

# Estimating Consumers' Willingness to Pay for Health Food Claims: A Conjoint Analysis

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**Abstract**—This study addresses whether health claims (claims of health-promoting effects) of food products positively influence product price and consumer choices. In developed countries in recent years, health claims regarding food products have become attractive cues for consumers and promotion tools for food makers. However, in several developed countries including Japan, such forms of labeling are subject to government regulations and the public sector requires a costly and time-consuming certification process during product development.

To address this problem, we surveyed 265 Japanese university students in a choice-based conjoint (CBC) experiment to determine the key factors that influence their consumer behavior and calculate whether such labeling increases a product's value. We found that health claims affirmatively affect the purchase of functional food and that consumers' marginal willingness to pay (WTP) for health claims is high. In addition, consumers rate country of origin highly when choosing a product; moreover, their WTP for foods of Japanese origin is high. We also found that health-conscious consumers tend to prefer smaller portions for functional food products. By identifying product characteristics that influence the consumption of functional food, our findings identify factors that are key to their successful introduction and marketing in Japan.

**Index Terms**—Conjoint analysis, consumer behavior, functional food, new product development, Japan, JEL codes: D12; M31; M37.

## I. INTRODUCTION

Consumer demand toward food products has drastically changed in recent years in most developed countries. Consumers take more interest in aspects such as nutrition, health, and quality of the foods they consume and no longer seek to simply satiate their appetites [1]. Moreover, maintenance and preservation of good health can enhance the quality of life [2].

Shifts in consumer demand, technological changes in production and marketing, and development of legal systems have altered the marketing conditions of food products. In particular, we must note that the development of laws and legal systems resulted in the emergence of a new food products market—the “functional food market” [3], [4].

New legal systems permit labels that state health claims,

such as “this product has a beneficial effect on health.” Thus, it is likely that consumers consider these products as good for health, thereby incentivizing food producers to use such labels to promote healthy images and arouse consumer interest in their products. These conditions encourage the development of new health-promoting ingredients among food makers [5].

These developments have significantly impacted the structure of the food products market. One of the most evident characteristics of functional food is the credence attribute of it being “functional.” This attribute cannot be observed by the consumer, neither at the point of sale nor after consumption. From this we conclude that a consumer cannot measure the positive effect of a type of food on his or her health.

Given this problem, firms in countries such as Japan, the US, the EU, and Taiwan are required to provide adequate scientific evidence and secure government approvals before placing health claims on food labels [4], [6], [7]. Japan's system of government approval is called the Food for Specified Health Uses (FOSHU), and products approved by them are called “FOSHU foods.” [4], [8], [9]. Despite market maturity due to protracted economic recession and an aging population, potential market value is high [10]. Assuming promising expectations, the size of the functional food market was ¥23.5 billion (US\$3.25 billion) in 2012—marginally less than the estimations of ¥36.2 billion (US\$3.38 billion) [11]. However, little empirical analysis examined Japanese consumers' attitude toward functional food, and thus only little is known about whether health claims influence customer purchases. The evidence that exists is primarily anecdotal (e.g., [12]–[15]). Analyzing how marketers position functional food in emerging markets and how they formulate a marketing strategy given the high costs of labeling and research and development (R&D) is necessary [16], [17]. This study attempts to answer these questions by analyzing the marketing conditions and strategies used by players in the functional food market. Previous studies have investigated the European and North American markets, and few studies have also investigated the Asian functional food market; therefore, this study takes cues to better understand the promising Asian market.

To successfully develop and market functional food, firms must understand the factors that attract Japanese consumers. In particular, they must determine whether acquiring a FOSHU certification (i.e., a health claims certification) is worth the cost and delay [16]. Therefore, this study investigates Japanese consumer attitudes and acceptance of functional food, examines whether health claims influence their buying behavior, and how much of a premium they are

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willing to pay for health food claims. In addition, this study determines consumers' willingness to pay (WTP) for health claims and identifies and discusses its impact on functional food marketing. It also analyzes the relative importance of each characteristic and estimates WTP using a conditional logit model. Finally, it analyzes whether price-related factors of manufactured goods can enhance a product's value.

This study is organized as follows. Section II reviews the relevant literature and constructs hypotheses for this empirical research. Section III describes the data and the methodology. Section IV discusses the findings of the empirical analysis. Section V concludes.

## II. LITERATURE REVIEW AND HYPOTHESES

This section reviews previous studies on functional food choices among consumers and develops conceptual hypotheses for this empirical study.

Previous studies revealed many factors that influence functional food choices among consumers. In general, consumers consider health and wholesomeness as important aspects of food quality, therefore expecting to have high appreciation for functional food.

However, consumers cannot directly perceive a product's "credibility attributes," unlike its taste and sensory appeal [18]. Therefore, the successful marketing of functional food requires making consumers aware of their health benefits [19], [20]. Consumers know little about the ingredients used in food products; hence, inferences on health depend on providing information to establish the link between food and health [19].

Several empirical studies revealed that health claims influence food choices of consumers [6], [21]–[23]. In addition, consumers' confidence in health claims and regulations significantly contribute to their purchase decisions [24]. One of the most important attributes of functional food choices is that these products have explicit effects on the body [19].

In Japan, the decision to acquire a FOSHU certification is a topic of discussion between academia and the business community [14], [25], [26]. The data revealed from a questionnaire implied that health claims related to the FOSHU certification play a key role in the selection of functional food products [27]. Thus, we present the following hypothesis:

*H1. Product health claims are positively related to purchase behavior.*

Consumers may perceive product attractiveness on the basis of its ingredients' country of origin. Consumers often considered farm products from domestic suppliers as being high in quality and safety, and appreciated such products. Japanese consumers often prefer domestic farm products [28]. A survey conducted by Japan Finance Corporation highlighted that Japanese consumers are of the opinion that Japanese farm products excel in safety and quality [29].

Accordingly, the differences in quality, safety, and taste between two or more countries of origin (i.e., whether a domestic product) are believed to influence consumer choice. Therefore, we present the following hypothesis:

*H2. Country of origin is positively related to purchase*

*behavior.*

Product volumes may affect consumer choices because prices and product volumes are inseparable. Thus, size is an important product attribute for functional foods. We present the following hypothesis:

*H3. The amount contained in a product package has positive effects on consumers.*

Generally, the purchase intentions of consumers are affected by product price. A major obstacle to developing and accepting functional food is its price. Food prices with product labels are important influencing factors in attracting consumers. Similarly, prices per unit also affect a consumer's purchase intention. Therefore, we present the following hypothesis:

*H4. The higher the price of products, the lesser the purchase intention for these products.*

Consumers can be segmented according to several characteristics, such as demographic factors.

Studies also revealed that health claims affect consumer decisions in a manner different from characteristics such as age, gender, income, and education [23], [30]–[35]. For instance, consumers' health orientation and lifestyle affect their perceptions and acceptance of functional food and their health claims [23], [36]. References [37] and [38] cited the effects of consumer perceptions of the appropriateness among carrier food and its functional ingredients on purchases. Often, consumers are spontaneously negative about functional food because they are regarded as artificial and as dietary "cheating" compared with "traditional" healthy eating [37], [19].

Therefore, we present the following hypothesis:

*H5. The higher consumers rate the maintenance of health as an important factor, the more likely they are to purchase functional food.*

These hypotheses are summarized as follows (see Fig. 1).

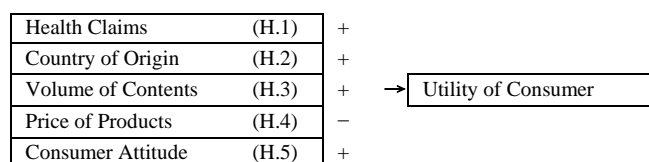


Fig. 1. Conceptual models of consumer utility of purchasing functional food products.

## III. DATA AND METHODOLOGY

### A. Methodology

Conjoint analysis is a convenient method of analyzing consumers' perception of food preferences and attitudes in terms of food attributes [32], [39], [40]. A choice-based conjoint experiment (CBC) was conducted to analyze preferences for different profiles of functional products and weighed the relative importance of a given attribute among consumers. The CBC experiment also estimated consumers' marginal WTP (MWTP) for each attribute of a food product. Consumers' perceptions and preferences for different attributes are trade-off tasks when choosing functional food. This method sheds light on the preferences and attitudes of each consumer on functional food products.

First, based on prior studies, this study's hypotheses, and

pilot interviews with young Japanese consumers, we constructed a questionnaire survey for a product choice experiment. We selected one product, functional green tea in a PET bottle, for the product choice experiment because it is a typical functional product among Japanese consumers [41] [42]. As previously discussed, we also selected four attributes of this product on the basis of our hypotheses: health claims, country of origin, size, and price. In addition, we provide specifications for each attribute (see Table I).

The health claims attribute features two specifications: FOSHU certification and no FOSHU certification. One attribute is the labeled FOSHU certification, for which the labeled health claim is “This product promotes burning of body fat.” The other attribute is no FOSHU labeling and no health claims.

The country attribute features two “country of origin” specifications: Japan (labeled as “Uses tea leaves from Japan”) and no labels.

The size attribute specifications denote product size: 350 ml, 500 ml, and 550 ml, corresponding to small, regular, and large bottles, respectively. It was priced in Japanese stores at ¥100 (US\$1.006), ¥150 (US\$1.509), and ¥180 (US\$1.811), corresponding to an affordable price (discounted price or price of popular private label products), regular price, and premium price, respectively.

Taking into consideration these factors, there were a total of 36 ( $2 \times 2 \times 3 \times 3 = 36$ ) possible product combinations, or profiles of functional food in the survey. Because having 36 different choices are too many for a consumer, we reduced the number of choices to nine using factorial design.

A respondent typically received four choice sets depending on the number of factors and levels in the design. Each respondent was asked the following question: Given products 1, 2, 3, and 4 with different characteristics and prices, which product would you buy? Respondents were also questioned about their lifestyle, habits, demographic information, and attitudes regarding functional food and food choices. Table II provides an example of functional tea product choices for this discrete choice experiment.

TABLE I: ATTRIBUTES AND SPECIFICATIONS FOR CONJOINT ANALYSIS

Attribute	Specification	Description
Health Claims	Yes	Labeled FOSHU certification and labeled health claim “This product promotes burning of body fat.”
	No	No FOSHU labeling and no health claims
Country of Origin	Japan	Labeled country of origin, “Uses tea leaves from Japan”
	No	No labeling
Size	350 ml	Content of bottled green tea (small, regular, and large bottle sizes, respectively)
	500 ml	
	550 ml	
Price	¥100	Price of bottled green tea (affordable price, regular price, high-price in common Japanese retail store, respectively)
	¥150	
	¥180	

For each attribute, this empirical method assesses

consumers’ relative emphasis and estimates their MWTP. The latter indicates how many additional dollars or yen consumers are willing to spend for a product with a particular attribute if all other attributes remained unchanged. Therefore, our results can guide producers and marketers in developing a new functional food.

TABLE II: PRODUCT CHOICES EXPERIMENT (AN EXAMPLE)

Product Attribute	Product 1	Product 2	Product 3	Product 4
Health Claims	No	Yes	Yes	No
Country of Origin	No	Japan	No	Japan
Size (ml)	555 ml	500 ml	350 ml	350 ml
Price (JPY)	¥100	¥180	¥150	¥180
Choice:				

### B. Data

We conducted the survey from April 2 to May 1, 2012, in Hiroshima, one of Japan’s largest cities. It was chosen as the study area because the incomes and preferences of its residents closely resemble those of an average Japanese consumer. Therefore, major producers and retailers routinely engage in test marketing in Hiroshima [43]. The sample comprised students of economics from a local university. Questionnaires were distributed to the students who agreed to participate and a total of 270 questionnaires were returned. Five incomplete questionnaires were eliminated, thus, 265 remained for sampling. The sample set included 243 males and 22 females aged 18–25 years. Although the gender ratio suggests a male bias, it is representative of economics students at Japanese universities.

## IV. EMPIRICAL FINDINGS AND DISCUSSION

This section tests the hypotheses and discusses the empirical results and findings.

Using the random utility framework proposed in [44], we constructed the following consumer behavior model for CBC experiments:

$$V_i = \beta_{HEALTH} HEALTH + \beta_{ORIGIN} ORIGIN + \beta_{SIZE} SIZE + \beta_{PRICE} PRICE. \quad (1)$$

In this model,  $V_i$  is the dependent variable that represents a consumer’s utility function when purchasing product  $i$ . Next,  $HEALTH$ ,  $ORIGIN$ ,  $SIZE$ , and  $PRICE$  represent attributes that affect a consumer’s utility, and  $\beta_{HEALTH}$ ,  $\beta_{ORIGIN}$ ,  $\beta_{SIZE}$ , and  $\beta_{PRICE}$  denote coefficient estimates for each attribute.  $HEALTH$  denotes the health claim attribute on products (labeling health claims or not).  $ORIGIN$  denotes the country of origin attribute on products (labels indicating that the tea leaves originated in Japan or not),  $SIZE$  denotes the size attribute of the product (small, regular, or large sizes),  $PRICE$  denotes the product price attribute (affordably, regularly, or highly priced, as seen in common Japanese retail stores). Therefore, each dependent variable affects a consumer’s utility of purchasing the functional food products.

We estimated a conditional logit model using SPSS Version 19. Tables III, IV, and V show the estimation results. The chi-square test statistic and the R-square show that the

model is highly significant. In addition, we use the coefficients to calculate MWTP for each attribute. MWTP is expressed in terms of a monetary unit or the change in consumers' utility for a change in a special attribute. MWTP are calculated as follows:

$$MWTP_i = -\beta_i / \beta_{PRICE} \quad (2)$$

These results are displayed in Table III, Table IV, and Table V.

#### A. Empirical Results in All Respondents

The coefficient for *Health Claims* was positive and statistically significant at the 1% confidence level. Among the respondents, *Health Claims* positively correlated with the purchase of functional food, thus supporting H1. Thereby indicating that the labeling of health claims significantly influences purchase behavior in the functional food category, which is consistent with findings from other studies that used surveys in other countries. Because health is categorized as a credence attribute, consumers prefer such labeled products over those with no labeling. This therefore indicates that FOSHU certification in the functional food category can enhance brand value.

Moreover, the study reported that respondents were willing to spend more for functional food with health claims labeling, or with FOSHU certification labels: MWTP corresponding to *Health Claims* was approximately ¥45—the second highest among all attributes. This finding suggests that, all other factors being equal, FOSHU certification increases a consumer's MWTP (WTP) by ¥45. Therefore, health claims can boost sales prices by approximately 20%, and thus we conclude that health claims increase a product's value. This is one of the most important factors in new product development for the functional food category—a finding that is consistent with evidence from the marketplace. Green tea bearing a FOSHU label sells for ¥170–190 in Japan, which is approximately ¥20–40 more than tea without a FOSHU labeling. In April 2012, a FOSHU-certified drink launched by Asahi was priced at ¥150 and became a megahit.

Second, *country of origin* is important to young Japanese consumers when selecting functional food. The coefficient for country is positive at the 1% confidence level, thus supporting H2. This suggests that, in functional food categories, Japanese consumers attach high value to food of Japanese origin. This finding is consistent with previous research and indicates the likelihood of Japanese consumers' belief that Japanese products excel in quality, taste, and safety. This finding also suggests that producers who use foreign tea leaves should position their products as featuring a foreign style of tea.

Moreover, MWTP associated with this attribute was the highest (¥58). Interestingly, functional food consumers preferred tea leaves from Japan in spite of some areas of the country's tea-producing regions being contaminated by the 2011 earthquake and the nuclear disaster. Several production areas were unable to ship production because of the excess radioactive content, and other production areas were hit hard by rumors.

Despite this disaster, the findings suggest that green tea

originating from Japan is expected to appreciate among Japanese consumers.

Third, the coefficient for *Size* is negative but not significant. This result implies that this factor will not affect consumers' choice of products; therefore, H3 is rejected. In addition, the coefficient for *Price* is negative but not significant, which rejects H4 and indicates that price does not have a significant effect on purchase intention. In this food category (functional beverages), consumers may believe that price corresponds with quality.

TABLE III: EMPIRICAL RESULTS OF CONDITIONAL LOGIT MODELS AMONG ALL RESPONDENTS

	Coefficients	Standard Error	Significance Probability	MWTP
Health Claims	1.7956***	0.2028	0.0000	44.8192
Country of Origin	2.3545***	0.2161	0.0000	58.7665
Size (ml)	-0.1848	0.1356	0.1728	-4.6143
Price (JPY)	-0.040	0.0323	0.2148	
LR chi2	295.387			
Prob > chi2	0.0000			
Pseudo R2	0.4038			
Log likelihood	436.0083			
Observations	265			

\*\*\* indicates that coefficients are significant at the 1% confidence level.

#### B. Empirical Results among Health-Conscious and Non-Health-Conscious Respondents

Tables IV and V present the empirical results after dividing the sample into consumers who describe themselves as health conscious and those who do not. Although the results reveal little difference among respondents, the health-conscious group's MWTP for *Health Claims* and *Country of Origin* are higher. This finding suggests that consumers value both FOSHU health claims and country of origin; moreover, health-conscious consumers place higher value on these attributes.

However, interestingly, these empirical results indicate that health-conscious consumers' coefficients for *Volume* is negative at the 5% confidence level, indicating that consumers do not place high value on volume and may perceive functional food as nutritious but not tasty; in other words, they "face a trade-off between taste and nutrition" [45]. Reference [45] highlighted that consumers often encounter a trade-off between taste and nutrition; thus, their evaluation of food characteristics is also sensitive to changes in product characteristics.

Accordingly, consumers may prefer functional food that is packaged in smaller volumes. Indeed, the volume of most drinks in the functional food category is 350 ml compared with 500–550 ml for other drinks. Reference [25] highlights that consumer's evaluate products according to product category (a consumer may view this product as in the normal soft drink category or in the functional drink category). That is, the appeal of FOSHU certified products is their functioning effects on one's body; therefore, marketing for this functional food category should focus on how these products affect consumers' health and not on basic functions such as quenching one's thirst. Hence, marketing activities

must focus on the perception gap between the marketer and consumer. If marketers target consumers who perceive products as functional food, these products require different marketing techniques. Marketers and product developers must position products in a clearly recognizable manner as functional food.

These results suggest that functional food requires marketing approaches that are different from those for conventional food, such as brand management, product size, and sales channels. Reference [14] notes that an appropriate selection of a sales channel was a success factor in marketing Kao Healthya. These findings suggest that smaller product volumes are more compatible with convenience store consumers.

TABLE IV: EMPIRICAL RESULTS OF CONDITIONAL LOGIT MODELS REGARDING HEALTH-CONSCIOUS RESPONDENTS

	Coefficients	Standard Error	Significance Probability	MWTP
Health Claims	1.5151***	0.2480	0.0000	120.4405
Country of Origin	1.8169***	0.2402	0.0000	144.4332
Size (ml)	-0.3524**	0.1691	0.0371	-28.0188
Price (JPY)	-0.0125	0.0399	0.7528	
LR chi2	145.006			
Prob > chi2	0.0000			
Pseudo R2	0.0968			
Log likelihood	1496.5799			
Observations	130			

\*\* and \*\*\* indicate significance at the 5% and 1% confidence levels, respectively.

TABLE V: EMPIRICAL RESULTS OF CONDITIONAL LOGIT MODELS AMONG NON-HEALTH-CONSCIOUS RESPONDENTS

	Coefficients	Standard Error	Significance Probability	MWTP
Health Claims	1.6315***	0.2743	0.0000	54.6070
Country of Origin	2.2397***	0.2845	0.0000	74.9648
Size (ml)	-0.2253	0.1831	0.2184	-7.5430
Price (JPY)	-0.0298	0.0438	0.4951	
LR chi2	137.594			
Prob > chi2	0.0000			
Pseudo R2	0.3693			
Log likelihood	234.9116			
Observations	135			

\*\*\* indicates that coefficients are significant at the 1% confidence level.

## V. CONCLUSION

Marketing communication of functional food is one of the most difficult tasks for makers and retailers because the functional food category possesses credence attributes and consumers are unaware of the quality of such products before purchase and consumption. Effective marketing is required to warrant the quality of the products and its effects on the body.

To ensure that products meet their expected health effects in addition to correct information being provided to consumers, large food makers attempt to certify their products through the FOSHU system [46]. Several recent studies analyzed this topic of FOSHU labeling. However,

few previous analyses determined the effects on prices and other characteristics.

This study used conjoint analysis to identify the factors that affect Japanese consumers' preferences for tea drinks with health-enhancing qualities. The conclusions are as follows.

Health claims positively and significantly influence the purchase of functional drinks according to 18–25 year-olds in Japan. Health claims and country of origin significantly influence consumer preferences, suggesting that producers who use foreign tea leaves should position their products as featuring a foreign style of tea. Moreover, our empirical results revealed that consumers prefer smaller volume tea products and health-conscious consumers are more likely to choose functional food.

These results suggest several managerial implications for effective product development and consumer communication in Japan's functional food markets. Health claims and country of origin—safety and the quality image of products—are key success factors in marketing functional food. Moreover, marketers should tailor product size to consumers' perceptions of functional food and use appropriate channels to reach them. New products should target consumers' singular perceptions of functional food, and marketers must find appropriate tools for the communication of health effects.

Research using a larger sample size and broader demographics is needed to make these findings more robust. Moreover, there is a need for research that more broadly explores the category of functional food and makes cross-comparisons to define specific characteristics within the broader category. Research into other products that make health claims may offer further insight into Japan's functional food market.

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