# EU product policy and consumer purchase decisions – empirical evidence from eight EU member states

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# Keywords

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# Abstract

EU product policy has contributed to driving purchase decisions towards more efficient products by influencing consumer purchase behaviour. However, sales data show that the uptake of energy efficient solutions differs considerably between the various EU member states, despite the fact that the regulation is the same. In order to make product policy more effective in influencing consumer behaviour, it is important to obtain an improved knowledge of how consumers make purchase decisions. We analyse data from a large-scale household survey that was conducted in eight EU member states (DE, FR, IT, ES, PL, RO, SE, UK) in June 2016. In each country, a representative sample of 1,500-2,000 participants was asked about their purchases of washing machines, refrigerators, dishwashers and light bulbs. The survey contained questions on a variety of external and internal factors influencing consumer purchase decisions including attributes that directly influence decision-making (purchase price, energy cost, energy label, social influence, influence of retailers, environmental friendliness, financial support, performance and design) as well as indirect factors such as gender, income level, attitudes, values and beliefs. We use descriptive and inferential statistics to analyse the role of these factors in purchase decisions and compare the results across the various countries. We find that the role of the different factors varies between the countries but only slightly between different population groups according to age, income or education. For household appliances and lighting, purchase

criteria are rated similarly overall but energy consumption is most important for lighting while the purchase price is most important for appliances.

# Introduction

EU product policy has contributed to transforming the EU appliance market towards energy efficiency (Zhou and McNeil 2014; Deutsch 2010; European Commission 2015). The implementation of the two main pillars of the European product policy, the Ecodesign directive (2009/125/EC) and the Labelling directive (2010/30/EC), is estimated to save 7,330 PJ primary energy per year by 2020, corresponding to 19 % savings with respect to business-as-usual energy use for those products (European Commission 2015).

Despite the success of EU product policy in increasing energy efficiency, sales data show that the uptake of energy efficient solutions differs considerably between the various EU member states, despite the fact that the regulation is the same (SoWatt 2009; Gaspar and Antunes 2016). For example, a comparison of 2008 market data for refrigerator purchases in eight EU member states shows that the uptake of A+ and A++ appliances is significantly above EU average in Germany and Italy, while being significantly below EU average in France and the United Kingdom (Attali et al. 2009).

While the variation in responses to identical policy conditions may partly be explained by differences in energy prices and appliance purchase prices, the wide variations reflects the often debated phenomenon that the adoption of energy efficiency technologies is driven by factors going beyond economic rationality (Allcott and Mullainathan 2010; Jacobsen 2015a). In order to make product policy more effective in influencing consumer behaviour, it is important to obtain an improved knowledge of how consumers make purchase decisions. While the factors that determine purchase behaviour for energy efficiency appliances and lighting have been investigated in numerous studies for various countries around the globe, empirical comparisons between different EU member states are scarce.

The research question we ask is: how do European households make energy efficiency investment decisions and how do households differ in their investment behaviour? Our study provides insights into the factors determining purchase behaviour by analysing data from a survey conducted in eight different EU member states (DE, FR, IT, ES, PL, RO, SE, UK) in June 2016. The survey formed part of the Horizon 2020 project *Behavioural Response to Investment Risks in Energy Efficiency* BRISKEE<sup>1</sup>.

The study analyses the stated relevance of nine purchase criteria (purchase price, energy cost, energy label, environmental friendliness, performance, design, financial support measures, recommendations by professionals, recommendations by friends and family). We investigate how the role of these purchase criteria varies for different population groups. Our approach allows for direct comparison of purchase behaviour between the eight EU member states. The study's scope includes refrigerators, freezers, washing machines, dishwashers and lighting. These appliance types use a large share of electricity in households and do not fundamentally differ in functionality across models. They are therefore commonly considered to be chosen mainly according to purchase price and operational costs, not according to features and design like, for example, products used for entertainment or devices that are only infrequently used. White goods present the most relevant category of electricity consuming products in European households for efficiency policy.

The article is structured as follows. The next section provides an overview of the relevant literature. The subsequent section outlines our methodological approach, followed by the presentation and discussion of our results. Lastly, we summarize our results and present conclusions.

# Literature review on empirical evidence for energy efficiency purchase behaviour

This section provides an overview of previous studies focussing on consumer purchase behaviour for residential appliances and lighting. The studies typically explore different attributes which might be correlated to households purchase behaviour. The most relevant attitudes considered in the literature include: electricity price, energy label, purchase price, information given at the point of sale, family size, property ownership, proenvironmental preference, age, gender and income.

As seen in Table 1, for many attributes some studies find a correlation between efficiency purchase behaviour, while other studies do not, depending on geographical scope and methodological approach. For the attributes *family size*, *property ownership*, *age* and *income*, most studies find that they are correlated to the energy efficiency purchase behaviour. For the attributes *electricity price*, *purchase price*, *information at the point of sale*,

*pro-environmental preference* and *gender*, different studies find different results. The differences might be due to the different geographical scopes and methodological approaches. Concerning the attribute *energy label*, a correlation could only be found if enough information about the label is given beforehand to the customer.

# Methodological approach

This study analyses data from a representative survey conducted via internet in June/July 2016 and included the following eight EU member states: France, Spain, Germany, Italy, Poland, Romania, Sweden and UK. The surveyed countries were chosen among the 28 EU member states to cover a large share of EU energy consumption and EU population as possible, while at the same time representing different economic and geographic circumstances. The selected countries cover 76 % of the EU's population and 74 % of EU energy consumption.

In each country, 1,500-2,000 participants completed the questionnaire (see Table 2), resulting in a total sample of 15,055 participants. The participants were selected using quotas per country for gender, age (18 through 65 years) and region. Participants were first screened for their most recent purchases in order to address the subsequent questions based on the participants' real purchase decision, which could most easily be recalled. For all participants that have bought a household appliance (refrigerator, freezer, washing machine or dishwasher) within the past five years, participants were divided into sub-samples based on their most recent purchase. Participants who had not purchased any appliance in the past five years were excluded from the sample. For lighting, participants who had not bought any light bulbs within the past two years were excluded from the sample. The sample sizes for the individual end-uses (see Table 2) reflect the most recent purchases.

For the end-use technologies selected in the initial screening questions, the questionnaire included questions on a variety of external and internal factors influencing consumer purchase decisions including attributes and decision criteria that directly influence decision-making as well as indirect factors such as gender, income level, attitudes, values and beliefs. Participants were asked to rate the following nine decision criteria regarding their importance in their most recent purchase decision on a five-point scale ranging from "played no role" (numerical value 1) to "very important" (numerical value 5):

- Purchase price
- Energy cost
- Energy label
- Recommendations by friends and family (social influence)
- Recommendations by professionals (e.g. retailers)
- Environmental friendliness
- Financial support (e.g. tax rebates, subsidies)
- Performance (quality, reliability, durability, functionality)
- Design, look, fit with current interior

<sup>1.</sup> Website: http://briskee.eu.

Table 1. Literature summary of attributes suggesting a correlation or no correlation to energy efficiency purchase behaviour. Methods: market data analysis (A), survey (S), discrete choice questionnaire (DCQ) or stated choice experiments (SCE). \* Studies found a correlation if enough information about the label was given beforehand.

| Attribute          | Studies suggesting a correlation            | Geographical scope   | Method   |     |
|--------------------|---|--|--|-----|
|                    | Yes   | No   |  |     |
| Electr. price      | (Attali et al. 2009)                        |  | EU   | A   |
|                    | (Nair et al. 2010)                          | Iation No   Image: No EU   Image: Image | S  |     |
|                    | (Sardianou 2007)                            |  | SE   | S   |
|                    |   | (Jacobsen 2015b)   | US   | А   |
| Energy label       | (Sammer and Wüstenhagen 2006)               |  | СН   | DCQ |
|                    | (Newell and Siikamäki 2015)                 |  | US   | SCE |
|                    | (Attali et al. 2009)*                       |  | EU   | A   |
|                    | (Murray and Mills 2011)*                    |  | US   | S   |
| Purchase price     | (Attali et al. 2009)                        |  | EU   | А   |
|                    | (Di Maria et al. 2010)                      |  | IS   | S   |
|                    | (Diekmann and Preisendörfer 1998)           |  | DE   | S   |
|                    |   | (Mills and Schleich 2014)  | DE   | S   |
| Information at the | (Attali et al. 2009)                        |  | EU   |     |
| point of sale      | (Brechling and Smith 1994)                  |  | UK   | S   |
|                    |   | (Mills and Schleich 2014)  | DE   | S   |
| Family size        | (Brandt and Ameli 2014)                     |  | AU, CA, Chile, FR, IL,<br>JP, KR, ES, SE, CH, NL | S   |
|                    | (Sardianou 2007)                            |  | GR   | S   |
| Prop. ownership    | (Brandt and Ameli 2014)                     |  | AU, CA, Chile, FR, IL,<br>JP, KR, ES, SE, CH, NL | S   |
|                    | (Brechling and Smith 1994)                  |  | UK   | S   |
| Pro-environmen-    | (Sardianou 2007)                            |  | GR   | S   |
| tal preference     | (Di Maria et al. 2010)                      |  | IS   | S   |
|                    | (Ramos et al. 2015a; Ramos et al.<br>2015b) |  | ES   | s   |
|                    |   | (Brandt and Ameli 2014)  | AU, CA, Chile, FR, IL,<br>JP, KR, ES, SE, CH, NL | S   |
| Age                | (Brandt and Ameli 2014)                     |  | AU, CA, Chile, FR, IL,<br>JP, KR, ES, SE, CH, NL | S   |
|                    | (Mills and Schleich 2012)                   |  | EU, NO   | S   |
|                    | (Carlsson-Kanyama et al. 2005)              |  | SE   | S   |
|                    | (Michelsen and Madlener 2012)               |  | DE   | S   |
|                    | (Nair et al. 2010)                          |  | SE   | S   |
|                    | (Torgler et al. 2008)                       |  | EU   | S   |
| Gender             | (Torgler et al. 2008)                       |  | EU   | S   |
|                    |   | (Sardianou 2007)   | GR   | S   |
| Income             | (Di Maria et al. 2010)                      |  | IS   | S   |
|                    | (Michelsen and Madlener 2012)               |  | DE   | S   |
|                    | (Ramos et al. 2015b)                        |  | ES   | S   |

We analyze the average rating across participants to investigate the differences in relevance of the criteria. We compare the ratings between the different countries and for the different energy end-uses.

We then analyze the effects of different personal and household attributes on purchase criteria using a multiple linear regression model. The attributes selected for the regression model are based on our literature review and reflect the findings from previous studies (see previous section). The regression analyses the factors that may influence purchase decisions, including them in the following independent variables:

- To save energy is an important part of who I am.
- I think of myself as an energy conscious person.
- I think of myself as someone who is very concerned with environmental issues.
- Being environmentally friendly is an important part of who I am.

The influence of the country of residence is analysed by comparing all countries to one reference country using dummy variables. We use France as the arbitrary reference country of the regression and thus introduce the following dummy variables for the remaining countries: *IT*, *DE*, *UK*, *ES*, *SE*, *PL*, *RO*.

# Results

### MARKET SHARES OF ENERGY EFFICIENCY CLASSES AND LIGHTING TECHNOLOGIES

The shares of EU efficiency classes and lighting technologies sold in the respective periods are shown in Figure 1. In France, the UK and Sweden, top efficiency classes have a lower market share than in the other countries, and the share of households that do not know the efficiency class is higher. In the case of lighting, as Figure 1 shows, the share of LEDs is particularly low in Romania (only 25 % market share). Despite the Ecodesign requirements that removed incandescent light bulbs from the

#### Table 2. Survey sample sizes by energy end-use.

|                   | FR   | ES    | DE    | IT    | PL    | RO    | SE    | UK    | Total  |
|-------------------|--|-------|-------|-------|-------|-------|-------|-------|--------|
| Total sample      | 2,000  | 2,001 | 2,002 | 2,000 | 2,008 | 1,529 | 1,515 | 2,000 | 15,055 |
|                   | Appliances bought within the past 5 years (2012–2016), most recent purchase: |       |       |       |       |       |       |       |        |
| Refrigerator      | 522  | 485   | 436   | 519   | 483   | 502   | 224   | 539   | 3,710  |
| Freezer           | 149  | 121   | 155   | 106   | 77    | 93    | 94    | 155   | 950    |
| Washing machine   | 583  | 629   | 642   | 744   | 753   | 604   | 294   | 630   | 4,879  |
| Dishwasher        | 387  | 278   | 328   | 274   | 310   | 65    | 259   | 183   | 2,084  |
| Appliances, total | 1,641  | 1,513 | 1,561 | 1,643 | 1,623 | 1,264 | 871   | 1,507 | 11,623 |
| Lighting          | 1,558  | 1,762 | 1,576 | 1,741 | 1,854 | 1,482 | 1,281 | 1,497 | 12,751 |

#### Table 3. Independent variables considered in regression analysis.

| Attributes considered in analysis   | Name of variable in regression | Variable type and range of values     |
|---|--------------------------------|---------------------------------------|
| Respondent age in years   | respAge                        | 18–65; integer                        |
| Education group, ranging from value 1 for "no degree or certificate" to 4 in case of a "higher education degree or equivalent"                                    | educ                           | 1, 2, 3, 4; integer-coded categories  |
| Having children (1 means respondent has children, 0 means does not have children)   | hasChildren                    | 0, 1; dummy                           |
| Household income in 12 groups, in steps of roughly EUR 800 per month.<br>In countries with low incomes, only the first few groups are significantly<br>populated. | income                         | 1–12; integer-coded cat-<br>egories   |
| Gender (0 for female, 1 for male)   | gender                         | 0, 1; dummy                           |
| Number of household members   | HHsize                         | 1–6 (99 % of respondents);<br>integer |
| Housing situation (dummy variable rented vs. owned property)  | renting                        | 0, 1; dummy                           |
| Participant pays for electricity according to consumption (dummy variable)  | paysElectricCons               | 0, 1; dummy                           |
| Environmental identity (average score from four questions*)   | ENV_ID                         | 1,00–5,00; floating point             |

\* Scale by Cardiff University (Whitmarsh and O'Neill 2010) includes four statements on environmental identity (rated from "strongly disagree" with value 1 to "strongly agree" with value 5):







Dishwasher 100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0% FR ES DE IT ΡL RO SE UK

Unknown A+, A or less efficient A+++ or A++



Lighting

*Figure 1. Market shares of EU energy efficiency classes in the survey regarding most recently purchased appliances (2012–2016) and lighting (2014–2016).* 

market from 2013, respondents still stated purchases in 2014 and later, especially in Romania (26 %).

## **RELEVANCE OF PURCHASE CRITERIA**

The relevance of the different purchase criteria differs between purchases of appliances and lighting (Figure 2). For appliances, performance is found to be the most important criterion for purchase decisions, followed closely by purchase price, energy cost and energy label. For lighting, energy cost is found to be the most important criterion, closely followed by performance and energy label. As opposed to appliance purchases, the purchase price does not play such an important role for lighting. For appliances, the standard deviation of the rating of purchase criteria (error bars shown in Figure 2) ranges from 0.8 to 1.3, increasing with lower priority. For lighting, it ranges from 1.0 to 1.2.

For both appliances and lighting, there is a set of criteria that are clearly less important: design, recommendations by professionals, financial support measures as well as recommendations by friends and family. We assume the criterion financial support measures to depend on national policies, as it can be expected that its rating is low if no support measures exist. Distinct from specific recommendations by friends and family, the general social context can be considered important for purchase decisions (Frederiks et al. 2015) though we regard it as an unconscious part of the decision process that the questionnaire did not cover.

#### DIFFERENCES BETWEEN MEMBER STATES

The ratings of the individual purchase criteria for appliance purchases vary between the different countries (Figure 3). Across all countries and purchase criteria the standard deviation is fairly uniform with values from 0.8 to 1.1. Performance is rated as the most important purchase criterion in all countries except France and UK, where purchase price is the most relevant criterion. As seen in Figure 1, these two countries show a low share of top efficiency appliances compared to the other countries. In all countries except of Germany and Italy, purchase price has a higher rating than energy cost and energy label. The largest variations between countries are seen for: design, recommendations by friends and family, financial support measures and recommendations by professionals. For the criteria recommendations by professionals as well as recommendations by friends and family, the rating is highest in Italy, Poland, Romania and Spain, whereas the rating is lowest in Germany and the UK.

As for appliances, the ratings of the individual purchase criteria for light bulbs vary between the countries (Figure 4). Across all countries and purchase criteria the standard deviation is fairly uniform with values from 0.9 to 1.2. For lighting, energy cost received the highest rating in all countries except France and UK, where performance has the highest rating. In contrast to the results for appliances, the relevance of purchase price is rated significantly lower than energy cost and energy label in all countries for lighting.



Figure 2. Purchase criteria for appliances and lighting in order of rating mean value and standard deviation.



Figure 3. Relevance of purchase criteria for appliances per country (mean value).

# COMPARISON OF APPLIANCE TYPES

The ratings of the individual purchase criteria show little variance between the four different appliance types (Figure 5). This implies they can be treated in very similar ways in policy measures but also in simulations of purchase decisions. Moreover, purchase price is clearly seen as much less important for lighting compared to household appliances while the other criteria are rated similarly. Recommendations by friends and family as well as financial support measures are the least important criteria for all products. Design shows the widest spread of ratings with highest importance for refrigerators and lowest importance for freezers. Across all purchase criteria and appliance types, the standard deviation is fairly uniform with values from 0.8 to 1.2.



Figure 4. Relevance of purchase criteria for lighting per country (mean value).



Figure 5. Rating of purchase criteria by appliance type.

# **REGRESSION ANALYSIS ACROSS MEMBER STATES**

We investigated the influence of various socio-demographic attributes on the purchase criteria for household appliances. We focused on purchase price, energy label, energy cost and recommendations by professionals as we consider these four criteria most relevant with respect to energy efficiency policy. For each criterion, a multivariate regression with the criterion's rating as dependent variable was performed in order to find significant variables and to estimate the strength of their effect on the rating of each purchase criterion.

Firstly, we examined the effect of a participant living in a specific country, i.e. the influence that the country of residence has on the purchase criteria. Table 4 presents the differences between ratings in the different countries, where France is chosen as a reference country. For each of the remaining countries, negative values mean that the rating is lower than in France, whereas positive values mean that the rating is higher. The values highlighted with an asterisk are statistically significant at the 5 % level (p-value, conventional threshold) (Wooldridge 2013). Due to the very large sample size of 9,835, the  $R^2$  values are quite low.

#### **REGRESSION ANALYSIS REGARDING SOCIO-DEMOGRAPHIC ATTRIBUTES**

We investigate the effect of socio-demographic attributes of households on the rating of purchase criteria in a second regression. Table 5 presents the estimation results for varying values for respondent-specific attributes (coding into variables laid out in Table 3). Environmental identity, variable *ENV\_ID*, is a strong predictor, particularly for a high rating of energy cost and the energy label. More environmentally conscious respondents put much more emphasis on these criteria than others. For example, switching from an average answer of "agree" to "strongly agree" means an increased rating of energy cost by

Table 4. Regression estimation results (coefficient and its standard error, SE) for purchase criteria using country dummy variables (France as the required reference). Asterisk \* indicates coefficients individually statistically significant at least at 5 % level (p-value).

| Dependent var.: rating of $\rightarrow$ | Purchase price |       | Energy cost |       | Energy label |       | Recommendations by professionals |       |
|---|----------------|-------|-------------|-------|--------------|-------|----------------------------------|-------|
| Independent var.: $\downarrow$          | Coeff.         | SE    | Coeff.      | SE    | Coeff.       | SE    | Coeff.                           | SE    |
| IT                                      | -0,049         | 0,029 | 0,339 *     | 0,033 | 0,319 *      | 0,033 | 0,248 *                          | 0,039 |
| DE                                      | -0,205 *       | 0,030 | 0,0137 *    | 0,033 | 0,074 *      | 0,033 | -0,067                           | 0,040 |
| UK                                      | -0,037         | 0,030 | -0,240 *    | 0,034 | -0,402 *     | 0,034 | -0,266 *                         | 0,040 |
| ES                                      | -0,193 *       | 0,030 | -0,046      | 0,034 | -0,141 *     | 0,034 | 0,229 *                          | 0,040 |
| SE                                      | -0,389 *       | 0,035 | -0,431 *    | 0,039 | -0,529 *     | 0,040 | -0,283 *                         | 0,047 |
| PL                                      | -0,127 *       | 0,029 | 0,075 *     | 0,033 | -0,100 *     | 0,033 | 0,211 *                          | 0,039 |
| RO                                      | -0,116 *       | 0,031 | 0,110 *     | 0,035 | -0,063       | 0,035 | 0,242 *                          | 0,042 |
| Constant                                | 4,268 *        | 0,021 | 3,955 *     | 0,023 | 4,018 *      | 0,023 | 3,073 *                          | 0,028 |
| R²                                      | 0,015          |       | 0,046       |       | 0,059        |       | 0,031                            |       |
| Ν                                       | 9,835          |       | 9,835       |       | 9,835        |       | 9,835                            |       |

Table 5. Regression estimation results for purchase criteria using personal attributes. Asterisk \* indicates coefficients individually statistically significant at least at 5 % level (p-value).

| Dependent var.: rating of $\rightarrow$ | Purchase | price | Energy   | cost  | Energy label |       | Recommendations by<br>professionals |       |
|---|----------|-------|----------|-------|--------------|-------|-------------------------------------|-------|
| Independent var.: $\downarrow$          | Coeff.   | SE    | Coeff.   | SE    | Coeff.       | SE    | Coeff.                              | SE    |
| respAge                                 | -0,002 * | 0,001 | -0,001   | 0,001 | 0,000        | 0,001 | -0,004 *                            | 0,001 |
| educ                                    | -0,007   | 0,009 | -0,034 * | 0,009 | -0,026 *     | 0,009 | -0,008                              | 0,012 |
| hasChildren                             | -0,028   | 0,021 | 0,045    | 0,022 | 0,037        | 0,022 | 0,098 *                             | 0,027 |
| income                                  | -0,033 * | 0,003 | -0,003 * | 0,004 | 0,013 *      | 0,004 | -0,017 *                            | 0,005 |
| gender                                  | -0,039 * | 0,017 | -0,055 * | 0,018 | -0,087 *     | 0,018 | -0,091 *                            | 0,023 |
| hhsize                                  | 0,003    | 0,006 | 0,019 *  | 0,007 | 0,012        | 0,007 | 0,032 *                             | 0,009 |
| renting                                 | 0,051 *  | 0,020 | -0,054 * | 0,021 | -0,039       | 0,021 | -0,194 *                            | 0,026 |
| paysElectricCons                        | 0,027    | 0,027 | 0,125 *  | 0,029 | 0,151 *      | 0,029 | 0,023                               | 0,036 |
| ENV_ID                                  | 0,108 *  | 0,010 | 0,464 *  | 0,011 | 0,489 *      | 0,011 | 0,276 *                             | 0,014 |
| Constant                                | 3,998 *  | 0,065 | 2,284 *  | 0,069 | 2,013 *      | 0,068 | 2,331 *                             | 0,087 |
| R <sup>2</sup>                          | 0,025    |       | 0,168    |       | 0,185        |       | 0,058                               |       |
| Ν                                       | 9,835    |       | 9,835    |       | 9,835        |       | 9,835                               |       |

0.46 and of energy label by 0.49 on the scale from 1 to 5. This seems reasonable, as the energy consumption of household appliances has the biggest impact on the environment over their life time. However, *ENV\_ID* also increases the rating of all criteria, e.g. 0.11 points more for the rating of purchase price and 0.28 for recommendations by professionals. This score may therefore also be an indicator for respondents tending to give stronger replies overall or answering in a more socially desired way. The effect is still clearly strongest for energy cost and energy label. This is consistent with the findings in most of the literature, e.g. (Sardianou 2007), (Ramos et al. 2015b). The effect of other household attributes is considerably weaker than that of environmental identity.

Households who pay electricity according to their consumption (86 % of respondents with moderate variation across countries) rate energy costs and energy label higher (0.13 and 0.15 points more, respectively) than households who do not pay electricity according to consumption or do not know. Respondents who own their home put more emphasis on recommendations by professionals than tenants, i.e. 0.19 points more.

Income decreases the importance of purchase price. For example, households with 4,000 euro net income per month have a rating 0,10 points lower than households with 1,600 euro income. This finding is similar to (Ramos et al. 2015b) and (Michelsen and Madlener 2012). Income is also found to be statistically significant for the rating of the other three criteria but with a much weaker effect. Having children is found to moderately increase the importance of recommendations by professionals by 0.10 points on average, with no significant effect on other purchase criteria.

Men are found to generally give slightly lower ratings for all criteria than women, especially the energy label and recommendations by professionals, both with ratings 0.09 points lower than women. This may indicate men to be less receptive for information on household appliances.

Respondent age is found to be related to the rating of recommendations by professionals. On average, a 60-year old person would give a rating 0.12 points lower than a 30-year old person. Contrary to previous studies (Table 1), we did not find a relation of age to the importance of energy cost or energy label and only a minor negative effect on the relevance of purchase price.

Education is found to lower the importance of energy costs (keeping income constant, to be clear). The difference, in the extreme case, between having no professional certificate and a higher education degree means 0.10 points less. A similar while weaker effect is found for the energy label.

A number of other relationships between variables and purchase criteria were found to be statistically significant while being practically negligible. For example, the number of household members slightly increases the importance of energy cost and recommendations by professionals. The most important household attributes that influence the rating of purchase criteria were found to be environmental identity and paying electricity according to consumption.

# Summary and conclusions

Our analysis showed that consumers rate the relevance of purchase criteria differently for household appliances and for lighting. Across the eight countries that were included in the survey, the purchase criteria for appliances that received the highest ratings were, in order of relevance, performance, purchase price, energy cost and energy label. By contrast, for lighting the criteria with the highest ratings were energy cost, performance, energy label and environmental friendliness. The relative role of purchase price was thus found to be significantly larger for appliances than for lighting, where energy cost is rated more important than purchase price in all countries.

We confirm that the decision criteria are rated differently depending on various socio-demographic attributes, however, the effects are small for most criteria. The biggest effect is found for environmental identity, which strongly increases the importance of energy cost and energy label. A similar and strong effect is also seen for paying electricity according to consumption. Other attributes such as income, education, age and gender only affect purchase criteria weakly.

Our findings indicate that for all countries included in the survey and across different socio-economic criteria, the energy label plays an important role in purchase decisions. Especially in countries where purchase price was rated more important than energy costs or energy labelling (e.g. UK, France), the uptake of energy efficiency appliances could be increased by introducing subsidies or rebates for highly efficient appliances. Furthermore, as our findings indicate that the relevance of the energy label in purchase decisions increases for consumers that pay electricity according to consumption, increasing awareness of the energy bill may support the uptake of highly efficient appliances.

While most previous studies focused on how actual purchases vary between countries, socio-demographic groups or for different appliances, here we focused on the differences in the purchase criteria. Our analysis thus provided additional insights into the factors that individuals take into account when making purchase decisions for appliances and lighting.

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