Classical music concerts attendance over the last 12 months. 0 = never; 1 = 1–3 times; 2 = 4–6 times; 3 = 7–12 times; 4 = more than 12 times.
other_music	Other music concerts attendance over the last 12 months. 0 = never; 1 = 1–3 times; 2 = 4–6 times; 3 = 7–12 times; 4 = more than 12 times.
theatre	Theatres attendance over the last 12 months. 0 = never; 1 = 1–3 times; 2 = 4–6 times; 3 = 7–12 times; 4 = more than 12 times.
Participation in social activities and other attitudes	
ecological	Participation in meetings held by ecological associations.
env_unsat	Satisfaction for the state of the environmental of the area where the respondent lives.
neighbour_trust	Trust in people living in the neighbourhood. 1 = Very or pretty confident. Reference group: not very confident or not confident at all.
politics	Participation in meetings with political parties over the last 12 months. 1 = Yes. Reference group: no.
volon	Voluntary activities taken on over the last 12 months. 1 = Yes. Reference group: no.

habits can be considered "based in part on the ability of the individual to learn or acquire/absorb the particular behaviour into a cognitive schemata or script" (Limayem et al., 2001, p. 277).

Although, to our knowledge, a full-fledged theoretical model of how cultural capital and energy saving behaviour are related has not yet been developed, from our previous discussion we can conclude that there is a robust conceptual basis for some preliminary empirical work in this area.

3. Empirical strategy

The dependent variable has been dichotomised, so it takes the value 1 if the respondent states that they adopt, habitually or sometimes, behaviours aimed at not wasting electricity, otherwise the value is 0. Our paper focuses on ascertaining whether a relationship between participation in cultural activities and the probability of adopting electricity saving behaviours at home exists, and there is a considerable stream of literature that emphasises that individuals' environmental concern has a significant role in shaping their domestic energy saving behaviours (Abrahamse and Steg, 2009; Ek and Söderholm, 2010; Gadenne et al., 2011; Han et al., 2013; Karlin et al., 2012; Martinsson et al., 2011; Steg and Vlek, 2009; Urban and Ščasný, 2012). In other words, the probability that a respondent adopts domestic energy saving behaviours also depends on whether the respondent is concerned with environmental problems. Hence, the observations are not random, and a sample selection bias is possibly occurring. To overcome such a self-selection problem, a Heckman two-step selection strategy (Heckman, 1979) is adopted, so that the impact of cultural consumption on electricity-saving behaviour is assessed after accounting for the respondents' sensibility to environmental problems.

The following Probit model is then used:

$$Pr(Y_i = 1 \mid X_i, Z_i) = \alpha + \beta X_i + \delta Z_i + \varepsilon_i \quad (1)$$

where Y_i is the dependent variable and is equal to 1 if the respondent adopts domestic electricity saving behaviours, and zero otherwise, for each i-th respondent; X_i is a set of socio-demographic variables, and Z_i is a set of variables related to different cultural consumption. As just emphasised, this specification of the probit model does not account for the individuals' different possible levels of attention to environmental problems. Therefore, a Heckman two-step probit model is implemented, which estimates two equations simultaneously: an "environmental concern" equation (the selection equation) and an "electricity saving" equation (the observation equation). The bivariate probit takes the following form:

$$selection\ equation: Pr(D_i = 1 \mid C_i) = \alpha + \mu C_i + \varepsilon_i \quad (2)$$

$$observation\ equation: Pr(Y_i = 1 \mid X_i, Z_i) = \alpha + \beta X_i + \delta Z_i + \lambda_i + u_i \quad (3)$$

$$\begin{pmatrix} \varepsilon_i \\ u_i \end{pmatrix} \sim i.\ i.\ d. \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\varepsilon^2 & \rho_{\varepsilon u} \\ \rho_{u\varepsilon} & \sigma_u^2 \end{pmatrix} \right)$$

where D_i is the dichotomous variable of the selection equation, which equals 1 if the individual is very sensitive to environmental concerns, and 0 otherwise; C_i is the set of covariates of the selection equation; Y_i is the dichotomous variable of the observation equation defined as above; X_i and Z_i are identically defined as above; λ_i is the inverse Mills Ratio, obtained by first-stage regression, which allows the self-selection

problem to be properly addressed. Both equations are estimated by maximum likelihood as two independent probit models.

The Heckman procedure assumes that the errors of the two equations are normally distributed with zero mean and variance, and are correlated among themselves. It is possible to test the null hypothesis that the two errors are not correlated: $H_0 : \rho = 0$ with a specific Wald test (concerning our model, the value of the Wald test is reported in the Table of the regression results).

4. Data

The analysis is based on data from the 2016 annual survey "Aspects of daily life 2014" of the Italian National Institute of Statistics. The data concern 18,864 households and 44,984 individuals, and include a large selection of information on the habits and the problems faced in everyday life.

We restrict the analysis to adult individuals (aged 18 or more), as, in general, the adoption of domestic electricity saving behaviour requires greater awareness and independence in the choice of personal lifestyle.

The definition and the descriptive statistics of the variables used in the econometric analysis are summarised in Tables 1 and 2 respectively.

As already specified, the dichotomous dependent variable of the observation equation (elect_saving) gets a value of 1 when the respondent states to adopt (habitually or sometimes) behaviours aimed at not wasting electricity, 0 otherwise. Our model includes a set of controls, well-established in the relevant literature, for the socio-demographic characteristics of the respondents (gender, age, education, health, family characteristics, type of housing, working conditions, house ownership status, et cetera). Respondents' participations in various cultural activities are used as explanatory variables, together with volunteering, in this framework assumed to be a relevant social activity. Table 2 shows that males constitute about 47.8% of the sample, 27.4% of the respondents are over 64, nearly 13% have attained at least a bachelor degree qualification and over 30% report that they suffer from chronic illnesses or long-term health problems. As far as cultural consumption is concerned, the most widespread activities are reading newspapers and books, as well as going to the cinema. The participation is lower in the cultural activities that are considered to be more highbrow and typically more expensive (such as classical music concerts). Finally, less than 11% of the survey participants have taken on voluntary activities over the previous year.

As for the selection equation, the dependent variable (the respondents' environmental concern, env_concern2), is built taking into account that the ISTAT questionnaire allows the respondents to tick a maximum of 5 answers out of 15 different environmental issues. Hence, we assign to 5 (the highest value of concern on environmental problems) the value 1, 0 to other scores (< 5). In this case, the sample becomes split into two parts, as 56% of the respondents show the maximum concern about environmental problems, while the remaining 44% show lower concern. In Appendix A, we report a statistical summary of the single components of the environmental concern variable.

To conclude, more than 1 respondent out of 4 report dissatisfaction with the environmental state of the area where they live in, but less than 2% have taken part in meetings held by ecological associations over the previous 12 months.

Table 2
Descriptive statistics.

Variables	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
elect_saving	36,553	0.9179	0.2745	0	1
env_concern2	37,544	0.5596	0.4964	0	1
Sociodemographic variables					
gender	37,544	0.4782	0.4995	0	1
age35_44	37,544	0.1739	0.3790	0	1
age45_54	37,544	0.1902	0.3925	0	1
age55_64	37,544	0.1584	0.3651	0	1
age64_	37,544	0.2740	0.4460	0	1
ncomp	37,544	28,574	12,898	1	10
bachelor_degree	37,544	0.1275	0.3336	0	1
sit_econ_good	37,309	0.5380	0.4986	0	1
child	37,544	0.2800	0.4490	0	1
ill	36,443	0.3027	0.4594	0	1
tenant	37,346	0.1490	0.3561	0	1
house_type	37,026	0.0364	0.1872	0	1
eq_intensity	37,153	1.8343	0.7716	0	3
retired	37,544	0.2287	0.4200	0	1
homemaker	37,544	0.1504	0.3575	0	1
munic_low	37,544	0.3490	0.4767	0	1
munic_high	37,544	0.4500	0.4975	0	1
area_center	37,544	0.1759	0.3808	0	1
area_south	37,544	0.3988	0.4897	0	1
Participation in cultural activities					
archeo	36,662	0.2889	0.6522	0	4
books	37,544	0.7855	1.1713	0	4
cinema	36,721	0.7041	1.0042	0	4
newspaper	36,940	1.1864	1.4684	0	4
opera_classic	36,606	0.1311	0.4673	0	4
other_music	36,587	0.2488	0.5963	0	4
theatre	36,682	0.2236	0.5724	0	4
Participation in social activities and other attitudes					
ecological	36,350	0.0172	0.1299	0	1
env_unsat	36,870	0.2552	0.4360	0	1
politics	36,509	0.0368	0.1882	0	1
volon	36,636	0.1078	0.3102	0	1

5. Econometric results

In the Appendix B, Table B, we present the estimates obtained through the uncorrected model (Eq. (1)).

Tables 3 and 4 illustrate the results achieved by Heckman's (1979) two-step estimation model.

The results of the first-stage equation (Eq. (2)) are shown in Table 3 (marginal effects).

The concern about environmental problems among people aged 45–54 is 2.2% higher than people aged 18–34, but reduces with age: the probability of worrying about the environment reduces to about 2.5% among people aged between 55 and 64, and decreases considerably among respondents aged more than 64 (– 17.7%). Relevant differences emerge also with respect to the respondents' macro-area of residence: those living in the South (Centre) Italy are less concerned

Table 3
Results from the first-stage equation (selection equation) of probit model à la Heckman (Eq. (2)).

Variables	Marginal effects	z-value	sign
Socio-demographic characteristics			
Male	– 0006	– 1,08	
Age 35–44 (Reference group: 18–34)	– 0005	– 0,53	
Age 45–54	0022	2,56	**
Age 55–64	– 0025	– 2,77	***
Age greater than 64	– 0177	– 22,67	***
Central Italy (Reference group: North Italy)	– 0031	– 4,00	***
Southern Italy	– 0096	– 16,04	***
Economic situation perceived as good	0061	11,12	***
Bachelor's degree	0122	15,51	***
Social capital			
Political parties	0122	8,80	***
Ecological association	0175	8,92	***
Environmental dissatisfaction	0079	13,05	***
Number of observations	35,938		

Notes: Regressors' legend: see Table 1. The standard errors are corrected for heteroskedasticity. The symbols ***, ** denote that the coefficient is statistically different from zero at 1% and 5% respectively.

Table 4
Results from observation equation of probit model à la Heckman (Eq. (3)).

Variables	Marginal effects	z-value	sign
Socio-demographic characteristics			
Male	– 0.016	– 4.950	***
Age 35–44 (Reference group: 18–34)	0.036	10.150	***
Age 45–54	0.046	13.820	***
Age 55–64	0.047	12.760	***
Age greater than 64	0.008	0.930	
Central Italy (Reference group: North Italy)	0.003	0.620	
Southern Italy	– 0.007	– 1.780	*
Municipalities up to 10,000 inhabitants (Reference group: metropolis)	0.021	5.570	***
Municipalities with more than 10,000 inhabitants	0.010	2.560	**
Bachelor's degree	0.023	4.670	***
Number of household members	– 0.006	– 4.350	***
Presence in the house of at least one child aged below 18.	0.014	3.670	***
Presence of chronic illnesses or long-term health problems.	– 0.003	– 0.840	
Tenant	0.005	1.330	
Type of Housing (Rural)	0.013	1.890	*
Equipment intensity	0.002	0.960	
Retired	0.017	3.190	***
Homemaker	0.023	4.860	***
Cultural consumptions			
Cinema	– 0.001	– 0.840	
Theatre	0.004	1.350	
Opera and classical music	– 0.016	– 4.680	***
Other music	– 0.003	– 1.180	
Archaeological and monuments sights	0.012	4.000	***
Newspapers	0.007	5.710	***
Books	0.011	6.700	***
Social capital			
Voluntary activities	0.021	4.870	***
Number of observations	33,724		
Mills ratio	0.079	4.520	***
Wald test (p-value)	0.0016		
Log-likelihood	– 9235.899		
BIC	18,763.72		
AIC	18,527.80		

Notes: the dependent variable takes value 1 if the respondent (habitually or sometimes) adopts a behaviour aimed at not wasting electricity. Regressors' legend: see Table 1. The standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1%, 5% and 10% respectively.

about environmental problems by about 9.6% (3.1%), compared to people in Northern Italy. Even education plays a role in fostering sensibility to environmental problems. Having a bachelor's degree increases the probability of being concerned about the environment (12.2% more than respondents with a lower level of education). Furthermore, an economic situation perceived as good is associated with a positive effect on sensibility to environmental problems (6.1% more). Not surprisingly, even dissatisfaction with the environmental situation is related to environmental concern: being unsatisfied with the environmental conditions increases by 7.9% the probability of being concerned about the environment. To conclude, the controls for the social capital dimension give interesting information. Participation in political meetings and ecological associations is positively related to a higher probability of being concerned about environmental problems, respectively by 12.2% and 17.5%.

Where the second-stage equation (the observation Eq. (3)) is concerned, the results obtained are presented in Table 4. Incidentally, the Wald test reported at the bottom of Table 4 implies that the null hypothesis of no correlation between the errors is rejected with a 1% significance. Therefore, the errors are correlated among themselves, and the Heckman two-stage approach is then appropriately adopted.

Results show that the probability of electricity saving decreases among male respondents, while it increases among older people. In detail, we observe that people aged more than 34 have a higher probability of adopting electricity saving behaviours, and this probability increases for age groups up to 65. In addition, people living in less populated municipalities have a moderately higher probability of paying attention to not wasting electricity (+ 2.1% for respondents living in municipalities up to 10,000 inhabitants; + 1% for those living in municipalities with more than 10,000 inhabitants, compared to people living in metropolitan areas).

The presence of children has a contained but positive impact on the probability of caring about electricity saving (1.4%). In fact, as highlighted in the extant literature (for instance, see Sweeney et al. (2013), Yue et al. (2013)), though children show a certain awareness of environmental problems, they rarely put in place behaviours aimed at energy saving. It is likely then that respondents with children will develop a more electricity saving behaviour, in order to offset – at least partially – children's uncaring attitude.

An analogous positive impact is associated with living in rural housing (+ 1.5%) – which is consistent with the evidence presented in papers dealing with the analysis of the structural differences between rural and urban areas in energy use and household energy-saving behaviours (Hori et al., 2013) – as well as being retired (+ 1.7%) or being a homemaker (+ 2.3%). A positive role is also played by respondents' education: people with a bachelor's degree show a higher probability (+ 2.3%) of caring about not wasting electricity. On the contrary, the number of family members seems to have (small) negative effects (– 0.6%).

Where participation in cultural activities is concerned,[2] its effect on electricity-savings behaviour is diversified, in terms of sign and magnitude,[3] depending on the characteristics of the cultural consumption. In fact, the attendance at opera and classical music concerts seems to have a negative impact on electricity saving behaviours (– 1.6%), while reading newspapers and books, as well as visiting archaeological sites and monuments, play a boosting role (0.7%, 1.1% and 1.2% respectively).

The negative impact of cultural participation such as opera and classical music concerts could be explained by the consideration that these cultural experience can be compared to club goods (Cornes and Sandler, 1984; Kushner and King, 1994) and positional goods (Hirsch, 1976), for which the level of social participation, i.e. the level of social interaction among people, is low. The principal motivation that leads people to consume these cultural goods is a very individual contentment and a social status ostentation. In such social contexts, cultural participation allows others to distinguish those who is carry out these actions (Bourdieu, 1986), an attitude that finds a reply in what Veblen (1912) calls "showy consumptions" in his theory of the wealthy class. On the contrary, visiting archaeological sites and monuments seems to be closer to the characteristics of relational goods (Uhlaner, 1989). Among other factors, people are motivated to show pro-environmental behaviour by social pressure from their relational environment, family and friends (Crociata et al., 2014). This interpretation is in line with a stream of literature that considers that the consumption of these cultural goods is motivated by social orientation, i.e. those who usually attend these cultural events aim at creating and/or strengthening ties with other members giving a special value to these ties (Sacco and Zarri, 2005). Both these two categories of cultural goods (club/status

[2] In order to check for possible multicollinearity issues between the variables, a VIF test has been run. No multicollinearity issue emerges, as all the VIF values are below 2, and the average VIF is 1.29.

[3] This line of research is still at its earliest stage, and the scope of our work is to provide some preliminary insights about the general relationship between cultural consumption and electricity saving behaviour. So, while the differences in the sign of the various (statistically significant) marginal effects can be traced back to the different nature of the cultural activities (as implied by the conceptual framework we presented), further research is needed in order to robustly account for the differences in the magnitude.

and relational) seem consistent with the evidence provided in the socio-psychological literature on energy use behaviour.

As for the positive impact of reading newspapers and books, these kind of cultural goods involve an educational-led process (Sherman, 2006). However, human capital plays a role in both the imagination and the appreciation of cultural content and experiences (Towse, 2006). We can argue that such examples of consumption pave the way for the accumulation of cultural and human capital, boosting the above mentioned open-mind and implying, as a primary result, a pro-active behaviour that seems to be consistent with the motivational behavioural economics literature on pro-environmental habits.

The Mills ratio coefficient is positive (and significant at 1%), which means that there is a positive selection effect occurring: those who select into environmental concern are more likely to adopt an electricity saving behaviour than a random drawing from the population of respondents with a comparable set of characteristics would be.

Finally, the comparison between the corrected and the uncorrected estimates suggests that the corrected model minimises the AIC and BIC criteria, and maximises the log-likelihood criteria.

6. Conclusion and policy implications

This paper addresses the question of whether individuals' participation in cultural activities may be related to a higher probability for individuals adopting electricity saving behaviours. To our knowledge, such a question has never been posed before in the literature, even if cultural access has a significant role in forming, reinforcing and sustaining overall individuals' habits and/or lifestyles, including those related to domestic energy behaviours (Steg and Vlek, 2009). Hence, some firm logical grounds exist in suitably considering the influence of cultural activities as an effective predictor of individuals' pro-environmental behaviour (Crociata et al., 2015). Engaging in some forms of cultural experiences stimulates mind-opening interactions that encourage a knowledge-oriented disposition, intellectual curiosity, and better awareness about the relatedness of everyday choices and long-term social outcomes (Sacco et al., 2012). In our research, we find that the relationship between participation in some (socially oriented or mind-opening) cultural activities and pro-social electricity-saving behaviour is positive and statistically meaningful for our large Italian population sample. In contrast, participation in highbrow cultural activities is negatively related to electricity saving behaviours, and this result may be traced back to the strongly solipsistic nature of the consumption of these cultural goods.

From an energy policy perspective, our findings suggest the opportunity to explore potential synergies between cultural and environmental policies, a possibility of particular interest in view of the increasing emphasis placed on smart growth strategies, but a totally overlooked option so far (da Graça Carvalho, 2012; European Commission, 2010; Zhang and Wang, 2017). Some cultural consumptions may determine greater social awareness of energy alternatives and growing concern about increasing climate problems and future generations. Consistent with socio-psychological literature on energy use behaviour, the decisions on the extent to which electricity saving is taken care of reflect the (club/status, relational or mind-opening) nature of the cultural goods consumed.

In a policy perspective, this evidence implies that effective reductions in energy consumption could be achieved with little costs, unlike large-scale measures or infrastructure changes (Dietz et al., 2009). When the embeddedness of energy behaviour within the physical and social contexts of daily life is taken into account (Karlin et al., 2015), individuals' awareness of environmental problems and of the environmental impacts of their behaviour could be also heightened by promoting individuals' participation in some cultural activities even when they are not directly targeted by specific informational strategies about electricity saving. Policies aimed at promoting individuals' cultural consumption could also be more effective in generating effects on domestic energy savings in the long term, as they may have a more direct and persistent impact on consumption patterns. In fact, there is evidence that other policies (e.g., those based on financial compensation or on information), when not continued long enough, have an impact which is often of limited persistence (Allcott and Rogers, 2014; ODYSSEE-MURE, 2015b). Furthermore, these policies might be effective even in countries which, like Italy, exhibit a low energy intensity, where the financial compensation (Oikonomou et al., 2009) related to energy conservation would hence be relatively small.

However, a number of data limitations suggest that caution should be used regarding the generalisability of these results and that there are still many open questions regarding policy implications. First, our data are cross-sectional (as are most studies based on surveys), so we cannot gather any evidence on the dynamics of the relationship between cultural consumption and electricity saving behaviour. In fact, it is reasonable that the association between the two phenomena is, to some extent, also conditioned by the time pattern of cultural consumption. Second, even if in this preliminary work we were essentially interested in assessing the statistical significance and the sign of the marginal effects of various cultural activities on the probability of adopting electricity saving behaviour, further research should be carried on in order to gain a deeper understanding of the factors to which the differences in the magnitude of the marginal effects could be attributed. Future research should also explore to what extent our findings are replicated in different socio-economic contexts, e.g., in other European countries, as well as in non-European ones. Finally, in order to refine insights in terms of cultural policy design, a deepening of the determinants of the participation in cultural activities is needed. The access to some forms of cultural consumption is geographically uneven, thus some policy options would not be available in all circumstances.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.enpol.2017.06.030.

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