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The effect of providing monetary information on energy savings for household appliances: a field trial in Spain

María del Mar Solà [a], Amaia de Ayala [a,b] and Ibon Galarraga [a,c]

Energy labels are one of the most widely used policies in the EU for increasing the energy efficiency of household appliances. However, their effectiveness in promoting energy-efficient purchases has sometimes been called into question. One of the reasons for this is that consumers may have difficulties in fully understanding the energy consumption information provided on labels (in kWh/year). Some authors argue that to avoid this problem energy consumption information should be converted into monetary information. We analyse whether providing monetary information on lifetime energy savings can significantly increase the purchase of energy-efficient appliances. To that end, a field experiment was carried out with small retailers in Spain. The experiment involved three types of appliances: washing machines, fridges and dishwashers. The impact of monetary information on actual purchases of appliances was tested in different ways: (i) by including a monetary label to display energy savings during the lifetime of the product; (ii) by the monetary information provided by the sales staff; and (iii) by combining (i) and (ii). We find that the effectiveness of providing monetary information depends on the appliance and the specific way in which the information is provided. For washing machines, providing monetary information through a monetary label seems effective in promoting the purchase of highly energy-efficient appliances. However, for fridges both monetary information provided by staff alone and the combination of the monetary label and information from sales staff seem to be effective in promoting purchases of A+++ fridges. Surprisingly, no effect is found for dishwashers.

Keywords: energy efficiency, monetary label, household appliances, EU energy efficiency label, field trial

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1. Introduction

The production and consumption of energy is the main source of the EU-28's GHG emissions from the household and industry sectors (Eurostat, 2018). In this context, one of the main targets and goals of EU energy policy is to increase the energy efficiency (EE) of energy-related products so as to reduce energy consumption (European Commission, 2008). Particularly, the EU seeks to achieve energy savings of at least 32.5 % in all sectors by 2030 under the Energy Efficiency Directive (2018/2002).

EE has been defined as the reduction of the energy used to provide a certain energy service or product, and it has become one of the principal instruments for reducing household energy consumption (Linares and Labandeira, 2010). Although EE can lead to several benefits such as cost reductions and decreases in carbon emissions, these are not always enough to boost investments in it. That is, even when EE may prove economically profitable for consumers, they may not always invest as much as seems rational (Jaffe et al., 2004; Linares and Labandeira, 2010; Gerarden et al., 2017). Among other reasons, this may be because consumers do not value present costs (benefits) and future costs (benefits) in the same way. In fact, consumers often fail to properly account for future costs (Train, 1985; Allcott and Wozny, 2013). This effect is known as the energy efficiency gap or the energy efficiency paradox, and refers to situations in which apparently beneficial investments are not made, and/or apparently non-beneficial ones are (Jaffe and Stavins, 1994).

Economic literature has considered several explanations for the EE gap. These can be grouped into three categories: (1) market failures (including informational failures); (2) behavioural failures; and (3) other personal factors. Market failures are considered to mean the inefficient distribution of goods and services in a free market, behavioural failures mean failures related to individuals (e.g. inattention) and other personal factors means other factors that cannot be classified under the first two headings (e.g. social norms).

Informational failures refer to situations in which a lack of or reduction in information could affect economic decisions. These include asymmetric and imperfect information (Davis and Metcalf, 2016; Phillips, 2012; Allcott and Sweeney, 2016), hidden and transaction costs (Sorrell et al., 2004; Ramos et al., 2015), myopia (Busse et al., 2013; Cohen et al., 2017; Gerarden et al., 2017) and uncertainty (Tversky and Kahneman, 1981; Greene, 2011; Ramos et al., 2015).

Imperfect information arises when the two parties (the seller and the consumer) do not have the same information or when they perceive the same information differently. Hidden and transaction costs represent the tendency of consumers to fail to perceive running costs or other costs associated with a specific product. Myopia arises when willingness to pay (WTP) for a product is not affected by changes in its future operating costs. Finally, uncertainty regarding future energy prices could also affect investments in EE.

Several policy instruments can be used to cope with the different failures. They are conventionally grouped under the following headings: command and control instruments (e.g. codes and standards), price instruments (e.g. taxes, subsidies and/or a combination of the two) and informational instruments (e.g. energy labels, smart meters and information feedback tools and energy audits).

In this paper we focus on energy labels as the most commonly used instrument for addressing informational failures and reducing the EE gap. They do so by highlighting the EE level and the energy consumption of a product (Banerjee and Solomon, 2003; Heinzle and Wüstenhagen, 2012; Lucas and Galarraga, 2015; Carroll et al., 2016). Energy labels often provide additional information such as water consumption or noise level. There are different EE labels for different product categories (e.g. cars,

household appliances, etc.) and they usually contain similar but differentiated information. In particular, the EE label for appliances shows the EE level of the product, the energy consumption per annum (kWh/year) and other technical attributes. For instance, along with EE level and energy consumption the label for washing machines also shows water consumption (in L), capacity (in kg), spin-cycle efficiency and noise level in the washing and spin cycles (in dB). In the case of cars however, the voluntary and comparative EE labels feature an A-G scale and additional information on running costs, annual tax costs, additional attributes of the car, etc.

Understanding the effectiveness of the EE label is crucial to successfully nudging consumers towards more energy-efficient products. Some authors have called into question the effectiveness of EE labels in recent years (Waechter et al., 2015, 2016; Stadelmann and Schubert, 2018). Several studies show a positive WTP for energy-efficient products (Galarraga et al., 2011, 2019), but others argue that consumers do not really properly understand the information displayed on labels (Waechter et al., 2016).

Some qualitative studies[1] show that consumers often misunderstand the energy consumption information displayed on EE labels (see examples of EU labels). In particular, when focus group participants were asked to suggest potential improvements in the EU EE label, one of their suggestions was for energy consumption information to be provided in monetary terms (as well as or instead of the physical unit of kWh/year). Participants argued that having information on the operating costs would help them to decide how much they were willing to pay for more energy-efficient appliances. Moreover, some focus group participants suggested that a reference point might be shown to enable energy consumption to be compared with a view to learning whether consumption was high or not.

Several studies have analysed how providing monetary information can help consumers to better understand EE related issues (e.g. energy consumption) but there is no clear consensus on this. Some studies show that providing monetary information may be helpful in encouraging the purchase of energy-efficient products (Kallbekken et al., 2013), but others find no significant impact (Carroll et al., 2016). In addition, the literature suggests that the effectiveness of monetary information could also change depending on the product category (Stadelmann and Schubert, 2018).

The study reported here seeks to analyse how providing monetary information on the energy efficiency of household appliances could encourage the purchase of the most energy-efficient options. This is done through a field experiment that provides information on energy savings at several retailers in Spain[2]. To that end, information on energy savings over the lifetime of a product was displayed in monetary terms (in euros) for 3 types of appliance: washing machines, fridges and dishwashers. The trial was conducted to analyse how effective providing such information may be in changing actual purchasing decisions at the point of sale. The information was displayed in three different formats: 1) using a monetary label (ML); 2) by having sales staff that provide it; and 3) via a combination of (1) and (2). Twenty-six small retailers[3] participated in the experiment. The trial was carried out in close collaboration with two chambers of commerce in Spain[4].

1 Results from Del 2.1 of the European project CONSEED (https://www.conseedproject.eu/conseed-focus-group-report)
2 Note that information could be provided on potential "energy savings" or "energy costs". Whether or not the resulting impact is different remains to be answered.
3 These were located at various stores around the Comunidad Autónoma Vasca (Autonomous Community of the Basque Country) and neighbouring regions belonging to the retailers Milar, Expert, Tien21 and others.
4 These were:

- Federación Mercantil de Gipuzkoa (FMG), http://www.fmg.es/ and
- Confederación Empresarial de Comercio de Bizkaia (CECOBI), http://www.cecobi.es/es/portada/.

The rest of the paper is structured as follows: Section 2 reviews EE labelling and the literature that analyses its effectiveness. Section 3 presents the design of the experiment, i.e. the recruitment process, the design of the 3 different treatments and the data collected. Section 4 reports the main findings and Section 5 sets out conclusions and policy recommendations.

2. Current energy efficiency labels and their effectiveness

2.1 European energy efficiency label

EE labels are information-based instruments used to let consumers know the EE level and annual energy consumption of a certain product. They may also show other technical characteristics such as noise level or water consumption, as per the EU Energy Labelling Directive (2010/30/EU).

Before 2010, EU labels classed the EE level of a product according to an A-G scale (with A as the most efficient level and G the least efficient). This scale was easy to understand for most (70–80 %) consumers (Consumer Focus, 2012) and many people took product energy ratings into account for white-line products (Heinzle and Wüstenhagen, 2010).

Due to technical and technological progress, this scale had to be updated and in 2010 a new directive was passed to change it. The EU Energy Labelling Directive (2010/30/EU) for household appliances required energy labels to be displayed on energy-related appliances at the point of sale with a scale that ranged from A+++ to D, in different colours (green for highly energy-efficient appliances and red for less efficient ones). However, after a few years with this complex scale, a new regulation was passed in January 2017 to restore the original A to G energy scale[5]. This regulation should be in force by 2021.

The EE label shows the EE level of an appliance, considering its energy consumption and many other factors such as capacity, water consumption and other technical attributes. Energy consumption information is currently displayed as the annual average in kWh. Depending on the product category, average energy consumption may be estimated differently. For example, for washing machines the average annual energy consumption is calculated during the control programme at 220 cycles per year (approx. 4 cycles per week)[6].

2.2 Effectiveness of EE labels

Both the information provided and the way in which it is provided are very important in enhancing the effectiveness of the energy label and promoting EE. Several factors are really crucial for the effectiveness of EE labels: the EE scale, the colours used on the label, whether the scale is horizontal or vertical, etc. (Waechter et al., 2016). All these factors could affect the perception of consumers towards EE labels and thus affect their reliance on and the effectiveness of the policy (Waechter et al., 2016).

Several studies have analysed potential improvements in EE labels to increase purchases with higher EE levels. There is a growing body of research on how to improve labels so as to influence consumers' choices (Noblet et al., 2006; Heinzle and Wüstenhagen, 2012; Waechter et al., 2015). In this context, it seems very important to understand the effectiveness of the EU labelling system and current awareness and understanding of it on the part of consumers (Tigchelaar et al., 2011; Waechter et al., 2015a, 2015b, 2016).

5 Existing labels are usually tested after five years to ensure their quality and effectiveness.

6 For example: Washing machine: 220 cycles per year and cotton programme (45º and 60º); Dishwasher: 280 cycles per year and standard programme (65º); Fridge: daily use.

Substantial research has been conducted into the best way to provide energy consumption information at the point of sale. Table 1 below presents a summary of some relevant papers that have tested the effectiveness of EE scales and monetary information in different formats. For instance, some of them test the effectiveness of the EU energy labelling scale and compare the two systems (the A to G and the A+++– D scales), with mixed results. Waechter et al. (2016) show that a short scale (A–C scale) could be more effective in terms of increasing EE awareness than the usual scale (A+++–D scale), removing the EE level categories no longer available on the market. In addition, A–G rated appliances seem to have a higher WTP than those rated with an A+++–D scale (Heinzle and Wüstenhagen, 2012). However, Waide and Watson (2013) find a higher WTP for more energy-efficient products using an A+++–D scale. These results show that consumers are willing to pay 40 € more for high-labelled refrigerators.

Another relevant piece of information is whether consumers fully understand the label. In this sense, Waechter et al. (2015) test the understanding of EE and the way in which information is plotted on the label. They show that consumers understand the concept of EE and are aware of the EE label and its scale. Despite that awareness, consumers do not always choose the most energy-efficient products as they do not pay enough attention to energy consumption.

London Economics (2014) reports an online experiment in several EU countries (Czech Republic, France, Italy, Norway, Poland, Romania and United Kingdom). In this study, different types of label (alphabetical closed scale, numerical closed scale, etc.) are tested. A benchmark that indicates the best available technology on the market is considered as a good reference point by consumers, and helps to promote EE. The same study suggests that the label scale is better understood when it is represented by letters. Moreover, no difference is found when comparing the effectiveness of A–G and A+++–D scales.

Another way of plotting EE is via numerical scales, but less research has been conducted on this option. Egan and Waide (2005) show that consumers in China and Tunisia generally understand scales of these types, though they are less understandable than alphabetical scales.

Energy consumption is currently displayed as average annual energy consumption (kWh/year), and some studies point out that for appliances providing running-cost information (in euros) could improve label effectiveness (Deutsch, 2010; Kallbekken et al., 2013; Allcott and Taubinsky, 2015; Carroll et al., 2016; Stadelmann and Schubert, 2018).

For example, Kallbekken et al. (2013) run a field experiment with two product categories (fridge-freezers and tumble driers) to test the role of providing monetary energy cost information through labels and through training staff to provide monetary information. Their results show a decrease in the average energy use of tumble driers sold of 4.9 % for the combined treatment and 3.4 % for the staff training treatment. A similar field experiment is carried out by Allcott and Sweeney (2016), who find that information and sales incentives need to be treated jointly in order to influence purchases by consumers. Similarly, Carroll et al. (2016) run a field experiment with a 5-year energy consumption cost label for tumble driers, but find no statistically significant effects.

Stadelmann and Schubert (2018) run a field experiment to compare the effectiveness of labels in different scenarios (no label, EU Energy label and monetary energy label based on annual energy consumption) for freezers, tumble driers and vacuum cleaners. They find that the presence of either label increases sales of efficient appliances. Moreover, when these labels are used the average energy

consumption[7] for tumble driers and vacuum cleaners decreases significantly, but for freezers, there is no significant change, apparently due to unawareness of the new monetary energy label.

Heinzle and Wüstenhagen (2012) conduct a discrete choice experiment and find that consumers will pay a higher price premium for televisions when ten-year monetary costs are displayed but a lower premium when one-year cost information is displayed (compared to non-monetary EE information). Using an online field experiment for washing machines, Deutsch (2010) finds a small but significant reduction in energy use (0.8 %) when consumers receive additional information on life cycle cost. In the UK, DECC (2014) finds a reduction of 0.7 % in the average annual energy consumption[8] of washer-dryers sold when lifetime energy cost information is given to customers. However, Min et al. (2014) show that providing estimated annual energy costs has no effect on consumers' decision making for the purchase of lightbulbs. Similarly, Allcott and Knittel (2019) find that running cost information has no effect on car purchases in the US.

Finally, Bull (2012) carries out a stated preference survey to test what additional information is most effective for investment in EE. They find that information about running costs and emissions increases WTP and that lifetime running cost information is more effective than per annum information.

Table 1: Summary of literature on EU energy label effectiveness for household appliances

Articles	Information related to energy consumption	Effectiveness of the energy scale	Other
Allcott and Knittel (2017)	Annual cost information		
Allcott and Sweeney (2016)			Annual savings information vs. rebates
Allcott and Taubinsky (2015)	Cost savings information		
Asensio and Delmas (2016)			Year cost/savings information vs. health information
Bull (2012)			Information on losses avoided
Carroll et al. (2016a)	5-year energy cost information		
Deutsch (2010)	Life cycle cost information		
Heinzle and Wüstenhagen (2012)		A^{+++}-A scale vs. A-D scale	
Kallbekken et al. (2013)	Lifetime energy cost information		
Min et al. (2014)	Annual operating cost information		
Noblet et al. (2006)			
Schubert (2017)	Cost and savings information		
Stadelmann and Schubert (2018)	Cost and savings information		
Waechter et al. (2015a)		EE scale vs. energy consumption	

7 This is the energy consumption that appears on the EU EE label.
8 This is the energy consumption that appears on the EU EE label.

3. Methodology

A field trial was conducted between February and July 2018 in cooperation with 26 small retailers in Spain to test the effectiveness of providing monetary energy savings information at the point of sale. The retailers were drawn from different Spanish autonomous regions: the Autonomous Community of the Basque Country, the Regional Community of Navarre, Cantabria and Aragón. The appliances studied were washing machines, dishwashers and fridges.

The design of the experiment consisted of three sequential treatments in some stores and business as usual in the control stores (Table 2). The three treatments were: (i) adding an ML with lifetime energy savings (LES) information to the existing EE label[9]; (ii) training the sales staff who provided the monetary information (but removing the ML); and (iii) combining the ML with staff training. The three treatments were then compared to understand which might be the best strategy for effectively promoting the purchasing of energy-efficient appliances in Spain. Each treatment is explained more in detail in the Subsections 3.2–3.4 below.

The suitability of these treatments was determined following earlier studies by Kallbekken et al. (2013) and Carroll et al. (2016). Additional qualitative research conducted under the aforementioned CONSEED project also helped to effectively design the treatments. The qualitative studies revealed the providing of detailed explanations by sales staff as a significant factor. In particular, the specific results for Spain showed that consumers may be aware of the existence of EE labels but do not fully understand or trust the information provided by them. More specifically, focus group participants stated that they tended to rely more on the information and advice provided by sales staff.

Table 2: Description of treatments

Treatment group (N=14)	Description	Period
Treatment 1	ML showing *LES* in euros	5th February – 4th April 2018
Treatment 2	Training of sales staff	5th April – 3rd June 2018
Treatment 3	Additional energy savings label + training of sales staff	4th June – 31st July 2018

3.1 Recruitment of participants

Retailers were recruited through two chambers of commerce and business federations: (1) the "Federación Mercantil de Gipuzkoa (FMG)" located in the province of Gipuzkoa; and (2) the "Confederación Empresarial de Comercios de Bizkaia (CECOBI)". These are non-profit associations set up to defend the interests of companies and small retailers and act as lobby groups with the public administration.

Once the organisations had been contacted, a kick-off meeting with FMG was held in July 2017 to explain the main objectives of the study and collect feedback. A second meeting was held with FMG in October 2017 to share full details of the experiment (e.g. the different designs of the proposed ML & the timeline of the field trial). FMG then conveyed this information to all the small retailers in their network and recruited volunteer stores in Gipuzkoa to participate in the field trial.

CECOBI was also contacted to provide support in managing and engaging with retailers. A kick-off meeting was held in October 2017 in which all the details of the field trial were explained.

9 The European EE label must be affixed at a visible point on all household appliances in physical stores.

CECOBI provided access to potential volunteer stores in the Autonomous Community of the Basque Country, the Regional Community of Navarre, Cantabria and Aragón, four of Spain's 17 autonomous regions.

Each participating retailer was visited in November 2017 for a face-to-face meeting to explain the field trial design in detail and respond to any questions or issues. Engaging with retailers proved crucial for the success of the field trial because it enabled us both to build the necessary trust and to improve the design of the trial.

The small retailers were assigned to each group based on their geographical location (provinces), the size of cities (small, medium and large) and their sales volumes. As a result, 12 retailers were assigned to the control group and 14 to the treatment group. Note that treatments were implemented simultaneously in all treatment stores.

In January 2018, we contacted all the retailers to explain their role in the field trial, the timeline and the tasks to be undertaken during the experiment.

3.2 Adding a monetary label (treatment one)

The first treatment started on February 5th and ended on April 4th. Table 2 gives a description and the timeline of each treatment in the experiment. This consisted of placing an ML close to the mandatory EE energy label10 (e.g. Figure 1). This ML showed the LES in monetary terms (in euros) for each specific appliance (see Figure 2). Consumers thus had information on the energy consumption of the appliance as well as on likely energy savings in monetary terms. The savings for each appliance were calculated in comparison to the similar appliance with the highest annual energy consumption (see Subsection 3.2.1 for more details). It is important to note that sales staff did not receive any specific training and were not required to highlight the information displayed on the label. That is, they were instructed to behave just as they did before the ML was available.

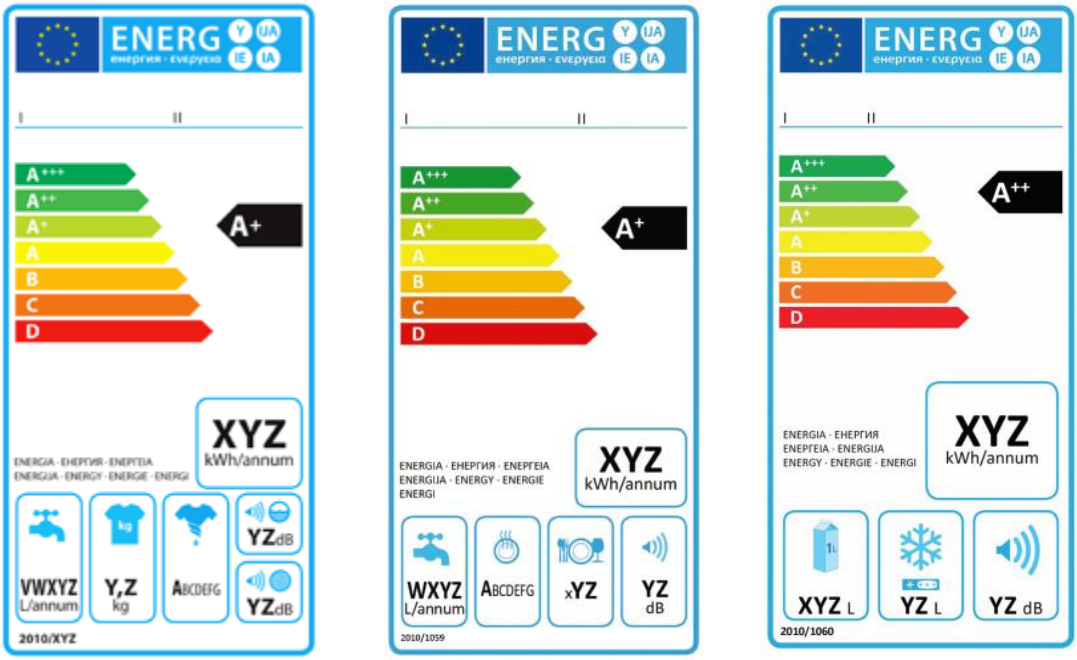

Figure 1: EU EE labels for washing machines, dishwashers and fridges

10 The European EE label must be affixed at a visible point on all household appliances in physical stores.

3.2.1. Design of the monetary label

Following advice from FMG, preference was given to information on *energy savings* rather than information on *energy costs*. The main reason for this was that small retailers preferred energy savings information to motivate sales with positive messages and to avoid any possible confusion with other cost concepts such as the price of the appliance.

On that basis, the ML shown in Figure 2 was designed for each appliance to be used in the field trial.

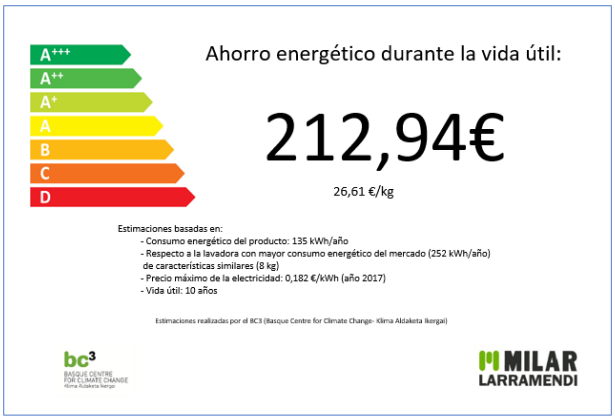

Figure 2: ML used in the field trial (example for a washing machine with an energy consumption of 135 kWh/year)[11]

3.2.2. Estimation of lifetime energy savings

One of the main challenges was calculating the LES. First, we created a database with all the stock available at each of the retailers (fridges, washing-machines and dishwashers) taking part, specifying types of appliance, EE levels, energy consumption and other technical attributes.

Based on that database, the following formula was used to estimate the LES following Stadelmann and Schubert (2018):

$$LES = (MEC - EC) * ep_{2017} * L,$$

where MEC is the maximum energy consumption for that product category, EC is the energy consumption of a specific product, ep_{2017} is the maximum energy price in 2017 and L is the lifetime of the product.

Thus, we estimated the MEC for each product category with similar characteristics. For example, to estimate the LES of an 8 kg washing machine, the MEC chosen was the maximum energy consumption of an 8 kg washing machine.

11 English translation: "Lifetime energy savings: €212,94. Estimations based on: (i) energy consumption of the product: 135kWh/year; (ii) highest energy consumption for a washing machine in this product category (8 kg): 252 kWh/year; (iii) maximum electricity price (2017): €0.182/kWh; and (iv) lifetime: 10 years".

An important issue when estimating the LES is the energy price considered. Here, we considered the maximum energy price recorded in Spain in 2017[12]. For product lifetime, suggestions made at our meetings with small retailers and experts led us to use a figure of 10 years for appliances, as this seems to be the average in Spain[13].

The colour scale from the official European EE label was maintained to link the current EU EE label with the additional energy savings label proposed (left-hand side of the ML in Figure 2). To increase trust in the information provided, the logos of the research centre leading the experiment (BC3) and the various retailers taking part were shown at the bottom of the label. This was a way of demonstrating that the calculations and information provided were officially backed by a research organisation. In no case were consumers informed that the labels were part of a field experiment or research project, so as not to bias the decision-making process.

3.3 Sales staff provide monetary information (treatment two)

The second treatment ran from April 5th until June 3rd (Table 2). In this treatment the sales staff provided potential consumers with information related to energy savings for each appliance under study. The aim was to gain an understanding of the role of sales staff in guiding and nudging consumers' purchasing decisions towards more energy-efficient appliances. Staff training was designed to teach several aspects of EE in regard to the products under study, including the main concepts, and general knowledge of EE (e.g. why EE is important)[14]. Other points taught included how EE levels are calculated and the assumptions[15] under which the energy consumption of a product is calculated.

The sales staff were familiarised with how LES is estimated under each product category. It is important to note that during this treatment the ML was not visible, i.e. information on the ML was provided solely by the (trained) sales staff.

3.4 Combination of ML with information from sales staff (treatment three)

The third treatment began on June 4th and ended on July 31st, as shown in Table 2. It consisted of a combination of the two previous treatments: explanations from sales staff (based on the training received) and the ML.

During this treatment, the retailers taking part were provided with the ML, and BC3 researchers contacted them regularly by telephone to ensure that they were providing the LES information adequately.

3.5 Data

The retailers provided us with the following information: date of sale, type of appliance sold, model of the product, price of the product and whether there was any discount on the product at the time. We supplemented these data with some technical attributes of each appliance using information from our database (e.g. capacity of the product, water consumption).

12 Red Eléctrica Española publishes all the data for PVPC (Precio Voluntario para el Pequeño Consumidor – Voluntary Price for Small-scale Consumers) on the Spanish market on this website: https://www.esios.ree.es/es/pvpc. We chose the highest energy price recorded because it was closer to the real price that consumers were paying.

13 https://www.ocu.org/electrodomesticos/frigorificos/noticias/electrodomesticos-marcas-mas-duraderas

14 See Appendix 2 for more details of the training.

15 In order to measure the energy consumption of an appliance, some baseline assumptions were made. In the case of the three products under study, the assumptions were: Washing machine: 220 cycles per year and cotton programme (45º and 60º); Dishwasher: 280 cycles per year and standard programme (65º); Fridge: 24/7 use.

Short surveys were also designed to obtain key socio-demographic information on the people buying the appliances in question. These included questions on gender, home post code and age range (see Figure A1 in Appendix A).

Customers' post codes enabled us to use the data on income per capita at municipality level provided by the regional statistics offices[16] . In the case of large cities, different post codes enabled different income per capita information to be collected[17]. Table 3 below summarises the data collected.

Table 3: Sources and data collected

Data collected	Source
Date of sale	Small retailer
Place of sale	Small retailer
Type of appliance sold	Small retailer or internal database*
Brand of the appliance sold	Small retailer or internal database
Model of the appliance sold	Small retailer
EE level of the appliance sold	Internal database
Energy consumption of the appliance sold	Internal database
Specific and technical attributes of the appliance sold	Internal database
Price of the product sold	Small retailer
Discount on the product sold	Small retailer
Socio-demographics: • Gender • Age range • Post code	Small retailer

* The internal database includes information on types of appliance, EE levels, energy consumption & technical attributes of appliances

4. Model specification

We use binary response models to analyse the data, so that the dependent variable takes only the value of zero or one. The specification of such models is the following:

Assume that $y^*$is a latent variable which follows $y^* = X\beta + e$, where X is the $1 \times K$ vector, β is a $K \times 1$ vector of parameters, e is independent of X and $e \sim$ Normal (0,1).

However, instead of observing y^*, only a binary variable indicating the sign of y^* is observed:

$$y = \begin{cases} 1 & if\ y^* > 0 \\ 0 & if\ y^* \leq 0 \end{cases} \qquad (1)$$

16 Income information on each municipality is available from the following sources: Instituto Aragonés de Estadística (IAEST, https://www.aragon.es/organismos/departamento-de-economia-planificacion-y-empleo/direccion-general-de-economia/instituto-aragones-de-estadistica-iaest-) for the regional community of Aragón; Instituto de Estadística de Navarra (NASTAT, https://www.navarra.es/home_es/Gobierno+de+Navarra/Organigrama/Los+departamentos/Economia+y+Hacienda/Organigrama/Estructura+Organica/Instituto+Estadistica/) for the Regional Community of Navarre; Instituto Cántabro de Estadística (ICANE, https://www.icane.es/) for the Cantabria región; and Instituto Vasco de la Estadística (EUSTAT, https://www.eustat.eus/indice.html) for the Autonomous Community of the Basque Country.

17 Income per post code is only available for large cities.

In binary response models, the interest lies in the response probability:

$$P(y = 1 \mid X) = P(y^* > 0 \mid X) = P(e > -X\beta \mid X) = 1 - G(-X\beta) = G(X\beta) \equiv p(x)$$

where G is the cumulative distribution function of a standard normal density function (called a Probit model). G can also be the cumulative distribution of a logistic function (a Logit model).

For this study, the probit model can be expressed as $P(y = 1 \mid X)$, where y is the EE level (=1, if A+++) and X contains explanatory variables referring to how monetary information is provided (Treatment 1 = Energy savings information through the ML; Treatment 2 = Energy savings information via sales staff; and Treatment 3 = energy savings information through a combination of the ML and sales staff) plus the attributes of the appliances (e.g. size, type of embedding and water consumption) and socio-economic characteristics (e.g. income):

$$P(y = 1 \mid X) = \beta_1 + \beta_2 Trat1 + \beta_3 Trat2 + \beta_4 Trat3 + \beta_5 Attributes + \beta_6 Socioeconomics + e \quad (2)$$

Tables 4 to 6 present the marginal effects of the explanatory variables on the probability of consumers purchasing an appliance labelled with high EE, i.e. A+++. The choice of the dependent variable is based on the percentage of appliances sold per EE level during the experiment period, as plotted in Figure 3. For the case of washing machines, most sales were A+++, while for fridges and dishwashers, most were A++. Given that the objective of this study is to successfully nudge consumers towards high energy-efficient products, we seek to determine whether the treatments are effective in increasing the adoption of EE. In other words, we want to see whether the monetary information received can nudge purchasers towards A+++ choices (for more details see Figure A2 in Annex A).

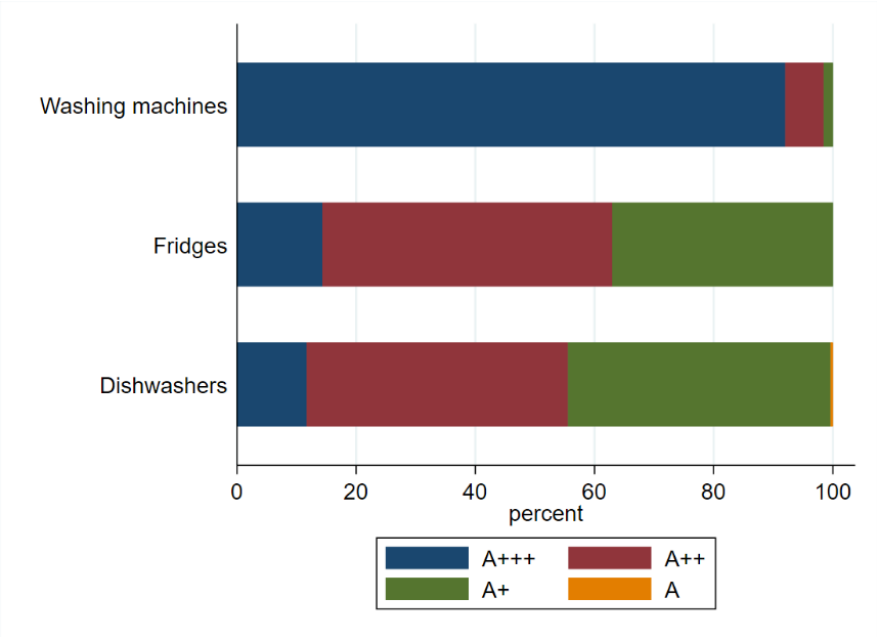

Figure 3: Percentage of appliances sold per EE level during the experiment in the control and treatment stores

Finally, our prior expectations are that (i) treatment 3 (combined treatment) will be the most effective; (ii) washing machines and dishwashers will have similar results; and (iii) the effect of treatments for fridges will be more substantial than for washing machines and dishwashers.

5. Results

5.1 Washing machines

The results for washing machines are displayed in Table 4. They show that Treatment 1 (the ML) is effective in terms of promoting the purchase of high energy-efficient, A^{+++} washing machines. That is, the presence of the ML seems to increase the probability of buying an A^{+++} washing machine by 3.16 % compared to the control group (no intervention). Moreover, the results for washing machines show that not just the type of embedding but also the capacity (kg) of washing machines is statistically significant. These attributes are determinant in deciding whether to purchase A^{+++} washing machines. The effects of capacity and the type of embedding are positive, which means that the probability of buying an A^{+++} increases. By contrast, water consumption has a negative effect. This means that the greater its water consumption, the less likely it becomes that an energy-efficient washing machine will be purchased. At this point, it is important to remember that the EE level of a specific washing machine takes into account not only its energy consumption but also other attributes such as water consumption.

Regarding the interaction between different variables, Table 4 shows that when Treatment 1 is combined with price, the resulting variable is statistically significant and negative. This may indicate that in the presence of Treatment 1 (the ML), the price may reduce the probability of consumers buying a high energy-efficient (A+++) washing machine. That is, the higher the price the smaller the probability of investing in an A+++ when the additional energy savings label is displayed (Treatment 1).

Table 4 shows another statistically significant interacted variable: Treatment 3 and Income. In this case the resulting variable has a positive effect in terms of increasing the probability of buying an A+++ washing machine. That is, when Treatment 3 is applied (the combination of the ML and information from sales staff), the higher their income is, the more likely consumers are to buy an A+++ washing machine. Even if this effect is small, income seems to determine whether people invest in energy-efficient washing machines.

One of the main questions raised by these findings is why the price variable alone is not statistically significant. In order to better understand this, we ran some additional tests in which we decided to change the reference variable in the probit model. As shown in the main model for washing machines (Table 4), our reference was the control group (i.e. no intervention). A look at Treatment 2, i.e. intervention of sales staff as the reference, reveals that the price variable has a positive sign and is statistically significant (full details are shown in Table A3). This can be interpreted as follows: when Treatment 2 is considered as the reference, price seems to increase the probability of purchasing an A+++ washing machine (the higher the price is, the greater the probability of buying high energy-efficient washing machines is).

5.2 Fridges

The results of the probit model are shown in Table 5 below. Treatment 2 (intervention of sales staff) and Treatment 3 (intervention of sales staff combined with the ML) both seem to be statistically significant and positive. That is, when sales staff provide monetary information to potential buyers the probability of investing in high energy-efficient fridges (A^{+++}) increases. Similarly, the results show that Treatment 3 (intervention of sales staff combined with the ML) is also effective in terms of promoting the purchase of high energy-efficient fridges. These findings suggest that both Treatment 2 and Treatment 3 increase the probability of buying A^{+++} fridges with respect to the control group (no intervention, business as usual). In addition, note that Treatment 2 seems to be more effective than Treatment 3 (by 11.5 %). This finding may be counter-intuitive, i.e. the opposite might be expected (i.e. that Treatment 3 would be more effective than Treatment 2). One possible explanation for this may be

the so-called "tiredness effect". That is, as earlier explained, stores were regularly reminded by telephone of how they should inform consumers about LES. The experiment ran for six months, so it could be argued that small retailers may have tired of interacting in the way suggested by the research design.

The analysis of the probit model shown in Table 5 reveals that some attributes of fridges are statistically significant. The volume of fridges (in L) and their price (in euros) are both expected to have a positive impact, i.e. the greater the volume of a fridge the more likely consumers are to buy a high energy-efficient fridge (A+++), and the higher its price is, the more likely consumers are to buy an A+++ fridge (by 0.3 %). This is in line with descriptive statistics: the average price of A+++ fridges is 956.52 € while the average price for A++ is 704.81 € (see Table A2 for more details of the average prices for each product category).

In addition, note that people aged between 30 and 45 tend to invest less in high energy-efficient fridges. One possible explanation for this is that people in this age range may, in general, be expanding their families and may therefore have less income available to invest in A+++ fridges, which are on average 251.71 € more expensive than A++ fridges. This could help explain the EE gap.

5.3 Dishwashers

None of the treatments seems to be effective in promoting the purchase of high energy-efficient dishwashers, contrary to initial expectations, under which Treatment 3 was expected to be the most effective. The first explanation for why no treatment is found to be statistically significant may be that consumers are not so worried about EE in the case of dishwashers as they are for fridges and washing machines. This makes sense if the way in which each appliance is generally used is taken into account. A second explanation may be that not all households have dishwashers at home, so some households do not consider them to be a necessary appliance. In fact, the number of dishwashers purchased during the field trial is significantly lower than the numbers of washing machines and fridges.

Table 6 shows that some attributes of dishwashers are significant, e.g. width (450 mm or 600 mm) and the number of services that they can provide. These variables have a positive sign, i.e. the more services it provides, the more likely people are to buy a high energy-efficient dishwasher.

A surprising result is that price is not statistically significant in this model despite a substantial difference between the average price of A+++ and A++ dishwashers (705.71 € for A+++ and 483.24 € for A++). As in the case of washing machines, we tested whether the reference point of the model could have an impact on this variable. In particular, if Treatment 3 is taken as the reference price becomes statistically significant, with a positive sign (see Table A4).

The interacted variable of Treatment 3 combined with price also has a positive impact. This means that the price during Treatment 3 (the combination of the additional energy savings label and information from sales staff) has a positive impact on the probability of buying an A+++ dishwasher. In other words, the higher the price during treatment 3, the more likely people are to buy an A+++ dishwasher. This may indicate that high-efficiency appliances are usually the most expensive ones. For the other significant interacted variable (Treatment 3 x Income) we find a negative sign, i.e. the higher the income of consumers is, the more likely they are to buy an A+++ dishwasher. Moreover, if the buyer is over 60 years old the probability of buying a high energy-efficient dishwasher seems to decrease. It is not rare to find this "age" effect, under which older people (especially those beyond a certain age) may tend to invest less in EE. Age could play a significant role in deciding whether to invest in EE or not, maybe because older buyers are less certain that they will recover their initial investment.

Table 4: Marginal effects for washing machines

Washing machines	
VARIABLES	**Marginal effects**
Treatments	
Control	--Ref--
Treatment 1 (=1 if the sale is under treatment 1)	0.0316* (0.0166)
Treatment 2 (=1 if the sale is under treatment 2)	-0.0985 (0.136)
Treatment 3 (=1 if the sale is under treatment 3)	-0.489 (0.303)
Attributes	
Capacity (kg)	0.0349*** (0.00763)
Type of embedding (=1 if free installation)	0.145*** (0.0381)
Water consumption (L)	-2.82e-05*** (6.19e-06)
Price	3.92e-05 (3.06e-05)
Treatment 1 * Price	-7.35e-05* (4.30e-05)
Treatment 2 * Price	3.23e-05 (4.30e-05)
Treatment 3 * Price	2.14e-05 (4.65e-05)
Socio-economic factors	
Income (€)	-5.16e-07 (3.46e-06)
Income^2 (€)	0 (8.31e-11)
Treatment 1 * Income	-1.09e-06 (1.82e-06)
Treatment 2 * Income	1.29e-06 (1.49e-06)
Treatment 3 * Income	3.99e-06** (1.69e-06)
Number of observations = 1,350 LR chi2(14) = 195.03 Prob > chi2 = 0.0000 Log likelihood = -200.57817 Pseudo R^2 = 0.3271	

Table 5: Marginal effects for fridges

Fridges	
VARIABLES	**Marginal effects**
Treatments	
Control	--Ref--
Treatment 1 (=1 if the sale is under treatment 1)	0.0998 (0.149)
Treatment 2 (=1 if the sale is under treatment 2)	0.486** (0.204)
Treatment 3 (=1 if the sale is under treatment 3)	0.371* (0.208)
Attributes	
Capacity- Volume of the fridge (L)	0.00184*** (0.000334)
Capacity- Volume of the freezer (L)	0.000671 (0.000776)
Price	0.000316*** (7.40e-05)
Treatment 1 * Price	-7.57e-05 (9.35e-05)
Treatment 2 * Price	-0.000245*** (8.15e-05)
Treatment 3 * Price	-0.000195** (9.10e-05)
Socio-economic factors	
Income (€)	1.11e-05 (1.46e-05)
Income^2 (€)	-3.01e-10 (3.33e-10)
Small city (=1 if the sale occurred in a small city)	-0.0197 (0.0269)
Big city (=1 if the sale occurred in a big city)	0.0294 (0.0181)
Age under 30 (=1 if the consumer is less than 30 years old)	0.0155 (0.0672)
Age 30 - 45 (=1 if the consumer is between 30 and 45 years old)	-0.0252* (0.0153)
Age over 60 (=1 if the consumer is more than 60 years old)	-0.0241 (0.0162)
Number of observations = 827 LR chi2(15) = 257.88 Prob > chi2 = 0.0000 Log likelihood = -211.76056 Pseudo R^2 = 0.3785	

Table 6: Marginal effects for dishwashers

Dishwashers	
VARIABLES	**Marginal effects**
Treatments	
Control	--Ref--
Treatment 1 (=1 if the sale is under treatment 1)	-0.651 (0.574)
Treatment 2 (=1 if the sale is under treatment 2)	-0.333 (0.854)
Treatment 3 (=1 if the sale is under treatment 3)	0.212 (0.425)
Attributes	
Size (=1 if the size is 600 mm)	0.548** (0.251)
Number of services	0.149** (0.0652)
Water consumption (L)	-0.00191*** (0.000233)
Price (€)	0.000350 (0.000521)
Treatment 1 * Price	0.00109 (0.00105)
Treatment 2 * Price	0.000286 (0.000883)
Treatment 3 * Price	0.00141* (0.000823)
Socio-economic factors	
Small city (=1 if the sale occurred in a small city)	0.0540 (0.128)
Big city (=1 if the sale occurred in a big city)	-0.0239 (0.0936)
Income (€)	-5.75e-06 (6.05e-05)
Income ^{2} (€)	1.69e-10 (1.33e-09)
Treatment 1 * Income	1.69e-06 (2.76e-05)
Treatment 2 * Income	8.07e-06 (2.80e-05)
Treatment 3 * Income	-4.47e-05* (2.43e-05)
Age under 30 (=1 if the consumer is less than 30 years old)	-0.0102 (0.377)
Age 30 - 45 (=1 if the consumer is between 30 and 45 years old)	-0.116 (0.113)
Age over 60 (=1 if the consumer is more than 60 years old)	-0.173* (0.101)
Number of observations = 421 LR chi2(19) = 409.59 Prob > chi2 = 0.0000 Log likelihood = -81.001876 Pseudo R^2 = 0.7166	

6. Discussion and Conclusions

Increasing the adoption of energy-efficient technologies is one the major challenges in the coming years if EU EE targets are to be met. Providing consumers with monetary information on energy savings from EE has been proposed in order to increase the purchase of energy-efficient appliances. However, some studies have shown discrepancies as to the effectiveness of these MLs.

This paper seeks to use behavioural economics to analyse the effectiveness of providing monetary information to consumers so as to promote the purchase of energy-efficient appliances. To that end a field trial was carried out with 26 small retailers in Spain for three different appliances: washing machines, fridges and dishwashers. Monetary information in the form of an ML was provided in addition to the existing EE label.

Three different treatments were tested. The first consisted of providing monetary information via an ML. During this treatment, consumers had access to monetary information only through the ML and sales staff were required not to give any such information. By contrast, the second treatment consisted of training sales staff to provide monetary information but not providing an ML. That is, consumers received monetary information only from sales staff. Finally, the two treatments were combined so that there was an ML and information was also given by sales staff.

Our findings suggest that for washing machines the ML (Treatment 1) may be effective in promoting the purchase of high energy-efficiency (A+++) products. However, when the label is combined with information from sales staff (Treatment 3) it is no longer effective. This seems to be a counter intuitive result. Possible explanations may include a "tiredness effect" on the part of sales staff in the last few months of the field trial. Moreover, sales staff may have had little incentive to encourage people to purchase A+++ washing machines, as most washing machines available at most of the retailers were already A+++.

Different results were obtained for fridges. Both Treatment 2 and Treatment 3 were found to increase the probability of buying a high energy-efficient (A+++) fridge compared to the control group. Moreover, Treatment 2 (intervention of sales staff) seems to have been more effective than Treatment 3 (combination of intervention of sales staff and ML). This may also reflect the "tiredness effect" mentioned above. Another interesting result in the case of fridges is a negative effect for the 30–45 age bracket. This suggests that people in this age range may be less inclined to invest in high energy-efficient fridges. One possible explanation may be related to socio-demographic factors in Spain: people of this age may have families and other responsibilities which leave them with less disposable income to invest in EE. This explanation however remains to be proven by further research.

None of the treatments seemed to be effective in promoting the purchase of energy-efficient dishwashers. This is also a rather surprising result. Initially, consumers might be expected to behave similarly when purchasing washing machines and dishwashers, but that is not what our study (or field experiment) showed. One possible explanation is that washing machines are considered as a primary appliance in households but dishwashers may not be considered so necessary. In fact, during the field experiment three times more washing machines were sold (N=1350) than dishwashers (N=421). Conversations with sales staff led us to infer that people care more about the EE level of fridges because they are connected 24–7. However, in the case of dishwashers, consumers may pay more attention to other technical attributes such as the duration of the quick programme or water consumption.

Overall, the results of this study show that the effectiveness of providing monetary information may depend greatly on the product category and on the way in which that information is provided. This is a very interesting finding that might explain why some earlier studies have found

positive effects while others have not. In the case of Spain in particular, information provided by sales staff and ML may be effective in the case of fridges while the ML alone is effective for washing machines.

These findings offer some evidence to suggest that providing monetary information can be useful in promoting the purchase of high energy-efficient (A+++) appliances, especially for washing machines and fridges. More research is needed to reach a clear consensus on the effectiveness of monetary information in successfully nudging consumers towards energy-efficient appliances. Earlier studies have shown, for instance, that lifetime energy cost information may be effective for some appliances (e.g. tumble driers) but not for others (e.g. fridges). Other studies show that this information can have a negative effect in the case of vacuum cleaners. More interestingly, there seem to be substantial differences from country to country: energy cost information is effective for tumble driers in Norway, but it does not seem to be so in Ireland. What information is displayed may also play a relevant role. For example, showing monetary information in terms of energy savings may have a different effect from showing it in terms of energy costs. The lifetime considered can also play an important role: some studies show no conclusive results for 5-year energy cost information but others show relevant effects for lifetime (10 or more years) energy cost information. Further research is needed to better understand the effects of all these factors. Finally, it could also be useful to understand the preferences of households regarding different types of appliance and how necessary they consider each one.

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Annex A

Store: _____

Date: _____

Type of appliance:

- ☐ Washing machine
- ☐ Fridge
- ☐ Dishwasher

Model: _____

1. Post code of your habitual residence: _ _ _ _ _ _
2. Gender:
   - ☐ Male
   - ☐ Female
3. Select your age range:
   - ☐ 18-30 years
   - ☐ 31- 45 years
   - ☐ 45- 60 years
   - ☐ More than 60 years

Figure A1: Short questionnaire used for consumers in the household appliances field trial (English version)

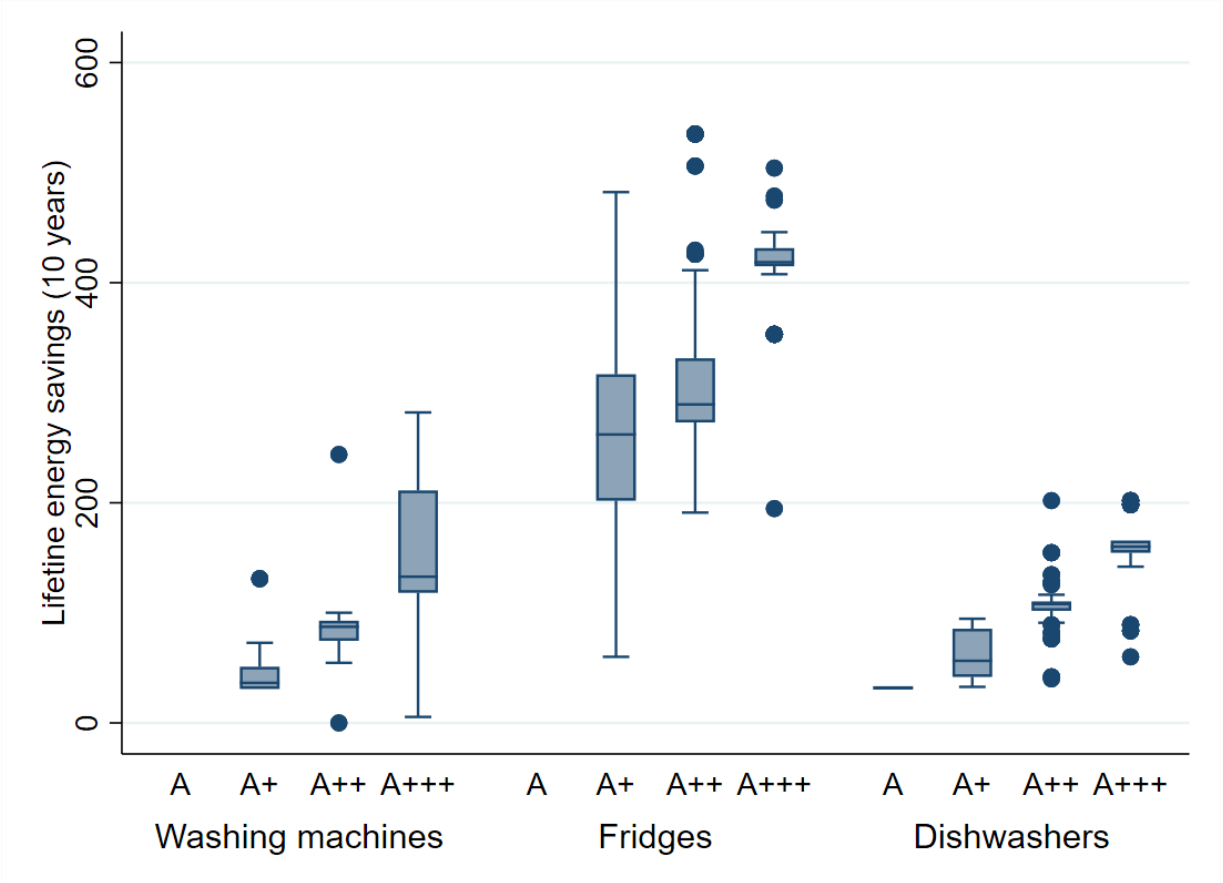

Figure A2: Distribution of the household appliances sold during the field trial

Table A1: Descriptive statistics

Washing machines	**Number of observations**	**Mean**	**Standard deviation**	**Min**	**Max**
Energy savings (€)	1599	149.965	52.13268	0	282.1
Efficiency (=1 if the appliance is A^{+++})	1599	.91995	.2714555	0	1
Price (€)	1479	460.7262	180.7984	186	1508.87
Size of the washing machine	1599	7.595997	.7115243	6	10
Type of embedding (=1 if free installation)	1599	.873671	.3323237	0	1
Water consumption (in L)	1576	9948.778	765.5639	7400	12900
Fridges	**Number of observations**	**Mean**	**Standard deviation**	**Min**	**Max**
Energy savings (€)	972	305.6589	75.16341	60.06	535.08
Efficiency (=1 if the appliance is A^{+++})	975	.1435897	.3508532	0	1
Price (€)	881	643.7569	275.6021	198	2345
Volume of the fridge (in L)	975	221.0185	40.16718	98	380
Volume of the freezer (in L)	967	80.34023	16.95284	16	119
Small town (=1 if the seller is from a small town)	976	.1956967	.3969395	0	1
Big city (=1 if the seller is from a big city)	976	.4723361	.4994901	0	1
Dishwashers	**Number of observations**	**Mean**	**Standard deviation**	**Min**	**Max**
Energy savings (€)	522	93.00828	36.77416	30.94	202.02
Efficiency (=1 if the appliance is A^{+++})	522	.1168582	.3215594	0	1
Price (€)	448	491.6848	175.3597	202.75	1399
Size (=1 if the size is 600mm)	522	.7203065	.4492791	0	1
Number of services	522	12.22031	1.963029	9	16
Water consumption (in L)	522	2944.954	380.4774	2100	4200

Small town (=1 if the seller is from a small town)	522	.2318008	.4223872	0	1
Big city (=1 if the seller is from a big city)	522	.4176245	.4936407	0	1

Table A2: Average energy prices per product category, energy efficiency level and treatment group

Washing machine	A^{+++}	A^{++}	A^{+}	A	Overall
Treatment 1	471.96€ N=238	410.85€ N=20	565€ N=1	.	472.28€ N=253
Treatment 2	494.49€ N=327	422.20€ N=20	594€ N=2	.	490.92€ N=349
Treatment 3	479.85€ N=217	477.46€ N=15	.	.	472.28€ N=253
Control	438.16€ N=584	441.05€ N=38	296.05 N=17	.	434.55€ N=639
Overall	464.16€ N=1366	436.37€ N=93	339.30€ N=20	.	460.72€ N=1479
Fridge	A^{+++}	A^{++}	A^{+}	A	Overall
Treatment 1	1136.93€ N=31	759.62€ N=64	436.60€ N=59	.	710.57€ N=154
Treatment 2	977.38€ N=37	795.01 N=76	446.31€ N=68	.	701.29€ N=181
Treatment 3	827.89€ N=25	685.05€ N=97	421.76€ N=75	.	602.94€ N=197
Control	847.93€ N=29	662.49€ N=195	465.76€ N=125	.	607.47€ N=349
Overall	956.52€ N=122	704.81€ N=432	446.40€ N=327	.	643.75€ N=881
Dishwasher	A^{+++}	A^{++}	A^{+}	A	Overall
Treatment 1	755.60€ N=5	545.81€ N=34	481.09€ N=26	459€ N=1	534.89€ N=66
Treatment 2	792.43€ N=19	495.93€ N=36	418.78€ N=32	334€ N=1	530.05€ N=88
Treatment 3	748.35€ N=11	472.21€ N=41	448.16€ N=40	.	494.77€ N=92
Control	587.40€ N=20	461.27€ N=97	427.24€ N=85	.	459.44€ N=202
Overall	705.71€ N=55	483.24€ N=208	437.98€ N=183	396.50€ N=2	491.68€ N=448

Table A3: Marginal effects of the additional regression for washing machines (Reference level: Treatment 2)

Washing machines	
VARIABLES	**Marginal effects**
Treatments	
1.control	0.0435 (0.0401)
Treatment 1 (=1 if the sale is under treatment 1)	0.0511** (0.0252)
Treatment 2 (=1 if the sale is under treatment 2)	--Ref--
Treatment 3 (=1 if the sale is under treatment 3)	-0.140 (0.221)
Attributes	
Capacity (kg)	0.0349*** (0.00763)
Type of embedding (=1 if free installation)	0.145*** (0.0381)
Water consumption (L)	-2.82e-05*** (6.19e-06)
Price	7.15e-05** (3.58e-05)
Control * Price	-3.23e-05 (4.30e-05)
Treatment 1 * Price	-0.000106** (4.69e-05)
Treatment 3 * Price	-1.09e-05 (4.98e-05)
Socio-economic factors	
Income (€)	7.76e-07 (3.74e-06)
Income^2 (€)	0 (8.31e-11)
Control * Income	-1.29e-06 (1.49e-06)
Treatment 1 * Income	-2.39e-06 (1.96e-06)
Treatment 3 * Income	2.70e-06 (1.78e-06)
Number of obs = 1,350 LR chi2(14) = 195.03 Prob > chi2 = 0.0000 Log likelihood = -200.57817 Pseudo R2 = 0.3271	

Table A4: Marginal effects of the additional regression for dishwashers (Reference level: Treatment

Dishwashers	
VARIABLES	**Marginal effects**
Treatments	
Control	-0.250 (0.605)
Treatment 1 (=1 if the sale is under treatment 1)	-0.784** (0.339)
Treatment 2 (=1 if the sale is under treatment 2)	-0.583 (0.766)
Treatment 3 (=1 if the sale is under treatment 3)	--Ref--
Attributes	
Size (=1 if the size is 600mm)	0.548** (0.251)
Number of services	0.149** (0.0652)
Water consumption (L)	-0.00191*** (0.000233)
Price (€)	0.00176*** (0.000624)
Control * Price	-0.00141* (0.000823)
Treatment 1 * Price	-0.000316 (0.00111)
Treatment 3 * Price	-0.00112 (0.000958)
Socio-economic factors	
Small town (=1 if the sale occurred in a small town)	0.0540 (0.128)
Big city (=1 if the sale occurred in a big city)	-0.0239 (0.0936)
Income (€)	-5.05e-05 (6.31e-05)
Income^2 (€)	1.69e-10 (1.33e-09)
Control * Income	4.47e-05* (2.43e-05)
Treatment 1 * Income	4.64e-05 (3.31e-05)
Treatment 2 * Income	5.28e-05 (3.30e-05)
Age under 30 (=1 if the consumer is less than 30 years old)	-0.0102 (0.377)
Age 30 - 45 (=1 if the consumer is between 30 and 45 years old)	-0.116 (0.113)
Age over 60 (=1 if the consumer is more than 60 years old)	-0.173* (0.101)
Number of obs = 421 LR chi2(19) = 409.59 Prob > chi2 = 0.0000 Log likelihood = -81.001876 Pseudo R2 = 0.7166	

Annex B

The training of sales staff consisted of 7 different points. This was done to cover all possible levels of knowledge of EE issues and household appliances. The structure was the following:

1. Introduction. Basic knowledge of EE. What is EE? Different EE levels.
2. How are the EE levels of appliances under study (washing machines, fridges and dishwashers) calculated?
3. Why are there appliances which have the same EE level but different energy consumptions?
4. What are the main assumptions made in estimating average energy consumption under the EU EE label?
5. How are monetary lifetime energy savings estimated for each appliance (washing machine, fridge, dishwasher)?
6. What energy price is used for these estimations?
7. What lifetime is used in estimating monetary lifetime energy savings?

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