The Reference Price Effect on Willingness-to-Pay Estimates: Evidence from Eco-labeled Food Products

Xiaohan Wei [a]
Master student
xwei9@vols.utk.edu

Xuqi Chen [a]
Assistant Professor
xchen88@utk.edu

Zhifeng Gao [b]
Associate Professor
zfgao@ufl.edu

Kimberly L. Jensen [a]
Professor
kjensen@utk.edu

Tun-Hsiang Yu [a]
Associate Professor
tyu1@utk.edu

Karen L. DeLong [a]
Assistant Professor
Kdelong39@utk.edu

[a] **Agricultural and Resource Economics Department**

The University of Tennessee, Knoxville

[b] **Food and Resource Economics Department**

University of Florida

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Abstract

As consumer's interest in eco-labeled products increases, consumer preference for eco-labeled products garnering more attention. Understanding the factors influencing consumer preference for eco-labeled food products can aid effective food marketing, and ultimately benefit farmer profit. This study investigates how reference prices would affect consumer preference for the same or similar eco-labeled products. The reference price is used to provide price information for the product that consumers are interested in. The data is obtained from a 2019 online national survey. The contingent valuation method (CVM) and a seemingly unrelated regression (SUR) are used to investigate the effect of different formats of reference price (i.e., low means versus high means, small intervals versus large intervals) on consumer willingness-to-pay (WTP) for conventional and eco-labeled chips and salad. The results show that a high mean of the reference price of conventional chips has a significant positive impact on WTP for all the chips products except for the transitional organic chips. In the case of salad, a higher mean of the reference price of conventional salad has a significant impact on consumer WTP for all the alternative salads, except for organic. However, the interval of reference prices does not have a significant impact on WTP on eco-labeled food products in either case of chips or salad. The internal reference price (the price consumers paid last time) is a significant impact on consumer WTP. The results indicate that when consumers are faced with more considerable uncertainty in the shopping environment, they become more reliant on the price they paid last time, while external reference information becomes obsolete.

Introduction

I. Background

Consumers have become increasingly interested in purchasing food products with labels regarding the practices used in their production and processing (Hermawan and Yusran, 2013; Hanspal and Devasagayam, 2017). For example, organic food consumption has shown an increasing trend in the United States since 1990 (McFadden and Huffman, 2017; Dimitri and Dettmann, 2012; McNeil, 2020). Especially in the recent ten years, organic food consumption in the U.S. has increased by $27.47 billion from 2008 to 2018 (Statista, 2019). Meanwhile, the forecast market value of organic food and beverage markets worldwide shows that the market value will increase to 679.81 billion dollars in 2027 (Statista, 2020). In addition to the high demand for organic food products, consumers would like to pay higher prices for organic food products (Marian et al., 2014; Goetzke, Nitzko, and Spiller, 2014; Suprapto and Wijaya, 2012; Rana and Paul, 2017). Furthermore, adopting organic practices could benefit soil health and increase food-plant quality (Reeve et al., 2016). However, only less than 1% of farmland is certified as organic in the U.S. for now (Economic Research Service, 2020). Thus, the increasing demands and potentially higher revenues may motivate farmers to adopt organic practices over conventional farming methods (Niggli, Schmid, and Fliessbach, 2008; Archer et al., 2007; Mahoney et al., 2007).

Nevertheless, adopting these methods usually incurs additional input costs and potentially affects yields, causing hesitation among farmers to adopt these practices (Pannell et al., 2006; Chen et al., 2018; Caldwell et al., 2014). Besides, when farmers adopt the organic farming practice on the land accustomed to using conventional production methods, they need to go through an at least three-year transitional period to transform from traditional to organic. Therefore, more cost, potentially less yield, and the transitional period would impact farmers' profitability and cause them to hesitate to transform. In these cases, in order for farmers to adopt organic practices that may incur added costs of production or influence yields, price premiums for those products may be needed to compensate for the potential loss and ensure farm profitability and economic returns (Reeve and Drost, 2012; Lesur-Dumoulin et al., 2017). Hence, the National Certified Transitional Program (NCTP) by the Organic Trade Association (OTA) and the United States Department of Agriculture (USDA) in 2017 (Organic Trade Association USDA Certified Transitional Program, 2017) created an innovative label named Transitional organic. This label guides farmers transitioning to certified organic agricultural production from conventional practices. The transitional organic label is introduced to help farmers during the transition period to distinguish their products by using this label so that farmers could sell their transitional products at a premium price instead of conventional price during the three-year transitional period (Organic Trade Association, 2017). Although recent news indicates that the transitional organic label program was withdrawn, other potential labels in the pipeline would bring similar benefits in the future. Therefore, this study could utilize the label and use it as a subject to study consumer preference for future reference. These results are essential for the success of the marketing of existing food labels and the forecasting of the future market for unfamiliar labels such as transitional organic. Besides the labels that are already popular and familiar to consumers, such as genetically modified organisms-free (GMO-free) and USDA organic[1], this study also includes those that are not so well populated and relatively new or potential to the market, such as transitional organic.

Previous research has tried better to understand the consumer preference for different labeled food products. Obtaining such knowledge is useful to facilitate the marketing of these products and potentially increase farmers' confidence in transforming to organic and other eco-friendly practices. For familiar products, consumers may already know the products well in

[1] In this study, "USDA organic" is represented by "organic".

their evaluation system (Rao and Monroe, 1988; Dodds, Monroe, and Grewal, 1991; Grewal et al., 1998). While for those unfamiliar products, consumers would need to rely on something else information sources to give their evaluation, such as the reference price (Biswas, 1992; Vaidyanathan, 2000; Lemmerer and Menrad, 2015). Consumers may be less familiar with the transitional label than other popular labels such as USDA organic and non-genetically modified organisms (Non-GMO). They may have little knowledge and reply upon reference price for transitional organic products' purchase decisions. This lack of familiarity will have room for the reference price to play a role in both their decision making and preference in terms of willingness-to-pay (WTP) because reference price could provide price information (LaRiviere et al., 2014; Hasselström and Håkansson, 2014; Georgantzís and Navarro-Martínez, 2010). For instance, when consumers buy transitional organic chips, they may value it according to organic chips' and conventional chips' prices because consumers are more familiar with these two similar products. In this case, organic and conventional chips' prices could be regarded as the reference price. Hence, estimating consumer preferences for familiar and unfamiliar labeled food products and exploring the influential factors, including the reference price, are critical. Due to its importance, previous studies have noticed the significant factors of reference prices and found it affected consumer preferences and measures for WTP (Chen, Huang, and Zhou, 2012; Putler, 1992; Shi et al., 2014). Continuing the example above, the consumer wonders how much to pay for transitional organic chips at first. After the consumer knows the reference prices of organic and conventional chips are $6 and $3, the consumer may have a WTP at $5. Besides, prior research has studied the effect of reference price on consumer WTP for unfamiliar labels or products. Their findings have shown that these effects can be particularly magnified when consumers are foreign with the label or the product (Grunert et al., 2009; Kopalle and Lindsey-Mullikin, 2003; Biswas, 1992; Rao and Monroe, 1988), such as the case with the transitional label.

Despite a large body of literature review on reference prices and consumer preference, we have not found many studies focusing on the impact of different formats of reference prices on consumer WTP. A limited number of studies examine the effect of reference price on consumer WTP for several familiar labeled products (Asche, 2015). Understanding how reference price formats may influence consumer preferences and WTP measures is of interest to researchers in developing WTP estimates for food labels, particularly the less familiar ones such as transitional organic. This study mainly extends the analysis of Shi et al. (2014) by modifying the format of a reference price to explore how different reference price formats affect WTP using its own- and cross-price. Besides, it presents a detailed empirical analysis of whether various patterns of reference price (i.e., high means versus low means, large intervals versus small intervals) affect consumer WTP for food labels that are both more familiar to consumers, Non-GMO and organic labels, and those less familiar ones, such as the transitional organic label. Two products (salads and chips) were chosen as the focal subjects since they were identified as the representative of healthy (salads) and unhealthy (chips) food according to previous studies (Grebitus and Davis, 2017; Van Loo et al., 2018). The WTP was measured by the payment card of the Contingent Valuation Method (CVM). The analytical framework is summarized in Figure 1.

[Insert Figure 1]

II. Objectives

Based on the background of this study, there are four main issues to be solved. Firstly, consumers may be less familiar with innovative or not that popular labels than other labels, such as organic and Non-GMO. Will measures of WTP for food products with different labels, including the unfamiliar transitional organic label, on two representative food products (chips and salads), be different? Secondly, consumers may have little knowledge about the price information for transitional labeled products. This lack of familiarity can have implications for measuring WTP. In this case, they may need to rely on the reference price to have a reasonable WTP for unfamiliar labeled food products. If so, will the reference price have a significant impact on consumer WTP for labeled food products? Thirdly, plenty of studies have studied the reference price effect on consumer WTP, but only a few studies have focused on how different formats of reference price influence consumer WTP. Therefore, in this study, we help advance the theoretical knowledge of reference price effect on consumer preference by providing a more holistic analysis of how different reference price patterns (e.g., different means and different uncertainties) would affect consumer preference for labeled food products systematically. The reference price formats include two major forms, high versus low means and large versus small intervals. Prices of the organic and conventional alternatives are provided as the reference price. By giving respondents different reference price formats, we could observe how consumers responded by estimating their WTP with these different information treatments. Lastly, this study focused on two products (chips and salads), which represent healthy and unhealthy food products. We examine whether the reference formats have different effects on consumer preference for healthy and unhealthy food products?

Specifically, based on the analytical framework and these objectives above, we propose five hypotheses below:

Hypothesis 1: *Consumer WTP for transitional organic food products may be between conventional and organic food products.*

Hypothesis 2: *Reference price would influence consumer WTP for labeled food products.*

Hypothesis 3: *High means of reference prices would increase consumer WTP for labeled food products.*

Hypothesis 4: *Consumers would have a higher WTP for food products, given large intervals of reference prices.*

Hypothesis 5: *The effect of reference price formats on consumer preference for healthy and unhealthy food products may differ.*

By answering questions in objectives and proving the hypotheses above, this study contributes to the literature in three aspects. First, different from previous research that solely focuses on the effect of reference price on consumer preference and WTP (Monroe, 1973; Putler, 1992; Chen, Huang, and Zhou, 2012; Asche, 2015), this study measures how different formats of reference price could affect consumer preference. People who face different means or intervals of reference price may have different preferences in terms of WTP. Secondly, this study's results would contribute to the theoretical knowledge of how different reference prices might influence consumers' WTP for food labels when they are more and less familiar with these labels. Third, this study could advance the empirical knowledge in the literature about the reference price and its impacts on consumer preference for labeled foods. Furthermore, the information about consumers' WTP could also contribute to a more efficient food marketing system by deepening the understanding of consumer demand for labels (Schäufele and Hamm, 2017; Tsakiridou, Zotos, and Mattas, 2006). Such information could help inform pricing strategies for the food industry and provide implications for policymakers to improve labeling in food products (Krystallis, Fotopoulos, and Zotos, 2006; Balogh et al., 2016). This research could also be meaningful for the government to help design new food labels. When the government develops new labels, it could consider some other factors, such as the mean of the reference price, the interval of the reference price, and even whether the food product is healthy or not. In this case, the government could have enough information about food marketing and food labels to avoid the failure of designing new labels, such as transitional organic.

The remainder of this thesis is as follows. First, a literature review is presented, followed by a data and methods section. Then, results are presented and discussed. Finally, we provide a discussion and conclusions section to conduct a robustness check, draw implications resulting from the study, as well as provide suggestions for future research.

Literature Review

I. Food Labels

Food labels in the U.S., such as Non-GMO, organic, and others, could provide information about environmentally friendly food products to consumers (Mohamed et al., 2014). Previous studies researched consumer preference for labeled food products, but they typically focus on organic and Non-GMO labels (Yiridoe, Bonti-Ankomah, and Martin, 2005; Yue et al., 2011; Sivathanu, 2015; Peschel et al., 2019; Berning and Campbell, 2017). Organic is a USDA certified label for grown and processed products that rely on natural substances and farming methods based on physical, mechanical, or biological to the greatest extent possible. Besides, at least three years cannot use any prohibited substances on organic food products growing lands, such as pesticides and fertilizers (USDA, 2019). As its name suggests, Non-GMO is a third-party label in North America for products that have not been genetically engineered. A non-profit organization initiated this Non-GMO program to verify that products are produced and produced in accordance with strict best practices for avoiding genetically modified organisms (Non-GMO Project).

This study aims to provide information about pricing strategy and consumer preference for familiar and unfamiliar labeled food products to food label agency. Most consumers are already familiar with organic and Non-GMO labels, which often appear in daily life. However, the transitional organic label is a certified transitional label between conventional and organic, a relatively unfamiliar label. Thus, three food labels, organic, Non-GMO, and transitional organic, are analyzed in this study (See Figure 2 for label details).

[Insert Figure 2]

II. Food Products with Different Labels and WTP

Consumer preference for value-added food products has always been a heated topic for food marketing research, and several influential factors have been concluded by previous literature (Orth, Wolf, and Dodd, 2005; Gao et al., 2011). Previous studies have shown that the effect of reference price on consumer preference is significant and premium exists for organic and Non-GMO food products (Marian et al., 2014; Chen et al., 2018; McFadden and Huffman, 2017; Gil and Soler, 2006; Soler, Gil, and Sanchez, 2002). Not only the reference price but also the demographics, such as gender, age, and education level, could impact consumer preference (Girard, Korgaonkar, and Silverblatt, 2003; Hanspal and Devasagayam, 2017; Vecchio, Van Loo, and Annunziata, 2016). Wang and Sun (2003) concluded that age, income, family size, and the number of children in the family could significantly influence consumer WTP for organic food products. Health concerns and educational levels have a significant relationship with consumer preference for Non-GMO food products (Onyango et al., 2004; Yuan et al., 2018). Also, Williams found that consumers who are less influenced by price and have strong healthiness beliefs would be more likely to purchase transitional organic food products. Loureiro, McCluskey, and Mittelhammer (2002) concluded that the bid amount, number of children in the family and gender, could significantly affect eco-labeled apple, which is certified by TFA. Mohamed et al. (2014) also showed a significant association between consumer WTP for eco-labeled food products and social demographics, such as past purchase experience, attitude, and knowledge.

Furthermore, since the concern for the environment could impact consumer WTP (Liu, Yan, and Zhou, 2017), consumers may have different WTP for different labels. Hence, this study will focus on consumer WTP for food products with familiar existing labels (i.e., Non-GMO, organic food products) and an unfamiliar potential product: transitional organic product.

When consumers are shopping for an innovative product or some products that they are not familiar with, the reference price becomes a more critical information source that consumers can rely upon (Hofstetter et al., 2013). However, the way that preference price was presented (e.g., formats) may bring various impacts on consumer preference for those products. Thus, we want to estimate the consumer preference for food products with different labels in this study and evaluate how different reference price formats would affect consumer WTP obtained using a contingent valuation method.

III. Contingent Valuation Method

Contingent valuation methods are often used to estimate WTP for non-market food products and public products (Brox, Kumar, and Stollery, 2003; Hu et al., 2011). CVM can be divided into two major categories, continuous methods and discrete methods. The former includes open-ended questions and a payment card approach. The latter, the discrete method, is the most popular approach, which can be used to check the consistency of WTP estimated with continuous methods (Ready, Buzby, and Hu, 1996). The payment card method allows respondents to choose the value of their maximum WTP from a range of WTP (Venkatachalam, 2004). Since the payment card method limits the amounts of WTP in a range, there is no boundary issue existing (Hu et al., 2011).

Mitchell and Carson (1989) first used the payment card approach to address survey bias in evaluating WTP toward public environmental and resource projects. Currently, many studies about WTP for food products and eco-labeled food products used the payment card method. Tian, Yu, and Holst (2011) adopted the payment card approach to estimate WTP for green food. Hu (2006) elicited WTP for Non-GM vegetable oil using this method. Yu, Gao, and Zeng (2014) also estimated consumer WTP for "Green food" in China using the payment card approach. Hu et al. (2011) modified this approach by giving reference intervals under the WTP questions and covering breaks on a wide scale so that respondents could obtain an accurate price without inferring it from the data. Furthermore, the distribution of values chosen by respondents could also show the spread of consumer WTP. In addition to the previous research above, several studies used the payment card method to estimate WTP. This method is widely used because it could reduce the estimation bias to a certain extent and include both advantages of the dichotomous choice and the open-ended approach (Yu, Gao, and Zeng, 2014).

The previous studies have several benefits of using the payment card method: First, it could avoid the boundary problem in open-ended CVM because of the limited value offered in the payment card approach (Hu et al., 2011). Second, WTP is answered so that it could be obtained directly from the first-hand dataset (Tian, Yu, and Holst, 2011; Ready, Buzby, and Hu, 1996). Furthermore, according to the study of Donaldson, Thomas, and Torgerson (1997), the payment card approach is more valid and has a higher answer rate than an open-ended approach because a payment card causes fewer zero values and makes the question easily understood. Therefore, this research will obtain consumer WTP for food products with different labels using a payment card CVM.

IV. Reference Price and WTP

Based on the assimilation-contrast theory (Sherif and Hovland, 1961), previous research showed that consumers have their ranges of the price that they could accept, which could be regarded as consumer WTP. However, when the product price exceeds the acceptable range, it will contrast with the price in this range, and consumers will perceive the price out of this range is unacceptable (Raman and Bass, 2002). The adaptation-level theory showed that the relationship between the stimuli level and adaptation level could affect the response to a new stimulus (Helson,1964). In terms of price response, the adaptation level could be called the standard price or the regular price (Emory, 1970). For example, a consumer bought an apple at a specific price. This consumer would then form an adaptation level (i.e., standard price or reference price) for the apple. Now, when he/she wants to buy another apple, his/her price response (i.e., WTP) will depend on the reference price and previous price paid. The reference price is first proposed to be influential in determining the price of products by Monroe (1973). This theory has already approved by Niedrich, Sharma, and Wedell (2001) using the experimental study of the reference price.

Numerous studies have also demonstrated that a reference price has an impact on consumer price expectations and purchase decisions (Jacobson and Obermiller, 1990; Kopalle and Lindsey-Mullikin, 2003), especially when consumers are not familiar with the products. For example, Shi et al. (2014) found the cross-price affects consumer WTP estimates through a contingent valuation method using different orange juice products. Greenleaf (1995) found that the reference price could affect promotion profits because it can help retailers determine the most profitable promotion strategy. Cai (2005) also concluded that many types of reference prices (e.g., the price paid last time, the average price of similar products) affect consumer's value elicitations and price perceptions significantly.

According to Shi et al. (2014), the different reference price formats could affect consumer WTP collected by an open-ended method. When people structure their preferences, the assessment of their choices will depend on the choice context (Bettman, Luce, and Payne,1998). The reference price is exogenously formed and given before consumers make purchasing decisions, influencing consumer behavior (Putler, 1992). Chernev (2003) showed that compared to "price selection" (i.e., "select your price"), "price generation" (i.e., "name your price") is not preferred when the reference price range is absent, which is consistent with the recommendations of Donaldson, Thomas, and Torgerson (1997). Furthermore, the reference price was more often used to assess innovative products (Lowe and Alpert, 2010). Thus, giving a reasonable reference price range could help consumers make a more consistent decision and enable researchers to assess a more reasonable consumer WTP for innovative products with an unknown market.

Two types of reference price effects can be measured: the own-price effect and the cross-price effect (Shi et al., 2014). Thaler (1985) introduced reference price as price directly into the value function for own-price effect research to know how the reference price affects WTP by incorporating the model in value elicitation procedures (Cai, 2005). The cross-price effect is also studied extensively in different fields. For instance, Rosas, Acerenza, and Orazem (2020) found that the existence of the cross-price effect and unobserved pure taste for sports could support an optimal pricing strategy through an application to collegiate sports events. Arnot et al. (2006) showed that even ethical consumption choice of conventional coffee could be influenced by price and switch to fair trade coffee. Hall, Kopalle, and Krishna (2010) concluded that the own-price effect and cross-price effect have an interaction. The current study will follow methods used in Shi et al. (2014) and modifies the reference price format to explore how different patterns of reference price affect WTP using its own- and cross-price.

Studies on communication discrepancy (Aronson et al., 1963; Bochner and Insko, 1966; Kopalle and Lindsey-Mullikin, 2003) suggested that consumer's price expectation (i.e., WTP) will change if the reference price is not equal to the original price expectation (e.g., communication discrepancy exists). Furthermore, the prospect theory (Kahneman and Tversky, 1979) shows that the effect of loss (i.e., price is higher than reference price) and gain (i.e., price is lower than reference price) on consumer's price response are different, and the effect of loss is stronger than the impact of gain (Mayhew and Winer 1992; Raman and Bass, 2002). This indicates that the reference price's value could largely affect the consumer's utility, correlated to consumer WTP.

V. Healthy and Unhealthy Food Products

Several previous studies have also researched consumer WTP for different product categories. Shen (2012) explored consumer WTP for eco-labeled products by analyzing different kinds of products since consumer WTP is different when they value different types of products. Hence, estimating different food products with the same label is necessary to explore further the reference price formats' effect on consumer WTP. Similarly, Biswas and Roy (2016) also estimated consumer WTP for different kinds of green products. Furthermore, using different products, including healthy and unhealthy food products, could identify product-specific differences between different labels (Grebitus and Davis, 2017; Van Loo et al., 2018). However, few studies focus on consumer WTP for eco-labeled food products with the consideration to include a variety of food categories. Thus, two representative products, chips (unhealthy) and salad (healthy), are chosen as the focal subject in this study to explore how different formats of reference price affect consumer preference for food products with familiar and unfamiliar labels.

Data and Methods

Data

This research was collected via an online survey from January to March 2019 across the United States. The survey was designed and administrated by Qualtrics, an international professional market research company. The survey was randomly distributed to the company's national respective consumer panels. Primary household grocery shoppers, who were older than 18 years old, were qualified to participate in the survey. The survey consisted of four parts, focusing, respectively on, 1) participants' knowledge and perception on conventional and three different kinds of eco-labels (i.e., Non-GMO, transitional organic, Organic), 2) internal reference price (the last purchased price of the product that respondents recall), 3) consumers WTP for the eco-labeled food products, and 4) demographics (age, gender, and educational level). The WTP for different labeled food products is answered in the payment card approach given two ranges of reference prices of conventional and organic food products. Furthermore, before respondents answer their WTP, we provide basic knowledge about each label to help respondents understand each label's meaning and avoid invalid WTP answers. Two products (salad and chips) were chosen as the focal subjects to identify the representative of healthy (salad) and unhealthy (chips) food because both salad and chips are common food with all kinds of labels in real life. Respondents were randomly assigned to one of the groups so that they would answer the questions for one group only. Finally, 2,268 valid responses were collected and used for this study.

Table 1 summarizes the demographics of survey respondents and the U.S. Census statistics in 2019. In the sample, female respondents account for 67.95%, which is higher than the general population (51.51%). The age distribution in this sample is slightly older than the general population, which may be because this study only focuses on 18 years or older people and the primary shopper of the household. Respondents aged 18 to 24 account for 7.89%, which is less than the general population (8.12%). However, those aged over 65 account for 20.24% of the sample, which is more than the Census data percentage. As for the educational level, more respondents have some college and above in the survey than the general population. Respondents whose academic levels are lower than high school and higher than master's degrees account for 20.86% and 18.22%, respectively. In terms of weekly food expenditure, only 11.02% of respondents spend less than $49 per week on food. Respondents with weekly food expenditure between $50 and $199 account for 69.14% of the sample. In addition, there are less than 20% of respondents spend more than $200 on food per week. The analyses above show that female respondents with higher educational level in the survey data account for higher percentages than the Census data, which is consistent with the results of online survey statistics in the previous research about consumer preference (Heng, Peterson, and Li, 2013; Gao, House, and Xie, 2016; Chen et al., 2016; Chen, Gao, and McFadden, 2020).

Furthermore, Figures 3 and 4 show consumer WTP distribution for chips and salads with different labels. Figure 3 illustrates plenty of zero WTP for GMO-free, transitional organic, and organic chips, which counts for around 10% of total responses. And the distribution of consumer WTP for chips shows a normal distribution. Most consumers would like to pay $2.99 for conventional chips and $3.99 for GMO-free, transitional organic, and organic chips. In Table 3, we can know the mean WTP for conventional, GMO-free, transitional organic, and organic chips are $2.88, $3.32, $3.24, and $3.62, respectively. For the distribution of consumer WTP for salads with different labels in Figure 4, we can know that consumer zero WTP for GMO-free, transitional organic, and organic salad accounts for 6.76%, 7.66%, and 6.40%, respectively. Consumer WTP for salads is very similar to consumer WTP for chips, which are also distributed normally. Most responses are willing to pay $2.99 for conventional salad, $3.49 for transitional organic salad, and $3.99 for GMO-free and organic salad. Table 3 shows the mean of consumer WTP for conventional and three labeled salads is $3.02, $3.57, $3.56, and $3.95. From the statistic summary of consumer WTP for all labeled chips and salads in this study, we can notice that consumer WTP for transitional organic products is between conventional and organic products. Hence, the first hypothesis (H1) is not rejected.

[Insert Table 1-3]

[Insert Figure 3-4]

Methods

I. Experimental and Survey Design

To test the impacts of different formats of reference prices, we used two versions of reference prices in the survey. In each version, the prices are generated using a two-by-two design. In the design of the first price version, the design factors are the means of conventional and organic reference prices, respectively (low means versus high means). In the second price version design, the design factors are intervals of conventional and organic reference prices, respectively (small intervals versus large intervals). The design results in a total of four different combinations of reference prices for each price version. The first price version includes four cases in total: 1) low means of both conventional and organic; 2) a low mean of conventional and a high mean of organic; 3) a high mean of conventional and a low mean of organic; 4) high means of both conventional and organic. The second price version also includes four cases: 1) small intervals of both conventional and organic; 2) a small interval of the conventional and a large interval of organic; 3) a large interval of the conventional and a small interval of organic; 4) large intervals of both conventional and organic. Detailed information on the different formats of reference prices is shown in Table 2. Because we used two products, there are a total of 2*8=16 versions of the survey. A between-subject design is used to randomly assign each respondent into one of 16 surveys and ask respondents their willingness to pay for the conventional and three eco-labeled alternative products, Non-GMO, transitional organic, and organic. The prices of conventional and organic food products are used as the reference price in this study because the conventional food product prices serve as the baseline. The organic product is likely the most well-known eco-label of the three examined. An example question of case 1) of the first version for chips in the survey is as follows:

In the market, the average prices for chips are:

Conventional chips (10oz, 283.5g): between $2-$4.

Organic chips (10oz, 283.5g): between $4-$6.

How much ($) are you willing to pay for one bag of your favorite chips (10oz, 283.5g) using the following production method? (select one price $0.00 or from $0.49-$9.99 in increments of $0.50)

Conventional ________________________

Non-GMO ________________________

Transitional organic ________________________

Organic ________________________

The other cases of two versions for two products are the same except for the reference price information.

II. Model Specification

Let $WTP_{mean,conventional}$ and $WTP_{mean,organic}$ be consumer WTP for an eco-labeled food product given the different means of reference prices of conventional and organic food products, collected from survey data using a payment card contingent valuation method (Hu et al., 2011; Yu et al., 2014). Let $WTP_{high\ mean,conventional}$, $WTP_{low\ mean,conventional}$, $WTP_{high\ mean,organic}$ and $WTP_{low\ mean,organic}$ represent the WTP given the high and low means of reference prices for conventional and organic foods, respectively. The T-test is used to check the effect of different reference price formats on WTP. If the impact of different mean patterns of reference price on consumer WTP for sustainable food products exists, the equation (1) and (2) will be the following:

$$WTP_{high\ mean,conventional} \neq WTP_{low\ mean,conventional} \tag{1}$$

$$WTP_{high\ mean,organic} \neq WTP_{low\ mean,organic} \tag{2}$$

Furthermore, let $WTP_{interval,conventional}$ and $WTP_{interval,organic}$ be consumer's willingness-to-pay for eco-labeled food products given the different interval patterns of conventional and organic reference prices. Besides, let $WTP_{large\ interval,conventional}$, $WTP_{small\ interval,conventional}$, $WTP_{large\ interval,organic}$ and $WTP_{small\ interval,organic}$ represent the WTP given the large- and small-interval of reference prices for conventional and organic food products. If the effect of the different interval formats of reference price on WTP exists, the equation (3) and (4) will be the following:

$$WTP_{large\ interval,conventional} \neq WTP_{small\ interval,conventional} \tag{3}$$

$$WTP_{large\ interval,organic} \neq WTP_{small\ interval,organic} \tag{4}$$

Given different formats of conventional and organic reference prices, different consumer WTPs for eco-labeled food products are obtained. Equations (5) and (6) can be estimated as seemingly unrelated regression (SUR) models with four equations to get the effect of different formats of the reference price. Equation (5) was estimated with respondents who were given the different mean patterns of reference prices, and equation (6) was estimated with respondents who were given the different interval patterns of reference prices.

$$WTP_{mean} = \beta_{mc}Conventional_m + \beta_{mo}Organic_m + \beta_{mr}internal_{mk} + \beta_{mk}X_{mk} + \varepsilon_m \quad (5)$$

$$WTP_{interval} = \beta_{ic}Conventional_i + \beta_{io}Organic_i + \beta_{ir}internal_{ik} + \beta_{ik}X_{ik} + \varepsilon_i \quad (6)$$

where βs are the unknown parameters. And ε_m and ε_i are random errors for each equation. $internal_{mk}$ and $internal_{ik}$ are the internal reference prices for each response k in mean and interval formats, respectively. X_{mk} and X_{ik} are demographics vectors for each response k in mean and interval formats, respectively. As for the patterns of the reference price of conventional and organic food products, the value of indicator functions is summarized below.

$$Conventional_m = \begin{cases} 1 & if\ given\ high\ mean\ conventional\ reference\ price \\ 0 & otherwise \end{cases} \quad (7)$$

$$Organic_m = \begin{cases} 1 & if\ given\ high\ mean\ organic\ reference\ price \\ 0 & otherwise \end{cases} \quad (8)$$

$$Conventional_i = \begin{cases} 1 & if\ given\ large\ interval\ conventional\ reference\ price \\ 0 & otherwise \end{cases} \quad (9)$$

$$Organic_i = \begin{cases} 1 & if\ given\ large\ interval\ organic\ reference\ price \\ 0 & otherwise \end{cases} \quad (10)$$

Empirical Results

Chips

The statistics of WTP estimates for chips are summarized in Table 3. Regarding the mean of reference price effect, the statistical summary shows that the WTP for all products in Case 1 is relatively higher than those in Case 2. This indicates that a higher mean of organic reference price may negatively impact consumer WTP. Moreover, in Case 1, consumer WTP is lower than in Case 3, which means the conventional product's reference price potentially positively correlates with consumer WTP. Besides, when WTP in Case 2 and Case 3 compare with that in Case 4, we can see that the former is lower than WTP in Case 4, but the latter shows a similar WTP as Case 4. Hence, the conventional product's reference price may positively influence consumer WTP, and the organic product's reference price might have no impact on consumer preference. However, from the T-test results, we notice that the mean WTP for all types of chips in each case is not significantly different at the 95% confidence level.

Regarding the effect of the interval of reference prices, results in table 3 show that the mean WTP estimates with smaller intervals of reference prices are relatively lower than those with larger intervals, except for transitional organic labeled products. This may be because the transitional food product is innovative; it already has considerable uncertainty. However, the T-test does not show significant differences between the WTP for all products of each case.

The SUR model results in equation (5) for WTP of different kinds of labeled chips are presented in Table 4. The high mean of the conventional product's reference price has a significantly positive impact on consumer WTP for conventional, Non-GMO, and organic products, consistent with the statistical summary of the WTP in Table 2. However, the mean of the organic product's reference price has no impact on consumer WTP for any chips. Therefore, we would not reject Hypothesis 3. The internal reference price, age, educational level, and gender could also impact consumer WTP for chips. For the effect of internal reference price, the price that consumers paid previously could positively affect consumer WTP for all products. Consumers who paid a higher price for chips would be willing to purchase the same or similar products at a higher price. This result is consistent with previous research (Ranyard, Charlton, and Williamson, 2001; Nieto-García, Muñoz-Gallego, and González-Benito, 2017). However, the respondents' age shows a negative impact on consumer WTP, which indicates that younger people tend to have higher WTP for chips. Furthermore, consumers with a higher educational level are more likely to have higher WTPs for Non-GMO and organic chips. Meanwhile, women respondents typically have higher WTP for conventional chips. The most special product is transitional organic products. Both the reference prices of conventional and organic products do not influence it. This may be because transitional organic is an unfamiliar label, and people are not familiar with it. Thus, the mean of conventional reference price could affect consumer WTP for conventional products, Non-GMO products, and organic products. Still, the mean of organic reference price has no impact on consumer WTP.

[Insert Table 4]

In this study, the different interval patterns of conventional and organic reference prices are indicated as different levels of uncertainties (i.e., smaller interval means a lower level of uncertainty, and large interval means a higher level of uncertainty). The effects of different interval patterns of conventional and organic reference prices on consumer WTP are shown in Table 5. It shows that neither the interval pattern of conventional product's reference price nor the interval pattern of organic product's reference price significantly impacts consumer WTP. Thus, this result suggests a rejection of Hypothesis 4. However, the internal reference price has a significant positive influence on consumer WTP for all four kinds of products. Therefore, when people face uncertainty in the reference price, they would be more reliant on the price they paid last time. In this case, the information of the reference price is becoming less influential. Moreover, younger consumers always have higher WTP for all kinds of food products in the study.

[Insert Table 5]

Salads

For the healthy food product representative, salad, the means of WTP given different reference prices are shown in Table 3. For the survey versions with different means of reference prices, consumer WTP for Non-GMO products of Case 3 is significantly higher than Case 1. This means that the result fails to reject the second hypothesis (H2). However, consumer WTP for other products of each case is not significantly different. Combining a high mean of conventional and a low mean of organic reference price leads to the highest WTP for Non-GMO salads among all reference price combinations. Thus, conventional reference price means have a more substantial positive impact on consumer WTP for healthy Non-GMO food products than the mean of the organic reference price. For the second price version with different reference price intervals, the smaller interval reference price pattern shows relatively higher WTP. From the T-test results, there is no difference between WTP for all products of each case. Larger intervals of reference prices provide more uncertainties for respondents. Thus, the uncertainty may decrease respondents' confidence in the products as well as the WTP, which is consistent with the results from previous studies (Shi et al., 2014; Caputo, Lusk, and Jr, 2018).

Table 4 summarizes the SUR results of the effect of mean patterns of reference prices on consumer WTP. The higher mean of the conventional product's reference price has a significantly positive impact on consumer WTP for conventional, Non-GMO, and transitional organic products. This means that consumer WTP for conventional, Non-GMO, and transitional organic salads with the higher mean of conventional products' reference price is higher than with the lower mean of a conventional product's reference price. Hence, Hypothesis 3 would not be rejected. Like the WTP for chips, consumer WTP for salads is influenced by internal reference price, age, gender, and educational attainment. The WTP for conventional, Non-GMO, and organic salads strongly correlates with their internal reference prices. There is no impact of internal reference price on consumer WTP for transitional organic. That because transitional organic is a new label and not very popular, and only a few people purchased it before. Furthermore, young people who received more education are more likely to give higher WTP for the study's salad. Also, female consumers are more likely to show higher WTPs for conventional salads. Thus, the mean of conventional products' reference price but not the mean of the organic products' reference price could impact consumer WTP for conventional, Non-GMO, and transitional organic salads.

As shown in Table 5, the different interval patterns of reference price have no impact on consumer WTP for conventional or other three eco-labeled food products, which has the same result as unhealthy food products. Therefore, we would reject Hypothesis 4. The WTP for a conventional salad could be impacted by internal reference price significantly. Moreover, older females are more likely to give lower WTP for conventional salad. This may be because older females are the primary grocery shopper, and they are more familiar with the price of conventional salad. For Non-GMO and organic food products, only age has a negative influence on consumer WTP. To some extent, consumer WTP for transitional organic food products is influenced by the last purchased price, probably because the transitional organic product is relatively new and unfamiliar to consumers. As a result, consumers have to rely on the internal reference price to bid for this new product. Also, younger people have higher WTP.

Comparisons of Different Models

Based on Table 3, the average consumer WTP for chips with different labels is slightly lower than salads. Moreover, the SUR results in Table 4 show that conventional mean effects on consumer WTP for chips and salads are similar; their differences are less than $0.1 per $1 change of conventional product's reference price. The high mean organic does not significantly influence consumer WTP for any products. However, in terms of different reference price means, the internal reference price effect on consumer WTP for chips is relatively magnified, compared to WTP for salads. Interestingly, no matter large interval conventional or large interval organic does not affect consumer WTP for both chips and salads. Besides, in the SUR results of the reference price interval effect, the internal reference price effects of chips and salads are similar. Hence, the results above indicate that the reference price formats effect does not differ between healthy and unhealthy food products, which fails to reject Hypothesis 5. Nevertheless, given different reference price means, internal reference price will have a more massive effect on consumer WTP for chips than salads.

Discussion and Implication

Robustness Check

To make the major results robust, we conduct some other different models in this study, such as the ordinary least square (OLS) regression, the Tobit regression, and the SUR Tobit regression. The OLS regression results (See Table 6-7 in Appendix) are the same as the results of SUR regression. Compared to the OLS regression, the SUR regression could consider the correlation between equations and improve estimation efficiency. That is why we use the SUR model instead of the OLS regression. Moreover, in some cases, the percentage of zero consumer WTP is greater than 5%, so we also consider the Tobit model. The Tobit regression results (See Table 8-9 in Appendix) are similar to the SUR results. We also conducted a mixed-process model, the SUR Tobit regression, to check the SUR regression's robustness. The SUR Tobit regression results (See Table 10-11 in the Appendix) are also very similar to the results of SUR regression. Therefore, we used the SUR regression in this study.

To check the correlation between each equation in the SUR regression, we used the Breusch-Pagan test. Table 12 in the Appendix shows that the relationship between each equation in the SUR model exists statistically. Therefore, SUR regression is suitable and robust in this analysis.

Implications

This study explored the effects of different reference price formats on consumer preference and decision making for the same or similar products. The results showed that people are more likely influenced by the conventional reference price's mean than the mean of the organic reference price or the intervals of reference prices. When provided a higher mean reference price of conventional products, consumers were more likely to bid a higher WTP for labeled food products. Because the effect of the conventional mean reference price is significant on consumer WTP for both familiar and unfamiliar labeled healthy food products.

Therefore, policymakers could predict the price strategy for food products with potential labels according to conventional food products' mean reference price. However, the conventional mean reference price only significantly influences consumer WTP for familiar labeled unhealthy food products. Thus, providing reference price information for healthy food products would be more beneficial. Since the reference price formats impact consumer WTP for healthy and unhealthy food products differently. Hence, policymakers and market managers should develop different strategies for different food categories.

Moreover, the reference price intervals' impact was not significant for any case, which suggests consumer WTP will be stable regardless of the reference price uncertainty they faced. Consumers would like to rely on their price last time, suggesting that consumers will rely on the internal reference price when facing uncertainty. Besides, consumer WTP is also influenced by demographics. Therefore, when they make the pricing prediction strategy of labeled food products, they would better consider the consumer segment groups, such as younger or older consumers and female or male consumers. Most of the previous literature on consumer WTP for labeled food products just focus on marketing and pricing.

Conclusion

Our study provides additional information by designing different treatments on reference prices to see how these different treatments of reference prices affect consumer WTP. The results of this study could provide information to farmers, marketers, and policymakers. Furthermore, the transitional organic is an unfamiliar label, which is rarely studied in the previous research. In this study, we include not only WTP for conventional but also WTP for three different kinds of labeled food products: Non-GMO, transitional organic, and organic food products.

In this study, we designed four higher means, lower means, larger intervals, and smaller intervals of reference prices to estimate the impacts on consumer WTP for chips and salad.

Different reference price means of conventional and organic products could impact consumer WTP for conventional food products and three other labeled food products (i.e., Non-GMO, transitional organic, and organic food products). The mean of the conventional reference price could significantly positively impact consumer WTP, which indicates consumers have higher WTP given a higher mean of the conventional product's reference price than given a lower mean of the conventional product's reference price. To be more specific, the effect of the reference price means of conventional chips on consumer WTP is similar for chips with familiar labels (i.e., Non-GMO and organic). For the case of salad, the effect of conventional reference price means is similar for both familiar and unfamiliar labeled salad (i.e., Non-GMO and transitional organic). Furthermore, when consumers face different uncertainty on reference prices, they would like to be reliant on the internal reference price, which is the price they paid last time. In this study, the treatments on the reference price intervals are not statistically influential. The preference is not homogenous as among demographics, age, gender, education can also influence consumer WTPs for different food products. Generally, younger males with higher education levels are more likely to provide higher WTP.

Limitations and Future Research

There are some points that could be improved in the future. This study uses chips and salad as objects to represent unhealthy and healthy food products, which may cause limitations to generalization. Future researchers could focus on additional products to make the results of this study more general. While this study used the payment card CVM to elicit WTP in this study, future research could test the results' reproducibility under various WTP estimation methods (i.e., choice experiments). Furthermore, this study only considers the treatment of reference prices on high mean versus low mean and large interval versus small interval. Other treatments for reference prices should likely be investigated as well as other design elements. For example, the difference between low mean and high mean is one U.S. dollar, and the interval patterns of reference prices are also not very large in this study. Future studies could design treatments on reference prices that might compare variations in both means and intervals to their effects on WTP.

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Tables and Figures

Table 1. Demographics of Survey Participants (N=2,268)

Independent variable	Sample (%)	Population[a] (%)
Female	67.95	51.51
Age (18-24)	7.89	8.12
Age (25-34)	18.43	12.81
Age (35-44)	15.83	13.80
Age (45-54)	20.24	12.48
Age (55-64)	17.37	11.96
Age (65 and over)	20.24	12.60
Education (Some High school)	2.29	1.32
Education (High school/GED)	18.47	21.16
Education (Some college)	20.94	13.20
Education (2-year college degree)	12.21	7.35
Education (4-year college degree)	27.87	15.12
Education (Master's degree)	13.98	6.44
Education (Doctoral degree)	1.59	1.32
Education (Professional degree (JD, MD))	2.65	0.94
Weekly Food Expenditure (Less than $49)	11.02	
Weekly Food Expenditure ($50-$99)	29.37	
Weekly Food Expenditure ($100-$149)	25.93	
Weekly Food Expenditure ($150-$199)	13.84	
Weekly Food Expenditure ($200-$249)	6.97	
Weekly Food Expenditure ($250-$299)	3.70	
Weekly Food Expenditure ($300-$349)	2.34	
Weekly Food Expenditure ($350-$399)	1.72	
Weekly Food Expenditure ($400-$449)	1.68	
Weekly Food Expenditure ($450-$499)	1.10	
Weekly Food Expenditure (Above $500)	1.06	
Weekly Food Expenditure (Not Sure)	1.28	

Note: [a] Population data source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement (2019).

Table 2. Reference Price in Each Survey Version

Survey version	Case	Reference price treatment	Reference price	
			Conventional ($)	Organic ($)
Version 1	1	Low Conventional Low Organic	2-4 (L)	4-6 (L)
	2	Low Conventional High Organic	2-4 (L)	5-7 (H)
	3	High Conventional Low Organic	3-5 (H)	4-6 (L)
	4	High Conventional High Organic	3-5 (H)	5-7 (H)
Version 2	1	Small Conventional Small Organic	3-5 (S)	5-7 (S)
	2	Small Conventional Large Organic	3-5 (S)	4-8 (L)
	3	Large Conventional Small Organic	2-6 (L)	5-7 (S)
	4	Large Conventional Large Organic	2-6 (L)	4-8 (L)

Notes: The L and H in parentheses in version 1 are abbreviations of Low and High; in version 2, S and L in parentheses are abbreviations of Small and Large.

Table 3. Summary of WTPs in Each Survey Version

Survey version	Case	WTP Conventional	WTP Non-GMO	WTP Transitional	WTP Organic
			Chips		
1	1) Low Low	2.82	3.25	3.24	3.44
	(N=213)	(1.22)	(1.62)	(1.63)	(1.76)
	2) Low High	2.74	3.19	3.19	3.57
	(N=223)	(1.20)	(1.66)	(1.67)	(1.84)
	3) High Low	3.01	3.46	3.23	3.75
	(N=216)	(1.41)	(1.55)	(1.61)	(1.81)
	4) High High	2.99	3.56	3.31	3.79
	(N=224)	(1.29)	(1.66)	(1.64)	(1.73)
2	1) Small Small	2.98	3.38	3.24	3.51
	(N=69)	(1.38)	(1.85)	(2.04)	(2.04)
	2) Small Large	2.91	3.13	3.30	3.57
	(N=70)	(1.63)	(1.94)	(1.95)	(2.01)
	3) Large Small	2.69	3.06	2.97	3.48
	(N=68)	(1.39)	(2.09)	(1.84)	(2.21)
	4) Large Large	2.81	3.18	3.33	3.62
	(N=71)	(1.50)	(1.91)	(1.98)	(1.98)
	Total	2.88	3.32	3.24	3.62
		(1.33)	(1.71)	(1.72)	(1.85)
			Salad		
1	1) Low Low	2.81	3.25[a]	3.25	3.61
	(N=206)	(1.39)	(1.51)	(1.59)	(1.58)
	2) Low High	2.89	3.41	3.43	3.88
	(N=215)	(1.27)	(1.58)	(1.75)	(1.82)
	3) High Low	3.07	3.68[a]	3.56	3.92
	(N=205)	(0.97)	(1.51)	(1.34)	(1.48)
	4) High High	2.96	3.61	3.54	3.98
	(N=204)	(1.17)	(1.61)	(1.60)	(1.72)
2	1) Small Small	3.31	4.18	4.24	4.62
	(N=71)	(1.42)	(1.87)	(1.89)	(2.10)
	2) Small Large	3.37	3.85	3.95	4.22
	(N=69)	(1.77)	(2.30)	(2.27)	(2.36)
	3) Large Small	3.12	3.54	3.56	4.05
	(N=68)	(1.36)	(1.99)	(1.98)	(2.04)
	4) Large Large	3.25	3.73	3.81	4.10
	(N=72)	(1.50)	(1.91)	(2.04)	(2.12)
	Total	3.02	3.57	3.56	3.95
		(1.30)	(1.70)	(1.72)	(1.81)

Notes: The unit for reference price and mean WTP is U.S. dollars. The numbers in parentheses are standard deviation.

[a] indicates that the mean WTP for Non-GMO salads of case 3) is significantly higher than that of case 1) at 95% level in version 1.

Table 4. SUR Estimation Results: Lower Mean Versus Higher Mean

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	2.75***	3.08***	3.14***	3.31***	3.17***	3.70***	3.89***	4.15***
High mean Conventional	0.19**	0.23**	0.004	0.20*	0.15*	0.29***	0.19*	0.17
High mean Organic	-0.01	0.10	0.09	0.17	-0.002	0.06	0.10	0.17
Internal reference price	0.18***	0.23***	0.23***	0.25***	0.07***	0.07**	0.04	0.06*
Age	-0.05*	-0.17***	-0.14***	-0.19***	-0.15***	-0.19***	-0.19***	-0.20***
Gender	-0.25***	-0.05	-0.14	-0.06	-0.18**	-0.15	-0.13	-0.08
Education	0.001	0.09***	0.05	0.11***	0.08***	0.11***	0.08**	0.10***
Observations	876	876	876	876	830	830	830	830

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 5. SUR Estimation Results: Smaller Interval Versus Larger Interval

Independent variables	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	Chips				Salad			
Intercept	3.15***	3.65***	3.63***	3.97***	4.67***	6.22***	5.56***	6.46***
Large interval Conventional	-0.26	-0.22	-0.20	-0.08	0.05	-0.07	-0.10	-0.004
Large interval Organic	0.05	-0.06	0.24	0.14	0.01	-0.14	-0.04	-0.21
Internal reference price	0.13***	0.19***	0.14**	0.18***	0.19***	0.09	0.14**	0.11
Age	-0.13**	-0.20***	-0.20**	-0.22***	-0.30***	-0.49***	-0.46***	-0.52***
Gender	-0.15	-0.35	-0.12	-0.16	-0.51***	-0.38	-0.04	-0.14
Education	0.04	0.09	0.05	0.05	-0.05	0.0001	0.05	0.03
Observations	278	278	278	278	280	280	280	280

Notes: * indicates $p<0.10$, ** indicates $p<0.05$, *** indicates $p<0.01$.

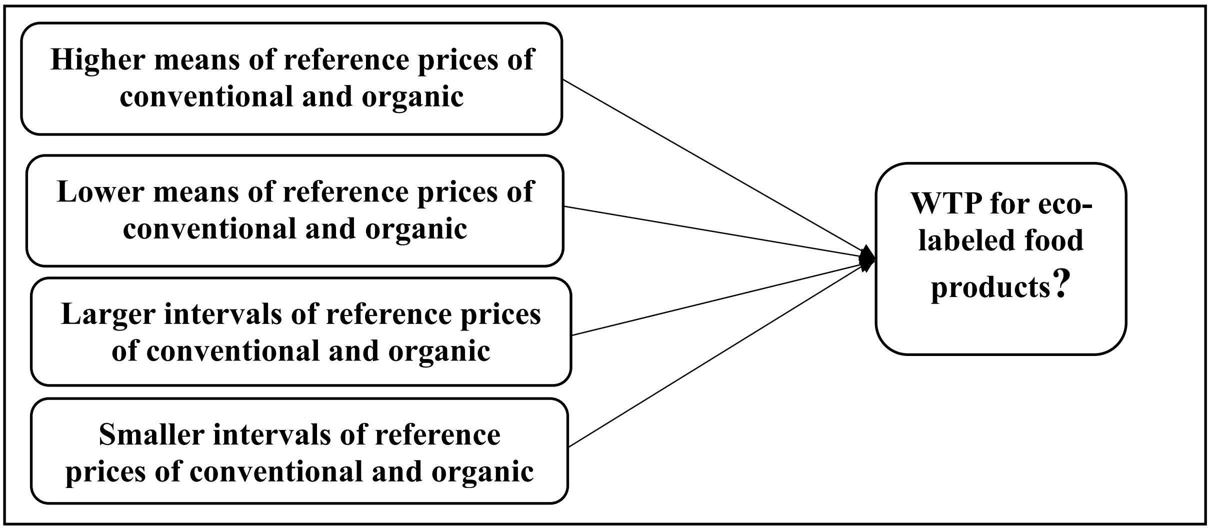

Figure 1. The diagram of the analytical framework

Figure 2. USDA organic label, non-genetically modified organisms label, and transitional organic label (from left to right respectively)

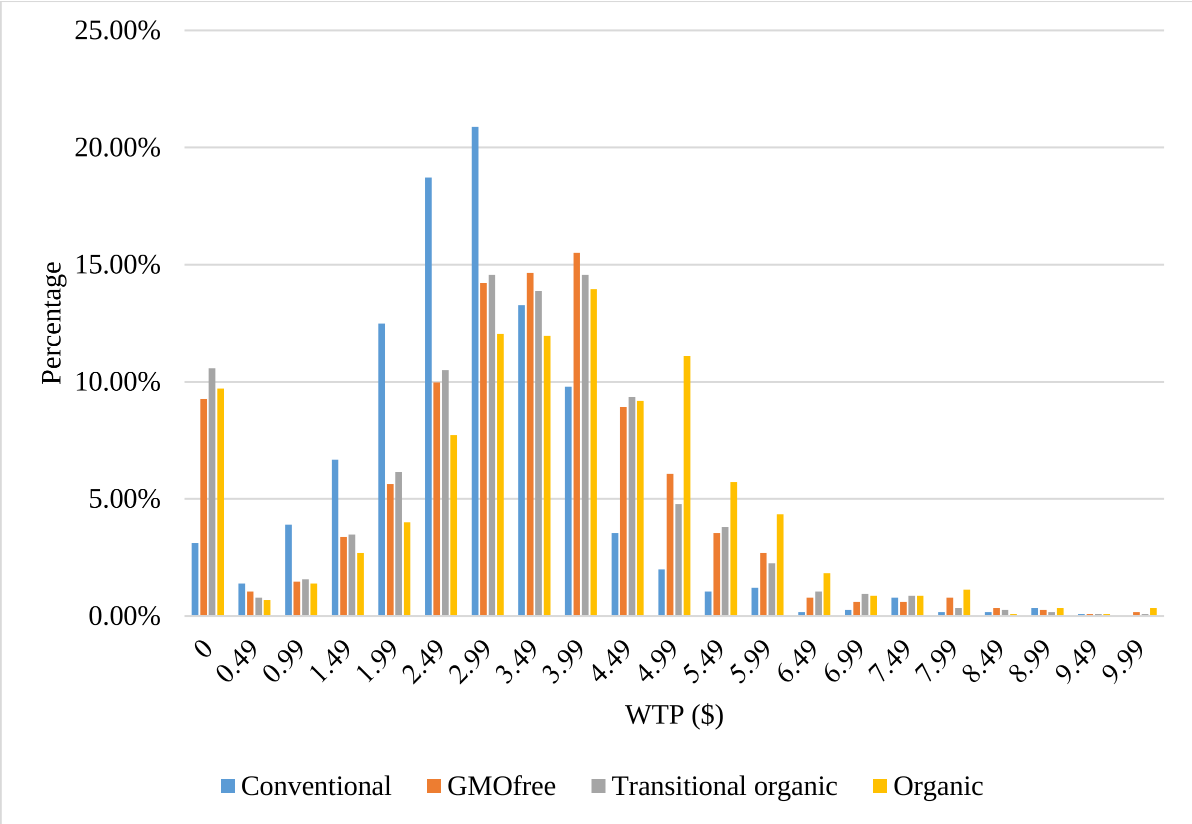

Figure 3 The Distribution of Consumer WTP for Chips with Different Labels

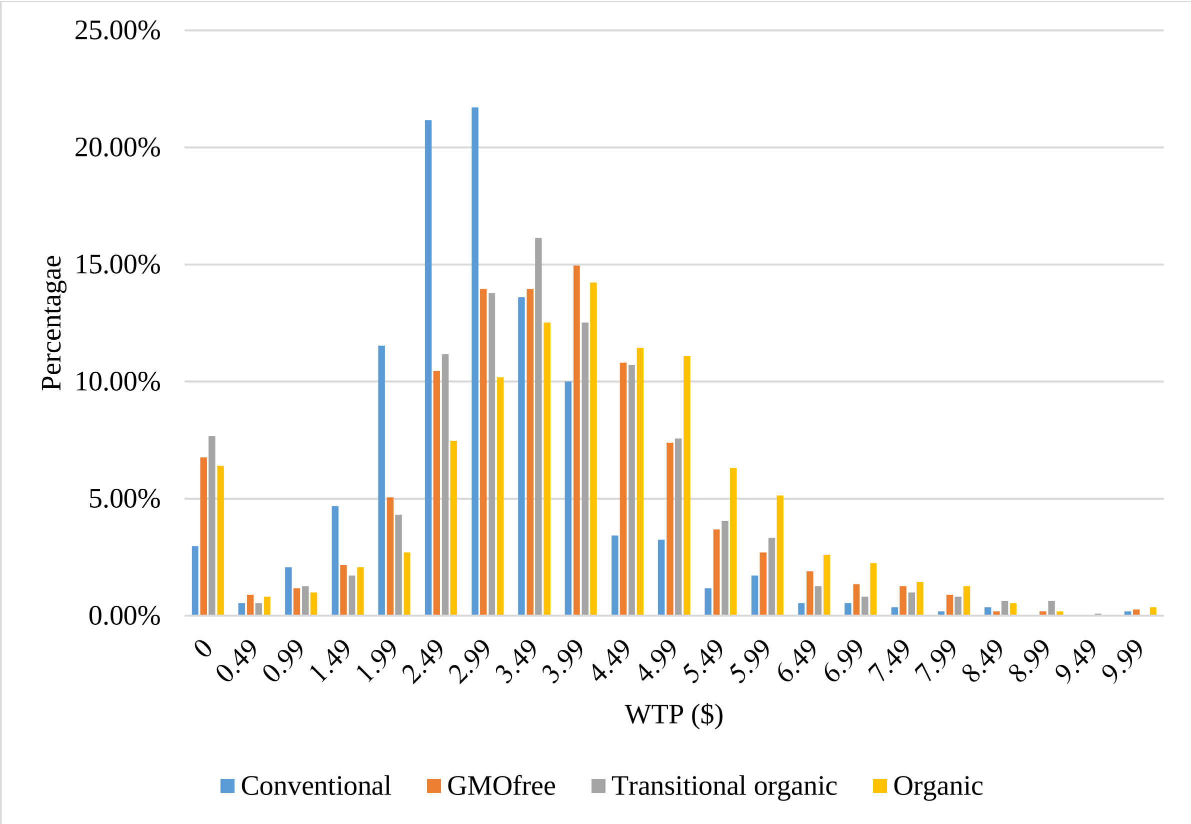

Figure 4 The Distribution of Consumer WTP for Salads with Different Labels

Appendix

Table 6. OLS Estimation Results: Lower Mean Versus Higher Mean

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	2.75***	3.08***	3.14***	3.31***	3.17***	3.70***	3.89***	4.15***
High mean Conventional	0.19**	0.23**	0.004	0.20*	0.15*	0.29***	0.19*	0.17
High mean Organic	-0.01	0.10	0.09	0.17	-0.002	0.06	0.10	0.17
Internal reference price	0.18***	0.23***	0.23***	0.25***	0.07***	0.07**	0.04	0.06*
Age	-0.05*	-0.17***	-0.14***	-0.19***	-0.15***	-0.19***	-0.19***	-0.20***
Gender	-0.25***	-0.05	-0.14	-0.06	-0.18**	-0.15	-0.13	-0.08
Education	0.001	0.09***	0.05	0.11***	0.08***	0.11***	0.08**	0.10***
Observations	876	876	876	876	830	830	830	830

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 7. OLS Estimation Results: Smaller Interval Versus Larger Interval

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	3.15***	3.65***	3.63***	3.97***	4.67***	6.22***	5.56***	6.46***
Large interval Conventional	-0.26	-0.22	-0.20	-0.08	0.05	-0.07	-0.10	-0.004
Large interval Organic	0.05	-0.06	0.24	0.14	0.01	-0.14	-0.04	-0.21
Internal reference price	0.14***	0.19***	0.14**	0.18***	0.19***	0.09	0.14**	0.11
Age	-0.13**	-0.20***	-0.20**	-0.22***	-0.30***	-0.49***	-0.46***	-0.52***
Gender	-0.15	-0.35	-0.12	-0.16	-0.51***	-0.38	-0.04	-0.14
Education	0.04	0.09	0.05	0.05	-0.05	0.0001	0.05	0.03
Observations	278	278	278	278	280	280	280	280

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 8. Tobit Estimation Results: Lower Mean Versus Higher Mean

Independent variables	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	Chips				Salad			
Intercept	2.75***	3.06***	3.13***	3.27***	3.17***	3.69***	3.89***	4.15***
High mean Conventional	0.19**	0.24**	0.004	0.22*	0.15*	0.30***	0.20*	0.19
High mean Organic	-0.01	0.10	0.10	0.19	-0.002	0.05	0.09	0.17
Internal reference price	0.18***	0.24***	0.24***	0.26***	0.07***	0.06**	0.03	0.05
Age	-0.05*	-0.18***	-0.15***	-0.21***	-0.15***	-0.20***	-0.20***	-0.21***
Gender	-0.26***	-0.06	-0.15	-0.08	-0.18**	-0.16	-0.14	-0.09
Education	-0.001	0.10***	0.06	0.12***	0.09***	0.12***	0.09**	0.11***
Observations	876	876	876	876	830	830	830	830

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 9. Tobit Estimation Results: Smaller Interval Versus Larger Interval

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	3.18***	3.79***	3.73***	4.08***	4.72***	6.28***	5.59***	6.48***
Large interval Conventional	-0.26	-0.23	-0.18	-0.06	0.06	-0.07	-0.11	-0.01
Large interval Organic	0.05	-0.07	0.28	0.14	-0.01	-0.18	-0.11	-0.28
Internal reference price	0.12***	0.19***	0.14**	0.19***	0.18***	0.08	0.14**	0.11
Age	-0.14**	-0.24***	-0.24***	-0.26***	-0.31***	-0.53***	-0.50***	-0.56***
Gender	-0.15	-0.39	-0.17	-0.22	-0.52***	-0.34	-0.03	-0.09
Education	0.04	0.07	0.04	0.04	-0.05	0.01	0.06	0.05
Observations	278	278	278	278	280	280	280	280

Notes: * indicates $p<0.10$, ** indicates $p<0.05$, *** indicates $p<0.01$.

Table 10. SUR Tobit Estimation Results: Lower Mean Versus Higher Mean

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	2.76***	3.07***	3.14***	3.28***	3.17***	3.71***	3.91***	4.17***
High mean Conventional	0.19**	0.24**	0.01	0.22*	0.15*	0.30***	0.20*	0.19
High mean Organic	-0.01	0.10	0.10	0.19	-0.001	0.05	0.08	0.16
Internal reference price	0.18***	0.24***	0.24***	0.26***	0.07***	0.05**	0.02	0.04
Age	-0.05*	-0.19***	-0.16***	-0.22***	-0.15***	-0.20***	-0.21***	-0.22***
Gender	-0.26***	-0.06	-0.15	-0.08	-0.18**	-0.16	-0.14	-0.09
Education	-0.001	0.09***	0.06	0.12***	0.09***	0.12***	0.10**	0.11***
Observations	876	876	876	876	830	830	830	830

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 11. SUR Tobit Estimation Results: Smaller Interval Versus Larger Interval

Independent variables	Dependent variable: WTP for conventional products, Non-GMO products, Transitional organic products, Organic products							
	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
	Chips				Salad			
Intercept	3.19***	3.84***	3.83***	4.16***	4.72***	6.30***	5.57***	6.51***
Large interval Conventional	-0.26	-0.23	-0.20	-0.06	0.06	-0.06	-0.11	0.01
Large interval Organic	0.05	-0.07	0.26	0.16	-0.01	-0.19	-0.11	-0.27
Internal reference price	0.12***	0.19***	0.12*	0.18**	0.19***	0.07	0.13*	0.09
Age	-0.14**	-0.25***	-0.24**	-0.28***	-0.31***	-0.54***	-0.52***	-0.58***
Gender	-0.15	-0.39	-0.16	-0.20	-0.52***	-0.30	0.07	-0.05
Education	0.04	0.07	0.03	0.03	-0.05	0.02	0.08	0.05
Observations	278	278	278	278	280	280	280	280

Notes: * indicates p<0.10, ** indicates p<0.05, *** indicates p<0.01.

Table 12. Correlation Matrix of Residuals for SUR Regression

	$WTP_{Conventional}$	$WTP_{GMOfree}$	$WTP_{Transitional}$	$WTP_{Organic}$
(1) WTP for Chips Given Different Means of Reference Prices				
$WTP_{Conventional}$	1.0000			
$WTP_{GMOfree}$	0.4329	1.0000		
$WTP_{Transitional}$	0.3779	0.7237	1.0000	
$WTP_{Organic}$	0.4041	0.8022	0.7641	1.0000
(2) WTP for Chips Given Different Intervals of Reference Prices				
$WTP_{Conventional}$	1.0000			
$WTP_{GMOfree}$	0.4172	1.0000		
$WTP_{Transitional}$	0.5418	0.7227	1.0000	
$WTP_{Organic}$	0.3833	0.8080	0.7792	1.0000
(3) WTP for Salads Given Different Means of Reference Prices				
$WTP_{Conventional}$	1.0000			
$WTP_{GMOfree}$	0.4881	1.0000		
$WTP_{Transitional}$	0.5002	0.6695	1.0000	
$WTP_{Organic}$	0.4037	0.7255	0.7220	1.0000
(4) WTP for Salads Given Different Intervals of Reference Prices				
$WTP_{Conventional}$	1.0000			
$WTP_{GMOfree}$	0.5065	1.0000		
$WTP_{Transitional}$	0.4329	0.7131	1.0000	
$WTP_{Organic}$	0.4921	0.7915	0.8022	1.0000

Breusch-Pagan test of independence: (1) chi2(6) = 1966.406, Pr = 0.0000; (2) chi2(6) = 666.363, Pr = 0.0000; (3) chi2(6) = 1782.194, Pr = 0.0000; (4) chi2(6) = 690.088, Pr = 0.0000.