JST: Engineering and Technology for Sustainable Development
Volume 35, Issue 1, March 2025, 044-050

The Effect of Nutritional and Environment Information on Consumer's Willing-To-Pay for Products Containing an Upcycled Ingredient

Doan Duy Le Nguyen [1*], My Phung Huynh Diep [2,3], Quoc Cuong Nguyen [2,3]
[1] Faculty of Food Science and Technology, Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam
[2] Department of Food Technology, Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam
[3] Vietnam National University Ho Chi Minh City, Ho Chi Minh City, Vietnam
[*]Corresponding author email: duylnd@huit.edu.vn

Abstract

With the aim of figuring out which product attributes influence consumers' willingness to pay for upcycled food and to investigate the consumers' attitudes to the upcycled food in Vietnam, the research aims to introduce upcycled food to Vietnamese consumers and investigate which information affects willingness to pay for an upcycled food, that is biscuit products adding spent coffee grounds (SCG). A choice experiment was conducted with more than 200 consumers, who are students at universities in Vietnam. Using Multinominal Logit Model (MNL) and Mixed Multinominal Logit Model (MMNL), it is found that the consumers concern about three information price, antioxidant, and coffee flavour, and they do not pay attention to type of flour, carbon trust information. Among the relevant information, consumers are willing-to-pay a premium 31.4 thousand VND and 19.6 thousand VND for antioxidant and coffee flavour. These findings provide insights into market opportunities and policy implementation regarding the production of upcycled food. Furthermore, the study highlights the potential of using upcycled ingredients to reduce food waste into the environment.

Keywords: Choice experiment, multinominal logit model, spent coffee grounds (SCG), upcycled food, willing to pay.

1. Introduction

1.1. From Food Waste to Upcycled Food

Recent years have seen a resurgence of interest in the upcycling movement as environmental worries over resource usage and waste levels have grown. The term "upcycling" refers to the practice of "repurposing, repairing, upgrading, and remanufacturing products and materials that are no longer in use or are about to be disposed of in a way that increases their value" [1]. The food business has recently seen a rise in the practice of "upcycling" which involves using leftover food and food waste to create items like animal feed, cosmetics, nutraceuticals, and dietary supplements. Upcycling is being considered by food enterprises as a potential strategy to decrease the quantity of food waste they produce. According to estimates from the United Nations, approximately one-third of the food produced worldwide is wasted or lost annually. This includes food that is left on restaurant plates, edible food that is left uneaten, crops left in the field, food that spoils during transportation, and food that is not made it to stores. This amounts to 1.3 billion tons of food, or enough to feed 3.5 billion people, at a cost of almost US $1 trillion [2]. Furthermore, food waste is extremely harmful to the environment and natural resources, accounting for 10% of greenhouse gas emissions worldwide. Food waste contributes more to global warming than vehicle emissions because it produces methane, which is thought to be eight times more dangerous than carbon, when it ends up in landfills [3]. One strategy that can, in part, lessen the negative impacts of food waste is upcycling. Food by-products, visually defective produce (sometimes unsightly to sell because of colour or appearance), food scraps, and excess food are all used in upcycling to create new items.

1.2. Coffee and Spent Coffee Grounds

1.2.1. Benefits and challenges

Coffee is the second most traded commodity after petroleum and one of the most popular drinks worldwide. Coffee is a major global industry with around 80 countries cultivating coffee. Additionally well-liked and consumed throughout the world, coffee has been linked in epidemiological research to a lower risk of cancer, heart disease, and non-alcoholic fatty liver disease. Spent coffee grounds disposal presents a

ISSN 2734-9381
https://doi.org/10.51316/jst.180.etsd.2025.35.1.6
Received: Jul 8, 2024; revised: Aug 26, 2024;
accepted: Oct 12, 2024

significant environmental challenge. Since these residues are typically put straight into the trash, they wind up in landfills where they become extremely polluting due to the large volumes of organic materials that require a lot of oxygen to break down [4]. As spent coffee and ground (SCG) and the beverage have several bioactive components that have been shown to have positive effects on health and to be safe for ingestion by humans, including as caffeine, chlorogenic acids, trigonelline, polyphenols, and melanoidins. Additionally, the estimated 6–8 million tonnes of waste produced annually worldwide from the manufacturing of coffee as a beverage could be reduced by the use of SCG. The fact that moderate daily coffee consumption might be linked to beneficial health effects makes SCG applications appealing to the food business.

1.2.2. Spent coffee grounds in biscuits

SCG has been utilized in the manufacturing of beverages, particularly alcoholic ones, as well as baked goods like cakes and pastries. These days, biscuits are a highly consumed product all over the world. This product is convenient, offers a fairly full spectrum of nutritional elements, and comes in a wide variety of forms. Martinez-Saez, García [5] evaluate the utilisation of SCG material as a food ingredient to improve baked products, focussing on the sensory attributes and microbiological safety of biscuits. When compared to biscuits that are sold commercially, these biscuits that were manufactured had an acceptable microbiological profile and better sensory qualities.

To effectively promote food items containing recycled ingredients, it is crucial to look at consumers' inclinations and their Willing-To-Pay (WTP) for these unique products. So far, few studies have investigated consumers' preferences for upcycled foods. Recently, Zhang, Ye [6] found that consumers have high intentions to purchase upcycled foods and that as the perceived quality of these foods decrease also consumers' intention to purchase also decrease. In a study of Grasso and Asioli [7], it showed that without providing information on benefits consumers reject upcycled biscuits. In other studies, Köpcke [8] found that by informing consumers that upcycled foods can reduce food loss they are willing to pay the same or a premium price compared to conventional foods while Bhatt, Ye [9] found that rational messaging is more effective than emotional messaging in increasing consumers' WTP for upcycled foods. Therefore, it remains unknown whether other rational messages around nutritional or other environmental benefits might be more persuasive and could be successfully communicated to consumers [10].

1.3. Aims of Study

In this study, we select nutrition and environmental information to drive consumers' food purchases because nutritional information (related to protein content in foods) and environmental information (related to food production) are important attributes which consumers consider when buying and eating food [11, 12]. Furthermore, nutritional, and environmental information are two different types of rational messages that can have different effects on consumers' acceptance of new foods. For example, Annett, Muralidharan [13] found that health information had an impact on consumers' preferences for organic bread, whereas environmental information about organic production did not.

This study aims to fill this by conducting choice experiment (CE) to estimate the effect of nutritional and/or environmental information on Vietnamese consumers' preferences for biscuits containing upcycled SCG flour (hereafter "upcycled biscuits"). Nutritional antioxidant and environmental (carbon trust label) messages were chosen as the nutritional and environmental messages were considered the most likely to raise consumers' preferences.

2. Materials and Methods

2.1. The Choice Experiment Method

In this CE study, participants were asked to make a choice between two hypothetical constructed alternatives described by attributes and attribute levels and a no-buy option. The no-buy option was included to make the buying situation more realistic and to avoid biased results from forced choices [14]. The different alternatives are composed of different combinations of attribute levels which characterize the goods based on an experimental design [15, 16]. Five attributes were included: ingredient, carbon trust, antioxidant, coffee flavour, and price. The ingredient includes two levels, namely flour, SCG. The carbon trust includes Carbon Trust logo, and no logo. The antioxidant content claim indicates whether the biscuits is labelled "Source of antioxidant". The sensory description indicates whether the biscuits is described "Coffee flavour". The selected price range of VND 25.000/150 g to VND 80.000/150 g is based on the Vietnam market price for various dried apple types, ranging from conventional to organic dried apple at different points-of-sale (supermarkets, local markets, grocery shops or stores), complemented by discussion with experts. The attributes and their levels are shown in Table 1.

We used a D-optimal design for the CE, using the software Ngene 1.1.1. This design allows parameters to be estimated with the lowest possible number of asymptotic standard errors in the parameter estimates (i.e., the square roots of the diagonal elements of the asymptotic variance-covariance) [17]. The design was based on 40 choice scenarios (i.e., choice sets) divided into 4 blocks and each choice set always offers two biscuits alternatives (called options "A" and "B") and

an "opt-out" or no purchase option (called option "C") (Fig. 1).

Table 1. Selected attributes and levels.

Attributes	Levels
Ingredient	1- SCG 0 - Flour
Carbon trust	1- Carbon trust label 0 - No label provided
Antioxidant content	1- "Source of antioxidant" label 0 - No information is reported
Sensory characteristics	1 - Coffee flavour 0 - No information is reported
Price (VND/150g)	25 000, 40 000, 65 000, 80 000

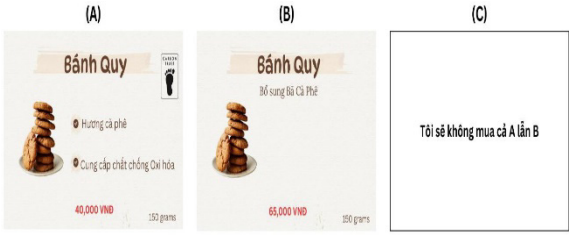

Fig. 1. An example of choice set

2.2. Data Collection

The data used in this study are drawn from an online survey conducted in 2023 involving consumers located in Vietnam (200 consumers) using the online platform Compusense. Only consumers who were at least 18 years old and who are responsible for food shopping in their household always or sometimes were included in the study. We obtained informed consent from all respondents in the study, and our study was approved by an institutional ethical clearance board.

To ensure data quality, we took two steps. First, before presenting the series of choice tasks, we asked respondents whether they had 'devoted [their] full attention to the questions so far' and whether, in their honest opinion, they believed that we should use their responses for the study. This 'attention check' question has been shown by Meade and Craig [18] to stimulate respondents to pay extra attention to the subsequent questions (it is not used to detect dishonest replies). We strategically placed this question right before the most important questions such as the choice tasks. Second, we included in the study only consumers who took more than one-third of the median time duration to complete the survey.

We assume that all other attributes not presented in the CE are the same across the product alternatives. Before the CE, explanations were provided about the meaning of attributes and the corresponding levels and cheap talk was provided to reduce potential hypothetical bias [19, 20]. Participants were informed about potential hypothetical bias and were reminded about their budget constraints. Upon completion of the choice tasks, the respondents were asked to complete a questionnaire to collect information on their socio-demographics, habits, and attitudes.

2.3. Econometric Analysis

According to the random utility theory [21], the i^{th} consumer's utility for choosing alternative j is specified by the following equation

$$U_{ijt} = \beta_i X_{ijt} + \epsilon_{ijt} \quad (1)$$

where i refers to the number of the participant; j refers to the alternative j in the choice set t; β_i is the vector of individual parameters; X_{ijt} is the vector of observed variables related to the alternative j and individual i; and ϵ_{ijt} is the unobserved error term which is assumed to be independent of β and X.

The mixed logit models (MMNL) are applied due to their flexibility and allowing for heterogeneity in consumers' preferences [22, 23]. The marginal Willing-To-Pay (mWTP) for each attribute was calculated by the negative ratio of the partial derivative of the utility function with respect to a given attribute level, divided by the derivative of the utility function with respect to the price attribute [24, 25].

Further to identify consumer segments, the Latent Class Logit (LCL) model was used which assumes constant model parameters within each group and captures consumer heterogeneity assuming a mixing distribution for the groups [26]. The LCL model assumes that the consumer group can be split into subgroups with a constant β vector in each group [26]. The choice probability that an individual of class s chooses alternative j from a particular set constituted of J_t alternatives, is expressed as

$$P_{j/s} = \frac{exp(\beta_s' X_{jt})}{\sum_{j=1}^{J_t} exp(\beta_s' X_{jt})} \quad (2)$$

where $s = 1, \dots, S$ represents the number of classes, and β_s' is the fixed (constant) parameter vector associated with class s.

3. Results

3.1. Consumer's Choices on Biscuits with Different Label Information

The label information (variables) has taken into account in the hypothesis including price, ingredient

(adding SCG flour), carbon (Carbon Trust Label), antioxidant, and coffee (coffee flavour). The estimates and *p*-values (from MMNL model) are shown in Table 2.

Table 2. Estimated parameters for MMNL model.

Attribute	Coefficient	*P*-value
antioxidant	1.59	0.00
sensory	0.99	0.00
ingredient	0.39	0.05
carbon	0.36	0.05
price	-0.05	0.00

From the MMNL model analysis (Table 2), this indicates that consumers selected *flour, carbon*, and *price* as factors influencing their decision to buy biscuits enhanced with spent coffee grounds with *p*-values of 0.00. Other attributes (*flour, carbon*) are also significant with *p*-values 0.05.

The *antioxidant* variable's coefficient represents the estimated effect of the antioxidant variable on the utility of choosing an option relative to not having antioxidant information available. Specifically, a coefficient of 1.59 indicates the magnitude and direction of the impact that the presence of antioxidant information has on individual decision-making. The positive sign of this coefficient suggests that the presence of antioxidant information increases the utility associated with choosing an option. In other words, consumers are more inclined to choose options that provide antioxidant information compared to options that do not provide such information. In practical terms, a positive coefficient for the antioxidant variable implies that consumers perceive options that provide antioxidant information as more attractive or desirable. This could be due to factors such as health consciousness, perceived benefits of antioxidants, or preferences for products with added nutritional value. This finding suggests that individuals are more likely to prefer options that provide antioxidant information compared to options that do not provide such information.

The coefficient of *sensory* variable is 0.99 representing the estimated effect of the coffee variable on the utility of the choice alternatives. Specifically, a coefficient of 0.99 indicates the extent to which the presence of coffee flavour information influences the utility of choosing an option relative to not having coffee flavour information. The absolute value of the coefficient (0.99) indicates the strength of the effect. In this case, a coefficient close to 1 suggests a relatively strong effect of coffee flavour information on choice behaviour. This indicates that the presence of coffee flavour information has a statistically significant and positive effect on the utility of choosing an option. This suggests that individuals are more likely to prefer options that provide coffee flavour information compared to options that do not provide such information.

A coefficient of 0.39 indicates the extent to which the type of flour (wheat flour or flour with added spent coffee grounds) influences the utility of choosing an option relative to the other option. A positive coefficient suggests that the presence of flour made with added spent coffee grounds increases the utility associated with choosing an option compared to wheat flour. The absolute value of the coefficient (0.39) indicates the strength of the effect. In this case, a coefficient close to 0.4 suggests a moderate effect of the type of flour on choice behaviour. This means that there is some evidence to suggest that the type of flour influences the choice of consumers, but it's not as strong as in the cases where *p*-values are closer to 0. In summary, the type of flour used (wheat flour or flour with added spent coffee grounds) has a marginally statistically significant and positive effect on the utility of choosing an option in this MMNL model. This suggests that options made with flour containing spent coffee grounds are slightly more preferred compared to options made with traditional wheat flour.

The coefficient represents the estimated effect of the *carbon* variable on the utility of the choice alternatives. Specifically, a coefficient of 0.36 indicates the extent to which the presence of the Carbon Trust label influences the utility of choosing an option relative to not having the label. A positive coefficient suggests that the presence of the Carbon Trust label increases the utility associated with choosing an option. In this case, a coefficient close to 0.36 suggests a moderate effect of the Carbon Trust label on choice behaviour. There is some evidence to suggest that the presence of the Carbon Trust label influences the choice of consumers, but it's not as strong as in the cases where *p*-values are closer to 0. In summary, the carbon variable indicates that the presence of the Carbon Trust label has a marginally statistically significant and positive effect on the utility of choosing an option in this MMNL model. This suggests that options carrying the Carbon Trust label are slightly more preferred compared to options without the label.

The coefficient represents the estimated effect of the price variable on the utility of the choice alternatives. Specifically, a coefficient of -0.05 indicates the extent to which the price of the product influences the utility of choosing an option. A negative coefficient suggests that as the price of the product increases, the utility associated with choosing that option decreases. In other words, consumers are less likely to choose options with higher prices. The absolute value of the coefficient (0.05) indicates the

strength of the effect. In conclusion, price has a statistically significant and negative effect on the utility of choosing an option in this MMNL model. This suggests that as the price of the product increases, consumers are less likely to choose that option, which is a common finding in consumer choice models.

3.2. Consumer Willing-To-Pay

Based on the MNNL model presented above, we calculated the consumers' WTP for the attribute's "antioxidant", "sensory", "ingredient", and "carbon". The consumer WTPs are shown in Table 3.

The consumer WTP yields comparable results in which antioxidant and sensory have the highest values (31.41 and 19.63, respectively). This suggests that consumers will give preference to biscuits with the information providing sensory perception (i.e. coffee flavour) and nutrition (i.e. antioxidant). In the meantime, the values of the two attributes, carbon and ingredient, are almost identical at 7.22 and 7.82, respectively. It follows that when the two extra facts regarding spent coffee grounds and the Carbon Trust label are presented on the package, consumers continue to disregard them.

Table 3. Estimated willingness to pay in preference space.

Attribute	WTP
Antioxidant	31.41
Sensory	19.63
Ingredient	7.82
Carbon	7.22

3.3. The Importance of Price in Purchase Decision

In order to figure out the importance of price in consumer purchase decision, the question "How important is price" has been asked. The answers are presented in Fig. 2.

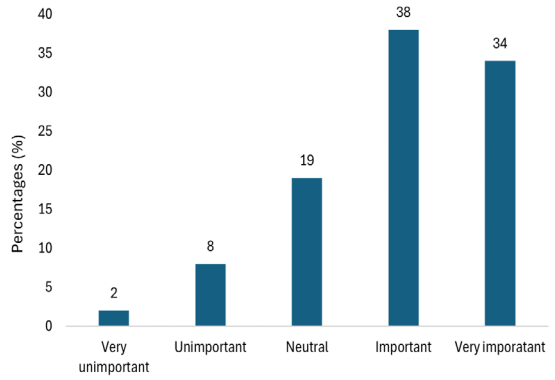

Fig. 2. The importance of price in purchase decision (on 5-point scale)

Fig. 2 shows how consumers concern about price of a food product when they make food choices. As expected, consumers consider price as important factor. Among consumers, 38% of them selected price as "important", and 34% of them selected price as "very important".

3.4. Consumer Heterogeneity

The results of the LCL model with the three-groups solution are reported in Table 4 and Table 5.

Table 4. Estimated coefficients from LCL model.

	Group 1	**Group 2**	**Group 3**
	Coeff.	Coeff.	Coeff.
antioxidant	2.39***	1.05	0.87**
sensory	0.59	1.21***	0.57**
ingredient	1.12	0.19	0.04
carbon	0.38	0.54	0.33
price	0.02	-0.05**	-0.67***

Abbreviations: Coeff., coefficient; ***, **, * significance respectively at 1%, 5%, 10% level.

Table 4 presents the consumer coefficients for each of the consumer groups. Group 1 (health oriented) involves consumers who have preference for biscuits provided antioxidant compounds. Group 2 (sensory and price oriented) includes consumers who strongly prefer more biscuits with coffee flavour. This group shows relative strong sensitivity to low-price biscuits. Group 3 (health, sensory, and price oriented) involves consumers who strongly prefer more biscuits that increase antioxidants and coffee flavour. Also, this group prefers low-price biscuits.

Table 5. Estimated mWTP from LCL model.

	Group 1	**Group 2**	**Group 3**
	mWTP	mWTP	mWTP
antioxidant	-106.64	22.49	13.05**
sensory	-26.52	26.08**	8.56
ingredient	-50.21	4.14	0.58
carbon	-16.76	11.63	4.99

Abbreviations: mWTP, marginal willingness to pay; ***, **, * significance respectively at 1%, 5%, 10% level.

Table 5 presents the consumer mWTP for each of the consumer groups. There are significant mWTP for sensory and antioxidant attribute for group 1 and 2,

respectively. This finding agrees with the coefficients in Table 4 in which consumers in group 2 prefer sensory and price, and consumers in group 3 prefer antioxidant and price.

4. Discussion and Conclusion

The findings from this study highlight that consumers' WTP for biscuits enhanced with spent coffee grounds is influenced by all label information in which antioxidant, sensory attribute, and price are more important than other information. Vietnamese consumers seem not to recognise the Carbon Trust label, even though the consumers valued environmental information.

In addition, ingredients used in biscuits such as spent coffee grounds were not appreciated. Possibly, consumers were not ready to try the upcycled biscuits as they concern that these biscuits have been made from food waste. Moreover, consumers suppose that the upcycled biscuit will not taste good, so they reject it. Finally, one of the most important reason, price of the upcycled biscuit usually is more expensive than conventional biscuits.

The findings are comparable to the findings from Grasso and colleagues [7] regarding the rejection of novel ingredients. These authors showed that consumers prefer biscuits made with conventional (i.e., wheat) flour and tend to reject biscuits made with upcycled sunflower flour. However, while in our study, consumers do not recognise Carbon Trust label, Grasso and colleagues pointed out that one group of consumers (environmentalist consumers) had strong preference for biscuits with the Carbon Trust label. Possibly, the UK consumers are familiar with sustainable information then the Vietnamese consumers, then they will use this information as one of criteria for product selection.

We found that not all consumers value antioxidant and coffee flavour of biscuits and therefore there will be groups of consumers who will be unlikely to purchase antioxidant or sensory-fortified biscuits and benefit from it. This indicates that there are consumers who prioritize (i.e., have strong preferences for) health aspect and other consumers who prioritize sensory aspect. We found that there is segment of the population which will not be interested in purchasing upcycled biscuits and therefore these groups of the population should not be the target group. Hence, strategies to increase upcycled food intake by population may focus on segments of the population where campaigns can be most effective.

To better exploit the consumer attitudes towards upcycled food, the future research should focus on evaluation on sensory profiles for upcycled foods, and investigation on environmental messages that can easily convey information to consumers.

Acknowledgments

We acknowledge Ho Chi Minh City University of Technology (HCMUT), VNU-HCM for supporting this study.

References

[1] Singh, J., *et al.*, Challenges and opportunities for scaling up upcycling businesses – The case of textile and wood upcycling businesses in the UK, Resources, Conservation and Recycling, vol. 150, Nov. 2019. https://doi.org/10.1016/j.resconrec.2019.104439

[2] FAO, Toolkit: Reducing the Food Wastage Footprint, 2013, Rome, Italy.

[3] FAO, Food wastage footprint and Climate Change, 2015, Rome, Italy.

[4] Franca, A. S. and L. S. Oliveira, Chapter 17 - Coffee, in Integrated Processing Technologies for Food and Agricultural By-Products, Z. Pan, R. Zhang, and S. Zicari, Editors, 2019, Academic Press, pp. 413-438. https://doi.org/10.1016/B978-0-12-814138-0.00017-4

[5] Martinez-Saez, N., *et al*., Use of spent coffee grounds as food ingredient in bakery products, Food Chemistry, vol. 216, pp. 114-122, Feb. 2017. https://doi.org/10.1016/j.foodchem.2016.07.173

[6] Zhang, J., *et al*., Addressing food waste: How to position upcycled foods to different generations, Journal of Consumer Behaviour, vol. 20, iss. 2, pp. 242-250, Jul. 2020. https://doi.org/10.1002/cb.1844

[7] Grasso, S. and D. Asioli, Consumer preferences for upcycled ingredients: A case study with biscuits, Food Quality and Preference, vol. 84, Sep. 2020. https://doi.org/10.1016/j.foodqual.2020.103951

[8] Köpcke, J., From waste to premium: Consumers perception of value-added surplus products and their willingness to pay, in BMS: Behavioural, Management and Social Sciences, Univeristy of Twente, 2020.

[9] Bhatt, S., *et al*., Consumers' willingness to pay for upcycled foods, Food Quality and Preference, vol. 86, pp. 104035, Dec. 2020. https://doi.org/10.1016/j.foodqual.2020.104035

[10] Asioli, D. and S. Grasso, Do consumers value food products containing upcycled ingredients? The effect of nutritional and environmental information, Food Quality and Preference, vol. 91, Jul. 2021. https://doi.org/10.1016/j.foodqual.2021.104194

[11] Banovic, M., *et al*., Foods with increased protein content: A qualitative study on European consumer preferences and perceptions, Appetite, vol. 125, pp. 233-243, Jun. 2018. https://doi.org/10.1016/j.appet.2018.01.034

[12] Asioli, D., J. Aschemann-Witzel, and R. M. Nayga Jr., Sustainability-related food labels, Annual Review of Resource Economics, vol. 12, pp. 171-185, Oct. 2020. https://doi.org/10.1146/annurev-resource-100518-094103

[13] Annett, L. E., *et al.*, Influence of health and Environmental information on hedonic evaluation of

organic and conventional bread, Journal of Food Science, vol. 73, iss. 4, pp. H50-H57, Apr. 2008. https://doi.org/10.1111/j.1750-3841.2008.00723.x

[14] Dhar, R. and I. Simonson, The effect of forced choice on choice, Journal of Marketing Research, vol. 40, iss. 2, pp. 146-160, May. 2003. https://doi.org/10.1509/jmkr.40.2.146.19229

[15] Hensher, D. A., J. M. Rose, and W. H. Greene, Applied Choice Analysis, Cambridge University Press, 2015. https://doi.org/10.1017/CBO9781316136232

[16] Louviere, J. J., *et al*., Stated Choice Methods: Analysis and Applications, Cambridge University Press, 2000. https://doi.org/10.1017/CBO9780511753831

[17] Jaeger, S. R. and J. M. Rose, Stated choice experimentation, contextual influences and food choice: A case study, Food Quality and Preference, vol. 19, iss. 6, pp. 539-564, Sep. 2008. https://doi.org/10.1016/j.foodqual.2008.02.005

[18] Meade, A. W. and S. B. Craig, Identifying careless responses in survey data, Psychological Methods, vol. 17, pp. 437-455, 2012. https://doi.org/10.1037/a0028085

[19] Cummings, R. G. and L. O. Taylor, Unbiased value estimates for environmental goods: A cheap talk design for the contingent valuation method, American Economic Review, vol. 89, no. 3, pp. 649-665, Jun. 1999. https://doi.org/10.1257/aer.89.3.649

[20] Silva, A., *et al*., Revisiting cheap talk with new evidence from a field experiment, Journal of Agricultural and Resource Economics, vol. 36, pp. 280-291, 2011.

[21] McFadden, D., Conditional logit analysis of qualitative choice behavior, Frontiers in Econometrics, pp. 105-142, 1974.

[22] Train, K.E., Discrete Choice Methods with Simulation, 2009, Cambridge University Press.

[23] Hensher, D.A. and W.H. Greene, The mixed logit model: The state of practice, Transportation, vol. 30, pp. 133-176, May. 2003. https://doi.org/10.1023/A:1022558715350

[24] Morrison, M., *et al*., Choice modeling and tests of benefit transfer, American Journal of Agricultural Economics, vol. 84, iss. 1, pp. 161-170, Feb. 2002. https://doi.org/10.1111/1467-8276.00250

[25] Gracia, A., M. L. Loureiro, and R. M. Nayga, Consumers' valuation of nutritional information: A choice experiment study, Food Quality and Preference, vol. 20, iss. 7, pp. 463-471, Oct. 2009. https://doi.org/10.1016/j.foodqual.2009.03.010

[26] Greene, W. H. and D. A. Hensher, A latent class model for discrete choice analysis: contrasts with mixed logit, Transportation Research Part B: Methodological, vol. 37, iss. 8, pp. 681-698, Sep. 2003. https://doi.org/10.1016/S0191-2615(02)00046-2