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Memory effect of appliance rebate programme: evidence from a lab experiment

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

Abstract

This paper aims to check in a controlled environment for evidence of the memory effect found in Solà et al. (2021b). We considered different risk framings that could lead to different cognitive processes, and therefore different appliance purchasing decisions. The experiment was staged at the Bilbao Laboratory of Experimental Analysis (Bilbao-Labean[1]) in March 2022 and 166 subjects took part, in 4 different sessions. This lab experiment included 3 different parts: (i) a risk-elicitation task to measure subject preferences; (ii) a role-playing exercise to check for evidence of the memory effect in the purchasing decision of a fridge; (iii) a post-experiment survey to control for differences in the choices of participants and explain their decisions as well as other personal factors (e.g. socio-demographic factors). The design of the experiment staged enables the factors that nudge consumers towards investing in EE to be explained. The results show that different characteristics such as age and social class may affect consumer decision-making. The older a participant is, the more likely they are to buy energy-efficient fridges and the less likely it is that RENOVE will have any effect. This could be because older people tend to have a higher economic status and could therefore invest more in EE. Social class has a negative impact on the memory effect but a positive impact on purchasing energy-efficient fridges. The decision criteria underlying the choices made in the lab experiment (e.g. energy consumption criteria, lifetime energy cost criteria, etc) were also significant.

Keywords: Energy Efficiency policies, Consumer decision-making, lab experiment, rebate programs.

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[1] *Official website: https://www.bilbaolabean.com/index.php?pag=13*

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1. Introduction

According to the latest report by the IPCC, the rate of growth of greenhouse gas emissions (GHG) continues to increase and we are already 54 % above 1990 levels (IPCC, 2022). Increasing the energy efficiency (EE) level of energy-using goods is important in reducing these emissions, especially in reducing household energy consumption (Dubois et al., 2019; Labandeira et al., 2020; Solà et al., 2020). EE is defined technically as improving the efficiency with which energy is used to provide a service (Linares and Labandeira, 2010). This could have several benefits (cost reduction, reduction in emissions, etc.), but these are not always enough to nudge consumers towards the most energy-efficient choices. Even when EE is financially profitable for consumers, they may not always invest as much as seems rational (Gerarden et al., 2017). This is known as the *energy efficiency gap* and refers to situations in which beneficial investments in EE are not made (Jaffe and Stavins, 1994).

Several policies, commonly known as EE policies, have been designed to promote the adoption of energy-efficient technologies and reduce the EE gap. They include command and control instruments, financial incentives and information-based instruments (Galarraga et al., 2013; Gerarden et al., 2017; Ramos et al., 2016; Solà et al., 2020).

Consumer decision-making, and therefore the effectiveness of EE policies, is conditioned by the investment and energy literacy of consumers and by other individual behavioural characteristics (e.g. risk aversion). Investment literacy is defined as the ability of consumers to understand financial issues, while energy literacy is the capability to understand energy-related topics (e.g. to understand concepts such as energy consumption). Blasch et al. (2022) run a randomised control trial in Switzerland and find that energy and investment literacy are closely correlated with the probability of investing in energy-efficient choices. Blasch et al. (2019) show that more energy- and investment-literate individuals tend to perform an optimisation process rather than relying on decision-making heuristics.

When making an economically rational choice, consumers usually have to make an investment analysis. To perform such an analysis, particularly for appliances, they have to consider not only the purchasing price but also the running cost of each appliance over its lifetime (Blasch et al., 2019, 2022; Solà et al., 2021a). To make this estimation, consumers must consider the energy consumption of the appliance, its expected lifetime, its frequency of use and energy prices. Estimating the lifetime energy cost of a household appliance thus involves a *deliberation cost*[2] (Pingle, 2015) or *decision-making cost*[3] (Conlisk, 1988). This is linked to concepts such as bounded rationality: in other words, processing and understanding information is costly for individuals.

In assessing the effectiveness of EE policies the main financial incentives studied in the literature are taxes, subsidies and rebate programmes. We focus mainly on rebate programmes here, defined as small-scale instruments such as subsidies for energy-efficient products. The objective of rebate programmes is to subsidise the replacement of products by new, more energy-efficient models. Governments have introduced various rebate policies for increasing the adoption of energy-efficient products, such as the RENOVE plan for appliances in Spain (Galarraga et al., 2013) and the State Energy-Efficient Appliance Rebate Programme in the USA (Houde and Aldy, 2017).

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[2] *This is the process of thoughtfully weighing options, usually prior to making a decision or choosing a product.*
[3] *This is the process of obtaining the best price for a product with no impact on service.*

The evidence as to how effective rebate policies are in increasing the acquisition of energy-efficient appliances is not conclusive. Some studies show that the effect may be positive (Datta and Filippini, 2016) while others show that effectiveness depends on the product category (Chuang et al., 2018) and on other variables such as income, risk and time preferences (Galarraga et al., 2013; Houde and Aldy, 2017; Olsthoorn et al., 2017).

Datta and Filippini (2016) analyse the effectiveness of the Energy Star rebate policy programme in the USA for washing-machines, dishwashers, refrigerators and air conditioners. They find an increase of between 3.3 % and 6.6 % in sales of highly energy-efficient appliances as a consequence of the programme. Chuang et al. (2018) find that rebate programmes in Southern California can be effective depending on the product category. They find that this programme is responsible for a reduction in energy consumption by pool pumps (12 %) and refrigerators (6 %), lighting and HVAC based on the EE label. But for dishwashers and washing-machines average energy consumption increases.

Other studies note that the effectiveness of rebate programmes is not assured. Houde and Aldy (2017) show that in the presence of a rebate programme consumers tend to buy appliances that are of higher quality but not necessarily more energy-efficient. Galarraga et al. (2013) show that the RENOVE rebate programme for dishwashers in Spain generated welfare losses and a rebound effect. Similarly, Olsthoorn et al. (2017) show that the effectiveness of rebate programmes across 8 EU Member States is affected by the income, risk and time preferences of recipients.

A new effect called the *RENOVE memory effect* (hereafter just *memory effect*) is found in a field experiment in Solà et al. (2021b). The experiment was run in Spain and designed to analyse the effectiveness of providing consumers with monetary information on appliances. The results show that in those places where a RENOVE programme was running before the experiment, the effect of the RENOVE lingered after the end of the programme. The presence of the memory effect shown in Solà et al. (2021b) opens a new space for debate concerning the effectiveness of rebate programmes. So far, studies have focused only on analysing the policy implementation period, but the fact that the effect of the RENOVE programme lasts beyond the end of the programme raises the question of whether the same happens for other policies or with other product categories.

The this study reported here sets out to test the results obtained in Solà et al. (2021b), i.e. to analyse in a controlled environment[4] whether there is a memory effect and what factors nudge consumers' purchasing decisions towards energy-efficient appliances. To address this issue, we consider different risk framings and other personal factors (e.g. recent experiences buying appliances) that could lead to different decisions.

The rest of the chapter is structured as follows: Section 4.2 explains the design of the lab experiment, giving details on the risk framing and role-playing exercises and the post-experiment survey. Section 4.3 sets out the model specification and Section 4.4 discusses the results. Section 4.5 provides the main conclusions of the study and some policy recommendations.

[4] *We acknowledge that from the summer of 2021 and particularly from the start of the war in Ukraine, there has been a significant increase in energy prices (particularly in the case of gas and electricity).*

2. Design of the Experiment

A lab experiment was run to check for any memory effect of the RENOVE programme and the factors promoting it in a controlled environment. This experiment took place at the Bilbao Laboratory of Experimental Analysis (Bilbao-Labean[5]) at the University of the Basque Country, in a computer-based form using z-Tree software, in March 2022. Subjects were recruited in Bilbao area by the independent company CPS[6]. This company was responsible for selecting subjects according to age, gender, social class and occupation.

166 subjects took part in the experiment, in 4 different sessions. Table 1 shows their socio-demographic characteristics: 54.22 % were women, 44.58 % men and 1.20 % were individuals who did not identify with either gender. Their average age was 44, with the youngest subject being 19 and the oldest 69. 49.40 % of the subjects had a university degree or vocational training qualification, 15.66 % had upper secondary education and 13.86 % basic secondary education. The rest had basic education (9.64 %), a master's degree (10.24 %) or a PhD (1.20 %). Another interesting characteristic connected to education is social class. When asked about their social class, 46.39 % of the subjects self-classified as middle class. It is important to note that this is their own opinion of their situation. Subjects were also asked whether they took part in environmental organisations and only 16.27 % said yes.

Table 1: Distribution of subjects by socio-demographic characteristics

Gender	%
Male	44.58 %
Female	54.33 %
Other	1.20 %
Education level	%
Basic education	9.64 %
Secondary education	13.86 %
Upper secondary education	15.66 %
University degree or vocational qualification	49.40 %
Master's degree	10.24 %
PhD	1.20 %
Social class	%
Upper	.
Upper-middle–	7.83 %
Middle	46.39 %
Lower-Middle	27.11 %
Lower	18.67 %
Participation in environmental org	%
Yes	16.27 %
No	83.73 %

[5] *Official website: https://www.bilbaolabean.com/index.php?pag=13*
[6] *CPS - Estudios de Mercado y Opinión, https://www.cps2000.com/.*

At the beginning of each session, subjects were provided with written general instructions which were read aloud to ensure that they understood the structure of the session. These instructions (see Annex 2) informed them that this lab experiment comprised 3 different parts: (i) a risk-elicitation task to measure subject preferences; (ii) a role-playing exercise to analyse whwther there is a memory effect in the purchasing decision for a fridge; (iii) a post-experiment survey to control for differences in decision-making and explain their decisions and other personal factors (e.g. socio-demographic factors).

2.1. Risk elicitation task

To analyse the risk preferences of subjects, we used the risk elicitation task developed by Falk et al. (2016) and extended by Markanday et al. (2022) (see Annex 1). This exercise entailed a staircase risk procedure to analyse the risk aversion of subjects. They had to make five independent choices between a lottery and a sure payment. The lottery was the same in all decisions, while the sure payment changed in each decision depending on how risk averse or risk-loving the subject was. This procedure generated risk scores between 1 (higly risk-averse) and 31 (highly risk-loving). The score for each subject was estimated according to the switching row, i.e. the point where the subject preferred the sure payment to the lottery.

2.2. Role-playing exercise

Subjects were asked to purchase a fridge for their main dwelling in four different scenarios (see Figure 1). As shown in Figure 2, subjects had to choose between a non-efficient fridge (hereafter *INEF*) and an efficient fridge (hereafter *EF*) with information on the range where energy prices would be and the life-time of fridges, and then with specific information on both fridges (energy consumption[7] and purchasing price).

We controlled these variables so that all subjects had the same context (see Figure 2). We set the energy consumption and price based on Solà et al. (2021b, 2021a). In the case of the energy price, subjects only knew the upper and lower bounds. In order to introduce uncertainty in the decision-making, the energy price was randomly chosen within that range. Given that consumers usually believe that their next appliance will last as long as the previous one, and to avoid widespread awareness of planned ob-solescence, we assume a 10-year lifetime, as in Solà et al. (2021b, 2021a) and Kallbekken et al. (2013).

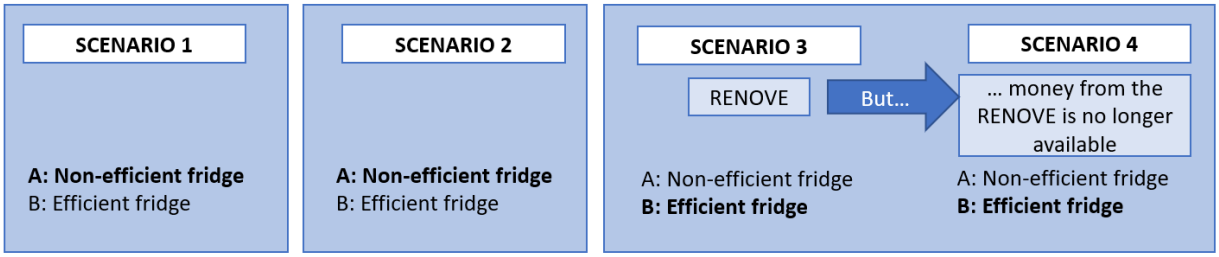
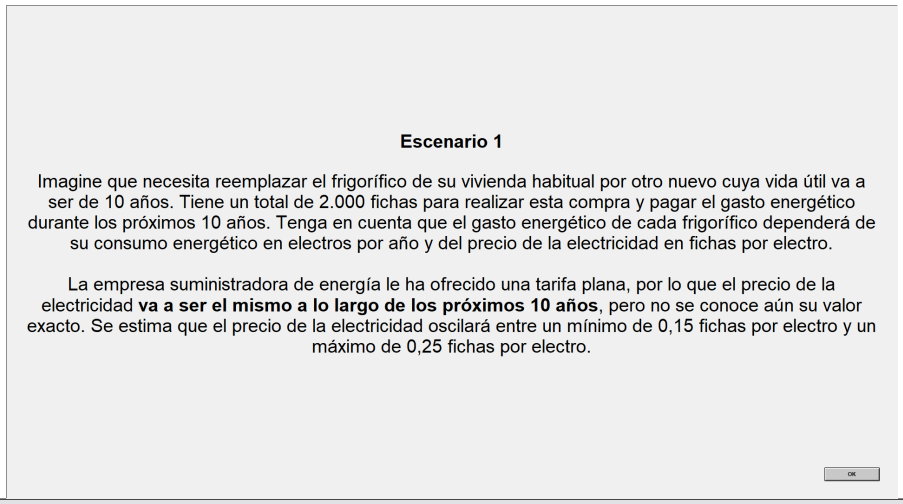


Figure 1: Diagram of the role-playing game

[7] *Waechter et al. (2015) point out that consumers usually misunderstand and mix up concepts like EE and energy consumption. In order to avoid this potential misunderstanding, for this study the EF fridge has a lower energy consumption than the INEF fridge.*



In English:

Scenario 1

Imagine that you need to replace the fridge at your usual residence. The new one will have a useful lifetime of 10 years. You have a total of 2000 tokens with which to buy the appliance and pay for the energy that it uses over the next 10 years. Bear in mind that the energy cost of each fridge will depend on its energy consumption in electros per year and the price of energy in terms of tokens per electro.

The power company offers a flat rate, so the price of electricity will remain the same for the next 10 years, but its exact level is not yet known. It is estimated that electricity prices will vary between a minimum of 0.15 tokens per electro and a maximum of 0.25.

Figure 2: Screenshot with the explanations of the purchasing context

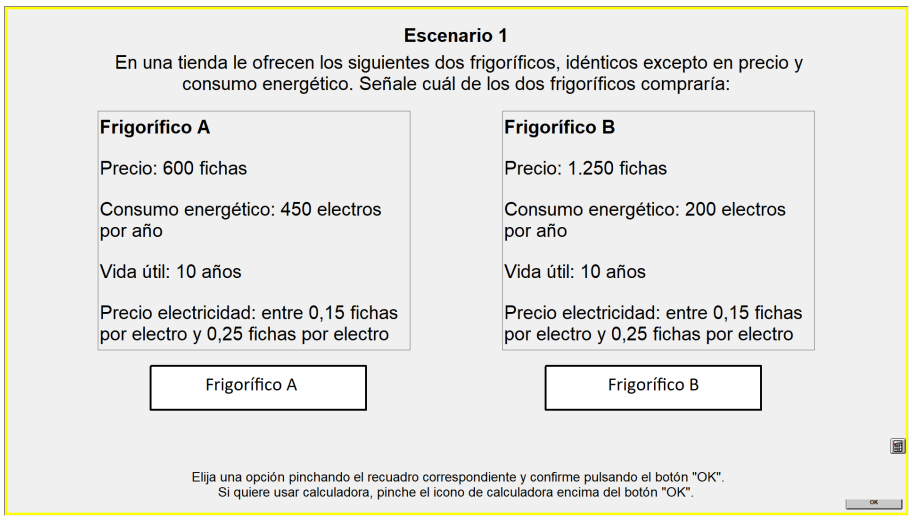
The budget in each scenario was the same for all subjects (2000 tokens). With this budget, they had to pay the price of the product and the potential lifetime energy cost (LEC) of the fridge chosen. Subjects were not told the final outcomes until the end of the role-playing exercise, to avoid any decision bias.

In Scenario 1, subjects had to choose between fridges A and B. This could be considered a control question (see Figure 3).

In Scenario 2 they had to repeat the same decision, but in this case subjects knew how many tokens were left after paying for the chosen fridge and the LEC. In this scenario, we wanted to overcome any potential miscalculations by subjects when estimating the LEC and other biases (e.g. subjects knew that they were in a lab experiment and they might have answered what they believed was expected).

In Scenario 3 subjects again made their purchasing decisions, with the only difference that in this case a RENOVE rebate programme was running. The objective of this programme was to encourage the replacement of old appliances by new, more efficient ones (Galarraga et al., 2013) so a discount of 150 tokens was offered to those subjects who choose the efficient fridge. Once subjects decided, they moved on to Scenario 4. In this scenario, a message appeared on the screen indicating that the RENOVE rebate programme had ended, and they had to decide whether to maintain their choice between the same two fridges (see Figure 1).

Table 2 shows the percentage of subjects who chose efficient fridges per scenario. 60.24 % chose *EF* in Scenario 2. In Scenario 3 (with the RENOVE) this figure increased to 89.75 % and then once the RENOVE was over it dropped to 66.86 %.



In English:

Scenario 1
A shop offers the following two fridges, which are identical except for their prices and energy consumption. Please indicate which you would purchase:

Fridge A	Fridge B
Price: 600 tokens Energy consumption: 450 electros per year Useful lifetime: 10 years Electricity price: between 0.15 and 0.25 tokens per electro	Price: 1250 tokens Energy consumption: 200 electros per year Useful lifetime: 10 years Electricity price: between 0.15 and 0.25 tokens per electro
Fridge A	Fridge B

Choose an option by clicking on the appropriate box and confirm by clicking OK. If you wish to use a calculator, click on the calculator button above the OK button.

Figure 3: Screenshot of fridge selection in Scenario 1. Fridge A on the left is INEF while Fridge B on the right is EF. (In English:)

Once all subjects had finished the role-playing exercise, final payments were shown on the screen. To help understand subjects' decision-making, just after this message on final payments we asked whether the main criterion underlying each choice in each scenario was based on the price of the two options, on energy consumption, on lifetime energy cost or on a random decision. We acknowledge that the responses could be biased by each subject's perspective, but this information could be useful in understanding subjects' decision-making.

2.3. Post-experiment survey

A post-experiment survey was conducted to control for subjects' characteristics, such as socio-demographic aspects and environmental concern. This survey was divided into 4 parts (see Annex 3): (i) Diffi-

Table 2: % of efficient fridges per scenario

% subjects who chose efficient fridges per Scenario	%
Scenario 1	75.90 %
Scenario 2	60.24 %
Scenario 3	89.75 %
Scenario 4	66.86 %

culty of the lab experiment (Questions 1 and 2); (ii) Personal experience regarding EE and the RENOVE rebate programme (Questions 3 to 8); (iii) Attitudes towards the environment (Questions 9 to 11); and (iv) Socio-demographic characteristics (Questions 12 to 18).

"Difficulty of the lab experiment" was intended to check how hard the subjects found the task. Subjects were asked to rate the complexity of the role-playing game (from 1 to 5) and about their feelings during the experiment (e.g. nervous, excited). These questions could be useful for contextualising the results (i.e. we can learn whether the subject understood the exercise correctly).

Questions 3 to 8 were designed to find out whether subjects had recently bought an appliance and how much they knew about EE. Then subjects were asked about their attitude towards the environment. According to Ramos et al. (2016), environmentally friendly consumers tend to invest more in energy-efficient appliances than those not interested in environmental problems. Finally, we asked about socio-demographic characteristics (e.g. age, gender) as they could affect EE investments (Jones and Lomas, 2015).

2.4. Payments

The experiment was incentivized so that subjects could experience real gains in the risk elicitation task and in the role-playing exercise. In the former, subjects could earn a maximum of 150 tokens, while in the latter they had to choose between two fridges with a budget of 2000 tokens and the final payments depended on (i) the decision made in each scenario; (ii) the scenarios chosen for the payment; and (iii) the final energy price. Two scenarios and energy prices were randomly selected in each session, and were the same for the subjects in each session. Because they were randomly selected, no-one knew what the final payment to subjects would be until the end of each session.

To maximise transparency, subjects were informed of the value of tokens in € (200 tokens = €1). Subjects also received €15 for participating. The minimum payment was €17.65 and the maximum €23. All these points were read aloud in the instructions before the experiment started (see Annex 2).

3. Model specification

We seek to explain each set of decisions given the decisions of the subjects throughout the scenarios. We use binary response models to analyse the data, so the dependent variable can only take a value of zero or one. This enables us to estimate the factors that affect different consumers' choices, and thus identify the characteristics that affect the probability of buying an energy-efficient appliance in different contexts. These models are specified as follows (Cameron and Trivedi, 2010):

Assume that y^* is a latent variable which follows $y^* = X\beta +$, 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 y^*, only a binary variable indicating the sign of y^* is observed:

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

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.

The probit model used can be expressed as $P(y = 1 \mid X)$ where y will express the dependent variable and *X* contains the explanatory variables referring to the *personal characteristics* of the subjects (gender, age, etc.) and the *experimental variables* (how subjects are feeling during the lab, the difficulty of the exercise, etc.) defined as:

$$\Pr(y|X) = \beta_0 + \sum_{i=1}^{n} \beta_i \, PersonalCharacteristics_i + \sum_{j=n+1}^{m} \beta_j \, ExperimentalVariables_j + \varepsilon.$$

Thus, β_i and β_j capture whether $PersonalCharacteristics$ and $ExperimentalVarables$, respectively, increase or decrease the probability of buying EF or INEF fridges under different scenarios.

We ran different models with different dependent variables. Table 3 presents the number of subjects for each set of choices and potential explanations for those choices: 51.20 % of the subjects always bought an efficient fridge, while 12.65 % only bought an energy-efficient fridge when a RENOVE programme was running.

The pure memory effect is represented by *INEF*, *INEF*, *EF*, *EF* choices in Scenarios 1 to 4 respectively, and the hybrid memory effect by *EF*, *INEF*, *EF*, *EF*[8]. This could be also considered a memory effect as subjects could choose an efficient fridge because they miscalculate the LEC. It can be seen that 13.25 % of the subjects show a memory effect (9.64 % hybrid and 3.61 % pure memory effect).

Thus, 6.02 % of the subjects always bought an inefficient fridge. The remaining sets of choices are not so common and it is not easy to provide an explanation for them. So, considering the distribution shown in Table 3, we define 4 variables that are considered as dependent based on the set of choices made by the subjects (highlighted in bold in Table 3): *Renove* (which takes a value of 1 if the subject chose *INEF, INEF, EF, INEF*); *MemoryEffect* (a value of 1 if the subject chose *EF, INEF, EF,EF* or *INEF,INEF,EF,EF*); AlwaysEfficient (a value of 1 if the subject chose *EF,EF,EF,EF*) and *AlwaysInefficient* (a value of 1 if the subject chose *INEF, INEF, INEF, INEF*).

As can be seen in equations (1)–(4), we include different explanatory variables grouped under *personal characteristics* such as *Gender* (which takes a value of 1 if the subject is male), *Age* (which takes the value of the age of the subject), *PeopleHome* (which takes the value of the number of people living in the subject's household), *Education* (1 if the subject has a Bachelor's, Master's or PhD degree), *SocialClass* (the social class of the subjects, i.e. upper, upper middle, middle, lower-middle or lower),

[8] *The pure memory effect is considered when the subject chose INEF in Scenarios 1 and 2, and then in Scenario 3 and 4 bought EF with no need for further information. In the case of the hybrid memory effect, subjects chose EF in Scenario 1 and then, once they received additional information, changed their decision to INEF in Scenario 2 (and EF in Scenario 3 and 4). In this case, subjects need the additional information before they buy an INEF fridge in Scenario 2.*

Table 3: Distribution of subjects' choices per Scenario

Purchasing decision per Scenario				Interpretation	Total	%
Scenario 1	Scenario 2	Scenario 3	Scenario 4			
EF	***EF***	***EF***	***EF***	**Environmentally friendly**	**85**	**51.20 %**
INEF	***INEF***	***EF***	***INEF***	**RENOVE effect - Investment in EE with RENOVE**	**21**	**12.65 %**
EF	***INEF***	***EF***	***EF***	**Hybrid memory effect**	**16**	**9.64 %**
INEF	***INEF***	***EF***	***EF***	**Pure Memory effect**	**6**	**3.61 %**
INEF	***INEF***	***INEF***	***INEF***	**Sceptical consumer**	**10**	**6.02 %**
EF	*INEF*	*EF*	*INEF*	Miscalculation in Scenario 1 and investment in EE with the RENOVE	9	5.42 %
EF	*EF*	*EF*	*INEF*	?	10	6.02 %
EF	*INEF*	*INEF*	*INEF*	?	3	1.81 %
EF	*EF*	*INEF*	*EF*	?	2	1.20 %
INEF	*EF*	*EF*	*EF*	?	1	0.60 %
INEF	*EF*	*EF*	*INEF*	?	1	0.60 %
EF	*EF*	*INEF*	*INEF*	?	1	0.60 %
INEF	*INEF*	*INEF*	*EF*	?	1	0.60 %

RiskLover (which takes a value of 1 if the subject is a risk lover), *RiskAverse* (1 if the subject is risk-averse), *EnvironmentalConcern* (1 if the subject is highly concerned about the environment), *EnvironmentalOrg* (1 if the subject is enrolled in an environmental organisation) and *Appliance* (1 if the subject has bought an appliance for their dwelling in the last 4 years).

Other variables grouped under *experimental variables* are also included in the model: *Interested* (which takes a value of 1 if the subjects feel interested during the lab experiment), *Excited* (1 if the subject feels excited during the lab experiment), *Nervous* (1 if the subject feels nervous during the lab experiment), *FutureGenerations* (1 if the subject agrees with the statement: "Future generations will be the ones who will have to deal mainly with environmental problems"), *Difficulty* (1 if the subject thinks that the exercise was difficult or very difficult), *ConsumptionCriteria* (1 if the subject makes choices during the scenarios by considering mainly the attribute of energy consumption), *LifetimeEnergyCostCriteria* (1 if the subject makes choices during the scenarios by considering mainly the LEC of each fridge) and *RandomCriteria* (1 if the subject makes choices during the scenarios randomly).

The descriptive statistics of the variables used in (1) to (4) are shown in Annex 4*:*

$$\begin{aligned}\Pr(y|x) = {} & \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 PeopleHome + \beta_4 Education + \beta_5 SocialClass + \beta_6 RiskLover \\ & + \beta_7 RiskAverse + \beta_8 EnvironmentalConcern + \beta_9 EnvironmentalOrg + \beta_{10} Appliance \\ & + \beta_{11} Interested + \beta_{12} Nervous + \beta_{13} FutureGenerations + \beta_{14} Difficulty \\ & + \beta_{15} ConsumptionCriteria \\ & + \varepsilon, \end{aligned} \quad (1)$$

$$\begin{aligned}\Pr(y|x) = {} & \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 PeopleHome + \beta_4 Education + \beta_5 SocialClass \\ & + \beta_6 EnvironmentalConcern + \beta_7 EnvironmentalOrg + \beta_8 Appliance + \beta_9 Interested \\ & + \beta_{10} Excited + \beta_{11} Nervous + \beta_{12} FutureGenerations \\ & + \beta_{13} ConsumptionCriteria \beta_{14} LifetimeEnergyCostCriteria \\ & + \varepsilon, \end{aligned} \quad (2)$$

$$\Pr(y|x) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 PeopleHome + \beta_4 Education + \beta_5 SocialClass + \beta_6 RiskLover + \beta_7 RiskAverse + \beta_8 EnvironmentalConcern + \beta_9 EnvironmentalOrg + \beta_{10} Appliance + \beta_{11} Interested + \beta_{12} FutureGenerations + \beta_{13} LifetimeEnergyCostCriteria + \beta_{14} RandomCriteria + \varepsilon, \quad (3)$$

$$\Pr(y|x) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 PeopleHome + \beta_4 Education + + \beta_5 RiskLover + \beta_6 RiskAverse + \beta_7 EnvironmentalConcern + \beta_8 EnvironmentalOrg + \beta_9 Appliance + \beta_{10} Interested + \beta_{11} FutureGenerations + \beta_{12} LifetimeEnergyCostCriteria + \varepsilon. \quad (4)$$

4. Results and discussion

In this section we analyse the factors affecting consumers' choices, particularly those that promote the memory effect. The various probit models described in Section 4.3 (Equations 1-4) are set out and discussed. The probabilistic models (1), (2), (3) and (4) were estimated using STATA version 16. Table 4 shows the marginal effects of the models and Table 5 gives a visual outline of the results.

Sections 4.1 and 4.2 discuss and contextualise the results for Models 1 and 2 and Models 3 and 4, respectively, while section 4.3 takes those variables that are significant in all the models and discusses them together.

4.1. Which factors nudge consumers towards energy-efficient appliances while a RENOVE is running? Is there a memory effect?

For Model 1, we find that age has a negative effect on the probability of consumers being nudged towards the efficient option with a RENOVE rebate programme. As pointed out in Solà et al (2021a), consumers in the range age of 30 to 45 seem to invest less in high-efficiency fridges. The potential explanation given in Solà et al (2021a) is that those consumers are of an age to be raising children and therefore have less income available to invest in EE. As shown, those subjects who feel interested in the experiment may be more likely to show this effect. One potential explanation is that people who are interested in a task generally concentrate more, and are therefore more susceptible to the small changes arising in each scenario. In fact, a careful, rational study of each scenario shows that Scenarios 1, 2 and 4 involve the same cognitive process, while in Scenario 3 the RENOVE effect changes the context.

Another relevant factor that affects consumer decision-making is recent experience in buying an appliance. Having bought an appliance for their home in the last 4 years increases the probability of consumers being nudged towards an efficient fridge while the RENOVE programme is running. This could be because those subjects who have bought an appliance recently still have all the explanations by sales staff fresh in their memories (Jones and Lomas, 2015). Therefore, they may care more about some attributes (for example, energy consumption and its associated lifetime energy cost). Subjects who make choices in each scenario using the lifetime energy cost criteria are 9.8 % more likely to be nudged towards the efficient fridge while a RENOVE is running.

For Model 2, where factors that promote the memory effect are analysed, we find that under the personal characteristics heading education level, social class and environmental concern are the statistically significant variables. Indeed, it seems that the higher their education level is, the more likely subjects are to be affected by the RENOVE after it has expired. In the case of social class, lower-middle class subjects are more likely to be affected by the memory effect. The literature reports a strong correlation between income and investment in EE. Indeed, Filippini et al. (2021) state that credit and liquidity constraints could affect investment in EE, as more energy-efficient options tend to be more expensive. The additional investment required could therefore only be affordable for higher-income individuals.

Similarly, there is more likelihood of a memory effect affecting subjects with high levels of environmental concern. In fact, the literature states that environmental variables could be a good predictor of investment in EE (Trotta, 2018). Ramos et al. (2016) also point out that more environmentally concerned households tend to invest more in energy-efficient technologies. These variables (education, social class and environmental concern) are linked, as individuals with higher education levels usually also have higher income levels, and therefore higher levels of environmental concern. Thus, as shown in Table 4, a lower probability of a memory effect is found in subjects who feel interested in the experiment.

Just before the post-experiment survey, subjects were asked about the main criteria that they had used to make decisions in each scenario. The results show that those subjects who answered that their main criterion was energy consumption are more likely to have the memory effect. Those who mainly care about energy consumption seem always to invest in those options which consume less energy (in this experiment, the lower-consuming fridge is the most efficient one).

Summing up, Model 1 (which analyses the factors that encourage subjects to change their decision from an inefficient fridge to an efficient one with the RENOVE programme) and Model 2 (which analyses those which cause the effect of RENOVE to linger after the scheme expires) show that age, education, social class and environmental concern seem to be relevant for nudging people towards making these decisions. So the effectiveness and the effects of rebate policies could vary from one individual to another. In the literature, the effectiveness and potential effects of rebate policies have mainly been analysed during the running period of the policy and analyses are conducted in general, without differentiating between consumer profiles (Chuang et al., 2018; Galarraga et al., 2013; Houde and Aldy, 2017). In this regard, our study opens up a new question regarding the effectiveness of rebate policies: are they effective for some part of society? Are they really effective in promoting the acquisition of energy-efficient appliances not only during the scheme but also once it is over? The answer to these questions is yes.

Table 4: Marginal effects of Model (1) - (4)

Variables	MODEL 1- RENOVE		MODEL 2 – Memory effect		MODEL 3 – always efficient		MODEL 4 – always inefficient	
	Marginal effects	z	Marginal effects	z	Marginal effects	z	Marginal effects	z
Gender (=1 if the subject is male)	0.0374435 (0.0271603)	1.38	-0.0346063 (0.0528432)	-0.65	-0.0505469 (0.0927407)	-0.55	**0.0401826* (0.0237633)**	**1.69**
Age	**-0.00239* (0.0013791)**	**-1.73**	0.0015412 (0.0022308)	0.69	**0.0077615* (0.004124)**	**1.88**	-0.0010658 (0.0010186)	-1.05
PeopleHome	0.0206309 (0.0155058)	1.33	-0.0348844 (0.0263735)	-1.32	-0.0027961 (0.0453796)	-0.06	-0.0093976 (0.0111091)	-0.85

Education (=1 if the subject holds a Bacelor's, Master's or PhD degree)	-0.0127729 (0.0312079)	-0.41	**0.1169006* (0.0620943)**	**1.88**	-0.0998195 (0.1011883)	-0.99	-0.0181992 (0.0212454)	-0.86
SocialClass								
Lower middle	0.0567254 (0.038046)	1.49	**-0.1611262** (0.0805291)**	**-2.00**	0.075307 (0.1357736)	0.55		
Middle	0.0292781 (0.0238578)	1.23	-0.0856762 (0.0829525)	-1.03	**0.2327231* (0.1264877)**	**1.84**		
Upper middle	0.057572 (0.07919)	0.73	-0.0983892 (0.1104725)	-0.89	0.0353253 (0.2034611)	0.17		
RiskLover (=1 if the subject is a risk lover)	-0.0149361 (0.0329894)	-0.45			0.0013197 (0.1091984)	0.01	0.0300463 (0.0251705)	1.19
RiskAverse (=1 if the subject is risk-averse)	0.0186073 (0.034607)	0.54			0.1203321 (0.1098915)	1.10	0.0106162 (0.0261606)	0.41
EnvironmentalConcern (=1 if the subject is highly concerned about the environment)	-0.0592757 (0.041676)	-1.42	**0.1547471** (0.0756408)**	**2.05**	0.0853811 (0.1226522)	0.70	-0.0126063 (0.0272957)	-0.46
EnvironmentalOrg (=1 if the subject takes part in an environmental organisation)	-0.0042434 (0.032657)	-0.13	-0.0727788 (0.0710509)	-1.02	-0.0200911 (0.1257927)	-0.16	-0.0143196 (0.0270963)	-0.53
Appliance (=1 if the subject has bought an appliance in the last 4 years)	**-0.0527857* (0.0300081)**	**-1.76**	-0.0391263 (0.0552374)	-0.71	0.1322801 (0.1022206)	1.29	-0.0273449 (0.022984)	-1.19
Interested (=1 if the subject feels interested in the experiment)	**0.0748845* (0.0422676)**	**1.77**	**-0.1114408* (0.062918)**	**-1.77**	0.0602908 (0.1056415)	0.57	-0.0423164 (0.028063)	-1.51
Excited (=1 if the subject feels excited about the experiment)			0.0372578 (0.0588423)	0.63				
Nervous (=1 if the subject feels nervous about the experiment)			-0.167776 (0.1139745)	-1.47	0.0893981 (0.1810481)	0.49		
FutureGenerations (=1 if the subject agrees with the statement "Future generations will be the ones who will have to deal with environmental problems")	-0.0352842 (0.0393579)	-0.90	**0.1492746*** (0.0568914)**	**2.62**	0.0185457 (0.1144941)	0.16	-0.0305531 (0.029616)	-1.03
Difficulty (=1 if the subjects think that the experiment was difficult or very difficult)					-0.0380307 (0.09834)	-0.39		
ConsumptionCriteria (=1 if subjects make choices during the scenarios considering mainly the energy consumption criteria)			**-0.1337564** (0.0680757)**	**-1.96**	**0.4704775*** (0.099288)**	**4.74**		
LifetimeEnergyCostCriteria (=1 if subjects make choices during the scenarios considering mainly lifetime energy cost criteria)	**0.0985732** (0.0411898)**	**2.39**	0.0025567 (0.0627744)	0.04			**0.0550345* (0.0288591)**	**1.91**

RandomCriteria (=1 if subjects make choices during the scenarios considering mainly random criteria)						**0.1389705* (0.0727298)**	**1.91**
	Number of obs = 164 LR chi2(15) =42.72 Prob > chi2 =0.0002 Log likelihood = -39.450006 Pseudo R2=0.3513		Number of obs=164 LR chi2(16) =28.04 Prob > chi2= 0.0313 Log likelihood = -48.737591 Pseudo R2=0.2234		Number of obs=164 LR chi2(17) =50.28 Prob > chi2= 0.0000 Log likelihood =-88.42531 Pseudo R2=0.2214	Number of obs=164 LR chi2(13) =18.12 Prob > chi2=0.1530 Log likelihood = -28.601451 Pseudo R2= 0.2406	

Standard errors are shown in parentheses
***, ** and * indicate significance at the 1 %, 5 % and 10 % levels.

4.2. What factors promote investment or underinvestment in energy-efficient appliances?

The factors that promote efficient or inefficient choices include gender, age and social class. As shown in Table 4 for Model 3, age increases the probability of always buying efficient appliances and middle-class individuals are also more likely always to make efficient choices (older individuals tend to have more income and therefore be of higher social class). Moreover, recent studies in Spain show that energy-efficient appliances tend to be in general more expensive than less efficient ones (Solà et al., 2021a). Another interesting factor that positively affects investing always in efficient products is the attribute on which subjects focus most. Model 3 shows that those subjects who mainly focus on energy consumption information tend to invest more in energy-efficient options.

Finally, Model 4 shows the factors that nudge individuals towards non-efficient choices. The results shown indicate that males are more likely to choose inefficient options. This could be because there is a gender gap in energy-related literacy (Blasch et al., 2021). In addition, those who make choices randomly in the scenarios are 13.89 % more likely always to make inefficient choices.

4.3. Age, social class and decision criteria

Table 4 shows some variables that are statistically significant in different models, such as age, social class and decision criteria. We briefly summarise these variables in Table 5.

Table 5: A visual outline of the results (+ for those with positive impact and - for those with negative impact)

Variables		Model 1 - RENOVE	Model 2- Memory effect	Model 3 - Purchase of an efficient appliance	Model 4 - Purchase of an inefficient appliance
Gender					+
Age		-		+	
Education			+		
Social class	*Middle*			+	
	Lower middle		-		
Environmental concern			+		
Recent purchase of an appliance		-			
Decision criteria	*Energy consumption criteria*		-	+	
	Lifetime energy cost criteria	+			+
	Random criteria				+

Age has a negative impact in Model 2 (RENOVE effect) but a positive impact in Model 3 (always efficient). This means that the older the subject is, the more likely they are to buy efficient fridges and the less likely it is that RENOVE will have any effect. This could have a simple explanation: older people tend to be financially better off and can therefore invest more in EE. Another statistically significant variable is social class: in other words those subjects with lower social class are less likely to invest in EE for fridges.

Another interesting variable is that of the decision criteria behind the choices made in the lab experiment. The design of the lab experiment shows that whichever criterion is used is significant in all the choices made. Some subjects based their decision-making on energy consumption criteria, which is positive for the acquisition of efficient fridges, but the same criteria decrease the likelihood of there being a memory effect. Another underlying criterion is lifetime energy cost estimations, and some subjects make choices according to random criteria. As can be seen in Table 5, lifetime energy consumption criteria promote two choices: buying efficient appliances when RENOVE is running and always buying inefficient ones.

5. Conclusions

Promoting the adoption of energy-efficient technologies is particularly crucial for reducing energy demand, and so is implementing effective EE policies. One such policy instrument is rebate programmes. This study looks at the factors that promote the memory effect of such programmes and analyses other factors that could nudge consumers towards efficient appliances (particularly fridges, which are one of the highest energy-consuming appliances in households).

In a lab experiment with 166 subjects in a controlled environment, we used various models to study what factors nudge consumers towards two different fridges (a non-efficient fridge, A, and an efficient fridge, B) in different scenarios. All subjects had the following information: the energy consumption and purchase price of each fridge, the range within which energy prices will move and a 10-year useful lifetime for fridges. With a budget of 2000 tokens, subjects had to pay the price of the fridge and its associated LEC.

The results of this study show that different personal characteristics and experimental variables can affect consumers' choices. The probability of there being a memory effect increases among subjects who have a PhD, Master's or Bachelor's Degree and when the subject shows high levels of environmental concern. The decision criteria increase the probability of investing in EE while a rebate programme is running, but a recent purchase of an appliance decreases that probability. In the case of efficient decisions, the models show that age, social class and decision criteria are the factors that nudge subjects towards efficient options. Finally, factors such as gender and decision criteria can influence the purchase of non-efficient fridges.

The design of the experiment means that we can identify which factors may promote different decisions, and thus distinguish which type of consumer tends to invest more (or less) in EE. We were able to identify which types of consumer (and for which behavioural characteristics) the RENOVE rebate programme was effective in increasing the adoption of energy-efficient technologies. Age, social class and the criteria underlying each decision seem to be factors that are highly relevant in all choices. On the

one hand, age seems to have a positive impact on the probability of buying energy-efficient fridges and a negative impact on the RENOVE effect (i.e. the older the consumer is, the less sensitive they are to the RENOVE rebate programme). Another factor that affects consumer decision-making is social class. The higher the social class (or income), the greater the probability of consumers being nudged towards energy-efficient fridges. As mentioned above, the criteria underlying subjects' decision is also important. As the results show, there are various criteria. Some subjects care mainly about energy consumption while others make choices according to the LEC.

The effectiveness of EE policies, and particularly rebate policies, is usually analysed without taking consumer profiles into account. This study enables a more general perspective on the factors conditioning consumers to invest (or not) in EE to be drawn up. An interesting question for further analysis is whether the current increases in energy price in society are really encouraging consumers to invest in EE.

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6. Annex

6.1. Annex 1: Risk elicitation task

Risk elicitation task adapted from Falk et al. (2016) and Markanday et al. (2022):

Exercise explanation: In this exercise you will be presented with **five** different decisions. For each decision you will have to choose between a lottery and a sure payment. The lottery is the same in all situations: it gives you a 50 % chance of receiving 30 tokens and a 50 % chance of receiving nothing. The sure payment is different in each situation.

Q1. What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 16 tokens as a sure payment?
- Lottery: go to question 17
- Sure payment: go to question 2

Q2: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 8 tokens as a sure payment?
- Lottery: go to question 10
- Sure payment: go to question 3

Q3: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 4 tokens as a sure payment?
- Lottery: go to question 4
- Sure payment: go to question 7

Q4: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 6 tokens as a sure payment?
- Lottery: go to question 5
- Sure payment: go to question 6

Q5: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 7 tokens as a sure payment?
- Lottery
- Sure payment

Q6: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 5 tokens as a sure payment?
- Lottery
- Sure payment

Q7: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 2 tokens as a sure payment?
- Lottery: go to question 8
- Sure payment: go to question 9

Q8: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 3 tokens as a sure payment?
- Lottery
- Sure payment

Q9: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 1 token as a sure payment?
- Lottery
- Sure payment

Q10: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 12 tokens as a sure payment?
- Lottery: go to question 14
- Sure payment: go to question 11

Q11: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 10 tokens as a sure payment?
- Lottery: go to question 13
- Sure payment: go to question 12

Q12: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 9 tokens as a sure payment?
- Lottery
- Sure payment

Q13: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 11 tokens as a sure payment?
- Lottery
- Sure payment

Q14: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 14 tokens as a sure payment?
- Lottery: go to question 15
- Sure payment: go to question 16

Q15: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 15 tokens as a sure payment?
- Lottery
- Sure payment

Q16: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 13 tokens as a sure payment?
- Lottery
- Sure payment

Q17: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 24 tokens as a sure payment?
- Lottery: go to question 25
- Sure payment: go to question 18

Q18: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 20 tokens as a sure payment?
- Lottery: go to question 22
- Sure payment: go to question 19

Q19: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 18 tokens as a sure payment?
- Lottery: go to question 20
- Sure payment: go to question 21

Q20: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 19 tokens as a sure payment?
- Lottery
- Sure payment

Q21: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 17 tokens as a sure payment?
- Lottery
- Sure payment

Q22: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 22 tokens as a sure payment?
- Lottery: go to question 23
- Sure payment: go to question 24

Q23: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 23 tokens as a sure payment?
- Lottery
- Sure payment

Q24: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 21 tokens as a sure payment?
- Lottery
- Sure payment

Q25: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 28 tokens as a sure payment?
- Lottery: go to question 29
- Sure payment: go to question 26

Q26: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 26 tokens as a sure payment?
- Lottery: go to question 27
- Sure payment: go to question 28

Q27: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 27 tokens as a sure payment?
- Lottery
- Sure payment

Q28: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 25 tokens as a sure payment?
- Lottery
- Sure payment

Q29: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 30 tokens as a sure payment?
- Lottery: go to question 31
- Sure payment: go to question 30

Q30: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 29 tokens as a sure payment?
- Lottery
- Sure payment

Q31: What would you prefer: a 50 percent chance of winning 30 tokens when at the same time there is a 50 percent chance of winning nothing, or would you rather have 31 tokens as a sure payment?
- Lottery
- Sure payment

6.2. Annex 2: Instructions for the experiment

This is an English translation of the text that researchers read aloud in each session of the lab experiment.

"THANK YOU FOR PARTICIPATING IN OUR EXPERIMENT!

Let's start the experiment. From this point on, you are not allowed to talk, watch what other subjects are doing or walk around the classroom. Please turn off your cell phone. If you have any questions or need help, please raise your hand and one of the researchers will come and talk to you. If you do not comply with the above rules, YOU WILL BE ASKED TO LEAVE THE EXPERIMENT AND NO PAYMENT WILL BE ISSUED. Thank you.

You will receive 15 euros for participating and an additional amount depending on the choices you make. This is an individual experiment and there are no right or wrong decisions. No subject will be able to identify any other subject by their decisions or by their final payments in the experiment. Each subject is identified by a number.

During the experiment you can earn experimental tokens (hereafter called tokens). Each token will be exchanged for euros: 200 tokens are equivalent to 1 euro. You will be paid in cash at the end of the experiment, strictly privately.

The experiment has 3 distinct parts. You can earn tokens in the first two parts. The last part is a short quiz.

1. PART 1

In this part you will be presented with five different decisions consisting of a choice between a lottery and a sure payment. The lottery will be the same in all situations: a 50 % chance of receiving 30 tokens and a 50 % chance of receiving nothing. The sure payment is different in each situation. In this part you can win up to 150 tokens.

To move to the next screen, press the OK button at the bottom right of the screen.

2. PART 2

In this second part you must decide to buy a refrigerator for your regular home, in 4 different scenarios. In each scenario:

- *You will be provided with basic information about 2 refrigerators.*
- *You will have 2000 tokens to pay for the refrigerator and its energy cost, which will depend on the price of energy.*
- *You must indicate which refrigerator you would buy with the available information.*

In each scenario you will be left with a number of tokens that will depend on the decision taken and the price of electricity. Two of the four scenarios will be chosen at random to determine the additional payment for this part 2.

Example: if at the end of part 2, in the two randomly chosen scenarios, you have 1200 tokens left, you will get a payment of 6€.

3. PART 3

A short questionnaire with questions about the difficulty of the exercise, how you felt, etc.

4. FINAL PAYMENTS

Once you have completed the experiment, the computer calculates the amount of the final payment based on your decisions and on the price of electricity. "

6.3. Annex 3: Post-experiment survey

Difficulty of the lab experiment (Q1, Q2):

Question 1: Please rate how difficult you found the previous exercise on a scale from 1 to 5:

- ❑ 1 (not at all difficult)
- ❑ 2
- ❑ 3
- ❑ 4
- ❑ 5 (very difficult)

Question 2: To what extent did the exercise make you feel:

	***1** (Very slightly or not at all)*	***2***	***3***	***4***	***5** (Very much)*
Interested					
Distressed					
Excited/ enthusiastic					
Strong/ empowered					
Guilty					
Afraid					
Determined					
Nervous					

Personal experience regarding EE and the RENOVE rebate programme (Q3-Q8):

Question 3: Have you purchased any appliances for your home in the last 4 years?

- ❑ Yes
- ❑ No

Question 4: If you answered yes in Q3, could you tell us the level of energy efficiency?

- ❑ High energy efficiency level
- ❑ Low energy efficiency level
- ❑ I don't know/I don't remember

Question 5: If you answered "Low energy efficiency level" in Q4, could you please explain why?

- ❑ Because I could not afford anything else at the time of purchase.
- ❑ Because I did not give priority to energy efficiency at the time of purchase.
- ❑ I don't know/I don't remember
- ❑ Other reason: _____

Question 6: Have you had any experience with the RENOVE rebate programme for the acquisition of highly energy-efficient appliances?

- ❑ Yes
- ❑ No

Question 7: If you answered "Yes" in Q6: for what appliance? _____

Question 8: Are you familiar with energy efficiency related concepts?

- ❑ Yes
- ❑ No

Environmental attitudes (Q9-Q11):

Question 9: Have you participated or do you participate in any environmental association, organisation or initiative?

- ❑ Yes
- ❑ No
- ❑ I don't know/I don't want to answer

Question 10: Please rate how concerned are you about the environment (e.g. air pollution, climate change, biodiversity loss).

- ❑ 1 (not concerned at all)
- ❑ 2
- ❑ 3
- ❑ 4 (very concerned)
- ❑ I don't know/I don't want to answer

Question 11: please indicate your degree of agreement or disagreement with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree	No opinion
a. I am not willing to do anything about the environment if others do not do the same					
b. Environmental impacts are frequently overstated					
c. Environmental issues should be dealt primarily by future generations					
d. I am willing to make compromises in my current lifestyle for the benefit of the environment					
e. Policies introduced by the government to address environmental issues should not cost me extra money					
f. Environmental issues will be resolved in any case through technological progress					
g. Protecting the environment is a means of stimulating economic growth					

Socio demographic characteristics (Q12-Q18):

Question 12: indicate your year of birth: _____

Question 13: Please indicate your education level:

- ❑ None
- ❑ Basic secondary school
- ❑ Upper secondary school
- ❑ Bachelor's degree/Higher vocational training
- ❑ Master's degree
- ❑ PhD

Question 14: indicate the number of people in your household:

- ❑ 1
- ❑ 2
- ❑ 3
- ❑ 4
- ❑ More than 4

Question 15: your current residence is:

- ❑ Your own property
- ❑ Rented property
- ❑ Other

Question 16: Please specify your gender:

- ❏ Female
- ❏ Male
- ❏ Other

Question 17: Please indicate your current occupation: _____

Question 18: Indicate which of the following social classes you belong to:

- ❏ Upper
- ❏ Upper middle
- ❏ Middle
- ❏ Lower-middle
- ❏ Lower

If you have any comments or opinions about the experiment, please indicate them below: _____

6.4. Annex 4: Descriptive statistics of the variables used

Table A 1: Descriptive statistics of the variables used in Models 1, 2, 3 and 4

	Variable	Mean	Std. Dev.	Min	Max
Personal characteristics	***Gender***	0.4512195	0.4991389	0	1
	Age	44.43902	12.73573	19	69
	PeopleHome	2.670732	1.051495	1	5
	Education	0.6097561	0.4892989	0	1
	SocialClass	2.439024	0.8805682	1	4
	RiskLover	0.2926829	0.4563877	0	1
	RiskAverse	0.3170732	0.4667614	0	1
	EnvironmentalConcern	0.8109756	0.3927272	0	1
	EnvironmentalOrg	0.1646341	0.3719859	0	1
	Appliance	0.6707317	0.4713869	0	1
Experimental variables	***Interested***	0.6707317	0.4713869	0	1
	Excited	0.3231707	0.4691197	0	1
	Nervous	0.0792683	0.2709845	0	1
	FutureGenerations	0.2195122	0.4151839	0	1
	Difficulty	0.3780488	0.486385	0	1
	ConsumptionCriteria	0.347561	0.4776542	0	1
	LifetimeEnergyCostCriteria	0.445122	0.4985014	0	1
	RandomCriteria	0.0182927	0.1344181	0	1

Number of observations: 164

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