Chapter 8
Consumer Behavior for Information on Food Products

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Abstract Since a monetized economy has existed since pre-Christian times, it was already more effective in obtaining food than the barter system because of its system of payment. This purchase behavior has undergone a transformation from the development of information technology. For example, consumers used to buy food products with limited information from their own assessment or through package information such as price and producing area. However, in modern society, consumers have access to much more diverse information, such as assessments by others, and manufacturing processes. This chapter provides an overview of related studies on food purchase behavior influenced by information.

Keywords Consumer behavior · Information · Food products

Highlights

- Lack of clarity on whether sensory or non-sensory information has more influence on consumer behavior.
- Several previous studies imply that tasting with information, or high preference by a target group without tasting, has a greater influence on the value of food products than just information on the food product.
- Several previous studies imply that sensory information is effective before tasting if the information is negative, while non-sensory information is effective after tasting.
- Several previous studies imply that negative information has a greater influence on human behavior than positive information. However, some studies obtain the inverse result.

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First, we categorized food information into sensory information, consisting of intrinsic properties such as taste, food texture, and color, and non-sensory information, consisting of extrinsic properties such as production technology and branding (Jaeger, 2006). The perception of such information was categorized as neutral, unfavorite (negative information), and favorite (positive information).

Next, it needs to show willingness to pay (WTP) such as consumer's value in some environments and measuring methods for identifying food purchase behavior. As the environments, there are hypothetical and non-hypothetical conditions with tasting, which are defined as experiments without and with monetary incentives, respectively. Measuring methods mainly consist of three techniques: Stated preference methods as Contingent valuation (CV) method, discrete choice experiment (CE); Second price auction; Becker-Degroot-Marschack (BDM) Mechanism; Hedonic scaling. Each environments and methods are explained in Appendix.

From here, this chapter presents an overview for related studies on the type of information (description) that influences the WTP for food products. Table 8.1 provides a summary of previous studies mentioned below.

8.1 Sensory Information

8.1.1 With Tasting

Here, I introduce four previous studies investigated sensory information with tasting.

Lange et al. (2002) compared the effects of three types of information (blind tasting, information with or without tasting) in evaluating Champagne. They employed SPA in both within and between designs under the non-hypothetical condition and the scaling. Both results for SPA and the scaling showed similar results. Also they revealed that information with tasting was more effective than blind tasting.

Siegrist and Cousin (2009) investigated the order effect of tasting and written information. They presented the information such as sensory information perceived as negative or positive information by evaluating wine critics. According to the results, the group that received negative written information before the tasting gave lower ratings to wine than the group that received positive information. On the other hand, there was insignificant difference between the groups when this written information was provided after the tasting.

Seppä et al. (2015) investigated the sensory information in three rounds; visual round, in which the respondents actually saw the apples; taster round, in which the respondents actually tasted the apples; and the written information round, in which the respondents tasted the apples and felt their texture. The order changed in each treatment. The results revealed that tasting, written information, and higher frequency of tasting increased the value of the apples.

Lima et al. (2019) categorized tasting status into three conditions as blind tasting, expected, and informed. Blind tasting was defined that the respondents neither taste

Table 8.1 Summary of previous studies

Authors	Subjects	N	Goods	Condition	Tasting	Measuring	Design	Treatment
Sensory information								
Lange et al. (2002)	Residents	123	Wine	Non-hypothetical	Yes: Blind, Full	SPA Hedonic scaling	Between/ Within	-Blind tasting -Bottle (= expected without tasting) -full info with tasting
Siegrist and Cousin (2009)	Students	136	Wine	Non-hypothetical	Yes	Points (0-100)	Between	-No-information -Information before tasting -Information after tasting
Seppä et al. (2015)	Residents	118	Apple	Non-hypothetical	Yes	Hedonic scaling BDM	Between/ Within	-Appearance only -Appearance, written information and tasting -Appearance, tasting and written information
Lima et al. (2019)	Adults, Children	800	Grape nectar, Chocolate, Flavoured Milk	Hypothetical	Yes: blind, informed	Selecting one	Between	-Blind tasting -Expected -Informed

(continued)

Table 8.1 (continued)

Authors	Subjects	N	Goods	Condition	Tasting	Measuring	Design	Treatment
Alfnes et al. (2006)	Residents	115	Salmon	Non-hypothetical	No (actual)	CE	Within	Color (five colors)
Non-sensory information								
Ginon et al. (2009)	Residents	123	Baguettes	Non-hypothetical	Yes	BDM	Between	-General information only -General and health information
Botelho et al. (2017)	Residents	545	Pear, Apple	Non-hypothetical (in-fruit stores)	Yes	CV	Between	-Blind tasting followed by information (Place) -Tasting with provision of information (Place)
Hayse et al. (2002)	Primary food shoppers	87	Ham sandwich	Non-hypothetical	Yes	SPA	Between	Food irradiation: -Health negative information -Health positive information -Both information

(continued)

Table 8.1 (continued)

Authors	Subjects	N	Goods	Condition	Tasting	Measuring	Design	Treatment
Caporale and Monteleone (2004)	Residents	105	Beer	Hypothetical	No (video)	Hedonic scaling (9 point)	Within	-GMO brand -Organic brand -Traditional brand
Marette et al. (2008)	Residents: women (18-45)	115	Tuna can Sardines can	Non-hypothetical	Yes	Original methods	Between/Within	-No-information -Omega3 (positive information) -Mercury (negative information)
Chalak and Abiad (2012)	Residents	284	Shawarma sandwiches	Hypothetical (face-to-face interview)	No	CE: D-optimal	Between	-No-information -Food certification information (ISO, ServSafe)
Chen et al. (2013)	Residents	108	Beef steak	Non-hypothetical	No	CE	Within	-No-information -Advantage of technology -Disadvantage of technology

(continued)

Table 8.1 (continued)

Authors	Subjects	N	Goods	Condition	Tasting	Measuring	Design	Treatment
Uchida et al. (2014)	Residents	3370	Salmon fillet	Hypothetical	No	CE: D-optimal	Between	-Minimal information -FAO information + minimal -Science information (Worm et al. 2006) + minimal
Sensory versus Non-sensory information								
Aoki et al. (2010)	Students, Residents	562	Ham sandwich	Non-hypothetical and hypothetical	Yes:NH No:H (picture)	CE: D-optimal	Between NH and H, Within information	-Health risk (negative, positive) information -flavor information
Aoki et al. (2019)	Residents, Chefs	386	Rice	Non-hypothetical	Yes	CE: D-optimal	Between treatments, Within information	-No-information -Cultivation information -Other tasting ranking

(continued)

Table 8.1 (continued)

Authors	Subjects	N	Goods	Condition	Tasting	Measuring	Design	Treatment
Williamson et al. (2016)	Chinese grape wine drinkers	828	Wine	Hypothetical in the field.	No (picture)	CE: Orthogonal	Between	-Control (coffee's explanation) -Tourism -Environment -Safety -Tradition, -Tasting
Li et al. (2019)	Students	93	Coffee	Hypothetical	Yes	Hedonic scaling (9 points)	Between	-No-information -Subjective sensory information (profiles) -Objective sensory information (cultivation environment)

nor receive any information about the apples. Expected was defined that the respondents were given some information but did not taste. And informed was defined the respondents were given some information with tasting. The results found that information with tasting more effectively influenced than that without tasting.

Additionally, the results of sensory information show different trends when the tasting is by professionals such as chefs and sommeliers, and when it is by ordinary individuals (Kelley et al. 2001; Nestrud and Lawless 2008).

8.1.2 Sensory Information Without Tasting

Here, I introduce a previous study investigated sensory information without tasting. Alfnes et al. (2006) investigated value of salmons' color by presenting four different shades of red to respondents and giving written explanations of the colors. The respondents showed a willingness to buy salmons that were of intermediate shades of red. However, the study did not find the effectiveness of information statistically.

8.2 Non-sensory Information

8.2.1 With Tasting

Here, I introduce two previous studies investigated non-sensory information with tasting. Ginon et al. (2009) investigated health information on baguettes with and without general nutrition information and label information by using BDM. Also, in this study, the respondents tasted both before and after the provision of information. The results showed that label information is more effective and that the order of tasting is insignificant different.

Botelho et al. (2017) studied the order effects of tasting and written information effect on the food-producing area. The results revealed that provision of information after tasting was more effective than before tasting.

8.2.2 Without Tasting

Here, I introduce six previous studies investigated non-sensory information without tasting. Hayse et al. (2002) compared the effects of three health information on food irradiation of ham used in sandwiches as negative, positive, and both information by using SPA in non-hypothetical condition. The result found that negative information is most effective among information.

Caporale and Monteleone (2004) investigated the effect of information on manufacturing beer. They conducted four treatments such as (1) using genetically modified yeast; (2) with organic barley and hops, and (3) using traditional brewing technology; (4) no information (blinding). The results showed that it was better rating of the beer in giving information treatments compared to no information one. However, it was unclear which of the three types of provided information was more effective.

Marette et al. (2008) investigated the effects of health information on the selecting of tuna and sardine cans by using an original method in within and between designs. They compared the provision of negative information on the risks of mercury, positive information on the good effects of omega 3, and no information. In case of both cans, negative information was more effective than positive information.

Chalak and Abiad (2012) investigated the effect of information on food certification information on high risk shawarma sandwiches in Lebanon by CE in hypothetical conditions with a between design. Used information is quality management (ISO 9001) and safety (ISO 22000 and ServSafe). They found that the effects were better when information was provided, and that safety (ISO 22000 and ServSafe) information was more effective.

Chen et al. (2013) investigated the effect of information on new technology (vacuum packaging) of beef steaks by using CE. Used information was negative information (high price, possibility of faster decay), and positive information (freshness, long lasting taste, etc.). They found that having any information, regardless of the type, was more effective.

Uchida et al. (2014) investigated the effect of information for ecolabel salmon by using CE. They compared three kinds of information such as general information, information published by the UN Food and Agricultural Organization, and science information from science magazines. The results suggested that while science information was more effective in changing consumer behavior, in some cases, it might be most lowering the value that a consumer attached to it.

8.3 The Comparison Between Sensory and Non-sensory Information

8.3.1 With Tasting

Aoki et al. (2010) examined the effects of sensory and non-sensory information for ham with sodium nitrate both hypothetical and non-hypothetical conditions by using CE. Sensory information was defined that the food additive sodium nitrite enhanced flavor, which non-sensory information stated that sodium nitrite prevented botulism poisoning but maight be carcinogenic. Tasting was conducted in non-hypothetical condition only. The results found that the flavor aspect of sensory information under non-hypothetical condition and that the carcinogenic aspect of

non-sensory information influenced the value of sodium nitrite under hypothetical condition, respectively.

Aoki et al. (2019) examined the effects of sensory and non-sensory information for rice in the non-hypothetical condition with tasting by using CE. Sensory information was defined the tasting rating results of Japanese chefs who stored manager class with over 10 years of experience) and residents. Non-sensory information stated rice cultivation methods. The results found that tasting with information was more effective than just tasting, and that the non-sensory information on cultivation leaded to a higher rating of rice than sensory information related to taste ranking.

8.3.2 Without Tasting

Williamson et al. (2016) compared the effects of sensory information related to taste information on wine vs. non-sensory information related to some information such as tourism information about the wine producing area, environmental information, food safety information, and cultural information about the producing area. They conducted it under virtual hypothetical conditions by using CE. They found that environmental information as non-sensory information and taste information as sensory information increased the rating of wine.

Li et al. (2019) compared the aroma, flavor, and body, such as taste information of coffee of the sensory information, and cultivator or growing environment of coffee as the non-sensory information. They used scaling. They found that sensory information related to taste was more effective in increasing preference for coffee than non-sensory information related to cultivator and growing environment.

8.4 Recent Trends

This chapter presents consumer behavior related to food by using the recent technological innovations, apart from researches on information mentioned above. The technology introduced here is eye-tracking (ET) technology, and we discuss the studies investigate the consumer behavior related to food using this technology.

Using CE and ET, Ballco et al. (2019) studied yogurt packaging, nutritional factors such as low sugar and low fat, suggesting that displaying such nutritional information on packages draws consumer attention to the product and may stimulate the urge to buy the product.

Siegrist et al. (2019) conducted a between design study by comparing displays of cereal using virtual reality (VR) versus displays in shops, to participants in a supermarket and found no significant difference. That is, the study suggested that VR has utility value.

8.5 Conclusion

This chapter classified researches on sensory and non-sensory information which affect consumers' food choice and summarized the experimental results in each information. The sensory information has significant impact on the food choice in the aspect of output such as taste, color, and texture. These factors are essential and robust effect. On the other hand, some non-sensory information has significant impact in the aspect of producing input such as organic, food additive, and health risk. Some of these information does not have significant impact in some foods. There is still needed to research the impact of this type of information. The most surprising thig is that there is still a few experiments which compare those information types. The result are sometimes inconsistent. To overcome this limitation, the authors advises readers to advance these field of study. To prompt this kind of study is to find out which type of information more affects the satisfaction of eating foods. That means, people decide the taste of foods by brains before tasting or tongue after tasting, which leads the collaboration of neuro brain research field.

8.6 Appendix

In the overview of related studies on information mentioned above, I explain environment and a way of measuring WTP. The methods presented in this chapter are also used in the food product sector for measuring WTP. A general description of each method is provided here. For more details, please refer to the respective references.

8.6.1 Environment

Normally, in the food sector also, the experimental environment is placed under non-hypothetical conditions and surveys are placed under hypothetical condition.

8.6.1.1 Experimental Economics

Experimental economics is a branch of economics that studies human behavior under an economic environment where the subjects are given monetary incentives. Therefore, the earnings depend on a result-reward due to decision-making mechanism. For more details, please refer to Friedman and Sunder (1994), Kagel and Roth (2016), Jacquemet and L'Haridon (2018), Holt (2019), and so on. In addition, in experimental economics, experiments are conducted not just in laboratories but also on the field. For details, please refer to Carpenter et al. (2005) and Banerjee and Duflo (2017).

Experimental designs consist of two types. One is a between design, which compares between groups. One merit of between-design is that results are non-personal, as it involves comparisons between different groups for a task. However, a demerit is that it may not be possible to deny the difference in results based on different individual attributes. The other is a within design, which compares within a group. A merit of the within design is that since the effects of a task are measured for the same individual, the results cannot be swayed by the individual attributes of the person. However, a demerit is that the results may be influenced by factors other than the task, as the target group may develop a learning effect. Therefore, researchers need to consider that they should employ between design or within design in their study.

Incidentally, it seems that people confuse experimental economics with behavioral economics. Both are similar in terms of exploring human behavior by offering monetary incentives, but both these branches differ at fundamentally essential aspects. A difference on the academic front is that experimental economics is a branch pursued by theoretical researchers while behavioral economics is pursued by people involved in empirical research. Experimental economics is a macro perspective as studying social systems, while behavioral economics is a micro perspective that closely observes the human behavior.

8.6.1.2 Survey

In the food sector, the use of hedonic scaling is common in surveys and for creating sensory profiles. Generally, 5 or 7 Likert-scales are often used in the studies.

8.6.2 Measurements

8.6.2.1 Choice Experiment (CE) Method

CE is a stated preference method (Louviere et al., 2000). Stated preference method is an approach to measure the value which is hard to price something such as services and risks. CE consists of alternatives with or without opt-out option and attributes describing these alternatives. Opt-out options mean not to buy in the alternatives mainly. Sometime opt-out options mean to keep condition such as status quo. For the effects of using or not using opt-out options, please refer to Kallas and Gil (2012). Several choice sets are created by setting the levels of ordinal scale or nominal scale for these attributes as example below. Respondents must choose one of the alternatives in each choice set as shown in Table 8.2.

Generally, the number of choice sets is based on full factorial design which is calculated the number of attributes and the levels. Since the number by the full factorial design is large to let respondents repeat their decision making, researchers often employ a fractional factorial design instead of the full factorial design because of reducing the number of choice sets. As the fractional factorial design, an orthogonal

Table 8.2 Example of a choice set

Alternative	Rice 1	Rice 2	Rice 3	Neither
Country of origin	USA	USA	USA	
Cultivation method	Conventional	Conventional	Organic	
Taste	Top 20%	Normal	Top 20%	
Fair trade	Non-Fair trade	Fair trade	Fair trade	
Price	100 Baht	200 Baht	300 Baht	
Which do you want to buy?		☑		

Source Aoki et al. (2017)

design aims to minimize the correlation between attribute levels, which an efficient design such as a D-efficient design aims to minimize all variances and co-variances of all parameter estimates. Hensher et al. (2015) write that the orthogonal design works well only in the case where a certain alternative is chosen in almost all choice sets. However, researchers need to consider whether they employ the orthogonal or the efficient designs. Before analyzing, the raw data set is created based on the choice sets such as example below (Fig. 8.1). Basically, first row is placed under variable names in the set. Figure 8.1 is inputted in vertical direction. For example, variables such as set and price which consist of assumed continuous figures are inputted them. On the other hand, variables such as alt and choice which are uniform such as corresponding or not are inputted as 1 if variables correspond, 0 if not. After finishing creating the set, researchers estimate models such as multinomial logit and random parameter logit by statistical software such as LIMDEP, STATA, SPSS. Consequently, WTP is calculated to identify the attribute with a higher value based on estimated coefficients. For methods to create the set, software and estimation models mentioned above, please refer to Hensher et al. (2015).

In CE, researchers often conduct in a hypothetical condition. For a further validity, a non-hypothetical condition is sometimes employed. Between hypothetical and non-hypothetical conditions may be different. That is called hypothetical bias, which WTP is higher in hypothetical condition than non-hypothetical condition (Murphy et al., 2005; Aoki et al., 2010; Hensher, 2010; Loomis, 2011; Penn and Hu, 2018). However,

set	alt1	alt2	alt3	niigata	sado	toki	price	choice
1	1	0	0	0	1	0	200	0
1	0	1	0	1	0	0	230	1
1	0	0	1	0	1	0	290	0
2	1	0	0	0	1	0	230	1
2	0	1	0	1	0	0	290	0
2	0	0	1	0	0	1	200	0
3	1	0	0	0	0	1	230	1
3	0	1	0	0	1	0	200	0
3	0	0	1	0	0	1	290	0

Fig. 8.1 Example of row data set. *Source* Author

a few studies do not indicate hypothetical bias (Carlsson et al., 2005; De-Magistris et al., 2013). Therefore, the results of the hypothetical bias have been mixed. To mitigate the hypothetical bias, cheap talk are often used in the CE though it is not always able to mitigate the hypothetical bias (Alemu and Olsen, 2018). As other bias, I introduce other bias, which is status quo bias in CEs (Meyerhoff and Liebe, 2009).

Incidentally, conjoint analysis (CA) is often confused. CA has many points in common with CE and was developed from psychology. Also CA is based on quantitative choices such as rating and ranking of the "Conjoint Measurement" theory (Krantz and Tversky, 1971). CA differs from it in many aspects, such as calculation of utility value. Louviere et al. (2010) describes this in detail.

8.6.2.2 Contingent Valuation (CV) Method

Similar to CE, CV is a stated preference method and is based on the theoretical framework Random Utility thory. CV has many formats; however, it requires respondents to directly express their willingness to pay such as examples below. While CV has its merit of multiple formats, it is criticized for the bias in the validity and reliability of the results (Diamond and Hausman 1994; Venkatachalam 2004). The relative merits of CV and CE are not yet known (Mogas et al. 2006). For classification of stated preference methods, including CE, please refer to Merino-Castelló (2003).

Example 1 (considered by author) This park contains many rare plants and living creatures that are documented in the Red Data Book. However, the number of visitors to the park has increased in recent years, making it necessary to establish a park design to preserve the rare species.

How much do you think you can pay for a park that preserves rare species? ( ) JPY

Example 2 (considered by author) This park contains many rare plants and living creatures that are documented in the Red Data Book. However, the number of visitors to the park has increased in recent years, making it necessary to establish a park design to preserve these rare species.

A. Per person expenses for the park to preserve the rare species is JPY 1000. Would you be willing to pay this amount? Yes/No
B. Per person expenses for the park to preserve the rare species is JPY 500. Would you be willing to pay this amount? Yes/No

8.6.2.3 Second Price Auction (Vickrey-Auction) (SPA)

In this auction, bidders simultaneously bid for an item, and the highest bidder gets to buy the item at the second highest bidding price. The auction invented by American economist and Nobel Prize winner in Economics, William Spencer Vickrey (1914–1996) is different from common first price auctions. In this auction, the highest bidder

wins the auction but pays the amount of the second highest bid (or the minimum price offered by the seller if there is no competitors) and not the amount he/she bid him/herself. At present, this concept is being used in many auction markets, for example, Yahoo! Auctions. For more detailed, please see Krishna (2009) in theory and Lusk and Shogren (2007) in experiment, respectively.

8.6.2.4 Becker-Degroot-Marschack (BDM) Mechanism

This is a simple mechanism designed by Becker et al. (1964). The BDM involves random determination of price and any bid exceeding this price is considered as the winning bid. Therefore, there may be more than one winner.

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