Journal of Geography, Environment and Earth Science International

Volume 27, Issue 11, Page 1-10, 2023; Article no.JGEESI.107785
ISSN: 2454-7352

Consumer Willingness to Pay for Energy Efficient Refrigerators in Nairobi City County, Kenya

Wahome Alvin Kabingu [a*], Ezekiel Ndunda [a++] and Gathu Kirubi [a++]

[a] Department of Environmental Sciences and Education, Kenyatta University, Kenya.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JGEESI/2023/v27i11723

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/107785

Original Research Article

Received: 19/08/2023
Accepted: 26/10/2023
Published: 01/11/2023

ABSTRACT

In Kenya, consumer choices regarding home energy appliances, such as refrigerators, are crucial for enhancing energy efficiency and environmental conservation efforts. This study examined the influence of the Kenya Energy Star Rating Label on consumer preferences for refrigerators. Using stratified random sampling, 330 respondents from five constituencies in Nairobi County, Kenya, were surveyed. The research employed a combination of conditional and mixed logit models to analyse the data. The results revealed a significant positive correlation (P = .05) between the Kenyan Energy Star Rating label and consumer preference for energy-efficient refrigerators across all models. Consumers demonstrated a willingness to pay an average premium of 28,708.5 Kenyan shillings for refrigerators displaying the Kenyan Energy Star Rating label, indicating their recognition of the label's value. There was no significant relationship between consumer environmental concern and their willingness to pay for energy labelled refrigerators. These findings have notable policy

[++] Senior Lecturer;
**Corresponding author: E-mail: alvokabingu@gmail.com;*

implications, emphasizing the importance of educating Kenyan consumers about the environmental advantages of energy-efficient appliances. Specifically, the results underscore the effectiveness of the Kenyan Energy Star Rating Label in guiding consumer choices toward more sustainable appliance options.

Keywords: Consumer willingness to pay; discrete choices; energy-efficiency; environmental concern; household appliance efficiency.

1. INTRODUCTION

Old and inefficient refrigerators pose a significant financial burden on households across Kenya. These outdated appliances not only consume electricity, driving up monthly utility bills, but also strain the power grids and, conversely, lead to increased emission of greenhouse gases (GHG) [1]. On average, residential appliances account for up to 19 % of the global primary residential energy use and are listed among the top six CO2-emitting end uses, contributing an estimated 6 % in global CO2 emission [2]. The widespread adoption of energy-efficient appliances and equipment can help manage energy demand and reduce greenhouse gas emissions cost-effectively. Energy efficiency is one of the most affordable ways countries can reduce capital investment in new power supply, expand electricity access, and reduce environmental pollution [3]. In this regard, the energy efficiency of household appliances is critical to helping Kenyan consumers reduce their electricity costs. Additionally, adopting and using energy-efficient appliances across Kenyan households is an effective way to manage the growing energy demand and reduce the strain on the power grids [4].

Energy policies such as Standards and Labelling (S & L) programmes have proven to be impactful towards enhancing the purchase of energy-efficient appliances. As of 2021, up to 120 countries had implemented National Energy Efficiency Standards and Labelling programmes for appliances. Currently, S&L programmes globally cover more than 100 types of appliances in the commercial, industrial and residential sectors [5].

In 2016, Kenya's Energy and Petroleum Regulatory Authority (EPRA) developed the Kenyan Standards and Labelling programme for appliances as a policy response tool towards the country's growing energy demand. Kenya's appliance S&L requires importers and suppliers to ensure their products meet the required minimum energy performance before selling them in the Kenyan market. The Kenyan Standards and Labelling program covers refrigerators, air-conditioners, motors and lighting.

Kenya's S & L programme is part of a continuing global process that aims at changing consumer behaviour towards sustainable energy use [6-8]. The Kenyan energy label works to influence consumers by providing them with information on the energy use of an appliance in kWh/year. Notwithstanding their benefits, Africa and largely sub-Saharan Africa is still experiencing a slow uptake of energy-efficient technologies [9,10]. Since implementing the Kenyan Standards and Labelling programme, EPRA has enforced compliance with the energy-star rating process [11]. However, studies have yet to be carried out to examine the degree to which the Kenyan energy-star label has succeeded in influencing consumer preference towards adopting and using energy-efficient refrigerators in urban households in Kenya.

Consumer preference for household appliances, particularly refrigerators, has been a popular energy efficiency research subject. [12], in their study of consumer choices for refrigerators in South Carolina, found that customers were willing to part with between USD 2.26 – 2.12 for 1 USD in energy savings [12]. Similarly [13], while studying the effects of energy standards on the utility of recent refrigerator owners, found that energy efficiency standards increase customers' utility. Ward et al. [14] studied Factors influencing willingness to pay for the ENERGY STAR label. The authors found that consumers were, on average, willing to play an additional 249.82 – 349.30 for refrigerators awarded the ENERGY STAR label. In Switzerland, [15] conducted a stated preference experiment via face-to-face interviews with consumers at major retail stores purchasing or shopping for washing machines. The authors found that consumers were willing to pay 30 % more for A-labelled products than C-labelled products. Likewise, [16] concluded that the Chinese energy label significantly influenced consumers' appliance purchase decisions. Their

results revealed a WTP of USD 76-89 for a single-step upgrade in a refrigerator's energy efficiency.

These studies show that consumers are highly willing to pay for energy-efficient appliances. According to Wang et al. [17], consumers who refer to energy labels as a purchase attribute are more likely to buy energy-efficient products. However, research on the influence of the Kenyan Energy Star rating label on consumer preference for appliances is piecemeal.

Environmental concern refers to the depth of people's willingness to recognize and actively engage in addressing problems that impact the environment. Several studies highlight environmental concern as a positive factor influencing individuals' willingness to pay for products that make a positive environmental contribution [18-20]. In many empirical studies, general environmental concerns and attitudes have a low to moderate association with pro-environmental behavior [21]. For example, [22] argue that establishing environmental policies will likely enhance energy efficiency investment. Contrary to the studies mentioned above, [23]; [24] argue that although consumers may show concern for the environment, this may not necessarily elicit their purchase of energy-efficient appliances.

To sum up, there has yet to be a consensus on the role of environmental information on energy labels for energy-efficiency decisions. More importantly, evidence of the relationship between environmental concern and consumer preference for energy-efficient appliances still needs to be examined. This study sought to understand the relations between energy efficiency and consumer willingness to pay for refrigerators and explore the consequences of residential consumers' reception and response to the Kenyan Energy star-rating label.

2. MATERIALS AND METHODS

2.1 Hypotheses

According to the above literature review, consumers are willing to pay extra amounts for appliances that are energy labeled. Energy labels provide consumer with information on the technical performance of a particular appliances and that consumers are motivated to purchase appliances that comparatively consume less energy. Given these, we hypothesized that energy labels positively influence consumer preferences for energy-efficient appliances

> H_{a1}: The Kenyan Energy Label has a positive influence on consumer willingness to purchase energy-efficient refrigerators.

Next, we consider the influence of environmental concern on consumer preference for energy-efficient refrigerators. Overall, we expect that consumer environmental concern will have a positive influence on consumer preference for energy-efficient appliances

> H_{a2}: Consumer self-rated environmental concern is positively related to willingness to purchase energy-efficient refrigerators.

2.2 Sampling

The sample size of the respondents was 399 households. Stratified random sampling was employed in selecting households for the study. Each of the constituencies provided samples for collection. The following equation was used to calculate the sample size for each sub county:

$$ni = \frac{n}{N} \times 399$$

Where:

> *ni* = the sample size in the sub county
> *n*=population of households with refrigerators in the constituency (stratum)
> N= total number of households with refrigerators in the 5 constituencies

2.3 Data Collection

Data was collected across five constituencies in Nairobi County, broadly representing Kenya's upper-middle and middle-income groups. According to Boucher et al. [25], refrigerator ownership is high among middle- and high-income earners. Respondents' information was captured using an online survey designed using the Survey King platform. The survey introduction detailed the criteria respondents required to qualify for the study. The researcher visited households in the area and engaged with community organizations and community members to identify eligible households for the survey. Broadly, respondents were required to be above 18 years old, residents of the specified study target areas, own a refrigerator, and currently act as household heads.

Questionnaires were administered at random in the corresponding constituencies. Eligible respondents were provided with a link to the survey via a personalized email or text. A total of 330 responses were considered complete and valid for analysis. In our analysis of incomplete surveys in this study, we compared the characteristics of respondents and non-respondents, and we found no significant differences between the two groups. This result suggests that our sample of 330 respondents is representative of the larger population of eligible households within the selected constituencies in Nairobi County.

2.4 Survey Design

Respondents were presented with questionnaires on the Survey King choice platform, containing six choice sets, each comprising three refrigerators with distinct combinations of attributes: Configuration, Brand, Energy Star Rating, Price, Technology, and Capacity. A no-choice option allowed participants to opt out if none matched their preference. Respondents were instructed to assume compatibility with their current refrigerator space, preferred color, and design. Before filling out the questionnaire, participants received detailed information about the refrigerator attributes surveyed. Additionally, data on consumer socioeconomic and demographic factors were collected.

2.5 Discrete Choice Model

The theoretical basis of Discrete Choice Experiments (DCE's) can be attributed to Lancaster's (1966) consumer theory [26,27]. According to Lancaster [28.], given several options consumers will choose the option with features that satisfy their utility. Consumer n is presented with J alternatives. The utility of consumer n from alternative j can be expressed as:

1) $U_{nj} = \beta_n x_{nj} + \varepsilon_{nj,}$

In the context where *n* represents the decision maker, and *i* and *j* denote the available choice options, with *U* representing utility, *x* representing explanatory variables or covariates, β representing parameters, and ε denoting the error term, [29] states that when estimating equation 1 through a conditional logit model, the likelihood of person *n* selecting alternative *j* can be expressed as:

2) $\prod_{nj} = \frac{\exp(\beta' X_{nj})}{\sum_{j=1}^{Jn} \exp(\beta' X_{nj})}$

WTP for the k_{th} attribute is expressed as:

3) $WTP_k = -\frac{\beta_k}{\beta_p}$

Where *p* is price, and *k* is a non-price attribute.

The conditional logit model is subject to several limitations. It presupposes homogeneous individual preferences [30]. Moreover, a critical assumption of the model is that unobserved factors are uncorrelated across alternatives and possess identical variances for all options. The current model can be modified by employing a mixed logit. Thus, the equation can be expressed as:

4) $U_{nj} = \hat{\beta}' X_{nj} + \sigma' X_{nj} + \varepsilon_{nj}$

Where the random coefficient β is decomposed to its mean $\hat{\beta}$ and standard deviation σ, an estimate of WTP for attribute *k* is expressed as:

5) $WTP_k = -\frac{\hat{\beta}_k}{\hat{\beta}_p}$

The study incorporated conditional and mixed logit models. The conditional logit models included one version with refrigerator attributes exclusively and another version integrating interactions between refrigerator attributes and attitudinal and sociodemographic variables. Likewise, the mixed model encompassed a variant with only refrigerator attributes and another variant incorporating interactions between refrigerator attributes and attitudinal and sociodemographic variables. Consumers environmental concern was captured using seven questions adopted from Li [31]. We conducted a factor analysis and applied VARIMAX method which revealed three factors. The factors defined three variables

- Consumer perceived efficacy in affecting product design and manufacturing and the ambient environment (PCE)
- Consumer perceived efficacy towards tackling global climate change (TGCC)
- Consumer need for intervening on environmental matters (IEM)

Table 2 shows the results of the factor analysis score

Table 1. Constituency sample representative

Serial No.	Constituency	Population of Households with refrigerators	Representative fraction
1	Embakasi	79,339	123
2	Roysambu	64,466	100
3	Westlands	43,465	68
4	Langata	29,792	46
5	Kasarani	39,671	62
Total		256,733	399

Table 2. Rotated factor loadings with reliability score

Factor Index	Factor Weight
perceived efficacy in affecting product design and PCE) *(Cronbach = 0.68)*	
By selecting appliances that are less harmful to the environment, I communicate to manufacturers the type of appliances they should be producing	0.68
By selecting appliances that are less harmful to the environment, I communicate to retailers the type of appliances they should be stocking	0.77
Consumer perceived efficacy towards tackling global climate change (TGCC) *(Cronbach = 0.65)*	
Global climate change is expected to have a discernible negative effect on the environment in which my family and I reside	0.78
We do not need to urgently combat climate change	0.61
Consumer need for intervening on environmental matters (IEM) *(Cronbach = 0.60)*	
Utilizing electricity generated from renewable sources, such as solar power, represents a constructive approach to mitigating climate change	0.6
Reducing electricity consumption is the most effective way of countering climate change	0.73

2.6 Model Inputs

The four models featured a varying combination of different variables. In the extended logit models the sociodemographic and attitudinal variables were interacted with the energy label variable. Table 3 shows the variables used across the four models.

3. RESULTS AND DISCUSSION

Respondents age ranged from 18 to 65 and above with an average age of 41. Approximately, 52 % of the respondents were female and 48 were male and up to 56 % had a bachelor degree or higher. Up to 27 % of respondents had average net monthly household incomes of 100, 000 KES or more and up to 32 % had incomes between 60, 000 – 99, 999 KES. Up to 77 % of the respondents had bought their refrigerators first hand and 73 % were involved in the purchase decision. Respondents were requested to indicate if they had previously seen the Kenyan Energy Star Rating label. Approximately 67 % of the respondents had seen the energy label prior to filling the questionnaire with 46 % indicating they had seen the label on an appliance in a retail store. Table 4 to Table 7 represent the results of running the four models.

The coefficient for price was negative and significant across all four models, suggesting that respondents were sensitive to price changes. The coefficient for the Kenyan Energy Star Rating Label was positive and significant across all four models, suggesting that respondents preferred refrigerators that had been awarded the Kenyan Energy Star Rating Label. The coefficient for capacity was positive and significant, which shows that respondents preferred larger-capacity refrigerators. The coefficient for Samsung and LG was positive and significant, showing that respondents

preferred these brands over the base brand (Ramtons). The coefficient for French door was negative and significant across all four models, suggesting that respondents preferred refrigerators with the base configuration (side-by-side). The Wi-Fi attribute was not significant across all four models.

In the mixed logit models, the coefficient for the interaction between energy label and sociodemographic variables was not significant. These results differ from those of Li [31]. The coefficient for the interaction between energy label and environmental concern was not significant, suggesting that respondents were not motivated by the environmental benefits associated with the energy label. These results agree with those of Asinyaka [32], who found no significant relationship between environmental concern and consumer preference for energy-labelled appliances in Ghana. The willingness to pay for the Energy Star rating label was calculated using the Delta method [33]. Estimates of WTP for the energy star rating attribute across all four models are presented in Table 8.

Table 3. Model inputs

Variables	Description	Hypothesized sign
Dependent variable		
Choice	1 if the refrigerator option is chosen, 0 otherwise	NA
Independent Variables		
Price	70,00 KES, 80,000 KES, 90,00 KES	+
EnergyStarRating (Label)	1 if appliance is energy-star rated, 0 if not	+
Capacity	150 Liters, 250 Liters, 350 Liters, 450 Liters	+
FrenchDoor	1 if French door configuration, 0 if side-by-side	NA
LG	1 if LG, 0 if otherwise	NA
Samsung	1 if Samsung, 0 if otherwise	
WiFi	1 if Wi-Fi enabled, 0 if otherwise	+
ASC	1 if “None” option, 0 if otherwise	NA
Demographic, attitudinal and explanatory Variables		
Age	Respondents’ age in years	-
Income	Annual household income in ‘000’ KES	+
ElectricityBill	Average monthly electricity Bill in ‘000’ KES	
PCE	Factor score for perceived consumer efficacy to influence product design	+
TGCC	Factor score for perceived efficacy to tackle climate change	+
IEM	Factor score for Need for intervening on environmental matters	+

Table 4. Basic conditional logit model

Choice	Coefficient	Std. err.	z-Test	P-Value
Price	-.0000417	3.84e-06	-10.86	0.000
ASC	.174008	.0256508	6.78	0.000
EnergyStarRating	1.011554	.0802969	12.60	0.000
FrenchDoor	-.2390061	.0617518	-3.87	0.000
LG	.3791085	.0762647	4.97	0.000
Samsung	.4349766	.0763768	5.70	0.000
WiFi	.1159642	.0619423	1.87	0.061
Capacity	.1574925	.0277989	5.67	0.000

On average consumers were willing to pay 28, 708.75 extra for refrigerators that were awarded the Kenya Energy Star Rating Label. The WTP for the mixed logit model was the highest across all models.

Akaike Information Criteria (AIC) and the Bayesian Information Criterion (BIC), were used in evaluating the models. In the AIC test, the model with the least or smallest AIC is considered the better. Similarly, in the BIC, the test model with the smallest BIC is considered the better model [34,35,36]. Table 9 and 10 show the results of employing the AIC and BIC in evaluating the models. Overall, the extended mixed logit model was the best performing model justifying the inclusion of the interaction terms.

Table 5. Extended conditional logit model

Choice	Coefficient	Std. err.	z-Test	P-Value
Price	-.0000419	3.85e-06	-10.88	0.000
ASC	.1711829	.0257181	6.66	0.000
EnergyStarRating	1.431976	.3714605	3.85	0.000
Samsung	.4304326	.0765616	5.62	0.000
LG	.3798935	.0765077	4.97	0.000
Capacity	.1585337	.0279145	5.68	0.000
WiFi	.1101916	.0621502	1.77	0.076
FrenchDoor	-.2442451	.0619109	-3.95	0.000
LabelAwareness	-.0637747	.1728195	-0.37	0.712
LabelIncome	-.000214	.0002719	-0.79	0.431
LabelAge	.0000413	.008557	0.00	0.996
LabelHS	-.0311367	.0343877	-0.91	0.365
LabelPCE	-.0238877	.0902527	-0.26	0.791
LabelIEM	.0289634	.092786	0.31	0.755
LabelTGCC	.2046589	.1051132	1.95	0.052
LabelEBill	-.0183378	.0724009	-0.25	0.800

Table 6. Basic mixed logit model

Choice	Coefficient	Std. err.	z-Test	P-Value
Mean				
Price	-.0000507	4.65e-06	-10.91	0.000
ASC	.2086794	.0304672	6.85	0.000
EnergyStarRating	1.349849	.1267648	10.65	0.000
FrenchDoor	-.2561915	.0776925	-3.30	0.001
LG	.4139097	.093917	4.41	0.000
Samsung	.4696941	.1066628	4.40	0.000
WiFi	.1091217	.0754648	1.45	0.148
Capacity	.1914177	.0376196	5.09	0.000
SD				
EnergyStarRating	.9531823	.18787	5.07	0.000
FrenchDoor	.5135813	.1660114	3.09	0.002
LG	.5516476	.1584803	3.48	0.000
Samsung	1.006937	.1387303	7.26	0.000
WiFi	.4036123	.170093	2.37	0.018
Capacity	.3151125	.0634897	4.96	0.000

Table 7. Extended mixed logit model

Choice	Coefficient	Std. err	z-Test	P-Value
Mean				
Price	-.0000512	4.67e-06	-10.96	0.000
ASC	.2075041	.0305506	6.79	0.000
LabelAwareness	-.0572659	.2348037	-0.24	0.807
LabelIncome	-.0010894	.0006843	-1.59	0.111
LabelAge	.001938	.0115474	0.17	0.867
LabelHS	-.0423455	.046501	-0.91	0.362
LabelPCE	-.0369253	.1212585	-0.30	0.761
LabelIEM	.0015775	.1249346	0.01	0.990
LabelTGCC	.2710561	.1441944	1.88	0.060
LabelEBill	-.0552908	.0977514	-0.57	0.572
EnergyStarRating	2.100022	.5556945	3.78	0.000
FrenchDoor	-.2585136	.0778724	-3.32	0.001
LG	.4203613	.0937854	4.48	0.000
Samsung	.4674695	.1068983	4.37	0.000
WiFi	.1093266	.0759571	1.44	0.150
Capacity	.1909472	.0380322	5.02	0.000
SD				
EnergyStarRating	.9009163	.1943082	4.64	0.000
FrenchDoor	.512093	.169218	3.03	0.002
LG	.5345872	.1605409	3.33	0.001
Samsung	1.010267	.1389981	7.27	0.000
WiFi	.4185452	.164066	2.55	0.011
Capacity	.3271436	.0614338	5.33	0.000

Table 8. Estimated willingness to pay for the discrete choice models

Model	Estimated WTP in Kenya Shilling
Basic Conditional Logit	24, 267
Extended Conditional Logit	31, 743
Basic Mixed Logit	26, 605
Extended Mixed Logit	32, 220

Table 9. Basic conditional vs basic mixed logit

Model	ll(null)	ll(model)	df	AIC	BIC
Conditional logit Basic	-1966.804	-1753.862	10	3527.725	3593.612
Mixed logit Basic	-1753.862	1717.8	10	3455.6	3521.487

Table 10. Extended Conditional vs extended mixed logit models

Model	ll(null)	ll(model)	df	AIC	BIC
Conditional logit Extended	-1966.804	-1748.143	10	3516.286	3582.174
Mixed logit Extended	1748.143	-1712.908	10	3445.816	3511.704

4. CONCLUSION

This study shows a positive relationship between consumer preference for energy-efficient refrigerators and the Kenyan Energy Star rating label. According to the four models' consumers are willing to pay an extra 24 267 to 32 220 Kenya shillings for refrigerators that have been awarded the Kenya energy label. Further, the results show no significant relationship between consumer preference for energy-labelled appliances and their environmental concern. The coefficient for the interaction between the energy label and the measures of environmental concern was not significant across all four models, suggesting that the environmental

benefits of the energy label did not necessarily result in respondents' preference for energy-labelled refrigerators. These results suggest that consumers of energy-efficient refrigerators in Kenya consider the energy label in their purchase decision.

Furthermore, the findings emphasize the crucial role of education and awareness campaigns. The government and stakeholders must collaborate to enhance public understanding of the environmental benefits associated with energy-efficient appliances. By fostering awareness, consumers can make more informed choices, benefiting themselves economically and contributing significantly to environmental conservation efforts. Additionally, policymakers and industry players can utilize these insights to refine energy efficiency standards and promote sustainable consumer choice.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. IEA. Africa energy outlook. Paris: IEA; 2022.
2. IEA. Energy efficiency. Paris: International Energy Agency; 2019.
3. Fowlie M, Meeks R. The economics of energy efficiency in developing countries. Review of Environmental Economics and Policy. 2021;238-260.
4. Government of Kenya. Kenya national energy efficiency and conservation strategy. Nairobi: Government of Kenya: Ministry of Energy; 2020.
5. Bennich P, Siderius HP, Ellis M, Waide P, Harrington L, Brocklehurst F. Global assessment of appliance energy efficiency standards and labelling programs achievements. ACEEE Summer Study on Energy Efficiency in Buildings. 2022;251-266.
6. Pollitt Michael G, Irina Shaorshadze. The role of behavioral economics in energy and climate policy. Handbook on energy and climate change. 2013;523-546.
7. European environmental agency. Achieving energy efficiency through behaviour change: what does it take? Luxembourg: Publications Office of the European Union; 2013.
8. Abbotts A. Energy efficiency is key to climate action; 2019. Available:https://www.rockwoolgroup.com/our-thinking/blog/energy-efficiency-is-key-to-climate-action/
9. USAID. Energy-efficiency opportunities In Sub-Saharan Africa scaling up renewable energy (SURE). USAID; 2022.
10. Murshed M, Khan S, Rahman A. Roadmap for achieving energy sustainability in Sub-Saharan Africa: The mediating role of energy use efficiency. Energy Reports. 2022;4535-4552.
11. EPRA. Embracing energy efficiency for growth: How institutions are reducing expenses through energy efficiency. Nairobi: EPRA; 2020.
12. Revelt D, Train K. Mixed logit with repeated choices: Households' choices of appliance efficiency level. Review of Economics and Statistics. 1998;647-657.
13. Moxnes Erling. Estimating customer utility of energy efficiency standards for refrigerators. Journal of Economic Psychology. 2004;707-724.
14. Ward D, Clark C, Jensen K, Yen S, Russell C. Factors influencing willingness-to-pay for the Energy Star® label. Energy Policy. 2011;39:1450-1458.
15. Sammer K, Wustenhagen R. The Influence of eco-labelling on consumer behaviour - Results of a discrete choice analysis for washing machines. Business strategy and the environment. 2006;15: 185-199.
16. Shen J, Saijo T. Does an energy efficiency label alter consumer purchasing decision? a latent class approach based on a stated choice experiment in shangai. Journal of Environmental Management. 2009;(90):3561-3573.
17. Wang X, Li W, Song J, Duan H, Fang K, Diao W. Urban consumers' willingness to pay for higher-level energy-saving appliances: Focusing on a less developed region. Resource, Conservation and recycling. 2020;157.
18. Albayrak T, Aksoy S, Caber M. The effect of environmental concern and scepticism on green purchase behaviour. Marketing Intellingence & Planning. 2013;31(1):27-39.
19. Chen MF, Tung PJ. Developing an extended Theory of Planned Behavior model to predict consumers' intention to visit green hotels. International Journal of Hospitality Management. 2014;36:221-230.

20. Chan ES, Hon AH, Chan W. An empirical study of environmental practices and employee ecological behavior in the hotel industry. Journal of Hospitality & Tourism Research. 2014;1-24.
21. Bamberg S. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. Journal of Environmental Psychology. 2003;21-32.
22. Urban J, Scasny M. Exploring domestic energy-saving: The role of environmental concern and background variables. Energy Policy. 2012;69-80.
23. Ramayah T, Wai Chow Lee J, Mohamad O. Green product purchase intention: Some insights from a developing country. Resource Conservation and Recycling. 2010;54(12):1419-1427.
24. Tan CS, Ooi HY, Goh YN. A moral extension of the theory of planned behavior to predict consumers' purchase intention for energy-efficient household appliances in Malaysia. Energy Policy. 2017;107:459-471.
25. Boucher Lauren, Asif Hassan, Elisa Lai, Riley Macdonald, Michael Maina, Michael Spiak, William Jamieson, Andrew Tod.. Appliance data trends: Insights on energy; 2021.
26. Ndunda EN, Mungatana ED. Evaluating the welfare effects of improved wastewater treatment using a discrete choice experiment. Journal of Environmental Management. 2013;49-57.
27. Hoyos D. The state of the art of environmental valuation with discrete choice experiments. Ecological Economics. 2010;1595–1603.
28. Lancaster K. A new approach to consumer theory. Journal of Political Economy. 1996;74(132).
29. McFadden D. Conditional logit analysis of qualitative choice. In P. Zarembka (Ed.), Frontiers in econometrics. New York, USA: Academic Press. 1973;105-142.
30. Train KE. Discrete choice methods with simulation. Cambridge: Cambridge University Press; 2003.
31. Li X. Consumer willingness t consumer willingness to pay for eco-labeled refrigerators. Trace: Tennesse Research and Creative Exchange; 2011.
32. Asinyaka M. Willingness to Pay for energy efficient refrigerating appliances in Accra, Ghana: A choice experiment approach. Review of Economics. 2019;70(2):15-39.
33. Hole AR. WTP: Stata module to estimate confidence intervals for willingness to pay measures. Statistical Software Components S456808, Boston College Department of Economics; 2007.
34. Mohammed Emad, Christopher Naugler, Behrouz Far. Chapter 32 - Emerging business intelligence framework for a clinical laboratory through big data analytics. In emerging trends in computational biology, Bioinformatics, and systems biology, edited by Quoc Nam and Hamid Arabnia. Morgan Kaufmann. 2015;577-602.
35. Akaike H. A new look at the statistical model identification. IEEE Transactions on Automatic Control. 1974;19(6):716-723.
36. Claeskens Gerda, Marteen Jansen. Model selection and model averaging. International Encyclopedia of the Social & Behavioral Sciences (Second Edition). 2015;647-652.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/107785