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Energy-saving behavior of Turkish women: A consumer survey on the use of home appliances

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Abstract

This paper focuses on energy-related attitudes and behaviors of Turkish women, who are the main users of electrical home appliances responsible for most household energy consumption. Answers from 1323 female respondents surveyed through a unique questionnaire formed the dataset. The results from analysis of variance show that education has a significant effect on the relationship between energy saving and awareness and attitudes about climate change. Significant differences also exist between education level groups in terms of knowledge of the classification of energy-saving electrical home appliances. Responses to questions related to energy-saving purchasing behaviors are consistently higher for knowledgeable respondents. The paper then uses factor analysis and ordinal logit models to reveal interactions between energy-saving behavior regarding electrical home appliances and several factors, namely awareness, sensitivity, essentials, and receptiveness. The identification of these factors can provide useful insights for policy makers that enable them to construct energy-saving policies specifically tailored toward women.

Keywords

Energy saving, electrical home appliances, women use, analysis of variance, factor analysis, ordinal logit model

Introduction

Given that climate change, exacerbated by human fossil fuel consumption poses a serious planetary threat, keeping energy consumption as low as possible promises a better future

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than generating more energy to meet ever-growing demand. In contrast to the industrial sector which is already working to save energy, household energy saving still needs encouragement and wider implementation. According to one statistics portal,[1] worldwide consumption of household appliances was 428.17 billion U.S. dollars in 2013 and is projected to reach 588.83 billion U.S. dollars by 2020. Given this expected growth, encouraging the use of energy-saving home appliances will be very important as one of the ways to increase energy efficiency in order to reduce the adverse effects of climate change. Given their significant role in selecting and using home appliances, it is important to focus on women regarding this issue. Accordingly, this research reports on a questionnaire survey to analyze Turkish women's awareness and behavior regarding energy-saving applications for electrical home appliances. It makes several valuable contributions to the literature on energy policy, particularly in demonstrating that education has a significant effect on awareness and behavior regarding energy-saving electrical home appliances.

Energy saving in households and the promotion of energy saving

Currently, there is widespread concern about how energy generation contributes to climate change and endangers biodiversity.[2] Nevertheless, although there has been increasing interest in energy efficiency and energy-saving issues dating back to the first energy crisis of the 1970s, as reflected in the development of energy-saving technology and the implementation of educational initiatives, it has not been possible to slow the growth of household energy use in developing countries.[3] Thus, it is becoming crucial to use energy more cautiously by reducing household energy consumption at households as this is far more environmentally friendly and can be implemented much more easily than increasing energy-generating capacity. In short, household energy use, mostly improving energy efficiency, is an essential area of public policy.[4]

In order to become a low-carbon society through energy saving, it is essential to implement changes in lifestyles. Yet, households in Japan have doubled their share of energy consumption since the 1970s while the industrial sector has almost stabilized its consumption through energy-saving efforts.[5] Therefore, pursuing the goal of reducing household energy consumption at the household level will have an immense effect on conversation. This has made energy policy makers focus strongly on this target.[6,7]

However, there are various obstacles and misconceptions regarding energy-saving policies that target household energy consumption. First, households are often conflated with the individuals within them so that all household members are considered as acting as one. This conflation of the two terms is observed when they are used as if they are interchangeable. For example, if one individual is the decision-maker for the entire household regarding energy use, then this must be taken into account by policies targeting energy conservation. Since the practices of specific household members affect the household's overall energy consumption, this misconception renders most policies ineffective.[8]

Another problem concerns the low level of knowledge about effective energy-saving measures[9] and wide variability regarding people's sources of information about energy saving and their trust in these sources,[10] which determines whether households are willing to invest in renewable or efficient energy. For example, a survey by Di Maria et al.[11] showed that half of respondents are unaware that compact fluorescent light bulbs are more energy efficient than traditional incandescent bulbs. More optimistically, Scott[12] found that consumers do become more likely to invest in energy-conserving measures once they become aware that these will enable them to save energy.

Given that widespread household use of energy-efficient technology would significantly reduce residential energy demand, and thereby CO_2 emissions, it is vital to take into account factors like those outlined above that determine consumer investment choices when constructing policies to promote energy saving. Thus, to ensure that households adopt such energy-related behaviors, it is crucial to monitor the diffusion of energy-saving policies and ensure that the policies are effective. Energy conservative actions may be either one-time behaviors, such as purchasing of new energy-efficient machine to replace an old inefficient one, or the adoption of new habitual practices, such as reducing motor vehicle usage or using less air conditioning.[13]

Consumer decisions on purchasing energy-efficient goods

The best way to reduce domestic energy consumption in order to reduce greenhouse gas emissions is to change consumers' investment decisions regarding energy-efficient home appliances because these determine whether such new technology can spread through society.[14] According to Simon's much referred work (1959), consumers simplify decision-making processes by eliminating alternatives based on only a subset of data in order to reduce the alternatives to one.[15] This simplifies the process, which would otherwise require complex computation to fully process all the information on the subject. Since the decision is no longer completely rational, such thinking is described as bounded rationality. Research on this concept suggests that, when deciding whether or not to make an investment, consumers tend to focus on relatively easy-to-perceive attributes rather than those that are more difficult to evaluate.[16] Applying this to decisions related to energy-saving investments, consumers are likely to easily perceive the initial costs of such an investment while finding it much harder to compute or process information regarding how much they will save in future over the lifetime of that investment.

Another concept relevant to this issue, ''status quo bias,'' is commonly seen in consumer behavior. This describes an inclination to place more weight on initial losses than future gains, reflecting individuals' strong aversion to loss compared to the potential gains, even when the gains are much larger under conditions of uncertainty. In the case of energy consumers, this translates into avoiding energy-efficient investments due to high initial costs and finding the future savings through energy conservation unreliable because of possible price fluctuations, which represents uncertainty for the consumers.[19]

Regarding home appliances, energy-efficient products are presented through campaigns and policies promoting energy conservation. One of the most common is energy efficiency labeling. For example, the EU labels home appliances according to their performance output compared to their energy consumption, with labels from G to A (and A+, A++, and A+++ representing even higher efficiency than A) to simply present each product's efficiency. These value labels are not universal but determined specific to each machine's function (Ecofys, 2014).[17] Labeling home appliances with their energy consumption levels makes it likely that consumers can estimate how much they will save during the product's lifetime if they purchase it. However, because individual households consume energy differently, there is often a difference between potential and actual energy efficiency, which means households may not save as much as expected according to the technical calculation.[14]

There is one matter that needs to be addressed when surveying women in Turkey for purchasing decisions of their households—their minor involvement in purchasing decisions. Despite that empirical findings in literature show that women are getting more influential in decision-making than men when purchasing electrical appliances[20–23] or taken decision jointly (Barlés-Arizón, et al., 2013), these results could be country specific and may not be relevant to the case of Turkey.[18] Being traditionally appointed as the leaders of their families by cultural norms in Turkey, the husbands have the responsibility to provide for the family and make the financial decisions. This fact might hinder the appropriateness of examining women as decision-makers in families. However, women might have a say when it comes to purchasing major electrical appliances (i.e. washing machine) even within the traditional gender roles in Turkey.

Caha's research[24] on women's status in Turkey yielded noteworthy results about who should be responsible for the labor at home. Major portion (over 70%) of the respondents that thought the housework belongs to women and not men were men, while about 64% of the respondents who stated that housework should be shared by spouses equally were women. This is a clear explanation for the reluctance of Turkish men to participate in housework. The common patriarchal view of power at home emphasizes men's power by providing money for the family and holds women responsible for managing the housework and care of children. The derivation of this view leads men to leave decisions regarding housework to women, as they would seem interested in interfering with the feminine work otherwise.[25] They would typically be content at just providing the money for the purchase, thus fulfilling their traditional responsibility. Therefore, wives usually have an equal footing at home in category-specific decision of major appliance purchases.

The energy-saving potential of female household members

Given that, as mentioned earlier, households should not be conflated with individual members, it is also necessary to focus research specifically on women's behavior and habitual practices regarding household energy consumption as various researchers have noted how gender is a key variable for analyzing household energy consumption.[26,27] They also note that women generally seem to be more willing to conserve energy. In a country like Turkey, in particular, where housework is traditionally assigned to female members in many households, home appliances are mainly operated by female members, which is important because most household electricity consumption nowadays results from use of electrical home appliances. Similar gender-related patterns are seen in other countries.[28] In short, the awareness and willingness of women to practice low-energy consumption is thought to play a crucial role in raising household energy efficiency.

Although the literature on energy demand analysis mostly focuses on how individual policies affect energy conservation, in reality such policies are always parts of multiple conservation measures. To capture how people respond to these multiple policies, it is necessary to develop an active demand management system.[29,30] According to Khansari et al.,[31] for example, it is "the combination of changes of renewable technology, awareness campaigns, social norms, city structure, and comparative information [that] can collectively drive a change, both in the energy consumption behavior and the adoption of renewable energy systems."

However, if we consider the integrative effect of such multipolicy schemes, it is necessary to analyze how these policies interact. Gomi et al.[32] suggest there may be three types of relationships: certain policies may increase the effect of other policies, certain policies may be prerequisites for others, certain policies may operate in tandem. Policies may, in addition, interfere with each other, for example, if they are sequenced wrongly, or due to interactions between policies related to social norms and technological innovations. Because these negative effects can be hidden, planned policies may fail. Gomi et al.'s analysis suggests that the total effect of a multipolicy scheme is not simply the sum of its components; rather, it is necessary to consider, specifically from the perspective of consumer behavior, how the components within the system interact.

Regarding consumer behaviors, energy efficiency or conservation programs must involve households actively as this will be more effective than merely trying to increase their investment in renewable energy or energy-efficient products. To keep households involved in these programs, policy makers could take various steps, such as "requiring repeated program participation in order to access higher-value financial incentives, staggered access to individual products, or additional support."[4] Research by Yue et al.[33] indicates that this approach reduces electricity usage more in proportion to the program's cost while enabling the implementers to check if householders use the adopted technology and use it correctly.

In the remainder of the paper, the first section gives information about sampling and data collection, then method and results of the factor analysis. This is followed by the econometrics process concerning differences in electrical home appliances used, including detailed presentation of all model results. "Discussion and policy recommendations" section discusses the implications of the results from the models in order to offer several policy recommendations and draw conclusions.

Survey

Sampling and Data Collection Method

The survey designed specifically for this this study focused on women's awareness and behavior regarding energy saving in electrical home appliances. The dataset comprised the responses of 1323 women, all aged over 18, to the survey conducted between 23 May and 15 June 2014 in three metropolitan provinces of Turkey: İstanbul, Bursa, and Kocaeli. The projected and actual sample sizes were very similar, at 1300 and 1323 respondents, respectively. A postsurvey check was undertaken in the field and over the phone.

All the responses were collected face to face, using a mixture of two sampling methods. The first method was convenience sampling, using university students on university campuses. The other respondents were selected using cluster random sampling from nonstudent women living in the three cities. Table 1 shows that two-thirds of responses were collected in İstanbul while the rest were collected from Bursa and Kocaeli.

As Table 2 shows, graduates were the smallest education group with 14 respondents, whereas high school graduates formed the largest group with 636 respondents. Primary school graduates or respondents with no education totaled 563, and 107 undergraduates were interviewed.

Table 1. Descriptive statistics (age/province).

			Province			
			İstanbul	Bursa	Kocaeli	Total
Age	18–25	Count	332	96	81	509
		%	65.2%	18.9%	15.9%	100.0%
	26–35	Count	202	51	41	294
		%	68.7%	17.3%	13.9%	100.0%
	36–45	Count	187	47	32	266
		%	70.3%	17.7%	12.0%	100.0%
	46–55	Count	95	27	26	148
		%	64.2%	18.2%	17.6%	100.0%
	56+	Count	66	21	19	106
		%	62.3%	19.8%	17.9%	100.0%
Total		Count	882	242	199	1323
		%	66.7%	18.3%	15.0%	100.0%

Table 2. Descriptive statistics (education/province).

			Province			
			İstanbul	Bursa	Kocaeli	Total
Education	No education	Count	33	16	10	59
		%	55.9%	27.1%	16.9%	100.0%
	Primary school	Count	324	97	83	504
		%	64.3%	19.2%	16.5%	100.0%
	High school	Count	438	106	92	636
		%	68.9%	16.7%	14.5%	100.0%
	Undergraduate	Count	73	21	13	107
		%	68.2%	19.6%	12.1%	100.0%
	Graduate	Count	12	2	0	14
		%	85.7%	14.3%	0.0%	100.0%
Total		Count	880	242	198	1320
		%	66.7%	18.3%	15.0%	100.0%

As Table 3 shows, within the 18–25 ages range, high school graduates (the group including university students) was the largest group at 85.1%. In the other age groups, primary school graduates formed the largest group.

Methodology

Analysis of variance (ANOVA). For the initial statistical analysis, one-way ANOVA and independent samples t-tests were used. The descriptive statistics and outcomes of the analyses are presented below.

Table 3. Descriptive statistics (age/education).

			Education					
			No education	*Primary school*	*High school*	*Undergraduate*	*Graduate*	*Total*
Age	18–25	Count	2	37	433	34	3	509
		%	0.4%	7.3%	85.1%	6.7%	0.6%	100.0%
	26–35	Count	9	142	99	37	7	294
		%	3.1%	48.3%	33.7%	12.6%	2.4%	100.0%
	36–45	Count	11	154	74	22	3	264
		%	4.2%	58.3%	28.0%	8.3%	1.1%	100.0%
	46–55	Count	17	98	26	5	1	147
		%	11.6%	66.7%	17.7%	3.4%	0.7%	100.0%
	56+	Count	20	73	4	9	0	106
		%	18.9%	68.9%	3.8%	8.5%	0.0%	100.0%
Total		Count	59	504	636	107	14	1320
		%	4.5%	38.2%	48.2%	8.1%	1.1%	100.0%

Table 4. ANOVA descriptive statistics (knowledge about climate change and energy efficiency/education).

						95% confidence interval for mean	
Knowledge about climate change and energy efficiency	*Education*	*N*	*Mean*	*Std. deviation*	*Std. error*	*Lower bound*	*Upper bound*
Do you have knowledge about climate change	No education	59	1.71	.457	.059	1.59	1.83
	Primary school	504	1.49	.500	.022	1.44	1.53
	High school	635	1.14	.347	.014	1.11	1.17
	Undergraduate	106	1.05	.213	.021	1.01	1.09
	Graduate	14	1.07	.267	.071	.92	1.23
	Total	1318	1.29	.454	.013	1.27	1.31
Do you have knowledge about the energy-efficient electrical home appliances	No education	59	1.61	.492	.064	1.48	1.74
	Primary school	501	1.35	.478	.021	1.31	1.39
	High school	635	1.21	.408	.016	1.18	1.24
	Undergraduate	107	1.14	.349	.034	1.07	1.21
	Graduate	14	1.07	.267	.071	.92	1.23
	Total	1316	1.28	.447	.012	1.25	1.30

ANOVA: analysis of variance.

Responses to the question regarding the awareness of climate change and energy-saving home appliances were analyzed in terms of education level using a one-way ANOVA (Tables 4 and 5). This showed significant differences between education level groups ($p < 0.001$), indicating that the probability of having knowledge and awareness about climate change and energy-saving electrical home appliances increases with education level.

As seen in Tables 6 and 7, education level influences the likelihood of respondents relating awareness of climate change to energy saving.

Table 5. ANOVA (knowledge about climate change and energy efficiency/education).

Knowledge about climate change and energy efficiency	*Variation*	*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
Do you have knowledge about climate change	Between groups	51.061	4	12.765	76.108	.000
	Within groups	220.223	1313	.168		
	Total	271.284	1317			
Do you have knowledge about the energy-efficient electrical home appliances	Between groups	14.668	4	3667	19.405	.000
	Within groups	247.754	1311	.189		
	Total	262.422	1315			

ANOVA: analysis of variance.

The respondents were asked to indicate the best energy-saving class for electrical home appliances in an open-ended question to measure knowledge of energy-saving electrical home appliances (Table 8). The responses were placed in three groups and coded ordinally. To make the statistical analysis possible, A+, A++, A+++ class responses were coded as 3, responses that only stated A class were coded as 2, and responses mentioning B class or lower, or "I don't know" were coded as 1. As Table 9 shows, the one-way ANOVA results indicated significant differences between education level groups in terms of knowledge of the classification of energy-saving electrical home appliances.

The next step was to measure any differences in awareness between those respondents who stated that they knew about energy-saving electrical home appliances and those who did not. An independent samples t-test was used, as presented in Table 10. The results show that there was a significant difference between the two groups in awareness about the relationship between climate change and energy saving.

One of the survey questions explored whether respondents with knowledge of the energy-saving issue utilized this knowledge during the purchase decision process. Tables 11 and 12 show the results of the independent samples t-test to determine if those respondents were more likely to utilize their knowledge in their decision processes. According to the results, responses to questions related to purchasing behaviors were consistently higher for those respondents with knowledge than for those without.

Another ANOVA was used to determine whether education level affected the importance given to product features during the product decision process. As Tables 13 and 14 show, the importance assigned to product price and brand variables was consistently (or significantly) distributed among education groups.

Factor analysis. Factorization was then used to reduce the number of dimensions within the dataset and name the factors and present the results more simply. By conducting a factor analysis, it is aimed to describe the women's attitudes and behaviors regarding energy-saving electrical appliances. In the next step, the factors served as independent variables in econometric models.

Initial factor analysis. The results from the initial factor analysis of the survey's 17 Likert scale item responses were inconclusive. Consequently, a Varimax rotation was applied to produce better factorization. This produced an acceptable rotated factor analysis with a reliability of 82.7%. However, because the total variance explained was only 56.5% and

Table 6. ANOVA descriptive statistics (climate change and energy saving, crisis, efficiency/education).

Climate change and energy saving, crisis, efficiency	*Education*	*N*	*Mean*	*Std. deviation*	*Std. error*	*95% Confidence interval for mean*	
						Lower bound	*Upper bound*
A climate change is going on	No education	59	3.49	.917	.119	3.25	3.73
	Primary school	504	4.11	.746	.033	4.04	4.17
	High school	636	4.26	.738	.029	4.20	4.32
	Undergraduate	107	4.42	.673	.065	4.29	4.55
	Graduate	14	4.50	.650	.174	4.12	4.88
	Total	1320	4.18	.764	.021	4.14	4.22
There is an energy crisis on Earth	No education	59	3.46	.795	.103	3.25	3.66
	Primary school	504	3.98	.822	.037	3.91	4.06
	High school	636	4.11	.792	.031	4.05	4.17
	Undergraduate	107	4.03	.783	.076	3.88	4.18
	Graduate	14	4.36	.745	.199	3.93	4.79
	Total	1320	4.03	.813	.022	3.99	4.07
There is a relationship between climate change and energy efficiency	No education	59	3.47	.916	.119	3.24	3.71
	Primary school	504	3.88	.772	.034	3.82	3.95
	High school	636	4.10	.780	.031	4.04	4.16
	Undergraduate	107	4.02	.858	.083	3.85	4.18
	Graduate	14	4.43	.646	.173	4.06	4.80
	Total	1320	3.98	.803	.022	3.94	4.03
It is possible to save energy by regulating the usage patterns of electrical home appliances	No education	59	3.81	.819	.107	3.60	4.03
	Primary school	504	4.15	.731	.033	4.08	4.21
	High school	636	4.23	.696	.028	4.18	4.29
	Undergraduate	107	4.21	.765	.074	4.07	4.36
	Graduate	14	4.50	.519	.139	4.20	4.80
	Total	1320	4.18	.725	.020	4.14	4.22
The society should be informed on energy-saving issue	No education	59	4.05	.879	.114	3.82	4.28
	Primary school	504	4.27	.740	.033	4.21	4.34
	High school	636	4.45	.702	.028	4.39	4.50
	Undergraduate	107	4.43	.766	.074	4.28	4.58
	Graduate	14	4.79	.426	.114	4.54	5.03
	Total	1320	4.36	.737	.020	4.32	4.40
Saving energy at homes may help the fight against climate change	No education	59	3.85	.827	.108	3.63	4.06
	Primary school	504	4.09	.790	.035	4.02	4.16
	High school	636	4.22	.748	.030	4.16	4.27
	Undergraduate	107	4.30	.703	.068	4.16	4.43
	Graduate	14	4.21	1.051	.281	3.61	4.82
	Total	1320	4.16	.773	.021	4.12	4.20

ANOVA: analysis of variance.

communalities below 50% were common, the factor analysis was repeated after omitting the two variables with the lowest factorization values. These were the two statements "Minding climate change" and "Cost saving," given in response to the question: "To what extent do the following factors affect your willingness to save energy at home?"

Table 7. ANOVA (climate change and energy saving, crisis, efficiency/education).

Climate change and energy saving, crisis, efficiency	*Variation*	*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
A climate change is going on	Between groups	42.118	4	10.530	19.013	.000
	Within groups	728.246	1315	.554		
	Total	770.364	1319			
There is an energy crisis on Earth	Between groups	26.292	4	6.573	10.211	.000
	Within groups	846.496	1315	.644		
	Total	872.788	1319			
There is a relationship between climate change and energy efficiency	Between groups	31.545	4	7.886	12.675	.000
	Within groups	818.152	1315	.622		
	Total	849.697	1319			
It is possible to save energy by regulating the usage patterns of electrical home appliances	Between groups	11.799	4	2.950	5.694	.000
	Within groups	681.200	1315	.518		
	Total	692.999	1319			
The society should be informed on energy-saving issue	Between groups	17.355	4	4.339	8.170	.000
	Within groups	698.371	1315	.531		
	Total	715.727	1319			
Saving energy at homes may help the fight against climate change	Between groups	12.477	4	3119	5.285	.000
	Within groups	776.062	1315	.590		
	Total	788.539	1319			

ANOVA: analysis of variance.

Table 8. ANOVA descriptive statistics (measure the knowledge of energy-saving electrical home appliances/education).

What is the most energy-efficient class you know that is written on the stickers of the electrical home appliances?	*N*	*Mean*	*Std. deviation*	*Std. error*	*95% Confidence interval for mean*	
					Lower bound	*Upper bound*
No education	59	1.54	.750	.098	1.35	1.74
Primary school	504	2.04	.783	.035	1.97	2.11
High school	636	2.45	.767	.030	2.39	2.51
Undergraduate	107	2.57	.646	.062	2.45	2.69
Graduate	14	2.43	.646	.173	2.06	2.80
Total	1320	2.26	.803	.022	2.22	2.31

ANOVA: analysis of variance.

Analyses regarding the sufficiency of the factor analysis. The results indicated that the analysis was better without these two variables. Although the reliability score decreased slightly, there was a more favorable increase in the total fit of the analysis (Table 15).

Table 9. ANOVA (measure the knowledge of energy-saving electrical home appliances/education).

What is the most energy-efficient class you know that is written on the stickers of the electrical home appliances?					
	Sum of squares	*df*	*Mean square*	*F*	*Sig.*
Between groups	87.596	4	21.899	37.707	.000
Within groups	763.710	1315	.581		
Total	851.306	1319			

ANOVA: analysis of variance.

The sample was reliable and adequate according to the Kaiser–Meyer–Olkin test for sample adequacy, with a score over 60%, and according to Bartlett's test for sphericity, which indicates whether variables are correlated with each other and suitable for conducting a factor analysis (Table 16).

Variables in the factor model. Communality measures the amount of variance a variable shares with another and is expected to exceed 50%. While variables with values close to 50% can be included, variables with much lower values should be removed and a new analysis conducted. Accordingly, three variables with communalities close to 50% were omitted from the final analysis of 15 variables (Table 17).

Determination of number of the factors. One of the most important criteria for a successful factor analysis is the percentage of the total variance explained. The final analysis reported here explained 60.2% of the total variance (Table 18), compared to 56.5% for the first analysis with all variables included. Although this percentage is not completely valid as it is lower than 66%, it is acceptable. Therefore, four factors were determined; in line with the principle of completing a factor analysis is complete once clear factorization of the variables has been attained.

Rotation of the factor axes. After the factor axes were rotated using Varimax, the factorization was significantly improved, and the component matrix showed that every variable could be easily assigned to a single factor (Table 19). The first six variables in Table 19 were assigned to the first factor, the following four variables to the second factor, the following three variables to the third factor, and last two to the fourth factor.

Labeling factors. To simplify the interpretation of econometric models, the factors produced by the foregoing analysis were labeled according to the distribution and relationship between their component variables.

The first factor was labeled ***awareness*** because the assigned variables reflected a combination of statements about climate change and energy saving, the presence of a climate change and a global energy crisis, the statement that energy saving might help in fighting climate change, and the statement that society should be informed about energy saving as it indicated a relationship between awareness about energy saving and support for its dissemination.

The variables assigned to the second factor included statements about electrical appliance purchasing behavior and energy-saving features as part of evaluating a product while making purchasing decisions. Reading user manuals, reading the label for the energy-saving

Table 10. Independent samples T-test descriptive statistics (climate change and energy saving, crisis, efficiency/knowledge about the energy-efficient electrical home appliances).

		Levene's test for equality of variances		*t-test for equality of means*						
									95% Confidence interval of the difference	
		F	*Sig.*	*t*	*df*	*Sig. (two tailed)*	*Mean diff*	*Std. error diff*	*Lower*	*Upper*
A climate change is going on	Equal variances assumed	1.439	.231	6.414	1317	.000	.297	.046	.206	.387
	Equal variances not assumed			6.107	595,532	.000	.297	.049	.201	.392
There is an energy crisis on Earth	Equal variances assumed	13.535	.000	6.744	1317	.000	.332	.049	.236	.429
	Equal variances not assumed			6.338	582,057	.000	.332	.052	.229	.435
There is a relationship between climate change and energy saving	Equal variances assumed	32.213	.000	6.558	1317	.000	.320	.049	.224	.415
	Equal variances not assumed			6.181	585,042	.000	.320	.052	.218	.421
It is possible to save energy by regulating the usage patterns of electrical home appliances	Equal variances assumed	.063	.802	7.630	1317	.000	.334	.044	.248	.419
	Equal variances not assumed			7.109	573,399	.000	.334	.047	.241	.426
The society should be informed on energy-saving issue	Equal variances assumed	.606	.436	7.149	1317	.000	.316	.044	.229	.403
	Equal variances not assumed			6.612	566,354	.000	.316	.048	.222	.410
Saving energy at homes may help the fight against climate change	Equal variances assumed	1.660	.198	5.914	1317	.000	.277	.047	.185	.368
	Equal variances not assumed			5.698	608,590	.000	.277	.049	.181	.372

Table 11. Independent samples T-test descriptive statistics (knowledge in decision process and knowledge about the energy-efficient electrical home appliances).

Knowledge in decision process	*Do you have knowledge about the energy-efficient electrical home appliances*	*N*	*Mean*	*Std. deviation*	*Std. error mean*
I read the stickers on the product about the energy consumption level	Yes	956	3.97	1.075	.035
	No	363	3.11	1.316	.069
I read the user manual of the product I purchased before I use it	Yes	956	4.20	.962	.031
	No	363	3.68	1.199	.063
I evaluate the price of a product considering the energy-saving capacity of it	Yes	956	4.03	.981	.032
	No	363	3.42	1.262	.066

Table 12. Independent samples T-test (knowledge in decision process and knowledge about the energy-efficient electrical home appliances).

		Levene's test for equality of variances		*t-test for equality of means*						
									95% confidence interval of the difference	
		F	*Sig.*	*t*	*df*	*Sig. (two tailed)*	*Mean difference*	*Std. error difference*	*Lower*	*Upper*
I read the stickers on the product about the energy consumption level	Equal variances assumed	48.937	.000	12.247	1317	.000	.865	.071	.727	1.004
	Equal variances not assumed			11.192	555,148	.000	.865	.077	.713	1.017
I read the user manual of the product I purchased before I use it	Equal variances assumed	37.868	.000	8.182	1317	.000	.521	.064	.396	.646
	Equal variances not assumed			7.418	548,002	.000	.521	.070	.383	.659
I evaluate the price of a product considering the energy-saving capacity of it	Equal variances assumed	68.939	.000	9.272	1317	.000	.609	.066	.480	.738
	Equal variances not assumed			8.295	536,641	.000	.609	.073	.465	.753

classification, and evaluating a product in terms of its energy-saving features were correlated with being concerned about a product's energy saving features when purchasing. These relationships indicate that the information gathering research process while making the purchase decision increases sensitivity to a product's energy-saving features. This factor was therefore labeled ***sensitivity***.

The third factor reflected attitudes to evaluate products by their more tangible and superficial features. These features (price, technical features, and brand) are commonly evaluated when purchasing any other product than electrical appliances. Therefore, this factor was labeled ***essentials***.

Table 13. ANOVA descriptive statistics (the features of a product in a purchasing decision/education).

The features of a product in a purchasing decision	*Education*	*N*	*Mean*	*Std. deviation*	*Std. error*	*95% Confidence interval for mean* Lower bound	*95% Confidence interval for mean* Upper bound
Energy saving	No education	59	3.73	1.271	.165	3.40	4.06
	Primary school	504	4.26	.838	.037	4.19	4.34
	High school	636	4.04	.859	.034	3.98	4.11
	Undergraduate	107	4.26	.769	.074	4.11	4.41
	Graduate	14	4.57	.514	.137	4.27	4.87
	Total	1320	4.14	.875	.024	4.09	4.18
Price	No education	59	4.41	.746	.097	4.21	4.60
	Primary school	504	4.43	.679	.030	4.37	4.49
	High school	636	4.43	.728	.029	4.38	4.49
	Undergraduate	107	4.39	.595	.058	4.28	4.51
	Graduate	14	4.36	.633	.169	3.99	4.72
	Total	1320	4.43	.698	.019	4.39	4.47
Technical features	No education	59	4.00	1.083	.141	3.72	4.28
	Primary school	504	4.24	.775	.035	4.17	4.31
	High school	636	4.31	.722	.029	4.25	4.36
	Undergraduate	107	4.35	.660	.064	4.22	4.47
	Graduate	14	4.50	.519	.139	4.20	4.80
	Total	1320	4.27	.758	.021	4.23	4.31
Brand	No education	59	4.20	.867	.113	3.98	4.43
	Primary school	504	4.26	.743	.033	4.20	4.33
	High school	636	4.18	.821	.033	4.12	4.24
	Undergraduate	107	4.29	.740	.072	4.15	4.43
	Graduate	14	4.14	.864	.231	3.64	4.64
	Total	1320	4.22	.788	.022	4.18	4.26

ANOVA: analysis of variance.

The fourth factor included variables related to reasons underlying a willingness to save energy. The two variables omitted after the first factor analysis would have been assigned to this factor. The remaining two variables were "recommendations from family and friends" and "social campaigns." This indicates that social interactions rather than rational reasons may be the main driving force behind a willingness to save energy. Accordingly, this factor was labeled ***receptiveness***.

Obtaining factor scores for econometric analysis. The factor scores for each factor were then assumed to form variables to use as independent variables in the econometric models. The mean of each factor was calculated for this estimation. Using this method instead of assigning representative variables for every factor prevents certain effects being ignored. In addition to the econometric models involving the entire sample, individual models were estimated for each type of electrical appliance including only the owners of that appliance type. To achieve this, new factor analyses were conducted for each electrical appliance type, involving 1321 respondents for refrigerators, 880 for dishwashers, 1310 for washing machine,

Table 14. ANOVA (the features of a product in a purchasing decision/education).

The features of a product in a purchasing decision	*Variation*	*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
Energy saving	Between groups	27.496	4	6.874	9.205	.000
	Within groups	981.958	1315	.747		
	Total	1009.455	1319			
Price	Between groups	.265	4	.066	.135	.969
	Within groups	642.898	1315	.489		
	Total	643.163	1319			
Technical features	Between groups	6.820	4	1.705	2.986	.018
	Within groups	750.998	1315	.571		
	Total	757.818	1319			
Brand	Between groups	2645	4	.661	1.065	.373
	Within groups	816.761	1315	.621		
	Total	819.406	1319			

ANOVA: analysis of variance.

Table 15. Reliability analysis.

Cronbach's alpha	*N of items*
.810	15

Table 16. Kaiser–Meyer–Olkin and Bartlett test.

Kaiser–Meyer–Olkin measure of sampling adequacy		*.836*
Bartlett's test of sphericity	*Approx. chi-square*	*5637.319*
	df	105
	Sig.	.000

1150 for cookers, and 1226 for televisions. Each of these analyses replicated the original factor analysis regarding reliability and fitness tests, omitted variables, final number of factors, and distribution of variables among the factors. Therefore, all factors could be utilized in the econometric models estimated in the next step of analysis.

Econometric modeling. Econometric analysis enables the use of discrete dependent variables using binary and ordinal logit models. In order to explain several such variables from the surveys, binary and ordinal logit models were constructed using factors from the preceding factor analysis and other independent variables in the statistical analysis. The models on women's approach to energy-saving campaigns and overall knowledge of energy consumption labeling included the entire sample, using factors formed by the main factor analysis as explanatory variables. Individual models were then constructed for each of the electrical appliances, including only those respondents with that type of appliance. Conducting this

Table 17. Communalities.

Variables	*Initial*	*Extraction*
A climate change is going on	1.000	.481
There is an energy crisis on Earth	1.000	.467
There is a relationship between climate change and energy efficiency	1.000	.482
It is possible to save energy by regulating the usage patterns of electrical home appliances	1.000	.535
The society should be informed on energy-saving issue	1.000	.556
Saving energy at homes may help the fight against climate change	1.000	.585
I read the stickers on the product about the energy consumption level	1.000	.705
I read the user manual of the product I purchased before I use it	1.000	.621
I evaluate the price of a product considering the energy-saving capacity of it	1.000	.723
Energy saving	1.000	.598
Price	1.000	.602
Technical features	1.000	.634
Brand	1.000	.548
Recommendations from family and friends	1.000	.758
Social campaigns	1.000	.729

Table 18. Percentage of variance explained.

	Initial eigenvalues			*Extraction sums of squared loadings*			*Rotation sums of squared loadings*		
Component	*Total*	*% of variance*	*Cumulative %*	*Total*	*% of variance*	*Cumulative %*	*Total*	*% of variance*	*Cumulative %*
1	4.248	28.322	28.322	4.248	28.322	28.322	3.045	20.300	20.300
2	2.072	13.811	42.133	2.072	13.811	42.133	2.595	17.297	37.597
3	1.487	9.912	52.045	1.487	9.912	52.045	1.871	12.474	50.071
4	1.216	8.109	60.155	1.216	8.109	60.155	1.513	10.083	60.155
5	.888	5.919	66.073						
6	.686	4.571	70.645						
7	.625	4.166	74.811						
8	.559	3.724	78.535						
9	.534	3.559	82.093						
10	.517	3.447	85.540						
11	.501	3.339	88.879						
12	.474	3.157	92.036						
13	.447	2.983	95.019						
14	.390	2.599	97.618						
15	.357	2.382	100.000						

Extraction method: principal component analysis.

analysis for each electrical appliance required individual factor analyses using only the respective portion of the sample and each analysis should replicate the main factor analysis results. The preceding section presenting the factor analysis results showed that each individual factor analysis had the same results in terms of the sufficiency of the factor analysis,

Table 19. Component matrix.[a]

Variables	Component 1	2	3	4
Saving energy at homes may help the fight against climate change	.734	.108	.121	.141
The society should be informed on energy-saving issue	.710	.076	.206	.056
It is possible to save energy by regulating the usage patterns of electrical home appliances	.702	.124	.152	.064
A climate change is going on	.687	.081	−.026	−.039
There is a relationship between climate change and energy saving	.685	.075	−.004	.084
There is an energy crisis on Earth	.672	.100	−.055	.045
I evaluate the price of a product considering the energy-saving capacity of it	.113	.834	.101	.074
I read the stickers on the product about the energy consumption level	.133	.828	.047	.003
I read the user manual of the product I purchased before I use it	.140	.766	.078	.096
Energy saving	.102	.691	.328	.047
Price	.107	.071	.764	−.039
Technical features	.116	.249	.741	.098
Brand	.000	.094	.713	.178
Recommendations from family and friends	.057	.025	.089	.863
Social campaigns	.167	.140	.111	.818

Extraction method: principal component analysis.
Rotation method: Varimax with Kaiser normalization.
[a]Rotation converged in five iterations.
Underlined values show a clear depiction of principal components (or variables) after rotation.

the number of factors, the allocation of variables to factors, and the rotation of the factor axes.

In logit models, the overall fit of the estimated model is tested by whether the Prob > chi^2 value is lower than 5% level of significance. In the findings of this research, this value was lower than 0.05 for every model estimated, indicating that the models fit the data. All other interpretations were made using the marginal effects of the independent variables in the models. Therefore, the output tables of the marginal effects are presented here. The significance of the independent variables in the logit models indicates that they have a statistical effect on the dependent variables, defined as the value in the P > |z| column in the output table being lower than the significance level of 5% (0.01; 0.10). However, these coefficients cannot directly explain the impacts of the independent variables so it is necessary to estimate the effect of a one-unit change in each independent variable on the dependent variable when all other independent variables are held constant at their mean values. These marginal effects are presented in the dy/dx column in the output tables.

The most frequently used independent variables in the following sections are as follows:

age: age variable, categorical
education: education variable, categorical
awareness: factor produced by the factor analysis
sensitivity: factor produced by the factor analysis
essentials: factor produced by the factor analysis
receptiveness: factor produced by the factor analysis

Table 20. Marginal effect after ologit Model 1 (campaigns) and Model 2 (energy class=1; =2; =3).

	Model 1	*Model 2*		
	y = Pr(campaigns) (predict) = .99093019	*(Model 2.1) y = Pr(energyclass = 1) (predict, p outcome (1)) = .20034692*	*(Model 2.2) y = Pr(energyclass = 2) (predict, p outcome (2)) = .32152251*	*(Model 2.1) y = Pr(energyclass = 3) (predict, p outcome (3)) = .47813057*
	dy/dx	*dy/dx*	*dy/dx*	*dy/dx*
Variables		*(energyclass = 1)*	*(energyclass = 2)*	*(energyclass = 3)*
age	0.0023598	0.031876***	0.0177704***	– 0.0496465***
	(0.00203)	(0.00783)	(0.00464)	(0.01212)
education	0.0108529**	−0.0981574***	−0.0547213***	0.1528787***
	(0.00367)	(0.01424)	(0.00958)	(0.02214)
awareness	−0.0050389	−0.0310603*	−0.0173157*	0.048376*
	(0.00504)	(0.01706)	(0.00964)	(0.02654)
sensitivity	−0.0054431	−0.0775068***	−0.043209***	0.1207158***
	(0.00339)	(0.01184)	(0.0075)	(0.01802)
essentials	−0.000552	−0.0384717**	−0.0214474**	0.0599191**
	(0.00473)	(0.01671)	(0.0095)	(0.02597)
receptiveness	−0.0004291	0.0011937	0.0006655	−0.0018592
	(0.0028)	(0.01117)	(0.00623)	(0.01741)

Note: *** is 0.01, ** is 0.01, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Table 21. Marginal effect after ologit Model 3 (refusage1, refusage2, refusage3, refusage4).

	Model 3			
	Model 3.1 (refusage1)	*Model 3.2 (refusage2)*	*Model 3.3 (refusage3)*	*Model 3.4 (refusage4)*
	y = Pr(refusage1) (predict) = .16685147	*y = Pr(refusage2) (predict) = .23018227*	*y = Pr(refusage3) (predict) = .91416524*	*y = Pr(refusage4) (predict) = .41899546*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.0043618	−0.0028768	0.0097851	−0.0203642
	(0.00921)	(0.01038)	(0.00703)	(0.0125)
education	−0.0468164***	−0.0016493	0.0162639	0.0046426
	(0.01659)	(0.01831)	(0.0125)	(0.02163)
awareness	0.0057625	−0.001988	0.016146	−0.0060204
	(0.02058)	(0.02279)	(0.01403)	(0.02807)
sensitivity	−0.0114112	−0.0345748**	0.0100559	0.0636221***
	(0.01308)	(0.01471)	(0.00948)	(0.0189)
essentials	0.0086008	−0.0066513	0.02993	0.1404199***
	(0.01977)	(0.02158)	(0.01315)	(0.02812)
receptiveness	0.0316226**	−0.0144236	−0.0111792	0.0462318**
	(0.01386)	(0.01508)	(0.01025)	(0.01853)

Note: *** is 0.01, ** is 0.01, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Explanations for any additional variables included in the specific models for each home appliance are given below.

Models involving the entire sample. Two variables related to energy saving were included as dependent variables in these models to estimate the effects of the independent variables.

The dependent variable ***campaigns*** in Model 1 output (Table 20) was obtained by coding "yes" responses as 1 and "no" as 0 to the question "Do you support campaigns promoting energy saving at homes?" In this binary logit model, education was the only significant variable, which had a positive effect, indicating that when all other independent variables were held constant at their mean values, each one-unit increase in education level increases the probability of support for campaigns by 0.1.

In Model 2, the dependent variable ***energyclass*** was obtained by coding responses to the question "What is the most energy efficient class you know that is written on the stickers of the electrical home appliances?" as 1, 2, or 3, as explained earlier. Models 2.1, 2.2, and 2.3 show that age, education, sensitivity, and essentials had 1% level of significance while awareness was significant at only 10%. Age had a negative effect on the probability of having knowledge about energy-saving classes while education had the largest positive effect, followed by sensitivity.

Table 22. Marginal effect after ologit Model 4.1 (dishwusage1 = 1; dishwusage1 = 2; dishwusage1 = 3; dishwusage1 = 4; dishwusage1 = 5).

	Model 4				
	Model 4.1 (dishwusage1 = 1)	*Model 4.1 (dishwusage1 = 2)*	*Model 4.1 (dishwusage1 = 3)*	*Model 4.1 (dishwusage1 = 4)*	*Model 4.1 (dishwusage1 = 5)*
	y = Pr (dishwusage1 = 1) (predict,p outcome(1)) = .00460934	*y = Pr (dishwusage1 = 2) (predict, p outcome (2)) = .01024698*	*y = Pr (dishwusage1 = 3) (predict,p outcome(3)) = .05868782*	*y = Pr (dishwusage1 = 4) (predict, p outcome(4)) = .36592873*	*y = Pr (dishwusage1 = 5) (predict, p outcome(5)) = .56052713*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	0.0003879	0.0008494	0.0045229	0.0150651	−0.0208253
	(0.00032)	(0.00064)	(0.00319)	(0.01057)	(0.01456)
education	0.0017085*	0.0037415**	0.0199222***	0.0663583***	−0.0917305
	(0.00088)	(0.00147)	(0.00562)	(0.01802)	(0.0243)
dishwfreq	−0.0001324	−0.00029	−0.0015444	−0.0051441	0.007111
	(0.0003)	(0.00065)	(0.00343)	(0.01142)	(0.01579)
awareness	−0.0014278*	−0.0031267*	−0.0166486**	−0.0554545**	0.0766576
	(0.00091)	(0.00172)	(0.00801)	(0.02617)	(0.03594)
sensitivity	−0.0015558**	−0.0034072**	−0.018142***	−0.0604288***	0.0835338
	(0.00081)	(0.00136)	(0.00526)	(0.01693)	(0.02286)
essentials	−0.0033781	−0.0073978***	−0.0393908***	−0.1312057***	0.1813724
	(0.0016)	(0.00251)	(0.00821)	(0.02532)	(0.03325)
receptiveness	0.0008869	0.0019423*	0.0103423**	0.034449**	−0.0476206
	(0.00058)	(0.00109)	(0.00507)	(0.0167)	(0.02291)

Note: *** is 0.01, ** is 0.01, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Models involving refrigerator owners. Following the model results for the entire sample, owners of each electrical appliance were asked whether they adopt energy-saving behaviors at home. Refrigerator owners were asked to indicate the behaviors they adopt by ticking boxes for various statements. The dependent variables for the models were constructed by coding a tick as 1 and no tick as 0 for every statement.

In Model 3.1, the dependent variable ***refusage1*** was constructed from responses to the statement "Its location receives sunlight." Two of the independent variables, namely age and receptiveness, were significantly related to this at $\alpha = 0.05$, meaning that these two variables significantly affected the dependent variable. The marginal effect of education was negative, which indicates that, holding other independent variables at their mean values, a one-unit increase in education level reduces the probability of positioning the refrigerator in sunlight by 0.05. Receptiveness had a positive marginal effect of 0.03, which is not unexpected since receptiveness measures a tendency to save energy, mostly driven by social motivators rather than rational reasons.

Responses to another similar behavioral statement on refrigerator usage, "Its location is close to the oven," were used to construct ***refusage2***. According to the results of the Model 3.2, sensitivity was the only independent variable that affected the dependent variable.

Table 23. Marginal effect after ologit Model 4.2 (dishwusage2 = 1; dishwusage2 = 2; dishwusage2 = 3; dishwusage2 = 4; dishwusage2 = 5).

	Model 4				
	Model 4.2 (dishwusage2 = 1)	*Model 4.2 (dishwusage2 = 2)*	*Model 4.2 (dishwusage2 = 3)*	*Model 4.2 (dishwusage2 = 4)*	*Model 4.2 (dishwusage2 = 5)*
	y = Pr (dishwusage2 = 1) (predict, p outcome(1)) = .01544145	*y = Pr (dishwusage2 = 2) (predict, p outcome(2)) = .02172585*	*y = Pr (dishwusage2 = 3) (predict, p outcome(3)) = .11692647*	*y = Pr (dishwusage2 = 4) (predict, p outcome(4)) = .36647945*	*y = Pr (dishwusage2 = 5) (predict, p outcome(5)) = .47942678*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.00119	−0.00161	−0.00738	−0.0093	0.019474
	(0.00091)	(0.00121)	(0.00539)	(0.00681)	(0.01415)
education	0.001408	0.001906	0.008757	0.011041	−0.02311
	(0.00147)	(0.00198)	(0.00894)	(0.01129)	(0.02354)
Dishwfreq	0.001376	0.001862	0.008556	0.010788	−0.02258
	(0.00096)	(0.00128)	(0.00565)	(0.00719)	(0.01487)
awareness	−0.0046**	−0.00623**	−0.02862**	−0.03609**	0.075539**
	(0.00234)	(0.00305)	(0.0129)	(0.01637)	(0.03362)
sensitivity	−0.00245*	−0.00331*	−0.01523*	−0.0192*	0.040187*
	(0.00145)	(0.00191)	(0.00828)	(0.01057)	(0.02176)
essentials	−0.0077***	−0.01043***	−0.04792***	−0.06042***	0.126482***
	(0.00264)	(0.00327)	(0.01204)	(0.01579)	(0.03076)
receptiveness	−0.00066	−0.00089	−0.00409	−0.00516	0.010798
	(0.0013)	(0.00176)	(0.00806)	(0.01017)	(0.02126)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

As expected, its marginal effect was negative as sensitivity measures tentativeness to take energy saving into account when purchasing and using electrical appliances. Therefore, any increase in this variable should decrease the probability of positioning the fridge close to the oven.

In Table 21, the dependent variable ***refusage3*** in Model 3.3 was constructed from responses to the statement "I check whether its door is completely shut." The estimated model explains the probability of owners' adopting this behavior. Only essentials had a significant effect on the dependent variable. Holding all other independent variables constant, one-unit increase in essentials increases the probability of owners checking whether the refrigerator door is completely shut by 3% level of significance. However, although the effect was in the expected direction, its effect was statistically insignificant.

Responses to the statement "I do not open and close [the refrigerator] for every need within a short time," formed ***refusage4***. Model 3.4 showed that two factors had significant effects, with the marginal effects of sensitivity, essentials, and receptiveness being positive, as expected. The variable essentials had the largest marginal effect. Holding other independent variable at their means, each one-unit increase in essentials increased refusage4 by 0.14.

Table 24. Marginal effect after ologit Model 4.3 (dishwusage3 = 1; dishwusage3 = 2; dishwusage3 = 3; dishwusage3 = 4; dishwusage3 = 5).

	Model 4				
	Model 4.3 (dishwusage3 = 1)	*Model 4.3 (dishwusage3 = 2)*	*Model 4.3 (dishwusage3 = 3)*	*Model 4.3 (dishwusage3 = 4)*	*Model 4.3 (dishwusage3 = 5)*
	y = Pr (dishwusage3 = 1) (predict, p outcome(1)) = .004517	*y = Pr (dishwusage3 = 2) (predict, p outcome(2)) = .004514*	*y = Pr (dishwusage3 = 3) (predict, p outcome(3)) = .05101364*	*y = Pr (dishwusage3 = 4) (predict, p outcome(4)) = .320253*	*y = Pr (dishwusage3 = 5) (predict, p outcome(5)) = .619703*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	0.000743	0.000736	0.007847	0.029616	−0.03894
	(0.00042)	(0.00042)	(0.003)	(0.01103)	(0.01434)
education	0.001209	0.001197	0.012764	0.048174	−0.06334
	(0.0007)	(0.00069)	(0.00501)	(0.01839)	(0.02394)
dishwfreq	0.000278	0.000275	0.002933	0.011068	−0.01455
	(0.00032)	(0.00032)	(0.00312)	(0.01174)	(0.01542)
awareness	−0.00049	−0.00049	−0.00517	−0.01952	0.025668
	(0.00069)	(0.00068)	(0.00693)	(0.02609)	(0.03427)
sensitivity	−0.001	−0.00099	−0.01051**	−0.03966**	0.052153**
	(0.00061)	(0.0006)	(0.00462)	(0.01704)	(0.02224)
essentials	−0.00416**	−0.00412**	−0.04393***	−0.16579**	0.217994***
	(0.00192)	(0.0019)	(0.00805)	(0.02618)	(0.0323)
receptiveness	0.000454	0.000449	0.004789	0.018076	−0.02377
	(0.00047)	(0.00047)	(0.00454)	(0.01708)	(0.02242)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

As expected, sensitivity and receptiveness also had positive marginal effects on behavior, perhaps from frequently observing and acquiring this behavior.

Models involving dishwasher owners. The three models estimated using data from dishwasher owners' responses, included ***dishwusage1***, ***dishwusage2***, ***dishwusage3*** as the dependent variables. A new independent variable, ***dishwfreq*****(dish washer frequency)** was also identified in the models, representing how often owners used their dishwasher. For ordinal logit models, it is important to determine which independent variable shows the largest marginal effect at which value of the dependent variable. The dependent variables were ordinally coded, with 1 being most infrequent and 5 being the most frequent for each dishwasher usage behavior.

As Table 22 shows, in Model 4.1, the dependent variable ***dishwusage1*** was constructed from responses to the statement "I use it when full." Age and ***dishwfreq*** had no significant effects. Because it is logical to expect that using the dishwasher more often will result in the tendency to use it when full, future research could investigate why this variable did not have a significant effect. Education, awareness, essentials, and receptiveness all had significant effects, with essentials being the strongest. Apparently, the tendency to keep in mind a dishwasher's technical features increases the probability of adopting the particular

Table 25. Marginal effect after ologit Model 5.1 (wmusage1 = 1; wmusage1 = 2; wmusage1 = 3; wmusage1 = 4; wmusage1 = 5).

	Model 5				
	Model 5.1 (wmusage1 = 1)	*Model 5.1 (wmusage1 = 2)*	*Model 5.1 (wmusage1 = 3)*	*Model 5.1 (wmusage1 = 4)*	*Model 5.1 (wmusage1 = 5)*
	y = Pr (wmusage1 = 1) (predict, p outcome(1)) = .021134	*y = Pr (wmusage1 = 2) (predict, p outcome(2)) = .031746*	*y = Pr (wmusage1 = 3) (predict, p outcome(3)) = .118404*	*y = Pr (wmusage1 = 4) (predict, p outcome(4)) = .406002*	*y = Pr (wmusage1 = 5) (predict, p outcome(5)) = .422713*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.0008 (0.00097)	−0.00113 (0.00137)	−0.00113 (0.00426)	−0.00393 (0.00475)	0.009405 (0.01132)
education	0.006659*** (0.00205)	0.009463*** (0.00276)	0.009463*** (0.00786)	0.032859*** (0.00907)	−0.07855*** (0.02043)
wmfreq	−0.00203* (0.00117)	−0.00288* (0.00163)	−0.00288* (0.005)	−0.01001* (0.0056)	0.023935* (0.0132)
awareness	−0.00387* (0.00229)	−0.0055* (0.00321)	−0.0055* (0.00981)	−0.01911* (0.01094)	0.045675* (0.02588)
sensitivity	−0.00591*** (0.00176)	−0.0084*** (0.00236)	−0.0084*** (0.00666)	−0.02916*** (0.00772)	0.069719*** (0.01729)
essentials	−0.00849*** (0.00251)	−0.01206*** (0.00335)	−0.01206*** (0.00948)	−0.04189*** (0.01108)	0.100133*** (0.02466)
receptiveness	−0.00227 (0.00152)	−0.00322 (0.00213)	−0.00322 (0.00656)	−0.01119 (0.00732)	0.026748 (0.01734)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

energy-saving behavior. Sensitivity and receptiveness, as expected, displayed positive marginal effects. The negative effect of education may be because more highly educated women lack the time or interest for dishwashing tasks while the negative effect of receptiveness may indicate that this usage pattern is not widely recognized or applied.

As Table 23 shows, the dependent variable of Model 4.2, ***dishwusage2*** represents responses to the statement "I choose between the full and economic programs according to the state of the dishes." Only awareness and essentials had significant positive marginal effects, with essentials being stronger. As both the factors are related with the awareness about climate change and energy saving, and since the technical features of electrical appliances are expected to have positive effects, the underlying hypothesis of this model is supported.

As Table 24 shows, in Model 4.3, the dependent variable ***dishwusage3*** was obtained from responses of dishwasher owners to the statement "I clean the worst dirt before I place the dishes in the dishwasher." Results from this model indicate that age and education had negative effects while sensitivity and essentials had positive significant marginal effects, with essentials being strongest. While the effects of sensitivity were somewhat as expected, the effects of age and education should be tested in future models.

Table 26. Marginal effect after ologit Model 5.2 (wmusage2 = 1; wmusage2 = 2; wmusage2 = 3; wmusage2 = 4; wmusage2 = 5).

	Model 5				
	Model 5.2 (wmusage2 = 1)	*Model 5.2 (wmusage2 = 2)*	*Model 5.2 (wmusage2 = 3)*	*Model 5.2 (wmusage2 = 4)*	*Model 5.2 (wmusage2 = 5)*
	y = Pr (wmusage2 = 1) (predict, p outcome(1)) = .00753	*y = Pr (wmusage2 = 2) (predict, p outcome(2)) = .032524*	*y = Pr (wmusage2 = 3) (predict, p outcome(3)) = .124515*	*y = Pr (wmusage2 = 4) (predict, p outcome(4)) = .457159*	*y = Pr (wmusage2 = 5) (predict, p outcome(5)) = .378273*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.00097**	−0.00403***	−0.01287***	−0.0127***	0.030568***
	(0.00045)	(0.00154)	(0.00469)	(0.00475)	(0.01102)
education	−0.00049	−0.00203	−0.00648	−0.00639	0.015387
	(0.00064)	(0.00259)	(0.00826)	(0.00815)	(0.01958)
wmfreq	0.000516	0.002141	0.006844	0.006751	−0.01625
	(0.00043)	(0.00169)	(0.00535)	(0.00531)	(0.01267)
awareness	−0.00136	−0.00565*	−0.01807*	−0.01783*	0.042917*
	(0.00089)	(0.0034)	(0.01067)	(0.01061)	(0.02521)
sensitivity	−0.002**	−0.00829***	−0.02649***	−0.02613***	0.062906***
	(0.00079)	(0.00245)	(0.0072)	(0.00744)	(0.01678)
essentials	−0.0026**	−0.01079***	−0.03451***	−0.03404***	0.081941***
	(0.00106)	(0.00336)	(0.0100)	(0.01038)	(0.02344)
receptiveness	−0.0009	−0.00374*	−0.01196*	−0.01179*	0.02839*
	(0.00058)	(0.0022)	(0.00689)	(0.00686)	(0.01629)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Models involving washing machine owners. In the four models using data from washing machine owners' responses, ***wmusage1***, ***wmusage2***, ***wmusage3***, ***wmusage4*** were identified as the dependent variables. A new independent variable, ***wmfreq*** was also identified to represent how often the owners used their washing machines. The dependent variables were coded ordinally, with 1 being the most infrequent and 5 being the most frequent for each usage behavior regarding the washing machine.

As Table 25 shows, in Model 5.1, ***wmusage1*** represents owners' responses to the statement "I use it when full." Age and receptiveness both had insignificant effects in this model for all categories. On the contrary, the frequency of washing machine use (wmfreq) and awareness had 10% level of significance while sensitivity and essentials had 1% level of significance.. Essentials had the strongest marginal effect, indicating that the tendency pay attention to the technical features of washing machines is the most effective driver for using the machine when full. Sensitivity had the second largest positive effect while wmfreq and awareness had much smaller effects. The negative effect of education may indicate that more highly educated women have to use their machines more frequently so that they cannot wait for it to be full every time.

Table 27. Marginal effect after ologit Model 5.3 (wmusage3 = 1; wmusage3 = 2; wmusage3 = 3; wmusage3 = 4; wmusage3 = 5).

	Model 5				
	Model 5.3 (wmusage3 = 1)	*Model 5.3 (wmusage3 = 2)*	*Model 5.3 (wmusage3 = 3)*	*Model 5.3 (wmusage3 = 4)*	*Model 5.3 (wmusage3 = 5)*
	y = Pr (wmusage3 = 1) (predict, p outcome(1)) = .01177776	*y = Pr (wmusage3 = 2) (predict, p outcome(2)) = .039655*	*y = Pr (wmusage3 = 3) (predict, p outcome(3)) = .107988*	*y = Pr (wmusage3 = 4) (predict, p outcome(4)) = .492418*	*y = Pr (wmusage3 = 5) (predict, p outcome(5)) = .348161*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.00152***	−0.00484***	−0.0111***	−0.0121***	0.029554***
	(0.00064)	(0.00183)	(0.00409)	(0.00455)	(0.01069)
education	0.001114	0.003555	0.008155	0.008894	−0.02172
	(0.00099)	(0.00309)	(0.00706)	(0.00773)	(0.01874)
wmfreq	0.002039***	0.006508***	0.014928***	0.016281***	−0.03975***
	(0.00077)	(0.00214)	(0.00474)	(0.00534)	(0.01236)
awareness	−0.00275**	−0.00876**	−0.02011**	−0.02193**	0.053544**
	(0.00139)	(0.00412)	(0.00931)	(0.01031)	(0.02453)
sensitivity	−0.00455***	−0.01453***	−0.03332***	−0.03634***	0.088739***
	(0.0013)	(0.00311)	(0.00644)	(0.00775)	(0.01634)
essentials	−0.00674***	−0.02152***	−0.04937***	−0.05384***	0.131465***
	(0.00188)	(0.00439)	(0.00904)	(0.01106)	(0.02285)
receptiveness	−0.00042	−0.00134	−0.00307	−0.00334	0.008165
	(0.00084)	(0.00267)	(0.00612)	(0.00667)	(0.01629)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

As Table 26 shows, the dependent variable of Model 5.2 is ***wmusage2***, from owners' responses to the statement "I use it with low temperature when washing less dirty laundry." In the model, education and wmfreq were insignificant at all five categories of the Model 5.2. However, awareness and receptiveness had 1% level of significance at the second, third, fourth, and fifth categories. Essentials had the largest effect, followed by sensitivity, which matches the pattern of results from the previous model.

As Table 27 shows, model 5.3 was estimated using ***wmusage3***, from responses to the statement "I adjust the detergent amount for every wash." In this model, for all the categories of the model 5.3, age, wmfreq, awareness, sensitivity, and essentials had significant effects whereas education and receptiveness were insignificant. The only variable with a negative marginal effect was wmfreq, which indicates that women who use washing machines more frequently are less likely to adjust the amount of detergent for every wash. Essentials and sensitivity had the largest positive marginal effects while the positive effect of age shows that older women care more about adjusting detergent usage according to the wash.

As Table 28 shows, for Model 5.4, ***wmusage4*** was constructed from responses to the statement "I choose between the full and economic programs according to the state of the

Table 28. Marginal effect after ologit Model 5.4 (wmusage4 = 1; wmusage4 = 2; wmusage4 = 3; wmusage4 = 4; wmusage4 = 5).

	Model 5				
	Model 5.4 (wmusage4 = 1)	*Model 5.4 (wmusage4 = 2)*	*Model 5.4 (wmusage4 = 3)*	*Model 5.4 (wmusage4 = 4)*	*Model 5.4 (wmusage4 = 5)*
	y = Pr (wmusage4 = 1) (predict, p outcome(1)) = .01141751	*y = Pr (wmusage4 = 2) (predict, p outcome(2)) = .022825*	*y = Pr (wmusage4 = 3) (predict, p outcome(3)) = .10501384*	*y = Pr (wmusage4 = 4) (predict, p outcome(4)) = .455537*	*y = Pr (wmusage4 = 5) (predict, p outcome(5)) = .405207*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.0000111	−0.0000214	−0.0000851	−0.00012	0.000236
	(0.00053)	(0.00102)	(0.00408)	(0.0057)	(0.01134)
education	0.002032*	0.003921**	0.015622**	0.021806**	−0.04338**
	(0.00104)	(0.00191)	(0.00732)	(0.01029)	(0.02017)
wmfreq	0.000584	0.001127	0.00449	0.006267	−0.01247
	(0.00063)	(0.0012)	(0.00476)	(0.00665)	(0.01319)
awareness	−0.00258*	−0.00497**	−0.01981**	−0.02765**	0.055015**
	(0.00135)	(0.00248)	(0.00954)	(0.01334)	(0.02622)
sensitivity	−0.0057***	−0.01099**	−0.04381***	−0.06115***	0.121644***
	(0.00149)	(0.00229)	(0.0068)	(0.01013)	(0.01758)
essentials	−0.00702***	−0.01354**	−0.05394***	−0.0753***	0.149792***
	(0.00191)	(0.00299)	(0.00933)	(0.01383)	(0.02455)
receptiveness	0.000548	0.001058	0.004214	0.005882	−0.0117
	(0.00081)	(0.00155)	(0.00613)	(0.00857)	(0.01701)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

clothes." For all categories of the model 5.4, age, wmfreq, and receptiveness had insignificant effects whereas education, awareness, and essentials were significant. Essentials and sensitivity had the largest effects, corresponding to the pattern of results in the two previous models. Education had a negative effect, possibly indicating that more educated women use the same program for every wash, regardless of the laundry's condition.

Models involving oven owners. The four models for oven owners' responses used four 5-point Likert scale independent variables: ***ovenusage1***, ***ovenusage2***, ***ovenusage3***, ***ovenusage4***. These were coded ordinally, with 1 being the most infrequent and 5 being the most frequent for each usage behavior. The model results showed that these variables often successfully explained the dependent variables.

The factors awareness and receptiveness were significant in one model each. Sensitivity and essentials were significant in oven use patterns of owners at 5-point Likert scale used. This shows that knowledge about energy-saving electrical appliances and their technical features has a stronger effect on adopting energy-saving oven use patterns than knowledge about climate change or the influence of the social environment. The insignificant or negative effect of education on oven usage behavior was unexpected.

As Table 29 shows, in Model 6.1, the dependent variable ***ovenusage1*** was constructed from owners' responses to the statement "I avoid opening its door when checking the

Table 29. Marginal effect after ologit Model 6.1 ((ovenusage1 = 1); (ovenusage1 = 2); (ovenusage1 = 3); (ovenusage1 = 4); (ovenusage1 = 5)).

	Model 6				
	Model 6.1 (ovenusage1 = 1)	*Model 6.1 (ovenusage1 = 2)*	*Model 6.1 (ovenusage1 = 3)*	*Model 6.1 (ovenusage1 = 4)*	*Model 6.1 (ovenusage1 = 5)*
	y = Pr (ovenusage1 = 1) (predict, p outcome(1)) = .03438	*y = Pr (ovenusage1 = 2) (predict, p outcome(2)) = .0543*	*y = Pr (ovenusage1 = 3) (predict, p outcome(3)) = .171761*	*y = Pr (ovenusage1 = 4) (predict, p outcome(4)) = .41055*	*y = Pr (ovenusage1 = 5) (predict, p outcome(5)) = .329*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.0038**	−0.00545**	−0.0128**	−0.00322*	0.025271**
	(0.00167)	(0.00236)	(0.00547)	(0.00174)	(0.01068)
education	0.00638**	0.009148**	0.021478**	0.005407*	−0.04241**
	(0.00281)	(0.00396)	(0.00912)	(0.00295)	(0.01789)
awareness	−0.00254	−0.00365	−0.00856	−0.00215	0.016901
	(0.00366)	(0.00524)	(0.01229)	(0.00316)	(0.02422)
sensitivity	−0.01946***	−0.0279***	−0.0655***	−0.01649***	0.129351***
	(0.00349)	(0.00457)	(0.00934)	(0.00597)	(0.01675)
essentials	−0.01262***	−0.01809***	−0.04248***	−0.01069**	0.083883***
	(0.00379)	(0.00522)	(0.01184)	(0.00474)	(0.02298)
receptiveness	0.003551	0.005091	0.011953	0.003009	−0.0236
	(0.00244)	(0.00348)	(0.00808)	(0.00228)	(0.01593)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

cooking process." Sensitivity and essentials had the largest positive marginal effect when ovenusage1 had the value "always" value, coded as 5. Age also had the highest marginal effect when the dependent variable was 5, which suggests that experience in oven use helps owners to develop this usage pattern.

As Table 30 shows, Model 6.2, using the dependent variable, ***ovenusage2*** to represent responses to the statement "I turn it off a couple of minutes before the cooking is complete," produced similar results to the previous model.

As Table 31 shows, in Model 6.3, the dependent variable is ***ovenusage3*** represented responses to the statement "I wait for frozen food to thaw before cooking it." Essentials had the largest positive marginal effect, followed by education, which had a negative effect. Awareness, sensitivity, and essentials also had significant effects on this behavior.

As Table 32 shows, Model 6.4 used the variable ***ovenusage4*** to measure responses to the statement "I avoid using the turbo feature of the oven." Education, sensitivity, essentials, and receptiveness were significant at $\alpha = 0.05$ while awareness was significant at $\alpha = 0.1$. Education and receptiveness had negative effects, which follows the general pattern for the models on oven use. Essentials and sensitivity had the largest marginal effect, which confirms the hypotheses of this model.

Models involving television owners. The results from the models estimated for the five television use patterns were somewhat less reliable than those for the other electrical appliances,

Table 30. Marginal effect after ologit Model 6.2 ((ovenusage2 = 1); (ovenusage2 = 2); (ovenusage2 = 3); (ovenusage2 = 4); (ovenusage2 = 5)).

	Model 6				
	Model 6.2 (ovenusage2 = 1)	*Model 6.2 (ovenusage2 = 2)*	*Model 6.2 (ovenusage2 = 3)*	*Model 6.2 (ovenusage2 = 4)*	*Model 6.2 (ovenusage2 = 5)*
	y = Pr (ovenusage2 = 1) (predict,' p outcome(1)) = .08739	*y = Pr (ovenusage2 = 2) (predict, p outcome(2)) = .07289*	*y = Pr (ovenusage2 = 3) (predict, p outcome(3)) = .203756*	*y = Pr (ovenusage2 = 4) (predict, p outcome(4)) = .390895*	*y = Pr (ovenusage2 = 5) (predict, p outcome(5)) = .245067*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.00772**	−0.00531**	−0.00939**	0.004503*	0.017915**
	(0.00382)	(0.00265)	(0.00465)	(0.00237	(0.00878)
education	−0.00136	−0.00094	−0.00166	0.000794	0.003159
	(0.00645)	(0.00443)	(0.00784)	(0.00376)	(0.01496)
awareness	−0.00739	−0.00508	−0.00898	0.004311	0.017149
	(0.00852)	(0.00587)	(0.01037)	(0.00504)	(0.01975)
sensitivity	−0.02967***	−0.0204***	−0.03606***	0.017302***	0.068832***
	(0.00615)	(0.00447)	(0.00763)	(0.00479)	(0.01369)
essentials	−0.02137***	−0.01469***	−0.02597***	0.012459**	0.049565***
	(0.0082)	(0.00571)	(0.01007)	(0.00526)	(0.01886)
receptiveness	−0.00549	−0.00378	−0.00668	0.003204	0.012746
	(0.00567)	(0.00391)	(0.00689)	(0.00337)	(0.01311)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Table 31. Marginal effect after ologit Model 6.3 ((ovenusage3 = 1); (ovenusage3 = 2); (ovenusage3 = 3); (ovenusage3 = 4); (ovenusage3 = 5)).

	Model 6				
	Model 6.3 (ovenusage3 = 1)	*Model 6.3 (ovenusage3 = 2)*	*Model 6.3 (ovenusage3 = 3)*	*Model 6.3 (ovenusage3 = 4)*	*Model 6.3 (ovenusage3 = 5)*
	y = Pr (ovenusage3 = 1) (predict, p outcome(1)) = .037577	*y = Pr (ovenusage3 = 2) (predict, p outcome(2)) = .059887*	*y = Pr (ovenusage3 = 3) (predict, p outcome(3)) = .167436*	*y = Pr (ovenusage3 = 4) (predict, p outcome(4)) = .368544*	*y = Pr (ovenusage3 = 5) (predict, p outcome(5)) = .245067*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	0.005222***	0.00748***	0.015416***	0.00541**	−0.03353***
	(0.00183)	(0.00256)	(0.00515)	(0.00219)	(0.011)
education	0.014098***	0.020193***	0.041619***	0.014605***	−0.09051***
	(0.00346)	(0.00472)	(0.00921)	(0.00463)	(0.0192)
awareness	−0.01254***	−0.01796***	−0.03701***	−0.01299**	0.080493***
	(0.00425)	(0.00594)	(0.1194)	(0.0051)	(0.02541)
sensitivity	−0.00774***	−0.01109***	−0.02286***	−0.00802**	0.049721***
	(0.00286)	(0.004)	(0.00806)	(0.00336)	(0.01725)
essentials	−0.0196***	−0.02808***	−0.05786***	−0.02031***	0.125846***
	(0.00444)	(0.006)	(0.01176)	(0.00633)	(0.02437)
receptiveness	0.00428	0.00613	0.012634	0.004433	−0.02748
	(0.00268)	(0.0038)	(0.00776)	(0.00292)	(0.01682)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

partly because the dependent variables for television use patterns were binary rather than ordinal, although television use frequency was represented by the ordinal variable ***tvfreq***, with values from 1 to 6.

As Table 33 shows, in Model 7.1, the dependent variable ***tvusage1*** represents responses to the statement "Its location is away from sunlight." This behavior was significantly affected by age, awareness, essentials, and receptiveness. Essentials had the largest positive marginal effect, followed by awareness, but with a negative sign. The positive effect of essentials confirms the expected relationship between knowledge of the technical features of a television, such as the brightness setting, and placing the device out of sunlight. In contrast, the negative effect of awareness was unexpected.

In Model 7.2, the dependent variable, ***tvusage2*** was constructed from responses to the statement "I keep the curtains closed when watching television in daylight." Only essentials had a significant effect, which was positive as expected.

As predicted, in Model 7.3, the dependent variable ***tvusage3***, which represented responses to the statement "I reduce the indoor illumination when watching television without sunlight," was positively significantly affected by essentials and education at $\alpha = 0.1$.

In Model 7.4, ***tvusage4*** measured responses to the statement "I use the automatic brightness setting of the television." The significant independent variables were tvfreq, sensitivity, and essentials, with sensitivity having the strongest effect. This was as expected because the

Table 32. Marginal Effect after ologit Model 6.4 ((ovenusage4 = 1); (ovenusage4 = 2); (ovenusage4 = 3); (ovenusage4 = 4); (ovenusage4 = 5)).

	Model 6				
	Model 6.4 (ovenusage4 = 1)	*Model 6.4 (ovenusage4 = 2)*	*Model 6.4 (ovenusage4 = 3)*	*Model 6.4 (ovenusage4 = 4)*	*Model 6.4 (ovenusage4 = 5)*
	y = Pr (ovenusage4 = 1) (predict, p outcome(1)) = .11956463	*y = Pr (ovenusage4 = 2) (predict, p outcome(2)) = .09798423*	*y = Pr (ovenusage4 = 3) (predict, p outcome(3)) = .2383832*	*y = Pr (ovenusage4 = 4) (predict, p outcome(4)) = .26101912*	*y = Pr (ovenusage4 = 5) (predict, p outcome(5)) = .27055088*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−.0011122	−0.0006797	−0.0007816	0.0005617	0.0021461
	(0.00475)	(0.00291)	(0.00334)	(0.0024)	(0.00917)
education	0.0225622***	0.0137877***	0.0158557***	−0.0113936***	−0.0435345***
	(0.00823)	(0.00512)	(0.00596)	(0.00439)	(0.01575)
awareness	−0.0191353*	−0.0116935*	−0.0134474*	0.0096631*	0.0369221*
	(0.01091)	(0.00672)	(0.00774)	(0.00566)	(0.02093)
sensitivity	−0.0337933***	−0.020651***	−0.0237484***	0.0170652***	0.0652053***
	(0.00761)	(0.00487)	(0.00574)	(0.00444)	(0.01429)
essentials	−0.0475923***	−0.0290836***	−0.0334458***	0.0240335***	0.0918309***
	(0.01052)	(0.00673)	(0.00804)	(0.00608)	(0.01994)
receptiveness	0.0156732**	0.0095778**	0.0110144**	−0.0079148**	−0.0302419**
	(0.00729)	(0.0045)	(0.00519)	(0.0038)	(0.01398)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

essentials factor is related to doing some reading and research, both before purchasing and when using the device. More frequent television use may reduce the probability of using the automatic brightness setting due to a tendency to set the brightness manually according to what is watched. The insignificant effect of essentials was unexpected.

Finally, Model 7.5 had ***tvusage5*** as the dependent variable; representing responses to the statement "I unplug or switch off the television when not in use." Age, education, and essentials had significant effects, which was not in accordance with the initial hypotheses.

Discussion and policy recommendations

One of the most important outcomes of this study of Turkish housewives and university students is that it demonstrates the similarities and differences between the two groups, particularly regarding the effects of education level.

The first finding is that women with a higher education level are more likely to know about climate change and energy-saving electrical appliances. This finding is particularly important regarding energy saving and preventing climate change considering that women use domestic electrical devices more often than men. Therefore, efforts at improving women's general education level help to raise awareness about climate change and make energy-saving behaviors more likely.

Table 33. Marginal effect after ologit Model 7 (tvusage1, tvusage2, tvusage3, tvusage4, tvusage5).

	Model 7				
	Model 7.1 (tvusage1)	*Model 7.2 (tvusage2)*	*Model 7.3 (tvusage3)*	*Model 7.4 (tvusage4)*	*Model 7.5 (tvusage5)*
	y = Pr (tvusage1) (predict) = .50314511	*y = Pr(tvusage2) (predict) = .42416753*	*y = Pr(tvusage3) (predict) = .36945116*	*y = Pr(tvusage4) (predict) = .33418841*	*y = Pr(tvusage5) (predict) = .6473166*
Variables	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*	*dy/dx*
age	−0.03884***	−0.01796	−0.01101	−0.00767	−0.02569**
	(0.01291)	(0.01264)	(0.01236)	(0.01202)	(0.01216)
education	−0.01248	0.013803	0.03945*	0.032894	−0.07434***
	(0.02259)	(0.02209)	(0.02144)	(0.02087)	(0.02143)
tvfreq	−0.00407	0.007961	−0.01317	−0.03085***	0.017664
	(0.01169)	(0.01146)	(0.01121)	(0.01097)	(0.01117)
awareness	−0.06838**	0.027407	0.002239	0.018583	0.02243
	(0.02945)	(0.02853)	(0.02788)	(0.02768)	(0.02742)
sensitivity	0.006922	−0.01632	0.031012	0.065994***	0.018739
	(0.01943)	(0.01902)	(0.01897)	(0.01913)	(0.01844)
essentials	0.083095***	0.089887***	0.077625***	−0.05371**	0.119496***
	(0.02801)	(0.02781)	(0.02742)	(0.02588)	(0.02627)
receptiveness	0.058721***	−0.02022	−0.01122	−0.01764	0.009547
	(0.0191)	(0.01852)	(0.0181)	(0.01768)	(0.0181)

Note: *** is 0.01, ** is 0.05, and * is 0.10 indicating significant level respectively, and standard error is in the parenthesis.

Another impact of an increase in education level concerns the relationship of knowledge about climate change with energy saving. That is, women with higher education levels know more about climate change and the role of energy saving to prevent it.

Energy-saving classification schemes help produce more informed consumers. However, results of this paper show that women's knowledge about such labeling and their ability to understand it varies according to education level. Thus, every component of energy-saving policy, such as awareness, and willingness to adopt is related in some way to education.

Although it is important to raise individual education levels to increase awareness about energy saving, the effectiveness of this awareness may be determined by an accompanying awareness about the role of energy saving in fighting climate change. As this study shows, having knowledge about energy saving is associated with awareness about its importance in fighting climate change.

The key point about the question whether the consumers informed about energy saving is that it utilizes the consciousness when purchasing electrical appliances, considering that consumers also are informed about the impact of energy saving in fighting climate change. This study shows that awareness about climate change motivates women to act in accordance with this when purchasing, indicating that efforts spreading such information may help fight climate change. Another result related to purchasing decisions is that education increases the importance that consumers assign to technical and energy-saving features in electrical household appliances.

Taking these results together, an increase in general education level stands out as the most important element determining women's understanding of the function and importance of energy-saving appliances in combating climate change. Additionally, as the main users of such machines, women particularly need greater awareness and so they should be provided with special training. Raising their awareness of the importance of energy saving in electrical devices could be achieved by campaigns involving flyers and brochures sent to homes and announcements on television, social media, etc. Lastly, to underline the importance of energy-saving features in purchasing decisions, there is a need for new forms of labeling on electrical devices aimed at less well-informed consumers by presenting easily understood information on the machines' energy-saving capacities.

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