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ABSTRACT

It has been shown that individuals often underinvest in energy efficiency despite net benefits over the longer term. One possible explanation is that agents do not understand and/or cannot interpret energy information when provided in physical units, as in most energy efficiency labels. Prior studies have investigated the effect of reframing energy information reported on energy labels into monetary units. Outcomes are mixed, and it is not clear whether this is due to the use of different products, different methods or because studies were conducted in different countries with different energy prices and labelling standards. This paper overcomes that ambiguity by testing the effect of alternative ways to provide energy consumption information using the same experiment in a multi-country setting. Results show that the specific national context in which an intervention is implemented is a key determinant of its effectiveness. Personalised energy expenditures increase the willingness-to-pay for energy efficiency in the United Kingdom, whereas monetary information has a negative impact in Canada. No significant effect is detected in Ireland and the United States. In addition, it seems that providing monetary information crowds out individuals who would buy a more efficient product for environmental reasons.

Keywords: Energy Efficiency Labels, Discrete Choice Experiment, Tumble dryers, Framing Effect.

JEL: Q41; Q48; Q49; D04; D10; D12; D90

1 Introduction

World energy consumption has been increasing over the past three decades (International Energy Agency, 2019), and, with a growing population condensed primarily in developing countries (The World Bank Group, 2020), this trend is likely to continue in the future. The residential sector contributes to more than 20% of global energy consumption (International Energy Agency, 2019), with shares close to 21% in the United States (U.S. Energy Information Administration, 2020) and above 27% in the European Union (European Environmental Agency, 2020). Governments and public administrations have seen energy efficiency as a powerful tool to combat these issues. While more energy-efficient products have a higher upfront cost, their lower consumption has the potential to make them better investments over their lifetime. However, the literature has documented the existence of an *energy efficiency gap* (Jaffe and Stavins, 1994), whereby agents' inability to recognize such trade-offs leads to an underinvestment in more energy-efficient technologies.

Although the existence and relevance of the 'energy-efficiency gap' has been questioned (Allcott and Greenstone, 2012), energy efficiency remains a key policy focus for many Governments. In an effort to improve agents' awareness and understanding of energy efficiency, various information tools and programs have been deployed[1]. Among the most well-known and widely adopted are energy efficiency labels (Collaborative Labeling and Appliance Standards Program, 2005). Examples include the U.S. "EnergyGuide", the EU "Energy Label", Australia's star "Energy Rating" and the "EnergyStar" logo. The motivation for energy labels rests on the assumption that making energy information more readily available to consumers facilitates the comparison among different products as well as between purchasing price and operating costs, ultimately leading to better energy investment decisions.

Energy efficiency labels generally provide consumption estimates in physical units (kWh/annum) based on average energy use and prices. However, it has been shown

[1] See Dranove and Jin (2010) for a review of the literature on disclosure of quality information and certifications.

that people are likely to make mistakes when translating physical consumption into expenditures and savings (Sammer and Wüstenhagen, 2006; Allcott, 2011a; Heinzel, 2012; Allcott, 2013; Brounen et al., 2013; Davis and Metcalf, 2016). Also, energy prices may vary substantially within regions. Over the past decade, several studies have been conducted to assess the efficacy of energy labels and whether reframing energy information improves effectiveness (Shen and Saijo, 2009; Heinzel, 2012; Heinzle and Wüstenhagen, 2012; Newell and Siikamäki, 2014; Davis and Metcalf, 2016; Andor et al., 2020; Jain et al., 2021; Carroll et al., 2021). Results from these studies on the effectiveness of reframing energy consumption have been mixed. This might be due to the specific contexts in which these studies were conducted. As Allcott and Greenstone (2012) note, there have not been large-scale evaluations on the impact of energy efficiency labelling on consumer choices.

This paper tries to fill this gap by answering the following questions: "Does providing long-term average energy consumption information in monetary terms increase uptake of more efficient technologies?"; "Does providing personalised long-term energy consumption information in monetary terms increase uptake of more efficient technologies?"; and "Does the effect differ across countries?". To do so, we run an online randomised discrete choice experiment (RDCE) in four countries using the same methodology, to investigate whether different ways of framing energy efficiency/consumption affect consumers' willingness-to-pay (WTP) for energy efficiency and whether this effect is the same for all countries. Specifically, we ask respondents from Canada, the Republic of Ireland, the United Kingdom and the United States to express their preferences for tumble dryers which vary over a number of attributes.

Information on energy efficiency/consumption is reported in three forms. As our benchmark, we use the EU Energy Label (for Ireland and the United Kingdom) and the EnergyStar logo (for Canada and the United States), with products being assigned to an energy class (from A+++ to C), or being given the EnergyStar, based on their physical energy consumption (kWh/annum).

In a first manipulation, we convert this physical value into its monetary counterpart (the

10-years energy costs), based on average usage and national electricity prices. In a second manipulation, we derive individual-specific energy consumption according to self-reported use patterns. Also in this case, we express it in monetary terms for a 10-years time span. To the best of our knowledge, this is the first paper to test the provision of long-term monetary energy consumption information using the same experiment in a multi-country setting.

Since one of the core motivations behind efficiency labels is that inducing consumers to purchase more energy-efficient products will make them better off, irrespective of the external impact on the environment (Allcott and Knittel, 2019), providing energy information in a clear and accessible way is of fundamental importance. For this reason, we reframe energy consumption in the form of the long-term cost of electricity, which should represent a more meaningful representation of energy information for individuals than physical energy consumption. The choice to focus on tumble dryers stems from the fact that it is one of the highest energy-consuming household appliances. Its consumption depends solely on actual usage and derives from just one ”fuel”, namely electricity. To make a comparison, appliances like refrigerators or most TV sets consume energy even when people are not actively using them, while washing machines or dishwashers require water inputs in addition to electricity to function. Also, tumble dryers present the broadest range of ratings on the market with models carrying a 'C-rating' still available for purchase at the time of the experiment (2018). This is not the case for other appliances where the lowest available rating is often A+. On top of that, none of the countries in the study have monetary labels for tumble dryers. The European Energy Label is a color-coded letter scale based on physical consumption, and while the United States and Canada provide annual energy cost labels for several appliances this is not the case for tumble dryers. Therefore, the treatments that we introduce present new information in all contexts.

The outcomes of our mixed logit models suggest that, in general, displaying energy consumption in monetary terms does little to improve the uptake of more efficient technologies, irrespective of whether consumption is based on average or individual-specific use. However, there are two exceptions. In the Canadian sample we detect a negative and significant effect of our treatments, with the WTP for an improvement in energy efficiency actually decreasing by between Can\$118 and Can\$126 for tumble dryers in the three higher-efficiency classes — with no statistical differences between the two treatments. On the other hand, in the United Kingdom, personalised energy information has a positive effect. Respondents receiving personalised information are willing to pay £81 more than those seeing the classic EU Energy Label and £64 more than those receiving generic cost information to purchase a product from the three higher-efficiency classes. The results remain substantially unaltered if we adopt different models or we split the sample based on various individual characteristics.

Previous studies have investigated the effect of providing monetary energy information in a variety of contexts: from TV sets and refrigerators in Germany (Heinzel, 2012; Andor et al., 2020), to cars in the United States (Allcott and Knittel, 2019), to refrigerators in India (Jain et al., 2021), to apartments in Ireland (Carroll et al., 2021). For those focusing on tumble dryers, Kallbekken et al. (2013) show that lifetime electricity costs reduce the average energy consumption of purchased products at retail stores in Norway only if coupled with staff training, the UK Department of Energy and Climate Change (2014) does not observe any effect in the United Kingdom, and Carroll et al. (2016b) find no significant improvement of providing 5-years energy expenditures in Ireland. It is not clear whether these mixed results are attributable to the different core products, methodologies or countries. By adopting a common framework which considers the same product and the same treatments in four countries, we are able to overcome this ambiguity. In particular, our findings point at the specific national context in which the intervention is implemented as a key determinant of its effectiveness. This suggests that, when designing new tools to provide energy efficiency information, there is no one-size-fits-all solution, and policy makers should carefully evaluate which approach is best suited for their country or region.

Our paper builds on two main strands of literature. First, it is related to the literature on energy efficiency information (Ayres et al., 2009; Allcott, 2011b, 2013; Brounen et al., 2013; Allcott and Rogers, 2014; Allcott and Taubinsky, 2015; Allcott and Sweeney, 2016); and, more specifically, to that focusing on energy labels and their effectiveness (Sammer and Wüstenhagen, 2006; Shen and Saijo, 2009; Heinzle and Wüstenhagen, 2012; Newell and Siikamäki, 2014; Carroll et al., 2016a; Andor et al., 2020).

Second, our work draws from the literature on the framing of information and its impact on intertemporal choices (Tversky and Kahneman, 1981; Kahneman and Tversky, 1984; Lowenstein, 1988; Lowenstein and Thaler, 1989; Lowenstein and Prelec, 1992). Over the years, research on information framing has been applied to several contexts, including health (Rothman et al., 1993; Block and Keller, 1995; Rothman and Salovey, 1997; Meyers-Levy and Maheswaran, 2004), tax compliance (Hasseldine and Hite, 2003; Holler et al., 2009), and environmental behaviour (Loroz, 2007; de Velde et al., 2010; Homar and Cvelbar, 2021). In the context of energy efficiency, studies have investigated the effect of providing physical versus monetary energy information (McNeill and Wilkie, 1979; Anderson and Claxton, 2014; Andor et al., 2020; Jain et al., 2021), short-term versus long-term cost forecasts (Heinzel, 2012; Carroll et al., 2021), generic versus state-specific energy prices (Davis and Metcalf, 2016), and personalised information (Allcott and Knittel, 2019). Our paper contributes to the current debate by helping to shed light on the reasons behind the mixed effects evidenced by previous studies.

The remainder of the paper is organized as follows. Section 2 introduces the discrete choice theory and our experimental design. Section 3 describes the data and investigates the differences between the four countries in our sample. Section 4 presents the results of the analysis; and Section 5 concludes.

2 Methodology

2.1 DCE overview

Discrete choice experiments (DCE) have gained popularity as a tool to elicit agents' preferences for goods and services, since they help overcome some of the limitations presented by revealed preferences (RP) data. DCEs are a stated preferences (SP) method, usually involving surveys in which respondents are presented with repeated choice situations (called choice sets) comprising the comparison between two or more alternatives that vary over several attributes.

This type of experiment facilitates the measurement of non-use values, as well as the utility attached to individual attributes, which can be difficult to retrieve from revealed preferences data that often suffers from collinearity between attributes (Adamowicz et al., 1994; Carroll et al., 2021). In addition, it gives the experimenter a greater degree of control and flexibility than RP methods, coupled with the possibility to accommodate for the randomization between various treatments. The main drawback, as for any SP method, is represented by the hypothetical nature of the task. In most cases, the decisions people make do not have any real-world consequence (e.g. they do not actually purchase the product they selected among the array of alternatives), which introduces the possibility of hypothetical bias.

DCEs can be used to evaluate willingness-to-pay, to assess non-monetary valuation, to provide insights on consumers' preferences, and to test the effectiveness of new policies. They were initially developed in the marketing literature (Louviere and Woodworth, 1983). Over the years, they have been applied to a number of other fields, including health (see Ryan et al., 2008, for a review of the literature), transport economics (Hensher and Louviere, 1983; Greene and Hensher, 2003), or environmental economics (Adamowicz et al., 1994; Hanley et al., 1998; Aravena et al., 2014). In the energy economics literature, DCEs have been used to study preferences for power generation (Rivers and Jaccard, 2005) and fuel mix (Komarek and Kaplowitz, 2011); to investigate WTP for energy efficiency improvements (Banfi et al., 2008; Carroll et al., 2016a) and financial instruments to encourage their adoption (Revelt and Train, 1998); and to evaluate the effectiveness of energy efficiency information and labelling (Sammer and Wüstenhagen, 2006; Shen and Saijo, 2009; Heinzel, 2012; Heinzle and Wüstenhagen, 2012; Newell and Siikamäki, 2014; Davis and Metcalf, 2016).

2.2 Empirical strategy

DCEs are based on Lancaster's characteristics theory of demand (Lancaster, 1966), according to which agents derive utility not from the good or service *per se* but from its characteristics

(Lancsar and Louviere, 2008). Their empirical analysis follows random utility theory (McFadden, 1974), which posits that the utility consumer i derives from choosing good j can be decomposed into an explainable component (V_{ij}) and a random component (ε_{ij}):

$$U_{ij} = V_{ij} + \varepsilon_{ij}. \tag{1}$$

The explainable or systematic component can then be expressed as a function of the good's attributes (or at least some of them, X_{ij}) and the consumer's individual characteristics (Z_i):

$$V_{ij} = X'_{ij}\beta + Z'_i\gamma, \tag{2}$$

where β and γ are vectors of marginal utilities coefficients to be estimated.

While utility is not directly observed (it remains a latent quantity), we can assume that consumers choose the alternative that gives them the greatest utility out of all the available options. Therefore, the probability that agent i chooses alternative k is:

$$\begin{aligned} P(Y_i = k) &= P(U_{ik} > U_{ij}) \\ &= P(V_{ik} + \varepsilon_{ik} > V_{ij} + \varepsilon_{ij}) \\ &= P(V_{ik} - V_{ij} > \varepsilon_{ij} - \varepsilon_{ik}), \forall j \neq k. \end{aligned} \tag{3}$$

For this to be estimable, a joint probability distribution for ε_{ij} needs to be specified. Typically, the error component is assumed to be independently and identically distributed as an extreme value type 1 random variable, thus resulting in a conditional logit form for the choice probabilities:

$$P(Y_i = k) = \frac{e^{\mu V_{ik}}}{\Sigma_{j=1}^{J} e^{\mu V_{ij}}} = \frac{e^{\mu X'_{ik}\beta + Z'_i\gamma}}{\Sigma_{j=1}^{J} e^{\mu X'_{ij}\beta + Z'_i\gamma}}, \tag{4}$$

where μ is a scale parameter inversely proportional to the variance of the error distribution which cannot be identified and is conventionally set to 1[2] (Lancsar and Louviere, 2008).

[2]This implies that we do not estimate the parameters β and γ, but their ratio to the variance of the error

The standard conditional logit, however, presents some limitations. The assumption of the error term being iid implies that independence of irrelevant alternatives (IIA) is a key feature of the model. In addition, the preference parameters (βs) are assumed to be the same for all agents. Over the years, different models have been adopted to overcome these limitations. We decide to use a mixed logit model for our analysis in light of its flexibility. As McFadden and Train (2000) demonstrate, any random utility model can be approximated with a mixed logit model.

The mixed multinomial logit model (or mixed logit for simplicity) relaxes IIA[3] and allows for heterogeneity of attribute coefficients across individuals (while keeping them constant for the same individual). In addition, it is also efficient with repeated choices and therefore can accommodate the panel structure of the data thanks to its flexible substitution patterns which allow for within subject correlation (Revelt and Train, 1998; Lancsar and Louviere, 2008). The individual parameters are obtained by including an individual-specific stochastic component (δ_i):

$$\beta_i = \overline{\beta} + \delta_i, \tag{5}$$

where $\overline{\beta}$ is the population mean (Lancsar and Louviere, 2008). Since, differently from the standard conditional logit model, the mixed logit does not have a closed form solution, it is estimated through maximum simulated likelihood.

2.3 Experiment design

The DCE experimental design was carried out in JMP using the software's Bayesian procedures, which allow for assumptions regarding the direction and variance of utility for each attribute. In particular, with JMP, we assume a utility range of one (split evenly across attribute levels) and a variance of 0.25. There were no dominant alternatives. Such a design enables us to assume, for example, that price is negatively correlated with utility whereas the number of stars in consumer rating is positively correlated.

distribution σ_ε, e.g. β/σ_ε (Adamowicz et al., 1994; Lancsar and Louviere, 2008).

[3] Other models that relax IIA include nested logit models, multinomial probit models, latent class models, or heteroscedastic error variance models (Lancsar and Louviere, 2008).

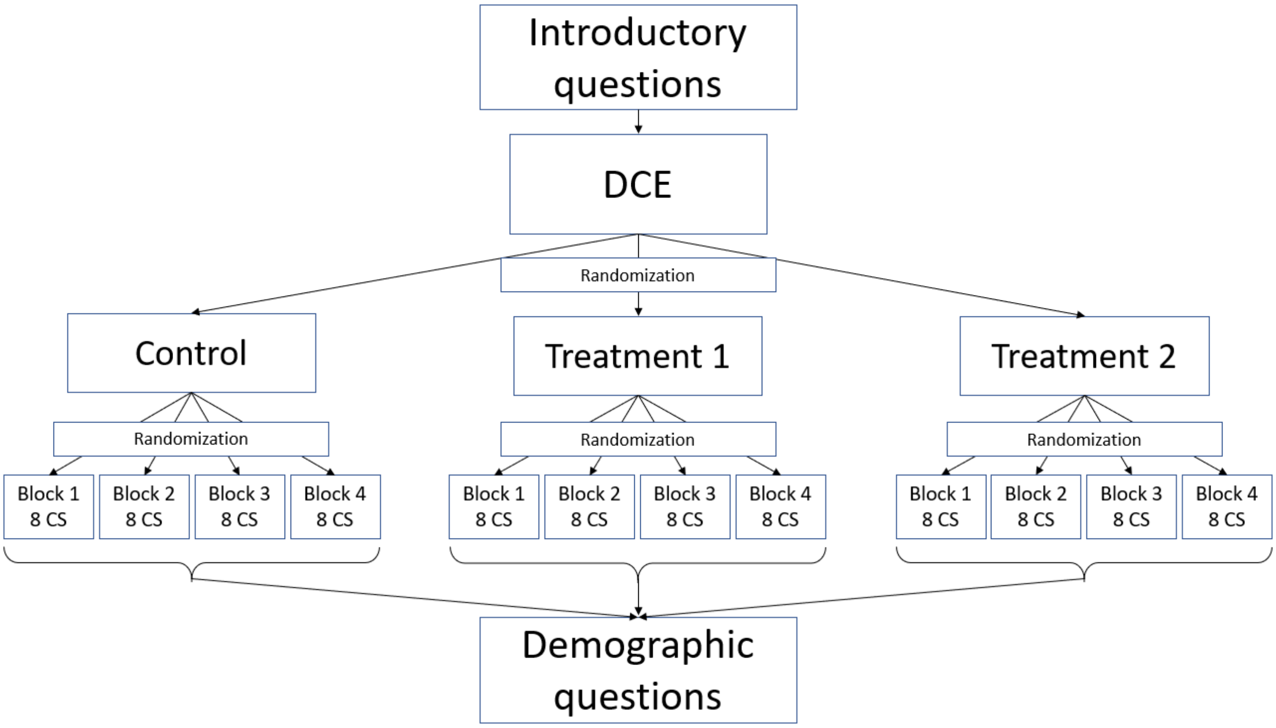

Figure 1: Structure of the discrete choice experiment

The final design contained 32 pairs of choices — called choice sets (CS) — which were split across four blocks. Each choice set consisted of two tumble dryers and an opt-out alternative. Including an ”opt-out” or ”neither” alternative is desirable in contexts where respondents are presented with hypothetical pairs, since its absence would force them to choose between potentially unappealing options, a choice that might not be made in a real world scenario (Lancsar and Louviere, 2008).

Respondents were randomly assigned to one of three groups which differed in the way in which energy information is displayed — namely control with the customary energy label, treatment 1 with generic energy expenditures, and treatment 2 with personalised energy expenditures. In addition, they were also randomly assigned into one of the four blocks, leading to eight choices per respondent. Figure 1 reports the structure of the DCE[4], highlighting the points of randomization.

The tumble dryers presented in each choice set vary over five attributes, which were chosen on the basis of previous research on household electric appliances (Sammer and

[4]In Figure 1 CS stands for choice set.

Wüstenhagen, 2006; Shen and Saijo, 2009; Heinzel, 2012; Heinzle and Wüstenhagen, 2012; Carroll et al., 2016b), through focus groups and in consultations with salespersons at retail stores[5,6]. The selected attributes are:

(i) *Price*. Price is based on the range of models available on the market on electrical retailer websites[7] in each country at the time of experimental design (2018).

(ii) *Brand*. Brand is characterized as either "established" or "new". An established brand is one with more than 5 years of activity that has developed a solid relationship with its customers. A new brand is one which has been operating for less than 5 years and has still not developed a solid relationship with the customers.

(iii) *Capacity*. Capacity is measured in kilograms (kg) for the Irish and British versions and cubic feet (cu ft) for the Canadian and American ones.

(iv) *Customer rating*. Customer rating takes the form of a typical star rating[8].

(v) *Energy efficiency*. Energy efficiency is based on physical energy consumption (kWh/annum), also consistent with typical products available on electrical retailer websites.

At the beginning of the DCE, all attributes were presented and described to respondents with the aid of images. A summary of the attributes and their levels in each country is reported in Table 1. The way these attributes and levels were introduced to respondents is displayed in Figures A1-A9 in Appendix A.

Participants were randomly assigned to one of three groups that differed in the way in which the energy efficiency attribute is presented. In the control group, energy efficiency is presented in the form of the typical energy label customary in the respective country: that is, the EU Energy Label for Ireland and the United Kingdom, and the EnergyStar logo for

[5]The DCE was run in parallel with a field experiment.

[6]One of the questions in the survey that accompanied the DCE asked participants to rate the importance of several characteristics in the hypothetical purchase of a new tumble dryer. Responses confirm that the selected attributes are also those considered more important by the individuals in our sample (results available from the authors upon request). The question can be found in Appendix B.

[7]Like Argos, Best Buy, Currys and The Home Depot.

[8]On electrical retailer websites there are almost no products with less than 3-star ratings. Therefore we use the range 3-5 stars in the experiment.

Canada and the United States. Tumble dryers were assigned a letter from C to A+++ or the EnergyStar logo based on their physical energy consumption (kWh/a) as shown in Table 1.

Treatment 1 frames energy efficiency as the 10-years energy costs according to the formula:

$$Energy\ cost = kWh/a \times national\ electricity\ price \times 10\ years, \tag{6}$$

where the physical energy consumption is considered for an average of 160 cycles per year[9]. In treatment 2, we still present energy efficiency as the the 10-years energy costs, however this is now based on individual-specific self-reported usage[10]:

$$\begin{aligned} Energy\ cost = & \frac{kWh/a}{160} \times individual\text{-}specific\ weekly\ use \\ & \times 52\ weeks \times national\ electricity\ price \times 10\ years. \end{aligned} \tag{7}$$

Figures A6-A9 in Appendix A provide examples of the descriptions of the energy efficiency attribute given to participants in each of the three groups, and Figure A10 of the choice sets.

2.3.1 Estimation strategy

As mentioned in Section 2.2, the mixed multinomial logit model allows to distinguish between parameters that are constant for all respondents (*non-random parameters*), and parameters that vary by respondent (*random parameter*). Therefore, the X_{ij} vector consists of both attributes with a constant impact on utility (N_{ij}), and attributes which impact varies by individual (R_{ij}).

We keep price and consumer rating as constant for all individuals, since it is reasonable to assume that everyone prefers products with a lower price and a higher star rating. On the other hand, capacity, brand and energy efficiency are allowed to vary by respondent, since it is possible that different individuals have different preferences over these attributes. We relax this categorization in the robustness checks reported in Appendix C.

[9] Average usage is based on the assumptions underlying the EU Energy Label.

[10] Electricity prices are €0.17 in Ireland, £0.15 in the United Kingdom; CAN$0.1465 in Canada and $0.1312 in the United States. They all include VAT.

In all specifications we define energy efficiency as a dichotomous variable "high efficiency versus low efficiency" (EE_{ij}), based on the underlying level of physical energy consumption used in the experimental design[11]. More specifically, the variable takes the value 1 for the three least efficient classes (which correspond to the higher consumption levels), and value 2 for the three most efficient classes (corresponding to lower consumption levels)[12]. The effect of reframing energy efficiency in monetary terms is captured by an interaction between the energy efficiency variable and treatment dummies.

We estimate the following model in each country:

$$U_{ij} = \alpha_j + N'_{ij}\beta_N + R'_{ij}\beta_{Ri} + \beta_{EET1i}(EE_{ij} \times T1_i) + \beta_{EET2i}(EE_{ij} \times T2_i) + Z'_i\gamma + \varepsilon_{ij}, \tag{8}$$

where α_j is an opt-out alternative-specific constant; Nij is the vector of non-random parameters and β_N a vector of their coefficients; R_{ij} is the vector of random parameters (including energy efficiency) and β_{Ri} a vector of their individual-specific coefficients; $T1_i$ and $T2_i$ are dummy variables for treatment 1 (the generic 10-years cost of electricity) and treatment 2 (the personalised 10-years cost of electricity), respectively; and Z_i is the vector of individual characteristics[13].

As aforementioned, the treatment effects are captured by an interaction between energy efficiency and the treatment dummies. This ensures that the coefficient of energy efficiency alone gives an indication of the baseline value of this attribute on individuals' utility, and the interaction terms represent the incremental effect generated by our treatments. The coefficients of the interaction terms (β_{EET1i} and β_{EET2i}) are also assumed to be individual-specific.

The models are estimated through maximum simulated likelihood using 1000 Halton draws. Standard errors are clustered at the individual level.

[11]See the notes of Table 1.

[12]We code the energy efficiency variable, like other binary attributes, as (1-2) rather than (0-1) because all attributes take value zero for the opt-out alternative.

[13]In order to include individual characteristics in the Stata routine `mixedlogit` they have to be interacted with alternative-specific constants.

Table 1: Attributes and levels by country and treatment groups

Attributes	Country	Levels					
Price	IRE(€),UK(£)	200	400	600	800	1000	1200
	CAN(CAN$)	400	600	800	1000	1200	1400
	USA($)	300	500	700	900	1100	1300
Brand	All		Established			New	
Capacity	IRE,UK(kg)	7	8	9	10		
	CAN,USA(cu ft)	6	7	8	9		
Customer rating	All(# stars)	3	4	5			
Energy efficiency (control, based on kWh/annum)	IRE,UK	C	B	A	A+	A++	A+++
	CAN,USA	No	No	No	Yes	Yes	Yes
Energy cost: 10-years cost based on average usage (treatment 1)	IRE(€)	1100	950	800	650	500	350
	UK(£)	950	825	700	575	450	325
	CAN(CAN$)	930	810	690	570	450	330
	USA($)	850	730	640	490	370	250
Energy cost: 10-years cost based on personalised usage (treatment 2)	IRE(€) UK(£) CAN(CAN$) USA($)	Based on respondent's self-reported use and national average electricity prices					

Notes. Energy efficiency and energy costs are based on the underlying level of physical energy consumption (kWh/annum). E.g. for the EU Energy Label: C = 636 kWh/a, B = 551 kWh/a, A = 466 kWh/a, A+ = 381 kWh/a, A++ = 296 kWh/a and A+++ = 211 kWh/a. An equivalent relationship applies to the EnergyStar logo. For energy costs the relations are expressed by Equations 6 and 7. In the case of generic energy costs the same average usage was assumed in all countries, the variation comes from differences in electricity prices. Conversely, in the case of personalised energy costs variation comes from both usage and electricity prices.

3 Data description

The DCE was embedded in a survey distributed in November 2018 by the market research company ResearchNow in all four countries. Our target was individuals who own and utilize a tumble dryer in their everyday life. Therefore, at the beginning of the survey, we screen out participants who do not have a tumble dryer in their home, or who never use it. The survey included demographic quotas based on National Census information to ensure a representative sample in each country.

The initial sample consisted of a total of 2,676 individual observations. However, we exclude respondents who did not provide any demographic information, who did not complete all 8 choice sets in the DCE[14], or who gave an extreme answer to the question: "Approximately how many times a week do you use your tumble dryer?"[15]. This leaves us with 634 valid respondents in the Canadian sample (214 in the control group, 205 in treatment 1 and 215 in treatment 2); 581 in Ireland (198 in the control group, 189 in treatment 1 and 194 in treatment 2); 655 in the United Kingdom (220 in the control group, 218 in treatment 1 and 217 treatment 2); and 657 in the United States (208 in the control group, 228 in treatment 1 and 221 in treatment 2).

As a first step, we want to test whether there are significant differences between the four countries in our sample, or if it is possible to pool them together in our analysis. For this reason, we conduct likelihood-ratio Chow tests to verify if it is possible to pool Ireland and the United Kingdom in a European group, Canada and the United States in an American group, as well as all countries together.

Table 2 reports the results of the tests. As we can see, for all the combinations considered, it is possible to reject the null hypothesis that pooling the countries together is the same as treating them individually. Therefore, in the remainder of the analysis we will run separate models for each country.

[14]There was one participant in the UK sample and one participant in the US sample for whom we have answers to just 4 choice sets.

[15]Specifically, we exclude from the analysis participants who report to use the tumble dryer, on average, more than 21 times per week (7 respondents). This exclusion leaves unaltered the final outcomes of the analysis.

Table 2: Likelihood-ratio test for pooled and country groups data

	Log likelihood	Degrees of freedom	LR test statistic	p-value
Ireland	-3,420.718			
UK	-4,156.447			
Europe	-7,609.117	29	63.902	0.0002
Canada	-4,008.181			
USA	-4,174.241			
America	-8,214.446	29	64.048	0.0002
Canada	-4,008.181			
Ireland	-3,420.718			
UK	-4,156.447			
USA	-4,174.241			
Pooled	-15885.673	87	252.169	0.0000

Notes. The log-likelihoods are derived from mixed logit models with the same specifications as those used in Table 4.

As mentioned in Section 2.3, participants to the experiment were randomly assigned to the control group or one of the two treatments. We want to control if, in the various countries, there are differences between the three groups in terms of their demographics and other relevant individual characteristics. The Levene's tests for homogeneity of variances report no significant differences in most of the cases[16]. This is also largely confirmed by the pairwise t-tests reported in Table 3, which do not show major differences in the averages between the control and treatment groups. The most notable differences are represented by a greater proportion of participants who hold a degree in the personalised energy cost treatment in Canada, and in the control group in Ireland. It is worth noting that most of the differences are relatively small compared to the dimension of the corresponding variable. Overall, these results suggest that the three groups (control group, treatment 1 and treatment 2) in each country do not present fundamental differences and are, therefore, comparable.

[16]The results of the Levene's tests are not reported in the paper but they are available from the authors upon request.

Table 3: Descriptive statistics and pairwise comparisons by country and treatment groups

	Control	Treatment 1	Treatment 2	Difference C - T1	Difference C - T2	Difference T1 - T2
A. IRELAND						
Age	3.500	3.545	3.531	-0.045	-0.031	0.014
	(1.688)	(1.733)	(1.689)			
Female	0.535	0.460	0.490	0.075	0.046	-0.029
	(0.500)	(0.500)	(0.501)			
Marital status	1.924	1.947	1.928	-0.023	-0.004	0.019
	(0.799)	(0.867)	(0.908)			
Degree	0.803	0.672	0.624	0.131***	0.179***	0.048
	(0.399)	(0.471)	(0.486)			
Working	0.742	0.667	0.675	0.076	0.067	-0.009
	(0.438)	(0.473)	(0.469)			
Env. Concern	3.914	4.011	3.948	-0.096	-0.034	0.062
	(1.174)	(1.135)	(1.203)			
Income	3.081	2.899	2.943	0.181*	0.138	-0.044
	(0.880)	(0.992)	(1.014)			
Impatience	6.439	6.503	5.959	-0.063	0.481**	0.544**
	(2.107)	(2.170)	(2.280)			
Risk	5.646	5.603	5.304	0.043	0.342*	0.299
	(1.932)	(2.123)	(2.117)			
Tumble dryer use	3.576	3.657	3.572	-0.081	0.004	0.085
	(2.414)	(2.976)	(2.687)			
B. UNITED KINGDOM						
Age	3.732	3.766	3.677	-0.034	0.054	0.089
	(1.748)	(1.797)	(1.792)			
Female	0.545	0.564	0.502	-0.019	0.043	0.062
	(0.499)	(0.497)	(0.501)			
Marital status	1.968	1.995	1.963	-0.027	0.005	0.032
	(0.665)	(0.823)	(0.907)			
Degree	0.627	0.606	0.604	0.022	0.024	0.002
	(0.485)	(0.490)	(0.490)			
Working	0.636	0.610	0.636	0.026	0.000	-0.026
	(0.482)	(0.489)	(0.482)			
Env. Concern	3.623	3.789	3.544	-0.166	0.079	0.245**
	(1.212)	(1.234)	(1.239)			
Income	3.173	3.275	3.309	-0.103	-0.136	-0.034
	(1.001)	(1.015)	(1.010)			
Impatience	6.232	6.408	6.300	-0.176	-0.068	0.109
	(2.132)	(2.134)	(2.092)			
Risk	5.173	5.266	5.290	-0.093	-0.118	-0.024

Table 3 — continued

	Control	Treatment 1	Treatment 2	Difference C - T1	Difference C - T2	Difference T1 - T2
	(2.108)	(2.327)	(2.170)			
Tumble dryer use	4.109	3.720	3.323	0.389	0.787***	0.398
	(3.247)	(2.954)	(2.668)			
C. CANADA						
Age	3.715	3.761	3.726	-0.046	-0.011	0.035
	(1.757)	(1.767)	(1.781)			
Female	0.505	0.478	0.540	0.027	-0.035	-0.061
	(0.501)	(0.501)	(0.500)			
Marital status	1.986	1.976	2.009	0.010	-0.023	-0.034
	(0.947)	(0.942)	(0.922)			
Degree	0.673	0.668	0.772	0.005	-0.099**	-0.104**
	(0.470)	(0.472)	(0.420)			
Working	0.607	0.600	0.665	0.007	-0.058	-0.065
	(0.489)	(0.491)	(0.473)			
Env. Concern	3.883	3.893	3.842	-0.010	0.041	0.051
	(1.230)	(1.162)	(1.145)			
Income	3.341	3.195	3.270	0.146	0.071	-0.075
	(1.007)	(1.058)	(1.010)			
Impatience	6.528	6.498	6.340	0.030	0.189	0.158
	(2.096)	(2.069)	(2.021)			
Risk	5.528	5.415	5.474	0.113	0.054	-0.060
	(2.157)	(2.200)	(2.055)			
Tumble dryer use	3.220	3.215	3.381	0.005	-0.162	-0.167
	(2.570)	(2.106)	(2.622)			
D. UNITED STATES						
Age	3.553	3.632	3.498	-0.079	0.055	0.134
	(1.713)	(1.717)	(1.752)			
Female	0.538	0.491	0.575	0.047	-0.036	-0.083*
	(0.500)	(0.501)	(0.496)			
Marital status	2.005	2.070	2.023	-0.065	-0.018	0.048
	(0.909)	(0.941)	(0.881)			
Degree	0.702	0.675	0.633	0.026	0.068	0.042
	(0.459)	(0.469)	(0.483)			
Working	0.606	0.605	0.624	0.001	-0.019	-0.019
	(0.490)	(0.490)	(0.485)			
Env. Concern	3.909	3.794	3.828	0.115	0.081	-0.034
	(1.257)	(1.286)	(1.320)			
Income	3.188	3.281	3.222	-0.093	-0.034	0.059
	(1.120)	(1.150)	(1.120)			
Impatience	6.370	6.500	6.448	-0.130	-0.078	0.052

Table 3 — continued

	Control	Treatment 1	Treatment 2	Difference C - T1	Difference C - T2	Difference T1 - T2
	(2.172)	(2.385)	(2.128)			
Risk	5.620	5.785	5.457	-0.165	0.163	0.328
	(2.287)	(2.347)	(2.160)			
Tumble dryer use	4.069	4.132	4.195	-0.063	-0.126	-0.063
	(3.300)	(3.300)	(3.121)			

Notes. Columns 1-3 report means and standard deviations (in parenthesis) of the various demographics for each treatment group in each country. Columns 4-6 report pairwise mean differences and the statistical significance of the t-tests. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$. The list of demographic questions included in the experiment is reported in Appendix B.

The age of respondents in our samples is in line with national averages: mean age ranges between 3 (from 35 to 44 years of age) and 4 (from 45 to 54 years of age), and average age is 37.4 in Ireland (Central Statistics Office, 2016a), 40.3 in the United Kingdom (Office for National Statistics, 2019b), 41.1 in Canada (Statistics Canada, 2020a), and 38.5 (median) in the United States (U.S. Census Bureau, 2019a). Also the gender ratio mirrors national averages, being close to 50% with a slight prevalence of females, in general. And so does the percentage of individuals in our samples that is working, albeit with some differences. Employed respondents range from 66-74% in the Irish sample, with a participation rate in the labour force of 61.4% in the country (Central Statistics Office, 2016b). They are around 60% in both the Canadian and US samples, with percentages of population in the labour force of 64.9% (Statistics Canada, 2016) and 63% (U.S. Census Bureau, 2019c), respectively. For the UK, the employment rate between 16 and 64 years of age was 75.2% in 2020 (Office for National Statistics, 2021), which is greater than the percentage of respondents who report to be employed in the British sample, between 61% and 63%, although these measures are not immediately comparable.

However, we also detect some discrepancies. First of all, the percentage of participants with tertiary education or higher in each sample is considerably greater than the respective country average — 42% in Ireland (Central Statistics Office, 2016c) and the UK (Office for National Statistics, 2017), 54% in Canada (Statistics Canada, 2016), and 32.1% in the United States (U.S. Census Bureau, 2019b). In addition, it also seems that individuals in our sample are more likely to be in a relationship than the corresponding national population. In fact, the percentage of respondents stating to be married or in a domestic relationship in the Irish sample is 63.7%, against a national average of married couples of 37.6% (Central Statistics Office, 2017); it is 72.2% in the UK, against the percentage of people being in a couple of 60% at the national level (with 50.4% being married or in a civic relationship; Office for National Statistics (2019a)); 61.6% in Canada, where the percentage of people married or living together is 47.6%[17]; and 64% in the USA, where 52% of individuals older than 15 are married[18].

It should be noted that while this sample is broadly representative of the main national population in each country, we do not have information on the population of 'typical tumble dryer owners'.

4 Results

Table 4 presents the results of mixed logit regressions for the four countries separately. These are considered over the whole sample for each country, with the inclusion of interaction variables to account for treatment groups one and two as shown in Equation 8. In Appendix C we report separate models for the control group, the generic cost information treatment and the personalised cost information treatment: results were qualitatively identical. All regressions control for income, gender, living area, whether the individual holds a degree, environmental concern, impatience, risk attitude and tumble dryer usage[19].

Although the magnitude of the coefficients does not have an immediate interpretation, their sign gives us an indication of the effect on the utility function. As it can be seen,

[17] Own calculations based on data from Statistics Canada (2020b).

[18] Own calculations based on data from the U.S. Census Bureau (2021).

[19] These coefficients are not displayed in Table 4 for ease of presentation. However, later in the paper we investigate if the effect of our manipulations differs by individual characteristics.

Table 4: Mixed logit models

	(1) Ireland	(2) UK	(3) Canada	(4) USA
Non-Random Parameters in Utility Function				
Constant (neither option)	0.4281	0.7840	1.7037	2.3724**
	(1.0975)	(0.9339)	(1.1259)	(0.9462)
Price	-0.0031***	-0.0031***	-0.0026***	-0.0027***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Stars	0.5559***	0.5493***	0.8139***	0.7344***
	(0.0483)	(0.0469)	(0.0459)	(0.0463)
Random Parameters in Utility Function				
Capacity	0.2338***	0.1046***	0.1959***	0.2348***
	(0.0291)	(0.0270)	(0.0294)	(0.0276)
Brand	-0.2587***	-0.2174***	-0.4637***	-0.1405**
	(0.0680)	(0.0691)	(0.0640)	(0.0650)
Energy efficiency	1.0191***	0.5424***	1.3251***	0.7712***
	(0.1028)	(0.0987)	(0.1090)	(0.0925)
EE × T1	-0.0235	0.0516	-0.3036**	-0.0483
	(0.1428)	(0.1321)	(0.1476)	(0.1270)
EE × T2	-0.0477	0.2506*	-0.3240**	-0.1085
	(0.1468)	(0.1300)	(0.1325)	(0.1248)
Model statistics				
Observations	13944	15720	15216	15768
Clusters	581	655	634	657

Notes. This table reports the results of mixed logit regressions of respondents' choices in each country separately. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

attributes have the expected effect on utility, with, for example, price being negative — signifying that respondents would prefer cheaper products —, and star rating and capacity being positive – meaning that people would rather purchase a tumble dryer with better reviews and that can accommodate more clothes[20].

Brand takes value 1 for an established brand and 2 for a new one, hence the negative sign of the coefficients represents the fact that respondents prefer products of established brands. Energy efficiency presents positive and significant coefficients for all countries: more efficient models have a positive impact on utility. However, the interaction terms are insignificant in most of the cases, which means that presenting energy efficiency information in monetary terms (treatment 1) does not have any relevant effects on people's choices, nor does personalising this information (treatment 2) produce any appreciable difference. There are however two exceptions. In the Canadian sample we find negative and statistically significant coefficients for the two interactions terms. This suggests that displaying energy efficiency information in monetary terms, rather than the simple EnergyStar logo, reduces utility. Conversely, for the UK, we detect a positive and significant effect (at the 10% level) of personalised energy costs information.

Table 5 presents respondents' willingness-to-pay[21] for the various attributes. As it can be seen, energy efficiency is the attribute with the highest WTP in all countries. When energy information is presented in the form of the classic EU Energy Label, Irish participants are willing to pay €334.98 more for a tumble dryer from the three most efficient classes with respect to one from the three least efficient ones, and British participants £182.51 more. Similarly, respondents are willing to pay $283.51 more in the United States and Can$516.44 more in Canada for a product with the EnergyStar certification.

Consistent with the results in Table 4, our manipulations of the way in which energy efficiency information is displayed have limited impact on WTP[22]. Once again, we highlight

[20] In the experimental instructions, participants were told that each model would fit the space they have available, so the size of the tumble dryer, which is connected to its capacity, does not represent an issue when selecting the preferred option.

[21] Willingness-to-pay for attribute a is obtained as the ratio between the attribute's coefficient and the price coefficient, $WTP_a = -\frac{\beta_a}{\beta_{price}}$.

[22] In almost every case, the 95% confidence intervals (in brackets) include 0.

Table 5: Mixed logit models willingness to pay

	Ireland	UK	Canada	USA
Stars	182.19	178.45	317.21	274.12
	[150.95 ; 213.43]	[149.01 ; 207.88]	[277.84 ; 356.57]	[238.53 ; 309.72]
Capacity	76.64	33.99	76.35	87.66
	[57.38 ; 95.89]	[16.51 ; 51.46]	[53.59 ; 99.10]	[66.80 ; 108.52]
Brand	-84.79	-70.61	-180.71	-52.46
	[-127.35 ; -42.23]	[-114.09 ; -27.12]	[-228.70 ; -132.72]	[-99.42 ; -5.50]
EE	334.00	176.18	516.44	287.89
	[264.60 ; 403.39]	[112.91 ; 239.46]	[428.89 ; 603.99]	[219.38 ; 356.40]
EE $\times$ T1	-7.69	16.77	-118.31	-18.03
	[-99.46 ; 84.08]	[-67.27 ; 100.82]	[-230.99 ; -5.63]	[-110.91 ; 74.84]
EE $\times$ T2	-15.65	81.40	-126.27	-40.50
	[-109.94 ; 78.64]	[-1.31 ; 164.11]	[-227.95 ; -24.59]	[-131.82 ; 50.81]

Notes. This table reports the willingness to pay of respondents in each country for the tumble dryer's attributes. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. The 95% confidence intervals are reported in brackets.

a negative effect of both treatments in the Canadian sample, where the willingness-to-pay for energy efficiency decreases by roughly Can$118 when generic energy costs are provided, and by Can$126 with personalised energy costs. Whereas, in the United Kingdom, personalised energy information based on self-reported use patterns increases consumers' willingness-to-pay for energy efficiency by more than £81 with respect to the baseline level under the current EU Energy Label[23], making consumers willing to pay almost £258 more for a tumble dryer in the three most efficient classes.

In a series of robustness checks we have relaxed the definition of random and non-random parameters in two ways. First, we allow all attributes except for price, as well as the opt-out alternative-specific constant, to be individual-specific, hence estimating an error component model. Second, we adopt the opposite approach and restrict all coefficients to be constant for all respondents, which yields the classic conditional logit model. The results, reported in Appendix C, are substantially in line with the mixed logit estimations presented in Table 4

[23]The 90% confidence interval is [11.99 ; 150.82].

and Table 5.

The overall absence of a positive effect of providing personalised energy information, although contrary to our prior beliefs, is not unprecedented. Considering the automobile sector, Allcott and Knittel (2019) evidence a limited impact of personalised fuel costs on individuals' purchasing decisions, which tended to disappear a few months after the intervention. A possible explanation in the context of our analysis is that tumble dryer usage in the sample could be fairly limited. If this was the case, the EU Energy Label and the EnergyStar logo, by somewhat shrouding the actual monetary value of energy costs, might induce people to overvalue energy efficiency.

It is therefore important to investigate whether the effect of framing energy information in alternative ways differs for various subgroups based on personal attitudes and demographics. One hypothesis, which has already been introduced, is that a limited average usage of the tumble dryer might make energy costs less relevant than the more general information contained in the current labels. I.e. if a household has a low usage of their tumbledryer, then monetary labelling may be less effective than the more general kWh energy label. Second, in light of the evidence, highlighted by previous studies, suggesting that people are typically not very good at translating physical consumption into energy expenditures, one could expect that the provision of more explicit information might benefit mainly those with lower levels of education. A third hypothesis is that people concerned about the environment will tend to chose the most efficient product irrespective of the way in which energy information is framed, while those less concerned will pay more attention to the monetary aspects of energy consumption. Finally, income-constrained individuals can benefit more from energy information reported in monetary terms if energy bills are a considerable proportion of their expenditures.

With this in mind, we run our models splitting the samples on the basis of the levels of self-reported weekly tumble dryer usage, educational attainments, environmental concern and income. For tumble dryer usage, we define as low usage values smaller than or equal to the median of the respective country, mid-high usage between the median and the 90th percentile, while very-high usage corresponds to the top 10th percentile in each country[24]. For education, we distinguish between respondents with and without a degree. For environmental concern we split the sample into participants who say to be concerned or extremely concerned about the environment, and those who are slightly concerned, not concerned or do not know. Lastly, we separate between people stating to live comfortably or very comfortably on current income, and those who do not live comfortably or are coping on current income.

We defer results of these estimations and the corresponding WTP to Tables D1-D8 in Appendix D. Here we present a discussion of their implications.

For all countries, and in particular for Canada, there are considerably more people in the low usage category. In fact, it is for this subgroup that personalised energy costs lead to a significant decrease in consumers' utility in the Canadian sample. On the other hand, for respondents in the top 10th percentile of the respective distribution, personalised information presents positive coefficients in all countries, with the effect being significant for the UK. Both these instances seem to confirm that the results in Tables 4 and 5 could be due, at least in part, to a limited average usage of the tumble dryer in our sample, which would make the current labels more salient than actual energy expenditures.

Conversely, the hypothesis that providing more accurate and personalised energy information should benefit mostly those with lower levels of education is not substantiated. Although the coefficients of our two treatments become positive (but insignificant) for respondents without a degree in the Canadian sample, this effect does not apply to the other countries. If anything, we observe outcomes that are somewhat contrary to this belief. The positive effect of the personalised energy costs treatment in the United Kingdom comes from the subgroup of respondents who hold a degree. While generic energy costs generate a negative effect for Irish participants without a degree.

[24]In all four countries the median is equal to 3 weekly cycles. The 90th percentile is 6 in Canada and 7 in Ireland, the United Kingdom and the United States. Therefore, low usage corresponds to 3 or fewer weekly cycles; mid-high usage is between 4 and 7 (both included) weekly cycles in Ireland, the UK and the US and between 4 and 6 in Canada; very-high usage is given by more than 7 cycles in Ireland, the UK and the US and more than 6 in Canada.

In each country, participants who state they are concerned about the environment have a higher WTP for energy efficiency than those who say they are not. In the subgroup of less concerned respondents, providing energy costs has a general positive impact on consumers' utility, which represents a statistically significant improvement with respect to the classic Energy Label in the Irish and British samples. On the other hand, monetary information is insignificant for individuals concerned about the environment. We also see that the negative effects of our treatments in the Canadian sample come mainly from this second subgroup, which is in line with the hypothesis that the EnergyStar logo appears more salient, especially if a substantial part of them does not make frequent use of the tumble dryer. Hence, providing monetary information seems to crowd out those who would buy a more energy efficient tumble dryer for environmental motivations.

Finally, we do not detect a clear impact of individuals' income on the effectiveness of our treatments. Personalised energy costs information does increase utility for income-constrained people in the United Kingdom, but this effect does not translate to the other countries — apart from a positive but insignificant coefficient in the Irish sample. In addition, the negative effect of our treatments in the Canadian sample evidenced in Table 4 interests both more and less wealthy individuals.

5 Conclusion

It has been asserted that the current kWh information reported on energy labels might not be sufficient to help consumers make well-informed energy efficiency investments. The literature has documented that individuals often struggle to interpret energy information when provided in physical units. Reframing energy information in monetary terms could allow them to make better and more informed purchasing decisions. Prior studies have investigated the effect of providing monetary energy information in several contexts. Outcomes have been mixed, and it is not clear whether this is to be attributed to the use of different core products, the employment of different methodologies, or the fact that they were conducted in different countries. This paper represents the first attempt to clarify that ambiguity by examining the impact of lifetime energy expenditures employing the same experiment in a multi-country setting.

With an online randomized discrete choice experiment we study individuals' preferences for tumble dryers in Canada, the Republic of Ireland, the United Kingdom and the United States. Energy information is presented in three forms. In the control group it follows the typical energy labels in each country. The first treatment converts the physical consumption at the basis of energy labels into the 10-years energy costs, assuming a uniform usage of 160 cycles per year. The second treatment adopts self-reported use patterns to derive individual-specific 10-years energy costs.

Our findings show that monetary information has different impacts in different countries. In Ireland and the United States we fail to detect any significant effect of providing lifetime energy expenditures. In Canada, both generic and personalised monetary information reduce the willingness-to-pay for energy efficiency with respect to the classic EnergyStart logo. Whereas in the United Kingdom the individual-specific 10-years energy costs has a positive impact people's preferences for energy efficiency. Disentangling the effect based on demographic and socio-economic characteristics highlights that the negative effect comes primarily from individuals who make less frequent use of the tumble dryer, and that monetary information seems to crowd out respondents who would buy a more efficient model for environmental motivations.

While framing information in monetary terms appears as a promising and easy to implement option to favour the uptake of more efficient appliances, the results of this paper suggest that a generic measure would have little impact. This is not to say that there is no scope for improvements on how to convey energy efficiency information, but that an effective intervention should be tailored to the characteristics of the context where it is to be implemented. Countries and individuals differ for a plethora of reasons, and policymakers should carefully consider these peculiarities to design effective policy solutions.

Our work paves the way for new research to examine additional products. Examples already exist as stand-alone analyses for refrigerators (Kallbekken et al., 2013; Andor et al., 2020; Jain et al., 2021), TV sets (Heinzel, 2012), washing machines (Department of Energy and Climate Change, 2014), cars (Allcott and Knittel, 2019) and the housing market (Carroll et al., 2021). In addition, labelling is only one means of promoting investments in energy efficiency — others include, but are not limited to, direct regulation, tax reductions, financial incentives, etc. Therefore, future efforts should be devoted to develop structured, multi-country studies to understand what is the most effective intervention in each specific context.

Finally, although stated preferences methods represent an invaluable tool to investigate consumers' behaviour in a variety of contexts and to assess the effectiveness of new policies thanks to their flexibility and ease of implementation, some studies have found differences in effects between online and field trials (Allcott and Taubinsky, 2015). So, future research should consider the value coupling survey data with field experiments and revealed preferences data.

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Appendices

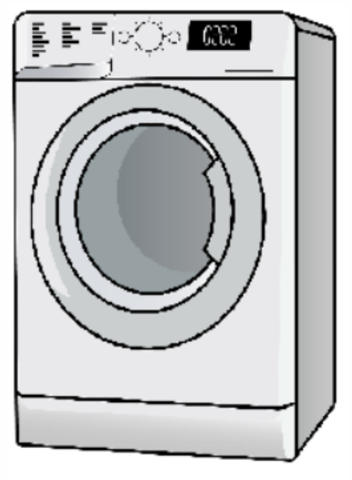
A Experiment

A.1 Attributes and levels

Figures A1-A9 display the images with the description of each attribute and their levels that participants were shown at the beginning of the discrete choice experiment. All images are taken from the Irish version of the experiment. Figure A6 reports the energy efficiency attribute for the control group in all countries.

Figure A1: Discrete choice experiment intro

Choose your favourite tumble dryer



Imagine you are looking to buy a new tumble dryer.

In a moment you will be shown a number of tumble dryers. They all fit the space you have, look exactly the same and have the same display features and functions.

Simply look at the characteristics of each, **think about what you can afford** and choose your favourite.

Figure A2: Price attribute

PRICE (purchase price in €)
- will be one of the following ...

€ 200	€ 400	€ 600	€ 800	€ 1,000	€ 1,200

Figure A3: Brand attribute

BRAND (Manufacturer of the tumble dryer)
- will be either ...

Established	New

Note: An "Established" brand is one that has been on the market for over five years and has developed a reputation with its customers. A "New" brand is on the market less than five years and hasn't yet built up a reputation with customers.

Figure A4: Capacity attribute

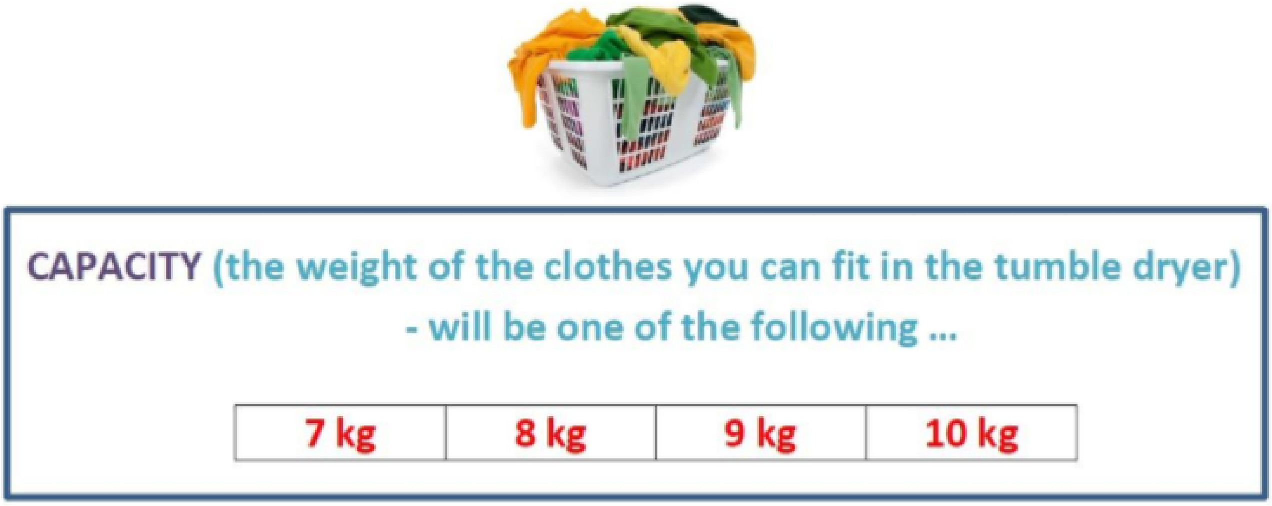
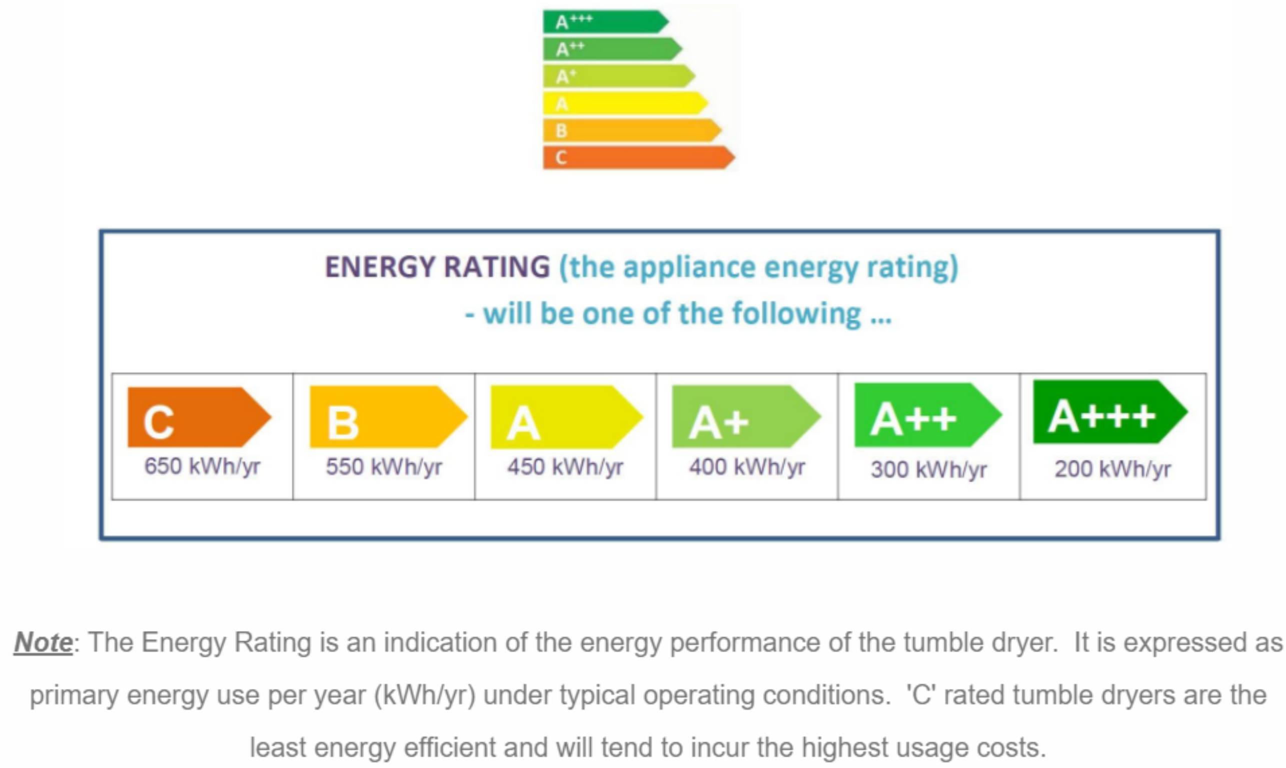


Figure A5: Customer rating attribute

Figure A6: Control group energy efficiency attribute



(a) Ireland ond United Kingdom

(b) Canada and United States

Figure A8: Treatment 1 energy efficiency attribute

10 YEAR ENERGY COST (the electricity cost associated with using the appliance for 10 years): - will be one of the following ...

€350	€500	€650	€800	€950	€1,100

Note: Costs are estimated based on the energy efficiency of the tumble dryer under typical operating conditions and constant electricity prices.
The most efficient tumble dryers consume the least amount of electricity and therefore involve the lowest energy cost.

Figure A9: Treatment 2 energy efficiency attribute

ELECTRICITY
BILL PAY

YOUR 10 YEAR ENERGY COST

(the electricity cost associated with your household using the appliance 2 times per week for 10 years):

- will be one of the following …

€ 234	**€ 328**	**€ 422**	**€ 514**	**€ 608**	**€ 702**

Note: Costs are estimated based on the energy efficiency of the tumble dryer and your answers to previous questions, in particular, **the number of times you stated you use your tumble dryer per week.** These are 10 year costs and assume constant electricity prices. The most efficient tumble dryers consume the least amount of electricity and therefore involve the lowest energy cost.

A.2 Choice sets

Table A1 reports all the 32 choice sets that were used in the experiment and their division into the 4 blocks. Energy efficiency is displayed according to the letter scale of the EU Energy Label. This was appropriately reframed in each specific treatment group and country version following the scheme shown in Table 1. As mentioned in Section 2.3, each choice set included an opt-out option and there was no dominant alternative. Figure A10 presents examples of choice sets for all three groups (control, treatment 1 and treatment 2) taken from the Irish version of the experiment.

Table A1: Full list of choice sets

Block	Choice Set	Alternative	Price	Capacity	Brand	Stars	Efficiency
1	1	1	400	New	7	4	B
1	1	2	1000	New	8	3	A+++
1	2	1	600	New	7	3	A
1	2	2	800	New	8	4	C
1	3	1	600	New	9	4	A++
1	3	2	400	New	7	3	A+
1	4	1	1200	New	8	4	A+++
1	4	2	600	Established	8	3	A++
1	5	1	800	Established	10	4	B
1	5	2	1200	Established	10	4	A+
1	6	1	400	Established	8	5	A
1	6	2	800	Established	9	3	C
1	7	1	200	New	8	4	A+++
1	7	2	1200	Established	8	5	A+
1	8	1	600	New	7	3	B
1	8	2	800	New	10	4	A+
2	9	1	1000	New	10	5	A++

Table A1 — continued

Block	Choice Set	Alternative	Price	Capacity	Brand	Stars	Efficiency
2	9	2	1200	Established	9	4	A+++
2	10	1	400	New	9	3	A++
2	10	2	1000	New	8	4	B
2	11	1	1200	New	8	5	A++
2	11	2	1000	New	9	5	C
2	12	1	1000	Established	9	4	A
2	12	2	600	New	7	3	A+
2	13	1	200	New	10	4	A++
2	13	2	400	Established	9	3	A+++
2	14	1	600	New	8	4	A++
2	14	2	800	New	10	3	A
2	15	1	200	Established	10	3	A++
2	15	2	600	New	9	5	A+++
2	16	1	400	Established	9	3	A+
2	16	2	800	Established	7	5	A
3	17	1	1000	Established	7	5	A++
3	17	2	600	Established	8	5	C
3	18	1	800	Established	9	5	A+
3	18	2	1000	Established	8	3	A++
3	19	1	400	New	9	4	A+
3	19	2	600	New	10	5	A+++
3	20	1	200	New	7	5	C
3	20	2	1000	Established	8	4	B
3	21	1	800	New	7	5	A++
3	21	2	400	New	10	5	B
3	22	1	800	Established	7	5	C

Table A1 — continued

Block	Choice Set	Alternative	Price	Capacity	Brand	Stars	Efficiency
3	22	2	1200	New	9	5	B
3	23	1	1200	Established	8	3	A
3	23	2	400	Established	7	4	A+++
3	24	1	1000	Established	9	5	A+
3	24	2	400	Established	8	5	C
4	25	1	400	New	10	5	A++
4	25	2	200	Established	9	5	A
4	26	1	200	Established	7	3	B
4	26	2	400	New	8	4	A
4	27	1	1000	Established	9	5	C
4	27	2	800	Established	7	4	A+
4	28	1	600	Established	10	4	C
4	28	2	200	New	9	5	A++
4	29	1	1200	Established	9	5	A
4	29	2	1000	Established	8	5	A+
4	30	1	800	Established	9	3	B
4	30	2	1000	Established	7	4	A
4	31	1	1200	Established	7	4	C
4	31	2	800	Established	8	3	A
4	32	1	1200	Established	8	5	B
4	32	2	600	New	9	4	A

Figure A10: Example of choice sets

Which of these two tumble dryers would you choose?

	Tumble dryer 1	Tumble dryer 2
Brand	New	New
Capacity	9 kg	10 kg
Energy rating	A+	A+++
Customer rating	★★★★☆	★★★★★
Price	€ 400	€ 600

	Tumble dryer 1	Tumble dryer 2	Neither
I would choose:	○	○	○

(a) Control

Which of these two tumble dryers would you choose?

	Tumble dryer 1	Tumble dryer 2
Brand	New	New
Capacity	9 kg	8 kg
10 year Energy Cost	€ 500	€ 950
Customer rating	★★★☆☆	★★★★☆
Price	€ 400	€ 1,000

	Tumble dryer 1	Tumble dryer 2	Neither
I would choose:	○	○	○

(b) Treatment 1

Which of these two tumble dryers would you choose?

	Tumble dryer 1	Tumble dryer 2
Brand	New	Established
Capacity	10 kg	9 kg
Your 10 year Energy Cost	€ 1148	€ 819
Customer rating	★★★★★	★★★★☆
Price	€ 1,000	€ 1,200

	Tumble dryer 1	Tumble dryer 2	Neither
I would choose:	○	○	○

(c) Treatment 2

B Demographics

Below are reported the questions included in the survey that accompanied the DCE (and that were used in the analysis).

- What age are you? Answer options: [Under 18; 18-24; 25-34; 35-44; 45-54; 55-64; 65-74; 75-84; Prefer not to say].
- Do you have a tumble dryer in your home? Answer options: [Yes; No].
- Approximately how many times a week do you use your tumble dryer? Enter number.
- What is your gender? Answer options: [Male; Female; Prefer not to say].
- How many people (including yourself) live in your household? Answer options: [1; 2; 3; 4; 5; 6; 7; 8; More than 8; Prefer not to say].
- Which of the following best describes your relationship status? Answer options: [Single (never married); Married or in a domestic partnership; Widowed; Divorced; Separated; Prefer not to say].
- What is your highest level of education? Answer options: [No formal education; Primary school/Elementary school; Secondary school/High school; Lower degree (certificate or diploma)/Associate Degree or Certificate; Higher degree/Bachelor's degree; Masters or higher; Other (please specify); Prefer not to say].
- What is your employment status? Answer options: [Self-employed; Employed; House persons and carers; Unemployed; Retired; Student; Unable to work (e.g. disability); Prefer not to say]
- Which of the following best describes your living situation? Answer options: [Living with my spouse/partner (with or without children); Living with my parents or other relatives; Living alone; Sharing a property with non-family members; Single parent; Prefer not to say].

- How many ADULTS live in your household? Enter number.
- Which of the following best describes the area you live in? Answer options: [Urban; Suburban; Rural; Prefer not to say].
- Suppose you are purchasing a new tumble dryer for your home. Please rate the importance of each of the following characteristics in making your decision on which model to buy. Answer options: [Not at all important; Slightly important; Moderately important; Very important; Don't know].
  - Price
  - Brand
  - Energy efficiency/energy consumption
  - Water consumption
  - Load capacity
  - Dimensions (height, weight, depth)
  - Features (timer, digital display)
  - Aesthetics (colour, design)
- In relation to the energy efficiency of electrical appliances, please state whether you disagree or agree with the following statements. answer options: [Strongly disagree; Slightly disagree; Slightly agree; Strongly agree; Don't know].
  - Buying more energy efficient appliances would reduce my household's environmental impact
  - All new appliances have similar energy efficiency levels
  - More energy efficient appliances are less reliable
  - I am willing to take a chance on new technologies to reduce my energy consumption
  - I am aware of energy prices; that is, the price of fuels such as gas, oil and electricity

  - I understand how much money I would save if I bought a more energy efficient appliance
  - I would like to buy more energy efficient appliances but I cannot afford them

- Please rate how concerned you are about the environment (for example, pollution, global warming and climate change). Answer options: [Not concerned; Slightly concerned; Concerned; Extremely concerned; Don't know].

- How would you describe your current income situation? (If you are married or in a domestic partnership consider your combined income). Answer options: [Finding it very difficult to live on current income; Finding it difficult to live on current income; Coping on current income; Living comfortably on current income; Living very comfortably on current income; Prefer not to state].

- Are you generally an impatient person, or someone who always shows great patience? Please rate yourself on a scale of 1 to 10, where 1 represents 'very impatient' and 10 is 'very patient'.

- Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please rate yourself on a scale of 1 to 10, where 1 represents 'unwilling to take risks' and 10 represents 'fully prepared to take risks'.

C Robustness

In this section are reported the results of our robustness checks to complement the mixed multinomial logit analysis presented in Section 4 of the paper. The approach we follow is threefold. First, we estimate separate models for the three experimental groups in each country. Second, we allow all attributes' coefficients to vary between individuals, apart from the price coefficient, which corresponds to estimating an error component model. Thirdly, we implement the opposite exercise, restricting all coefficients to be constants for all individuals, thus reverting back to the conditional logit model.

C.1 Split samples models

The mixed logit model estimated for the control group, the generic information treatment and the personalised information treatment separately present similar patterns to the polled models reported in Table 4 in all four countries.

C.2 Error component models

The error component models do not present any meaningful difference with respect to the mixed logit models reported in the main corpus of the paper, both in terms of coefficients and WTP. All attributes retain the same effect on individuals' utility. Energy efficiency remains the most valuable attribute in all samples, followed by customer rating. Presenting energy information in monetary terms does not significantly increase WTP in Ireland and the United States, while it reduces it in Canada; personalised energy costs lead to a marginally significant improvement in the United Kingdom.

Table C1: Split samples models - Ireland

	(1) Control	(2) Treatment 1	(3) Treatment 2
Non-Random Parameters in Utility Function			
Constant (neither option)	0.2182	1.0185	0.6450
	(1.8587)	(1.7074)	(1.8173)
Price	-0.0034***	-0.0029***	-0.0030***
	(0.0003)	(0.0003)	(0.0003)
Stars	0.5618***	0.4889***	0.6213***
	(0.0803)	(0.0909)	(0.0816)
Random Parameters in Utility Function			
Capacity	0.2311***	0.3060***	0.1781***
	(0.0491)	(0.0600)	(0.0434)
Brand	-0.1332	-0.2875**	-0.3375***
	(0.1107)	(0.1316)	(0.1101)
Energy efficiency	1.1161***	0.9490***	0.9124***
	(0.1241)	(0.1319)	(0.1187)
Model statistics			
Observations	4,752	4,536	4,656
Clusters	198	189	194

Notes. This table reports the results of mixed logit regressions of respondents' choices in the Irish sample. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C2: Split samples models - UK

	(1) Control	(2) Treatment 1	(3) Treatment 2
Non-Random Parameters in Utility Function			
Constant (neither option)	0.2548	0.2512	1.0233
	(1.7875)	(1.6404)	(1.5598)
Price	-0.0033***	-0.0033***	-0.0027***
	(0.0003)	(0.0003)	(0.0003)
Stars	0.4932***	0.5691***	0.5999***
	(0.0776)	(0.0851)	(0.0845)
Random Parameters in Utility Function			
Capacity	0.1461***	0.0786*	0.0944**
	(0.0453)	(0.0473)	(0.0479)
Brand	-0.0521	-0.2743**	-0.3180***
	(0.1144)	(0.1330)	(0.1143)
Energy efficiency	0.5331***	0.5345***	0.8739***
	(0.1185)	(0.1236)	(0.1139)
Model statistics			
Observations	5,280	5,232	5,208
Clusters	220	218	217

Notes. This table reports the results of mixed logit regressions of respondents' choices in the UK sample. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C3: Split samples models - Canada

	(1) Control	(2) Treatment 1	(3) Treatment 2
Non-Random Parameters in Utility Function			
Constant (neither option)	6.3177***	2.4083	-2.3835
	(1.8550)	(1.8314)	(1.8814)
Price	-0.0028***	-0.0031***	-0.0020***
	(0.0002)	(0.0002)	(0.0002)
Stars	1.0001***	0.8187***	0.6732***
	(0.0882)	(0.0820)	(0.0700)
Random Parameters in Utility Function			
Capacity	0.3461***	0.1643***	0.1143**
	(0.0532)	(0.0516)	(0.0482)
Brand	-0.7446***	-0.4648***	-0.2503**
	(0.1210)	(0.1144)	(0.1019)
Energy efficiency	1.7476***	0.9594***	0.7426***
	(0.1436)	(0.1394)	(0.1076)
Model statistics			
Observations	5,136	4,920	5,160
Clusters	214	205	215

Notes. This table reports the results of mixed logit regressions of respondents' choices in the Canadian sample. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C4: Split samples models - USA

	(1) Control	(2) Treatment 1	(3) Treatment 2
Non-Random Parameters in Utility Function			
Constant (neither option)	2.1495	2.6941**	2.1098
	(1.4845)	(1.2846)	(2.0091)
Price	-0.0034***	-0.0024***	-0.0024***
	(0.0003)	(0.0002)	(0.0002)
Stars	0.8890***	0.7339***	0.6353***
	(0.0913)	(0.0742)	(0.0782)
Random Parameters in Utility Function			
Capacity	0.3489***	0.1902***	0.1987***
	(0.0485)	(0.0469)	(0.0487)
Brand	-0.4426***	-0.1392	0.1071
	(0.1108)	(0.1081)	(0.1183)
Energy efficiency	1.1864***	0.6593***	0.4005***
	(0.1328)	(0.1124)	(0.1100)
Model statistics			
Observations	4,992	5,472	5,304
Clusters	208	228	221

Notes. This table reports the results of mixed logit regressions of respondents' choices in the USA sample. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C5: Error component models

	(1) Ireland	(2) UK	(3) Canada	(4) USA
Non-Random Parameters in Utility Function				
Price	-0.0031***	-0.0031***	-0.0026***	-0.0027***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Random Parameters in Utility Function				
Constant (neither option)	0.2831	0.9386	0.8568	2.2544**
	(1.2345)	(0.9836)	(1.3095)	(1.0058)
Stars	0.5621***	0.5366***	0.8144***	0.7300***
	(0.0514)	(0.0470)	(0.0476)	(0.0493)
Capacity	0.2598***	0.1403***	0.2253***	0.2662***
	(0.0290)	(0.0264)	(0.0292)	(0.0280)
Brand	-0.2609***	-0.2243***	-0.4683***	-0.1419**
	(0.0700)	(0.0693)	(0.0651)	(0.0655)
Energy efficiency	1.0910***	0.5647***	1.4621***	0.8528***
	(0.1112)	(0.1029)	(0.1155)	(0.1034)
EE $\times$ T1	-0.0796	0.0018	-0.4453***	-0.1429
	(0.1500)	(0.1398)	(0.1486)	(0.1416)
EE $\times$ T2	-0.1264	0.2693*	-0.4962***	-0.2185
	(0.1556)	(0.1384)	(0.1451)	(0.1381)
Model statistics				
Observations	13,944	15,720	15,216	15,768
Clusters	581	655	634	657

Notes. This table reports the results of error component models of respondents' choices in each country separately. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C6: Error components models willingness to pay

	Ireland	UK	Canada	USA
Stars	178.60	170.44	309.26	266.01
	[148.25 ; 208.96]	[142.18 ; 198.71]	[271.47 ; 347.05]	[231.57 ; 300.46]
Capacity	82.57	44.58	85.55	96.99
	[63.81 ; 101.32]	[27.65 ; 61.50]	[63.30 ; 107.79]	[76.19 ; 117.79]
Brand	-82.89	-71.25	-177.83	-51.69
	[-125.13 ; -40.65]	[-113.66 ; -28.84]	[-225.00 ; -130.67]	[-97.71 ; -5.67]
EE	346.66	179.36	555.18	310.74
	[274.64 ; 418.67]	[114.91 ; 243.82]	[464.35 ; 646.01]	[236.60 ; 384.87]
EE $\times$ T1	-25.28	0.57	-169.08	-52.08
	[-118.88 ; 68.32]	[-86.46 ; 87.60]	[-280.18 ; -57.98]	[-153.07 ; 48.91]
EE $\times$ T2	-40.16	85.55	-188.42	-79.63
	[-136.94 ; 56.62]	[-0.55 ; 171.65]	[-297.15 ; -79.69]	[-178.28 ; 19.01]

Notes. This table reports the willingness to pay of respondents in each country for the tumble dryer's attributes. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. The 95% confidence intervals are reported in brackets.

C.3 Conditional logit models

The conditional logit models tell a somewhat different story. Firstly, the coefficient for the neither option is now positive and significant in all countries, suggesting that respondents are more inclined to select neither the two alternatives. But the main differences are represented by the coefficients of the two treatments, which become positive in all countries, with personalised energy costs having a slightly positive effect in the United States (significant at the 10% level).

Table C7: Conditional logit models

	(1) Ireland	(2) UK	(3) Canada	(4) USA
Constant (neither option)	1.6090**	1.5402***	2.1789***	2.8473***
	(0.6389)	(0.5413)	(0.5915)	(0.5608)
Price	-0.0025***	-0.0024***	-0.0020***	-0.0023***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Stars	0.4272***	0.4009***	0.6013***	0.6309***
	(0.0409)	(0.0390)	(0.0381)	(0.0377)
Capacity	0.1736***	0.0843***	0.1339***	0.1842***
	(0.0230)	(0.0206)	(0.0232)	(0.0229)
Brand	-0.1664***	-0.1165**	-0.2847***	-0.1145**
	(0.0572)	(0.0571)	(0.0531)	(0.0547)
Energy efficiency	0.7183***	0.4471***	0.7563***	0.4534***
	(0.0821)	(0.0758)	(0.0812)	(0.0769)
EE $\times$ T1	0.0336	0.0210	0.0852	0.1320
	(0.1179)	(0.0992)	(0.1043)	(0.0965)
EE $\times$ T2	0.0165	0.0273	0.0664	0.1745*
	(0.1197)	(0.1007)	(0.1035)	(0.0968)
Model statistics				
Observations	13944	15720	15216	15768
Clusters	581	655	634	657

Notes. This table reports the results of conditional logit regressions of respondents' choices in each country separately. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C8: Conditional logit willingness to pay

	Ireland	UK	Canada	USA
Stars	170.04	165.84	297.12	277.80
	[138.56 ; 201.52]	[135.03 ; 196.65]	[255.76 ; 338.49]	[242.29 ; 313.31]
Capacity	69.08	34.88	66.15	81.11
	[50.75 ; 87.41]	[18.04 ; 51.72]	[43.49 ; 88.81]	[60.83 ; 101.39]
Brand	-66.25	-48.18	-140.67	-50.42
	[-109.47 ; -23.03]	[-93.76 ; -2.59]	[-191.01 ; -90.34]	[-96.97 ; -3.88]
EE	285.91	184.94	373.70	199.65
	[217.18 ; 354.64]	[122.61 ; 247.26]	[289.53 ; 457.87]	[132.40 ; 266.90]
EE $\times$ T1	13.39	8.70	42.11	58.13
	[-78.56 ; 105.33]	[-71.74 ; 89.13]	[-59.15 ; 143.37]	[-25.40 ; 141.65]
EE $\times$ T2	6.55	11.29	32.83	76.84
	[-86.82 ; 99.92]	[-70.34 ; 92.92]	[-67.30 ; 132.95]	[-6.94 ; 160.62]

Notes. This table reports the willingness to pay of respondents in each country for the tumble dryer's attributes. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. The 95% confidence intervals are reported in brackets.

D Individual characteristics

Another important thing to investigate is whether the effect of our treatments varies for different types of people. To do so, we run our models splitting the samples on the basis of the levels of various individual characteristics.

D.1 Tumble dryer usage

A first consideration we can make is that a limited average usage of the tumble dryer would translate into small energy expenditures, thus making energy cost information, especially personalised one, less salient than the current EU Energy Label and the EnergyStar logo. To investigate this, we have divided respondents based on their self-reported weekly usage, considering as low usage values smaller than or equal to the median of the respective country, mid-high usage between the median and the 90th percentile, while very-high usage corresponds to the top 10th percentile in each country. Specifically, in all four countries, the median is equal to 3 weekly cycles. The 90th percentile is 6 in Canada and 7 in Ireland, the United Kingdom and the United States. Therefore, low usage corresponds to 3 or fewer weekly cycles; mid-high usage is between 4 and 7 (both included) weekly cycles in Ireland, the UK and the US and between 4 and 6 in Canada; and very-high usage is given by more than 7 cycles in Ireland, the UK and the US and more than 6 in Canada.

From Table D1 we see that there are considerably more people in the low usage category[25], which may sustain our prior claim. From Panels B and C it appears that personalised energy information no longer has a negative impact on Canadian respondents. In fact, the coefficient of the interaction between energy efficiency and treatment 2 is insignificant for the subgroup of mid-high usage respondents, and it becomes positive for those with high usage. In addition, in this last subgroup, personalised energy costs information presents positive coefficients in all four countries. However, we still fail to detect a significant effect of our treatments apart from the United Kingdom. Also, the number of clusters is borderline

[25]The variable reporting tumble dryer usage right-skewed, with a median of 3 weekly cycles and a mean between 3 and 4 depending on the country.

for unbiased inference.

Table D1: Mixed logit models by tumble dryer usage

	Ireland	UK	Canada	USA
A. LOW USAGE				
Non-Random Parameters in Utility Function				
Constant (neither option)	1.5920	0.8043	1.8160	0.9276
	(1.2597)	(1.3551)	(1.3097)	(1.4794)
Price	-0.0033***	-0.0033***	-0.0027***	-0.0030***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Stars	0.5796***	0.6075***	0.8279***	0.6922***
	(0.0639)	(0.0637)	(0.0566)	(0.0639)
Random Parameters in Utility Function				
Capacity	0.2018***	0.0735**	0.1846***	0.1618***
	(0.0372)	(0.0356)	(0.0358)	(0.0382)
Brand	-0.3016***	-0.3122***	-0.4446***	-0.1719*
	(0.0891)	(0.0895)	(0.0796)	(0.0922)
Energy efficiency	1.0637***	0.6575***	1.3082***	0.6678***
	(0.1323)	(0.1386)	(0.1341)	(0.1514)
EE $\times$ T1	-0.0605	-0.0083	-0.0845	-0.0411
	(0.1784)	(0.1819)	(0.1796)	(0.1845)
EE $\times$ T2	-0.2177	0.1955	-0.3870**	-0.2370
	(0.1707)	(0.1754)	(0.1637)	(0.2057)
Model statistics				
Observations	8,448	9,600	10,440	8,328
Clusters	352	400	435	347
B. MID-HIGH USAGE				
Constant (neither option)	-1.9033	1.3134	3.7114	7.7983***
	(2.8505)	(1.9506)	(2.7317)	(1.5629)
Price	-0.0027***	-0.0028***	-0.0026***	-0.0025***
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Stars	0.5576***	0.4940***	0.8583***	0.8486***
	(0.0832)	(0.0808)	(0.0978)	(0.0771)
Random Parameters in Utility Function				
Capacity	0.2499***	0.1426***	0.2671***	0.3012***
	(0.0497)	(0.0475)	(0.0614)	(0.0430)
Brand	-0.1498	-0.0598	-0.5985***	-0.1650
	(0.1198)	(0.1262)	(0.1289)	(0.1029)
Energy efficiency	0.9393***	0.3638**	1.5738***	1.0815***
	(0.1853)	(0.1596)	(0.2271)	(0.1333)
EE $\times$ T1	0.0259	0.2747	-0.9670***	-0.2160
	(0.2769)	(0.2251)	(0.2856)	(0.2015)
EE $\times$ T2	0.2253	0.1012	-0.4814	-0.2350

Table D1 — continued

	Ireland	UK	Canada	USA
	(0.2982)	(0.2356)	(0.2933)	(0.1700)
Model statistics				
Observations	4,656	4,848	3,480	6,000
Clusters	194	202	145	250
C. HIGH USAGE				
Constant (neither option)	-2.2415	0.9739	2.2848	-0.2994
	(4.5573)	(3.1072)	(2.9170)	(2.5441)
Price	-0.0032***	-0.0027***	-0.0014***	-0.0018***
	(0.0005)	(0.0005)	(0.0003)	(0.0004)
Stars	0.3814**	0.4361***	0.6426***	0.6034***
	(0.1555)	(0.1321)	(0.1353)	(0.1447)
Random Parameters in Utility Function				
Capacity	0.5290***	0.1992**	0.1283	0.3849***
	(0.1129)	(0.0855)	(0.0976)	(0.0861)
Brand	-0.4541*	-0.1782	-0.2599	0.0529
	(0.2451)	(0.2190)	(0.1930)	(0.2058)
Energy efficiency	1.0598***	0.5789*	1.0051***	0.3765
	(0.3254)	(0.3185)	(0.3199)	(0.3066)
EE $\times$ T1	0.3266	-0.0827	-0.0532	0.3446
	(0.4079)	(0.3856)	(0.3737)	(0.4286)
EE $\times$ T2	0.7602	1.6218***	0.2201	0.6026
	(0.8590)	(0.6023)	(0.3145)	(0.4394)
Model statistics				
Observations	840	1,272	1,296	1,440
Clusters	35	53	54	60

Notes. Panel A reports the results of mixed logit models for respondents who report a low tumble dryer usage (less than the median), Panel B for mid-high usage (between the median and the 90th percentile), and Panel C for very-high usage (90th percentile). Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D2: Willingness to pay by tumble dryer usage

	Ireland	UK	Canada	USA
A. LOW USAGE				
Stars	176.07	182.91	302.68	229.75
	[138.68 ; 213.46]	[146.58 ; 219.24]	[257.63 ; 347.73]	[186.96 ; 272.53]
Capacity	61.30	22.12	67.49	53.69
	[38.06 ; 84.54]	[0.95 ; 43.28]	[41.42 ; 93.56]	[28.84 ; 78.55]
Brand	-91.63	-94.01	-162.53	-57.04
	[-142.63 ; -40.64]	[-145.54 ; -42.49]	[-218.89 ; -106.17]	[-116.17 ; 2.08]
EE	323.15	197.96	478.28	221.63
	[238.61 ; 407.69]	[115.54 ; 280.38]	[378.03 ; 578.54]	[123.35 ; 319.91]
EE $\times$ T1	-18.38	-2.51	-30.91	-13.66
	[-124.81 ; 88.05]	[-109.86 ; 104.83]	[-159.36 ; 97.54]	[-133.58 ; 106.27]
EE $\times$ T2	-66.13	58.88	-141.48	-78.66
	[-168.30 ; 36.04]	[-44.68 ; 162.44]	[-259.36 ; -23.60]	[-212.33 ; 55.02]
B. MID-HIGH USAGE				
Stars	206.42	175.56	326.99	336.64
	[144.41 ; 268.42]	[119.78 ; 231.35]	[250.20 ; 403.77]	[272.02 ; 401.26]
Capacity	92.53	50.68	101.75	119.48
	[57.78 ; 127.27]	[16.75 ; 84.61]	[55.33 ; 148.18]	[83.97 ; 154.99]
Brand	-55.46	-21.24	-228.02	-65.46
	[-141.64 ; 30.73]	[-109.02 ; 66.54]	[-320.37 ; -135.66]	[-144.08 ; 13.16]
EE	347.72	129.29	599.56	429.06
	[208.14 ; 487.29]	[18.44 ; 240.14]	[410.51 ; 788.61]	[318.01 ; 540.11]
EE $\times$ T1	9.58	97.62	-368.41	-85.69
	[-191.16 ; 210.31]	[-59.50 ; 254.74]	[-599.33 ; -137.49]	[-244.29 ; 72.91]
EE $\times$ T2	83.42	35.95	-183.40	-93.24
	[-132.66 ; 299.49]	[-127.87 ; 199.78]	[-403.79 ; 36.99]	[-227.17 ; 40.68]
C. VERY-HIGH USAGE				
Stars	117.60	159.90	453.49	328.45
	[22.95 ; 212.25]	[54.27 ; 265.52]	[184.66 ; 722.32]	[160.12 ; 496.78]
Capacity	163.10	73.03	90.55	209.54
	[81.95 ; 244.25]	[3.72 ; 142.33]	[-42.38 ; 223.48]	[86.98 ; 332.10]
Brand	-140.03	-65.33	-183.41	28.82
	[-280.94 ; 0.87]	[-221.36 ; 90.69]	[-451.33 ; 84.51]	[-193.83 ; 251.48]
EE	326.79	212.23	709.26	204.96
	[110.53 ; 543.04]	[-23.49 ; 447.95]	[235.48 ; 1183.05]	[-120.63 ; 530.56]
EE $\times$ T1	100.70	-30.31	-37.52	187.61
	[-144.67 ; 346.07]	[-307.73 ; 247.11]	[-552.70 ; 477.66]	[-275.58 ; 650.80]
EE $\times$ T2	234.40	594.61	155.32	328.01
	[-299.25 ; 768.05]	[145.85 ; 1043.36]	[-288.65 ; 599.28]	[-183.88 ; 839.91]

Notes. Panel A reports the WTP for respondents who report a low tumble dryer usage (less than the median), Panel B for mid-high usage (between the median and the 90th percentile), and Panel C for very-high usage (90th percentile). Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the ”neither” option like all other attributes. 95% confidence intervals in brackets.

D.2 Education

A second consideration we can make is whether the effect differs for more or less educated people. In particular, one might argue that the provision of more explicit information on energy costs might benefit mainly those with lower levels of education. To check this, we run separate models distinguishing between participants who hold a degree and those who do not. Remember that, from Table 3 in the main corpus of the paper, this was the variable that showed the most differences between the three groups, although not in the same direction for all countries.

The results in Table D3 do not give any particular indication that monetary information — either generic of personalised — has a bigger effect for less educated people. Although the coefficients of our two treatments become positive (but insignificant) for respondents without a degree in the Canadian sample, this effect does not apply to the other countries. If anything, we observe outcomes contrary to this belief, with the coefficient for the generic energy costs treatment being negative and significant for Irish participants without a degree.

Table D3: Mixed logit models by education

	Ireland	UK	Canada	USA
A. WITH A DEGREE				
Non-Random Parameters in Utility Function				
Constant (neither option)	0.5585	0.3637	1.5939	1.8199*
	(1.2586)	(1.1128)	(1.2611)	(1.0719)
Price	-0.0031***	-0.0028***	-0.0024***	-0.0027***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Stars	0.5556***	0.5385***	0.8160***	0.7488***
	(0.0580)	(0.0595)	(0.0540)	(0.0569)
Random Parameters in Utility Function				
Capacity	0.2323***	0.1226***	0.2175***	0.2602***
	(0.0345)	(0.0331)	(0.0353)	(0.0343)
Brand	-0.2247***	-0.1798**	-0.4571***	-0.1956**
	(0.0832)	(0.0810)	(0.0763)	(0.0814)
Energy efficiency	0.9458***	0.5543***	1.4095***	0.7284***
	(0.1156)	(0.1274)	(0.1361)	(0.1084)
EE $\times$ T1	0.1397	0.0709	-0.4901***	-0.0562
	(0.1739)	(0.1724)	(0.1834)	(0.1527)
EE $\times$ T2	-0.0856	0.3541**	-0.4932***	-0.0577

Table D3 — continued

	Ireland	UK	Canada	USA
	(0.1686)	(0.1734)	(0.1641)	(0.1508)
Model statistics				
Observations	9768	9624	10728	10560
Clusters	407	401	447	440
B. WITHOUT A DEGREE				
Constant (neither option)	1.0626	0.8344	0.4247	3.5218**
	(2.0298)	(1.5751)	(1.5433)	(1.3973)
Price	-0.0031***	-0.0037***	-0.0030***	-0.0027***
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Stars	0.5644***	0.5800***	0.8202***	0.7201***
	(0.0878)	(0.0744)	(0.0888)	(0.0807)
Random Parameters in Utility Function				
Capacity	0.2348***	0.0787*	0.1499***	0.1873***
	(0.0539)	(0.0473)	(0.0536)	(0.0469)
Brand	-0.3327***	-0.2985**	-0.4741***	-0.0237
	(0.1177)	(0.1266)	(0.1169)	(0.1091)
Energy efficiency	1.3164***	0.5423***	1.2016***	0.8657***
	(0.2128)	(0.1543)	(0.1887)	(0.1745)
EE × T1	-0.4954*	0.0358	0.0907	-0.0014
	(0.2563)	(0.2060)	(0.2264)	(0.2260)
EE × T2	-0.1098	0.1077	0.0043	-0.2457
	(0.2633)	(0.2005)	(0.2280)	(0.2268)
Model statistics				
Observations	4176	6096	4488	5208
Clusters	174	254	217	217

Notes. Panel A reports the results of mixed logit models for respondents who hold a bachelor's degree (or a corresponding title for Canada and the United States) or higher. Panel B presents the results for those how do not have one. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D4: Willingness to pay by education

	Ireland	UK	Canada	USA
A. WITH A DEGREE				
Stars	181.44	195.75	335.37	278.63
	[143.88 ; 219.00]	[155.25 ; 236.25]	[286.42 ; 384.32]	[235.25 ; 322.01]
Capacity	75.86	44.56	89.37	96.82
	[53.95 ; 97.76]	[20.35 ; 68.76]	[60.62 ; 118.13]	[71.00 ; 122.65]
Brand	-73.38	-65.36	-187.84	-72.79
	[-125.16 ; -21.59]	[-121.92 ; -8.80]	[-247.78 ; -127.91]	[-131.33 ; -14.24]
EE	308.90	201.49	579.27	271.02
	[231.88 ; 385.92]	[109.66 ; 293.32]	[463.31 ; 695.24]	[191.19 ; 350.85]
EE $\times$ T1	45.64	25.77	-201.42	-20.93
	[-65.39 ; 156.67]	[-96.97 ; 148.52]	[-349.58 ; -53.25]	[-132.28 ; 90.42]
EE $\times$ T2	-27.96	128.72	-202.71	-21.48
	[-136.00 ; 80.07]	[5.37 ; 252.08]	[-336.75 ; -68.67]	[-131.50 ; 88.54]
B. WITHOUT A DEGREE				
Stars	184.19	156.08	277.83	266.57
	[129.89 ; 238.49]	[114.02 ; 198.13]	[213.01 ; 342.65]	[204.49 ; 328.66]
Capacity	76.63	21.17	50.78	69.35
	[38.51 ; 114.74]	[-4.02 ; 46.36]	[14.40 ; 87.17]	[34.51 ; 104.20]
Brand	-108.59	-80.34	-160.60	-8.77
	[-181.53 ; -35.65]	[-147.45 ; -13.23]	[-238.98 ; -82.21]	[-87.66 ; 70.12]
EE	429.58	145.94	407.03	320.47
	[284.16 ; 575.00]	[63.54 ; 228.34]	[275.42 ; 538.63]	[189.63 ; 451.32]
EE $\times$ T1	-161.68	9.62	30.72	-0.52
	[-328.86 ; 5.49]	[-98.87 ; 118.12]	[-119.78 ; 181.22]	[-164.49 ; 163.45]
EE $\times$ T2	-35.85	28.98	1.44	-90.97
	[-203.97 ; 132.28]	[-76.74 ; 134.70]	[-149.94 ; 152.82]	[-255.86 ; 73.91]

Notes. Panel A reports the WTP for respondents who hold a degree. Panel B presents the results for those without a degree. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. 95% confidence intervals in brackets.

D.3 Environmental concern

Another possible consideration is that people concerned about the environment will always tend to chose the most efficient product, irrespectively of how energy information is framed. This is confirmed in Table D6, where the WTP for energy efficiency is consistently higher in the subgroup of respondents who are concerned about the environment.

As we can see from Panel B of Table D5, presenting energy information in monetary terms seems to have a positive effect for those who are less concerned about the environment, especially in Ireland and the UK; while no appreciable impact can be detected for people more concerned about environmental problems. A possible explanation could be that the first group is more interested in how much money they are going to spend for energy consumption rather than its environmental impact, and the treatments are more effective in making this information easily available and understandable.

Table D5: Mixed logit models by environmental concern

	Ireland	UK	Canada	USA
A. CONCERNED ABOUT THE ENVIRONMENT				
Non-Random Parameters in Utility Function				
Constant (neither option)	1.9209	1.9707	1.2735	2.6740
	(1.8422)	(2.1897)	(1.8231)	(1.6723)
Price	-0.0029***	-0.0031***	-0.0025***	-0.0026***
	(0.0002)	(0.0002)	(0.0001)	(0.0002)
Stars	0.5221***	0.6042***	0.8373***	0.7843***
	(0.0533)	(0.0571)	(0.0527)	(0.0544)
Random Parameters in Utility Function				
Capacity	0.2410***	0.1133***	0.1650***	0.2424***
	(0.0327)	(0.0330)	(0.0336)	(0.0325)
Brand	-0.2633***	-0.2078**	-0.4121***	-0.1337*
	(0.0752)	(0.0822)	(0.0744)	(0.0756)
Energy efficiency	1.1475***	0.7177***	1.3710***	0.8563***
	(0.1172)	(0.1286)	(0.1248)	(0.1122)
EE $\times$ T1	-0.1831	-0.0161	-0.4124***	-0.1146
	(0.1654)	(0.1655)	(0.1599)	(0.1533)
EE $\times$ T2	-0.2406	0.1637	-0.3718**	-0.2275
	(0.1736)	(0.1753)	(0.1597)	(0.1487)
Model statistics				
Observations	10,992	10,872	11,952	11,928

Table D5 — continued

	Ireland	UK	Canada	USA
Clusters	458	453	498	497
B. NOT CONCERNED ABOT THE ENVIRONMENT				
Non-Random Parameters in Utility Function				
Constant (neither option)	-5.7161**	1.2830	2.6564	0.0196
	(2.7743)	(1.6268)	(2.3223)	(1.8580)
Price	-0.0038***	-0.0031***	-0.0027***	-0.0028***
	(0.0004)	(0.0003)	(0.0003)	(0.0003)
Stars	0.7259***	0.4424***	0.7503***	0.5897***
	(0.1228)	(0.0819)	(0.0956)	(0.0885)
Random Parameters in Utility Function				
Capacity	0.2008***	0.0959**	0.3183***	0.2159***
	(0.0669)	(0.0481)	(0.0606)	(0.0530)
Brand	-0.2560*	-0.2603**	-0.6579***	-0.1661
	(0.1550)	(0.1295)	(0.1278)	(0.1337)
Energy efficiency	0.5544***	0.2048	1.2165***	0.4375***
	(0.2130)	(0.1395)	(0.2210)	(0.1695)
EE $\times$ T1	0.5490*	0.1470	-0.0477	0.2897
	(0.3118)	(0.2000)	(0.2796)	(0.2266)
EE $\times$ T2	0.7490**	0.4169**	-0.1586	0.2802
	(0.3174)	(0.1790)	(0.2478)	(0.2500)
Model statistics				
Observations	2,928	4,848	3,264	3,816
Clusters	122	202	159	159

Notes. Panel A reports the results of mixed logit models for respondents who state to be concerned or extremely concerned about the environment. Panel B presents the results for those who are slightly concerned, not concerned or they don't know. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. All regressions control for income, gender, living area, whether the individual holds an degree, environmental concern, impatience, risk attitude and tumble dryer usage. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D6: Willingness to pay by environmental concern

	Ireland	UK	Canada	USA
A. CONCERNED ABOUT THE ENVIRONMENT				
Stars	181.34	196.37	329.39	295.96
	[144.75 ; 217.93]	[160.12 ; 232.61]	[283.94 ; 374.84]	[253.10 ; 338.81]
Capacity	82.45	36.82	64.92	92.57
	[59.93 ; 104.98]	[15.04 ; 58.60]	[38.98 ; 90.85]	[67.54 ; 117.59]
Brand	-91.96	-67.55	-162.13	-50.00
	[-141.32 ; -42.61]	[-119.52 ; -15.58]	[-218.93 ; -105.34]	[-105.73 ; 5.73]
EE	392.37	233.27	539.36	325.34
	[308.69 ; 476.05]	[150.19 ; 316.35]	[436.84 ; 641.87]	[241.18 ; 409.51]
EE $\times$ T1	-53.34	-5.24	-162.22	-44.69
	[-161.07 ; 54.40]	[-110.68 ; 100.21]	[-286.16 ; -38.27]	[-163.26 ; 73.87]
EE $\times$ T2	-79.80	53.19	-146.27	-85.02
	[-190.99 ; 31.38]	[-58.64 ; 165.02]	[-269.91 ; -22.63]	[-195.33 ; 25.30]
B. NOT CONCERNED ABOUT THE ENVIRONMENT				
Stars	190.18	141.50	276.69	208.73
	[132.49 ; 247.87]	[90.88 ; 192.12]	[199.64 ; 353.73]	[147.49 ; 269.98]
Capacity	52.61	30.66	117.37	76.44
	[16.58 ; 88.63]	[0.83 ; 60.50]	[69.27 ; 165.46]	[38.88 ; 113.99]
Brand	-67.06	-83.26	-242.62	-58.79
	[-144.71 ; 10.59]	[-163.01 ; -3.51]	[-329.68 ; -155.57]	[-151.14 ; 33.57]
EE	145.25	65.50	448.60	154.86
	[39.36 ; 251.14]	[-20.16 ; 151.16]	[285.00 ; 612.20]	[39.62 ; 270.10]
EE $\times$ T1	143.84	47.01	-17.59	102.57
	[-18.83 ; 306.51]	[-78.72 ; 172.73]	[-219.30 ; 184.13]	[-57.93 ; 263.06]
EE $\times$ T2	196.24	133.34	-58.49	99.17
	[26.74 ; 365.75]	[19.97 ; 246.72]	[-238.40 ; 121.42]	[-76.93 ; 275.27]

Notes. Panel A reports the WTP for respondents who state to be concerned or extremely concerned about the environment. Panel B presents the results for those who are slightly concerned, not concerned or they don't know. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. 95% confidence intervals in brackets.

D.4 Income

A final important factor to be taken into account is income, since making energy costs more explicit could benefit mostly income-constrained people. However, dividing respondents on the basis of their income — whether they live comfortably on their current income or not — does not provide a clear indication in this sense. The coefficients suggest that this seems to be the case only in the UK, where the personalised energy costs information increases utility and the WTP for energy efficiency. We also detect a positive impact of personalised energy costs in the Irish sample, but this is not significant. On the other hand, we find a negative effect for both subgroups in Canada, and no significant effect for either of them in the United States. This might indicate that if energy costs are relatively small, making them more explicit has a limited impact on the importance attached to energy efficiency, especially for people who are not in financial hardship; while more explicit information could benefits mainly less wealthy households if energy bills are a considerable proportion of their expenditures.

Table D7: Mixed logit models by income

	Ireland	UK	Canada	USA
A. LIVING COMFORTABLY ON CURRENT INCOME				
Non-Random Parameters in Utility Function				
Constant (neither option)	8.0536*	5.7640**	3.7666	1.5771
	(4.8066)	(2.4475)	(2.6573)	(2.0732)
Price	-0.0026***	-0.0028***	-0.0025***	-0.0023***
	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Stars	0.6529***	0.6075***	0.9551***	0.7904***
	(0.0906)	(0.0725)	(0.0678)	(0.0694)
Random Parameters in Utility Function				
Capacity	0.2424***	0.1443***	0.1907***	0.2207***
	(0.0532)	(0.0434)	(0.0436)	(0.0418)
Brand	-0.2912**	-0.3030***	-0.5775***	-0.1718*
	(0.1241)	(0.1082)	(0.0885)	(0.0955)
Energy efficiency	1.2609***	0.7366***	1.3391***	0.7343***
	(0.1928)	(0.1634)	(0.1567)	(0.1362)
EE $\times$ T1	-0.0685	-0.0544	-0.1615	-0.0933
	(0.3092)	(0.1981)	(0.2287)	(0.1787)
EE $\times$ T2	-0.4533*	-0.0942	-0.3462*	-0.2030

Table D7 — continued

	Ireland	UK	Canada	USA
	(0.2593)	(0.2303)	(0.1939)	(0.1764)
Model statistics				
Observations	4,008	6,408	6,840	7,008
Clusters	167	267	285	292
B. NOT LIVING COMFORTABLY ON CURRENT INCOME				
Non-Random Parameters in Utility Function				
Constant (neither option)	0.5798	0.7468	0.7873	2.5198**
	(1.5435)	(1.3352)	(1.5236)	(1.2553)
Price	-0.0033***	-0.0032***	-0.0027***	-0.0031***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Stars	0.5129***	0.5139***	0.7072***	0.6974***
	(0.0591)	(0.0617)	(0.0623)	(0.0635)
Random Parameters in Utility Function				
Capacity	0.2284***	0.0819**	0.2067***	0.2463***
	(0.0355)	(0.0343)	(0.0397)	(0.0371)
Brand	-0.2378***	-0.1566*	-0.3681***	-0.1077
	(0.0846)	(0.0895)	(0.0914)	(0.0904)
Energy efficiency	0.9117***	0.4428***	1.3314***	0.8021***
	(0.1170)	(0.1261)	(0.1474)	(0.1287)
EE $\times$ T1	0.0063	0.1049	-0.4211**	0.0036
	(0.1610)	(0.1731)	(0.1772)	(0.1828)
EE $\times$ T2	0.1338	0.4733***	-0.3350*	-0.0288
	(0.1721)	(0.1684)	(0.1803)	(0.1775)
Model statistics				
Observations	9,912	9,312	8,376	8,736
Clusters	413	388	364	364

Notes. Panel A reports the results of mixed logit models for respondents who state they live comfortably or very comfortably on current income. Panel B presents the results for those who are copying on current income, finding it difficult or very difficult to live in current income, or prefer not to say. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the "neither" option like all other attributes. Standard errors are clustered at the participant level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D8: Willingness to pay by income

	Ireland	UK	Canada	USA
A. LIVING COMFORTABLY ON CURRENT INCOME				
Stars	253.65	213.92	385.80	347.53
	[185.12 ; 322.18]	[162.96 ; 264.88]	[323.29 ; 448.32]	[280.10 ; 414.96]
Capacity	94.16	50.79	77.04	99.94
	[54.11 ; 134.20]	[19.84 ; 81.75]	[42.37 ; 111.71]	[62.07 ; 137.81]
Brand	-113.15	-106.70	-233.25	-77.30
	[-202.46 ; -23.85]	[-180.79 ; -32.62]	[-303.33 ; -163.16]	[-158.67 ; 4.08]
EE	489.87	259.37	540.90	324.69
	[317.70 ; 662.03]	[145.52 ; 373.22]	[400.91 ; 680.90]	[206.59 ; 442.78]
EE $\times$ T1	-26.61	-19.17	-65.25	-30.92
	[-262.91 ; 209.69]	[-155.86 ; 117.53]	[-246.39 ; 115.89]	[-182.26 ; 120.41]
EE $\times$ T2	-176.11	-33.18	-139.85	-91.85
	[-378.19 ; 25.97]	[-192.08 ; 125.72]	[-295.47 ; 15.78]	[-236.47 ; 52.77]
B. NOT LIVING COMFORTABLY ON CURRENT INCOME				
Stars	156.61	158.21	266.02	228.14
	[122.24 ; 190.99]	[122.00 ; 194.41]	[215.34 ; 316.70]	[187.44 ; 268.84]
Capacity	70.32	25.22	77.75	80.58
	[48.61 ; 92.03]	[4.39 ; 46.05]	[47.91 ; 107.60]	[56.29 ; 104.87]
Brand	-70.97	-48.20	-138.47	-35.23
	[-119.35 ; -22.60]	[-101.57 ; 5.17]	[-204.84 ; -72.09]	[-92.53 ; 22.08]
EE	278.27	136.33	500.83	262.40
	[208.17 ; 348.37]	[59.97 ; 212.70]	[392.01 ; 609.64]	[179.86 ; 344.93]
EE $\times$ T1	6.57	32.28	-158.39	1.19
	[-88.29 ; 101.43]	[-71.89 ; 136.46]	[-288.71 ; -28.08]	[-116.03 ; 118.41]
EE $\times$ T2	43.77	145.71	-126.03	-9.43
	[-60.02 ; 147.57]	[44.05 ; 247.38]	[-258.69 ; 6.63]	[-123.27 ; 104.41]

Notes. Panel A reports the results of mixed logit models for respondents who state they live comfortably or very comfortably on current income. Panel B presents the results for those who are copying on current income, finding it difficult or very difficult to live in current income, or prefer not to say. Energy efficiency is a dummy variable taking value 1 for the three highest levels of energy consumption (lower efficiency), and 2 for the three lowest levels of energy consumption (higher efficiency). It takes value 0 for the ″neither″ option like all other attributes. 95% confidence intervals in brackets.