

Impact of Cultural and Religious Attributes of Olive Oil on Consumers' Willingness to Pay in the USA

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Abstract: Olive oil in the Mediterranean is closely associated with the traditional dietary, religious, and local cultures. This paper aims to assess the impact of olives' religious and cultural values on consumers in nontraditional markets. Through the choice experiment, this study examines the influence of religious attribute labels and cultural information about olives on consumer preference in California. The analysis adopts a mixed logit model to reflect the heterogeneity of consumer preferences. The results reveal that the respondents prefer olive oil labeled with religious and cultural values, which is particularly pronounced among respondents with lower levels of education. However, the impact of cultural information on olives has not been detected. The subjects are found to be interested in the landscapes, backgrounds, and traditional cultures related to olives and olive oil. Religious and cultural value labels for olive oil can satisfy the consumers' potential need for foods associated with cultures. This study suggests that olive oil's religious and cultural values can effectively promote product differentiation and consumption. This research focuses on the issue of how the cultural meaning embedded in traditional foods is received when the foods are consumed in different cultures, namely the possibility of food communicating meaning.

Keywords: Consumer behavior; cultural information of food products; religious information of food products; values of traditional food culture.

1. INTRODUCTION

In today's society, the diversification of food culture and the increase in food choices heighten consumers' interest not only in the food products themselves but also in the background of the products, or rather, safety, origin, environmental friendliness, or cultures found in tourism (Ares, Giménez, & Deliza, 2010; Murgado, 2013; Tempesta & Vecchiato, 2019; Williamson, Lockshin, Francis, & Mueller Loose, 2016; Yu, Legendre, & Ma, 2021). Intangible benefits, such as brand image and consumption experience, become more important than tangible benefits, such as price and food quality cues (Bell, Gray, & Ponsonby-McCabe, 2008). Consumers seeking new experiential perspectives demand positive, sensitive, memorable, and original experiences when purchasing goods (Trabelsi Trigui & Giraud, 2012).

One of the important cues for selecting food products is the indication of a place of origin. This includes not only a name of origin, brand, and specific food functionality but also a background of the product, such as a cultivation method, landscape, and cultural image.

Hence, the indication of place of origin carries symbolic and social meaning, which can potentially affect consumers'

attitudes and behavior toward the products. Trabelsi Trigui & Giraud (2012) remarked that labels of origin and organic food products have historical, cultural, and sensory contents that elicit nostalgia for the good old days. Moreover, Dekhili & d'Hauteville (2009) stated that the name of the region of origin evokes the general characteristics of the area (traditions, inhabitants, culture) that can trigger emotions associated with the local product. By choosing products based on the origin information, consumers can connect themselves with the place of production and the culture behind the product and feel closer to the place.

These effects are expected to occur in the labeling of origin and more direct indications of symbolic and social dimensions. For instance, by depicting a winery's landscape on wine bottle labels, producers can demonstrate the history and culture of the producing region. Tempesta et al. (2010) found that the preference is significantly higher when the product was associated with an evocative landscape of the wine-growing region.

Labeling the origin and characteristics of the region can help to share the cultural image of the products with consumers. It may increase the potential needs of consumers in a globalized society who demand various food products (Dekhili & d'Hauteville, 2009; Giraud, 2004; Tempesta et al., 2010; Trabelsi Trigui & Giraud, 2012). This approach respects the diversity of consumer preferences and opens up new opportunities for the food industry to cater to these needs.

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Meanwhile, olive oil was consumed in limited areas until the 1990s and started to be introduced in association with the Mediterranean background to new consumers who had never used it before daily (Neves & Pires, 2018; Regmi, Ballenger, & Putnam, 2004; Xiong, Sumner, & Matthews, 2014). Olive oil, especially in nontraditional production areas, is often associated with the image of the “Mediterranean diet,” with its health features and Mediterranean landscape. Whereas much research has been conducted on the impact of information on the place of origin and its health functionality, there is not much on the background of the land from which the olive oil comes. Namely, discussions are not frequent on the impact of the information on the cultural context of olive oil on consumer behavior in different cultures that do not share it.

North Africa is one of the significant olive oil-producing regions in the Mediterranean Sea. While European olive-growing regions are losing their old customs related to olives due to modernization, North Africa retains their traditional customs of olive cultivation and processing, as well as traditional medicine and beliefs using olives that have been handed down from generation to generation (Kitagawa, 2021). Olives have been highly endowed in various religious beliefs in the Mediterranean since ancient times (Kambanis & Hellenic Folklore Research Centre of the Academy of Athens, 2006; Polymerou-Kamilakis, 2006; Wirgin, 1962). The olive tree and olive oil are believed to have sacred powers in Greek mythology, Christianity, and Islam. Especially in North Africa, people have maintained a close association with olive trees in their life events, such as the veneration of the ancient olive tree to pray for marriage fulfillment, safe childbirth, and healing of illness (Kitagawa, 2017; Kitagawa, 2018; Westermarck, 1962a; Westermarck, 1962b). Despite the influence of modernization and Islamic fundamentalism, such traditional customs are still practiced in the area. However, these religious and cultural backgrounds embedded in the production areas are rarely shared by olive oil producers with consumers. Therefore, this paper aims to shed light on the influence of religious attribute labels and cultural information about olives on consumers’ preferences in California. This research highlights how the cultural meanings embedded in traditional foods are received when consumed in different cultures via global markets. It is an attempt to explore the adaptability of the traditional function of food to convey cultural content in the consumer market. This will make it possible to discuss more practically the role that consumers potentially seek in foods and the symbolic function that foods can fulfill.

The following section reviews previous research on how the various characteristics of olive oil affect consumer choice in traditional and nontraditional markets, as well as in the United States.

2. LITERATURE REVIEW

Steenkamp showed that culture is essential in understanding consumer behavior. Culture is a complex of values, ideas, attitudes, and other meaningful symbols (Steenkamp, 1997). When consumers purchase a product, they expect it to meet their needs, which vary by culture (Jiménez-Guerrero et al., 2012). The olive oil market continues to grow, and con-

sumers worldwide purchase olive oil; however, consumer needs differ significantly between traditional olive oil-producing and nonproducing countries. For example, in Mediterranean countries, olive oil is a traditional food that is inseparable from its historical and cultural context. In contrast, this cultural context does not exist in emerging markets, where olive oil has not traditionally been produced and consumed. Culture is an essential factor influencing every stage of consumer choice, and transmitting cultural symbols to other countries influences reasons for purchasing products from different cultures (Blackwell, Miniard, & Engel, 2001). Consumer behavior in traditional and emerging markets for olive oil shows different preferences depending on the presence or absence of olive oil culture.

The literature has shown that in traditional markets, olive oil tends to be evaluated on attributes such as origin (country or region of origin), certificate of origin, sensory cues, price, organic farming, and variety. Dekhili and other authors surveyed consumer trends in France and Tunisia, finding that both countries’ price and origin attributes were essential determinants. Furthermore, sensory evaluation and olive variety were the primary cues for Tunisian consumers, while in France, official certification and human factors (i.e., traditional production methods using manual labor in the farming process) were the most critical factors (Dekhili & d’Hauteville, 2009; Dekhili, Sirieix, & Cohen, 2011). A study by Ballco & Gracia (2020) in Spain showed that both the place of origin and the protected designation of origin raised the willingness to pay for extra virgin olive oil. Their results of the Real Choice Experiment showed that the place of origin positively impacted prices in the real market, but the protected designation of origin did not. Di Vita et al. (2021) showed that in the Italian market, the organic label was the primary cue to evaluate the quality of olive oil. Additionally, price was the most important signal of quality when purchasing, especially for consumers in Northern Italy, which is far from the production area. Tempesta & Vecchiato (2019) found that the production area and the protected designation of origin were among the most vital cues when choosing extra virgin olive oil for Italian consumers. They also found that olive cultivation, which protects traditional landscapes, significantly impacted consumer behavior in some segments.

Regarding the evaluation of olive oil attributes in emerging markets, consumers in nontraditional olive-producing countries are less aware of the characteristics of olive oil, and the price is an essential indicator of quality (Delgado & Guinard, 2011; Martínez, Aragonés, & Poole, 2002; Sgroi, Sciortino, Giamporcaro, & Modica, 2024). In comparison, a tendency to value health and hedonic attributes and types (e.g., extra virgin or virgin) of olive oil and country of origin is also evident. Antonialli, Mesquita, Valadares, de Rezende, & de Oliveira (2018) studied Brazilian consumers’ sensory perception and purchase intentions. They found that, despite the potential influence of price, consumers had some knowledge of the essential sensory characteristics of olive oil and could fully evaluate it. In contrast, Mtimet, Kashiwagi, Zaibet, & Masakazu (2008) found that Japanese olive oil consumers lacked knowledge of oil and preferred milder “refined” olive oil over extra virgin and virgin olive oil. Based on interviews with German and British olive oil con-

sumers, Peršurić & Silvana (2020) found that both groups valued the health properties of olive oil, followed by its hedonic properties. This attention to health characteristics was particularly pronounced in highly educated and higher-income groups. Furthermore, Chrysochou, Tiganis, Trabelsi Trigui, & Grunert (2022) compared consumer preferences in traditional and nontraditional markets of Denmark, France, Tunisia, and the United States. They found that consumers in all countries rated type, price, previous experience, and country of origin as essential product attributes.

Among the emerging global markets, the United States (U.S.) stands out as one of the fastest growing, with both consumers and olive oil producers showing a high level of interest in olive oil (Vázquez-Araújo, Adhikari, Chambers, Chambers, & Carbonell-Barrachina, 2015). Earlier studies indicated that even though most American consumers perceived olive oil as “healthy” food, they were unaware of its bioactive components and specific health benefits (Delgado & Guinard, 2011; Santosa, Clow, Sturzenberger, & Guinard, 2013). Moreover, increased olive oil demand in the U.S. was associated with increased news articles about olive oil’s health and culinary benefits (Xiong *et al.*, 2014), and media coverage significantly impacted its reputation as a “healthy” food. However, most U.S. consumers do not prefer the pungent or bitter taste which is characteristic of olive oil’s antioxidant components of polyphenols, preferring refined or fruity oils (Delgado, Gómez-Rico, & Guinard, 2013; Delgado & Guinard, 2011; Vázquez-Araújo *et al.*, 2015). Delgado *et al.* (2013) analyzed the purchase intention of extra virgin olive oil based on packaging and labeling versus blind tasting. Their results were inversely proportional, indicating that U.S. consumers preferred olive oils with an “authentic, high-quality” appearance but disliked the strong taste. This aversion arose because Americans are “new consumers” and have relatively little knowledge and experience in evaluating the essential quality attributes of olive oil (Jiménez-Guerrero *et al.*, 2012; Roselli, Carlucci, & De Gennaro, 2016). Jiménez-Guerrero *et al.* (2012) also noted that U.S. consumers purchased olive oil from supermarkets and specialty stores, unlike consumers in traditional producing countries who purchased it directly from farmers and producers or make oil from their orchards (Fotopoulos & Krystallis, 2001). Thus, American consumers do not have direct access to sensory characteristics of olive oil at the time of purchase; thus, extrinsic characteristics such as price (Delgado *et al.*, 2013; Delgado & Guinard, 2011; Santosa *et al.*, 2013), packaging (Roselli *et al.*, 2016), and label (Delgado *et al.*, 2013) become important purchase motivations. Origin is also a variable that significantly impacts olive oil preferences (Roselli *et al.*, 2016), and California extra virgin olive oil is significantly preferred over imported extra virgin olive oil (Delgado *et al.*, 2013). In these markets, education and communication activities with consumers are essential to increase their familiarity with and knowledge of olive oil (Delgado & Guinard, 2011; Jiménez-Guerrero *et al.*, 2012).

Therefore, this study conducted an olive oil preference survey among olive oil consumers in California, an olive oil-producing region. A choice experiment was conducted in which the product attributes of price, origin, taste, and olive oil’s religious and cultural values were presented. A choice

experiment is a widely adopted method in food consumption analysis (Aoki, Akai, & Ujiie, 2017; Balcombe, Fraser, & Falco, 2010; Lusk, Nilsson, & Foster, 2007; Nugraha, Yang, & Ujiie, 2021; Van Loo *et al.*, 2015). Half of the subjects were given background information on olive oil’s religious and cultural significance in traditional oil-producing countries to determine if these details influenced their willingness to purchase. The effect of sociodemographic variables on the subjects’ preferences was also estimated.

3. DATA COLLECTION

To determine consumer trends in nontraditional olive oil-producing countries, 424 consumers residing in California—216 (50.9%) women and 208 (49.1%) men, ranging from 20 to 69 years—participated in an online survey that Macromill, Inc. conducted. The sample was defined by gender in 10-year age segments from 20 to 60 and demographic composition. The survey was conducted from January 24 to February 5, 2020. Regarding those in their 20s through 60s, the 2020 Census of Population by Age reveals that California had 20.7% of its population in their 20s, 20.2% in their 30s, 18.1% in their 40s, 12.7% in their 50s, and 10.5% in their 60s, with a gender ratio of 50:50 (Census Reporter, 2023). In our survey sample, 22.2% are in their 20s, 22.6% are in their 30s, 18.9% are in their 40s, 18.9% are in their 50s, and 17.0% are in their 60s, which is an appropriate sampling because it reflects the age distribution in the region. According to The World Bank (2022), there were approximately 300,290,000 Internet users in the United States (U.S.), representing 90.6% of the total population, thus avoiding the problem of online access bias in the survey.

The questionnaire was separated into four parts. The first part of the questionnaire concerned the frequency of olive oil consumption and purchase, and the second part asked about the cultural and religious images and cultural knowledge about olive oil. The third section was about the questions for the choice experiment, and the fourth section was about the sociodemographic characteristics of the respondents. The first part opened with the question, “Do you use olive oil at home?” The responses were chosen from the following three options: (1) “Yes, I do”; (2) “Not yet, but I want to try it someday”; and (3) “No, I do not think I ever will,” where 366 (86.3%) chose (1), 35 (8.3%) chose (2), and 23 (5.4%) chose (3), indicating that most of the survey respondents were olive oil users.

The selection of the appropriate attributes and their levels for the choice experiment was based on a review of the relevant literature on olive oil consumption (Dekhili & d’Hauteville, 2009; Mili & Zúñiga, 2001; Ward, Briz, & de Felipe, 2003), including previous studies on Japanese olive oil consumers (Mtimet *et al.*, 2008; Kitagawa, Kashiwagi, & Isoda, 2020). The choice experiment profile was defined by four attributes: country of origin, taste, religious and cultural value, and price of 500 ml of olive oil. Olive oil with religious and cultural values was defined as a product that is associated with a particular religious connotation, such as myth, legend, or a sacred site, on its label (e.g., olive oil produced in a pilgrimage destination, a land of a myth, or made from a sacred olive tree). This definition was shown to the respondents. The presented olive oil prices covered the U.S.

low- to high-tier price range for olive oil, from ordinary olive oil to extra virgin olive oil, according to Roselli et al. (2016). The selected attributes and their levels are presented in Table 1.

In the choice experiment, the respondents were asked to choose the options they were most likely to buy, with each of the three options being a product presented as a random combination of the three olive oil attributes described above and a fourth option to choose none of them (opt-out alternative). The profiles were designed using a mixed-level orthogonal array of MA36.2.1.3.2.6.1 with 36 sets. Based on the array, the profile and choice set design followed the mix-

and-match method using R (R. Core Team, 2021) and its add-on packages support. C.E.s (Aizaki, 2021). To reduce the respondents' burden, these sets were divided into four blocks, each comprising nine sets randomly distributed to the respondents. An example of the choice experiment set is presented in Table 2.

In the experiment, the respondents were divided into two. Group 1 was given information on olive use's cultural and religious background in Tunisia and the Mediterranean region, whereas Group 2 was not. The information provided to Group 1 is presented in Table 3.

Table 1. Selected Olive Oil Attributes and Their Corresponding Levels.

Attributes	Levels
Country of origin	Spain
	Italy
	Tunisia
Taste	Sweet
	Bitter
	Pungent
Religious Cultural Value	Indicated
	Not Indicated
Price (USD per 500 ml bottle)	4
	12
	20
	28
	36
	44

Table 2. A Choice Experiment Sample Card “Which 500 ml Olive Oil Bottle Would You Like to Buy? Please Check the Selected Alternatives with (X) Below.”

Bottle A	Bottle B	Bottle C	None
Spain	Italy	Tunisia	I do not want to purchase any of them
Sweet	Bitter	Pungent	
Religious Cultural Value is Indicated	Religious Cultural Value is Not Indicated	Religious Cultural Value is Not Indicated	
4 USD	12 USD	44 USD	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table 3. Explanation of the Cultural and Religious Background of Tunisian Olive Oil.

Information	Explanation for Respondents of Group 1
A	Olive has been widely cultivated in the Mediterranean area since antiquity. Its frequent appearance in ancient myths demonstrates its importance.
B	In Tunisia, which is located on the South coast of the Mediterranean, the olive has supported people's lives due to its durability to dryness. It has been used for traditional foods as well as traditional medicines.

C	In Tunisia, olive trees are considered blessed trees, and some of the old olive trees are venerated by people. Moreover, olive oil is considered to possess the power to bring them happiness.
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4. METHODOLOGY

The discrete choice model used to analyze the choice data set was based on the random utility theory (McFadden, 1974). U_{ijt} represents respondent i 's utility of alternative j under occasion t , and V_{ijt} represents a deterministic part of the utility U_{ijt} and is assumed to be a linear function of the olive oil attributes:

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} = \beta'X_{ijt} + \varepsilon_{ijt} \quad (1)$$

where β represents the preference parameter vector, which is consumer preferences, whereas X_{ijt} represents the olive oil attributes in alternative j under occasion t , and ε_{ijt} is assumed to follow a type I extreme value distribution.

In order to reflect the heterogeneity of consumer preferences in the analysis, a mixed logit model was adopted (Train, 2009). The model assumes that the parameter β is distributed to all the respondents. In this paper, the distribution of the parameters was assumed to be a multivariate normal distribution. The probability that respondent i chooses alternative j under occasion t for olive oil attributes can be expressed as follows:

$$P_{ijt} = \int \left\{ \frac{\exp(V_{ijt})}{\sum_k \exp(V_{ikt})} \right\} g(\beta|\mu, \Omega) d\beta \quad (2)$$

Where $g(\beta|\mu, \Omega)$ denotes the probability density function of parameter β , with mean μ and variance covariance matrix Ω . This model was estimated as the main effect model.

Moreover, this study estimated a cross-effect model to capture the effects of the respondents' characteristics on their preferences. In the model, the mean of parameter μ assumes a linear function of the respondents' characteristics:

$$\mu = \gamma Z_i \quad (3)$$

where γ is the coefficient vector denoting the effect of the respondents' characteristics, and Z_i is a vector of the respondents' characteristics.

The respondents' marginal willingness to pay $MWTP$ for olive oil could be calculated using the following formula (Lusk & Hudson, 2004):

$$MWTP = - \frac{\beta_n}{\beta_{price}} \quad (4)$$

Where β_n indicates the coefficient of non-price attribute n , and β_{price} indicates the coefficient of the price. The model was estimated with STATA/IC 15.1 using the maximum likelihood method.

5. RESULTS

5.1. Results of the Choice Experiment

In the questionnaire, socioeconomic information about the respondents was collected, i.e., age, income, level of education, and the number of children in the household. To describe the socioeconomic characteristics of the respondents, Table 4 presents the scales of the option numbers of the variables and the percentages of responses to each option. The mean age of the sample ranged from 40 to 49 years, and the mean value of educational level was between "some college, but no degree" and "associate degree." The mean number of children in the household was between 0 and 1, and the mean annual household income was 6 million to 7 million USD. The average frequency of visits to religious facilities by respondents, which was indicated as "churches, synagogues, mosques, or any other" in the question, ranged from "once in a few months" to "once in a year."

The estimation results of the choice experiment with the mixed logit model are summarized in Table 5, and the correlations between each attribute are summarized in Table 6. All samples were included in the estimation. To determine the effects of the characteristics of the respondents on their choice of product attributes, the cross effects of the following variables were estimated: education, gender, age, number of children in the household, household income, frequency of visiting religious facilities, displaying or not displaying religious and cultural information in the choice experiment, and olive oil usage.

Table 4. Scales and Percentages of Selected Sample Characteristics.

Variable	Option No.	Definition	Percentage
Gender	-	Female	50.9%
	-	Male	49.1%
Age in years	1	Under 20	0%
	2	20–24	9.7%
	3	25–29	13.0%
	4	30–34	10.60%
	5	35–39	12.00%

	6	40–44	9.00%
	7	45–49	9.90%
	8	50–54	9.20%
	9	55–59	9.70%
	10	60–64	9.40%
	11	65–69	7.50%
	12	70 and over	0%
Educational level	1	Less than high school diploma	1.4%
	2	High school diploma or GED	17.7%
	3	Some college, but no degree	27.6%
	4	Associate degree	12.3%
	5	Bachelor's degree	29.2%
	6	Master's, Professional, or Doctoral degree	11.8%
Number of children in the household	1	0	66.50%
	2	1	18.90%
	3	2	10.80%
	4	3	1.90%
	5	4	1.70%
	6	5 or more	0.20%
Annual household income (USD)	1	Under 10,000	8.7%
	2	10,000–19,999	7.3%
	3	20,000–29,999	10.8%
	4	30,000–39,999	8.7%
	5	40,000–49,999	9.0%
	6	50,000–59,999	8.5%
	7	60,000–69,999	6.1%
	8	70,000–79,999	6.8%
	9	80,000–89,999	4.0%
	10	90,000–99,999	5.0%
	11	100,000–109,999	3.8%
	12	110,000–119,999	1.2%
	13	120,000–129,999	3.8%
	14	130,000–139,999	1.90%
	15	140,000–149,999	2.10%
	16	150,000–159,999	2.80%
	17	160,000–169,999	0.90%
	18	170,000–179,999	1.20%
	19	180,000–189,999	1.70%
	20	190,000–199,999	0.90%

	21	200,000 and over	4.70%
Frequency of visiting a religious facility	1	Once a week or more	19.1%
	2	A few times a month	9.2%
	3	Once a few months	12.0%
	4	Once a year	9.4%
	5	Less than above	19.3%
	6	Never	30.9%

Table 5. Estimation Results.

	Main Effect Model	Cross Effect Model									
		Constant	Education	Gender	Age	Child	Income	Religious Commitment	Information	Potential User	Non-user
Price	−0.039*** [0.002]	−0.040*** [0.002]									
Tunisia	−0.340*** [0.082]	−0.737** [0.361]	0.140** [0.067]	0.108 [0.158]	−0.005 [0.030]	0.023 [0.091]	−0.030* [0.016]	0.022 [0.042]	−0.188 [0.157]	0.159 [0.286]	0.631 [0.410]
Spain	−0.329*** [0.073]	−0.292 [0.326]	−0.002 [0.06]	−0.157 [0.143]	0.012 [0.027]	0.115 [0.080]	−0.017 [0.014]	−0.018 [0.039]	−0.057 [0.143]	−0.093 [0.276]	0.440 [0.388]
Pungent	−0.870*** [0.100]	−0.115 [0.435]	−0.065 [0.081]	0.242 [0.192]	−0.109*** [0.035]	−0.026 [0.107]	−0.005 [0.020]	0.032 [0.051]	−0.040 [0.19]	0.297 [0.344]	0.657 [0.499]
Bitter	−1.470*** [0.126]	−0.232 [0.516]	−0.130 [0.095]	0.334 [0.226]	−0.138*** [0.042]	−0.040 [0.127]	−0.033 [0.023]	0.077 [0.061]	−0.032 [0.224]	0.150 [0.407]	0.337 [0.600]
Religion	0.159** [0.068]	0.200 [0.273]	−0.084* [0.051]	0.058 [0.120]	−0.005 [0.023]	0.080 [0.068]	0.002 [0.012]	0.038 [0.032]	0.039 [0.119]	0.257 [0.219]	−0.206 [0.317]
ASC	2.352*** [0.198]	3.327*** [0.775]	−0.039 [0.143]	1.067*** [0.331]	−0.349*** [0.062]	−0.135 [0.200]	0.049 [0.034]	0.278*** [0.090]	−0.016 [0.329]	−0.933 [0.582]	−3.225*** [0.856]
Number of obs	15,264	15,264	-								
LR chi2(21)	1770.47	1425.4									
Log likelihood	−4039.1	−3965.72									

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Note: The coefficient corresponding to “Made in Italy” is fixed at 0 as the base.

Note: The coefficient corresponding to “Sweet” is fixed at 0 as the base.

Note: The coefficient corresponding to “Religious Cultural Value is Not Indicated” is fixed at 0 as the base.

Note: Figures in square brackets are standard errors.

According to the results of the main effects model, the price was negatively significant to consumer preference; the lower the price, the more consumers chose the product. Regarding the country of origin, compared with Italian olive oil, Tunisian and Spanish olive oils had a negative significance. It indicated a higher consumer preference for Italian olive oil. Conversely, the cross-effects results indicated a significant preference for Tunisian olive oil by respondents with higher levels of education; consumers with lower levels of education preferred Italian olive oil, whereas respondents with higher household income did not prefer Tunisian olive

oil. Compared with Spanish olive oil, preference for Tunisian olive oil may be determined by consumer attributes.

Regarding taste, the main effect model had a negative sign; compared with sweetness, pungency and bitterness were less likely to be selected. In the cross-effect model, older respondents had a clear non-selection tendency for both pungent and bitter tastes.

Regarding preferences for religious attribute, the results revealed positive significance in the main effect model, indicating that consumers preferred olive oils that presented reli-

Table 6. Estimation Results with Correlation.

	Tunisia	Spain	Pungent	Bitter	Religion	ASC
Tunisia	0.597*** [0.186]					
Spain	0.349** [0.152]	0.246 [0.151]				
Pungent	0.145 [0.146]	0.230 [0.144]	1.950*** [0.315]			
Bitter	0.206 [0.171]	0.256* [0.136]	2.251*** [0.327]	2.987*** [0.460]		
Religion	0.066 [0.092]	0.107 [0.087]	−0.132 [0.133]	−0.227 [0.146]	0.227** [0.103]	
ASC	−0.632** [0.262]	−0.366* [0.216]	0.018 [0.362]	0.192 [0.469]	−0.141 [0.326]	11.324*** [1.473]

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Note: The coefficient corresponding to “Made in Italy” is fixed at 0 as the base.

Note: The coefficient corresponding to “Sweet” is fixed at 0 as the base.

Note: The coefficient corresponding to “Religious Cultural Value is Not Indicated” is fixed at 0 as the base.

Note: Figures in square brackets are standard errors.

gious and cultural values on the label. However, the respondents with higher levels of education were less likely to prefer religious attributes. In the main effect model, there was a clear preference for the alternative specific constant (ASC), the basic olive oil product with all the attribute variables set to zero, indicating a tendency to purchase olive oil regardless of the product’s attributes. This preference for ASC was particularly pronounced among males and those with a higher level of religious commitment. Conversely, older respondents and non-users of olive oil demonstrated a clear non-selection of ASC. Although the sample in the present study was divided based on whether information on the cultural and religious background of olives in the Mediterranean region was provided, the differences were not apparent.

Table 6 shows the results of estimating the correlations between the attributes to determine the interrelationship of each attribute choice by consumers. It indicates that a preference for Spanish olive oil correlated with a preference for Tunisian olive oil. Preference for ASC correlated with non-preference for Tunisian and Spanish olive oils. Therefore, those who chose Tunisian or Spanish olive oils did not choose ASC olive oil, so the respondents who consumed olive oil selectively tended to choose Tunisian or Spanish olive oil. In contrast, those who consumed olive oil non-selectively tended to choose Italian olive oil. Furthermore, there was a correlation between preference for bitterness and pungency, indicating that unique flavors were evaluated as a counterpart to sweetness.

This study also estimated the willingness to pay for each attribute of olive oil, as shown in Table 7. The results indicated the willingness to pay a premium of 4.03 USD per 500

ml for olive oil labeled with religious and cultural values. Regarding the country of origin, Italian olive oil was highly valued, with a price differential of 8.63 USD and 8.36 USD, respectively, with Tunisian and Spanish olive oils. Although the willingness to pay a premium for Tunisian olive oil was negative, the cross-effects results indicated that the respondents with higher levels of education were more likely to pay 3.54 USD per 500 ml for Tunisian olive oil. Regarding sensory characteristics, sweetness was highly valued, with a disparity in the willingness to pay 22.07 USD and 37.31 USD for spicy and bitter, respectively. Older consumers valued sweet olive oil more highly, with the price being 2.7 USD and 3.4 USD higher than pungency and bitterness, respectively.

There was also a high willingness to pay a premium of 59.67 USD for 500 ml of olive oil for ASC. Out of that amount, men were willing to pay a premium of 27.0 USD, and those with a high frequency of religious commitment were willing to pay a premium of 7.03 USD for ASC. However, neither gender nor religious commitment influenced preferences for other attributes, such as place of origin or religious attributes.

5.2. Discussion and Supplementary Results

The results of the choice experiment revealed the following. First, sweetness was the most preferred taste and became more pronounced with age. Bitter and pungent sensory characteristics, unique to edible oils, were not preferred by consumers from the region, especially the old, who tended to be more conservative in their taste habits (Van Loo *et al.*, 2015). This result was consistent with the previous studies

Table 7. Estimation Results of Willingness to Pay for Each Attribute.

	Main Effect Model	Cross Effect Model									
		Constant	Education	Gender	Age	Child	Income	Religious Commitment	Information	Potential User	No-user
Tunisia	-8.63 [-12.7, -4.6]	-18.65 [-36.6, -0.7]	3.54 [0.2, 6.9]	2.74 [-5.1, 10.6]	-0.13 [-1.6, 1.3]	0.57 [-3.9, 5.1]	-0.76 [-1.6, 0.05]	0.56 [-1.5, 2.7]	-4.76 [-12.6, 3.1]	4.02 [-10.2, 18.2]	15.97 [-4.4, 36.4]
Spain	-8.36 [-12.1, -4.7]	-7.40 [-23.6, 8.8]	-0.05 [-3.0, 2.9]	-3.97 [-11.1, 3.1]	0.30 [-1.0, 1.6]	2.92 [-1.0, 6.9]	-0.43 [-1.1, 0.3]	-0.46 [-2.4, 1.5]	-1.43 [-8.5, 5.7]	-2.34 [-16.0, 11.3]	11.15 [-8.1, 30.4]
Pungent	-22.07 [-27.5, 16.6]	-2.90 [-24.5, 18.7]	-1.65 [-5.7, 2.3]	6.12 [-3.4, 15.6]	-2.75 [-4.5, -1.0]	-0.65 [-6.0, 4.7]	-0.14 [-1.1, 0.8]	0.80 [-1.7, 3.3]	-1.00 [-10.4, 8.4]	7.51 [-9.6, 24.6]	16.64 [-8.2, 41.5]
Bitter	-37.31 [-44.3, -30.3]	-5.87 [-31.5, 19.7]	-3.30 [-8.0, 1.4]	8.46 [-2.8, 19.7]	-3.48 [-5.6, -1.4]	-1.02 [-7.3, 5.3]	-0.83 [-2.0, 0.3]	1.94 [-1.1, 5.0]	-0.81 [-11.9, 10.3]	3.79 [-16.4, 24.0]	8.52 [-21.3, 38.3]
Religion	4.03 [0.6, 7.4]	5.07 [-8.5, 18.6]	-2.12 [-4.6, 0.4]	1.46 [-4.5, 7.4]	-0.14 [-1.3, 1.0]	2.02 [-1.4, 5.4]	0.06 [-0.5, 0.7]	0.95 [-0.6, 2.5]	1.00 [-4.9, 6.9]	6.51 [-4.3, 17.4]	-5.21 [-21.0, 10.5]
ASC	59.67 [49.5, 69.9]	84.20 [45.3, 123.1]	-0.99 [-8.1, 6.1]	27.00 [10.4, 43.6]	-8.84 [-12.0, -5.6]	-3.42 [-13.3, 6.5]	1.23 [-0.5, 2.9]	7.03 [2.5, 11.6]	-0.40 [-16.7, 15.9]	-23.63 [-52.6, 5.3]	-81.62 [-124.7, -38.5]

Note: The coefficient corresponding to “Made in Italy” is fixed at 0 as the base.

Note: The coefficient corresponding to “Sweet” is fixed at 0 as the base.

Note: The coefficient corresponding to “Religious Cultural Value is Not Indicated” is fixed at 0 as the base.

Note: Figures in square brackets are ll and ul.

(Delgado *et al.*, 2013; Delgado & Guinard, 2011; Roselli *et al.*, 2016; Vázquez-Araújo *et al.*, 2015) that U.S. consumers disliked olive oil’s bitter and pungent taste. Secondly, there were no significant differences due to providing religious and cultural background information for any attribute preferences, such as religious attribute. This result differed from that of a study in Japan, which showed that the presentation of religious information increased willingness to pay for olive oil (Kitagawa *et al.*, 2020), and that in Italy, which showed that the presentation of the scenery of a winery increased willingness to pay for wine (Tempesta *et al.*, 2010). One possible reason is that the subject may have already known about the information given, or the content may have needed to be more interesting. In contrast, the respondents had a significant preference for olive oil labeled with religious and cultural values, which was more significant among those with less education. Highly educated consumers chose olive oil based on different characteristics other than religious values. This result contradicted the direct proportion between educational level and religious attribute preferences shown in the previous study (Kitagawa *et al.*, 2020). Potential reasons for this are the differences in what it means to be “religious” in the U.S. and Japanese societies, especially for the educated classes. A clear monotheistic religion has historically influenced U.S. society and has a scientific worldview opposing it. In contrast, Japanese society has an

ambiguous and composite religious view based on polytheism, where science and religion are not very contradictory (Earhart, 1967; Hori, 1994).

Furthermore, the overall tendency to choose olive oil just because it is olive oil, regardless of the individual characteristics of olive oil, was evident. In particular, men and those frequently involved in religious practices tended to prefer olive oil without regard to its attributes. The difference in ASC preference by gender may be because men are less concerned about the attributes of olive oil as they are less likely to purchase it than women, who perform household duties and are more likely to purchase it daily. Regarding the factors that contribute to the preference for olive oil for those with high religious commitment, this study analyzed the religious denomination of the respondents based on their level of commitment and found that 88.9% of the respondents who answered “Once in a week or more” or “Few times in a month” belonged to Abrahamic religions, such as Christianity, Islam, or their variants. It was noticeably higher than the percentage of Abrahamic religions (or variants thereof) in the total surveyed population (52.0%), indicating that many practicing religious commitments belong to Abrahamic religions. Abrahamic religions are closely associated with olives, as they sometimes refer to them in their scriptures. It is possible that those deeply involved in religious activities are

more knowledgeable about the religious values of olive oil in their religion and, thus, are more likely to value olive oil.

Concerning the countries of origin, Italy was the most preferred place of origin; however, Tunisian olive oil had a particular reputation among consumers who were more educated and had access to more specialized information. The preference of U.S. consumers for Italian olive oil over Tunisian and Spanish olive oil was consistent with information presented in the previous study (Santosa *et al.*, 2013). As a possible reason for this, Jiménez-Guerrero *et al.* (2012) mentioned the robust marketing strategy of Italian olive oil. It may also be because years of marketing have built existing knowledge, familiarity, and associations between Italy and olive oil (Meneley, 2004). This assumption is supported by the fact that when asked about the country of origin they associate with olive oil (multiple responses), 69.6% of respondents chose Italy, far ahead of Greece (38.4%) and Spain (27.8%). In addition, when asked about the religious culture associated with olive oil (multiple responses), Ancient Greece (52.1%) was the most popular, followed by Ancient Rome (46.2%), Christianity (26.2%), Middle East (14.4%), Judaism (12.7%), Islam (7.1%), and North Africa (5.2%), indicating that the source of the religious or cultural images of olive oil was mainly Greek and Roman. In other words, among the choices of origin countries (Italy, Spain, or Tunisia) in this experiment, Italy was the country that best embodied the historical and cultural image consumers had for olive oil, and this may be one of the reasons why olive oil from Italy is preferred. However, the current dominance of cultural information on olive oil in favor of Italy also indicates the possibility of changing the Italian-biased preferences by actively distributing cultural information of less known producing countries, such as Tunisia.

Furthermore, the results from the second part of the questionnaires, which explored consumers' interest and knowledge of olives' cultural and religious characteristics, revealed a diverse range of consumer perceptions. Many of the respondents had a cultural image of olives or olive oil. When asked to select concepts associated with olives (multiple responses), the most common response was health (71.5%), followed by longevity (33.7%). This aligns with the findings of Xiong *et al.* (2014), which suggested that health benefits were a key factor in the increasing demand for olive oil in the U.S. However, the responses also included a wide range of other associations, such as peace (24.8%), sacred tree (19.8%), abundance (16.3%), good fortune (14.2%), fertility (11.6%), and holiness (11.3%). Besides, those who answered that they had no image of olives accounted for 8.3%, revealing that 91.7% of the respondents had a specific image of olives.

Regarding the particular religious characteristics of olive oil products, "Olive oil from a sacred land" (25.0%) was the most preferred, followed by "Olive oil of a traditional ritual" (24.5%), "Olive oil from a sacred tree" (23.3%), "Olive oil of mythology" (17.9%), "Olive oil of legend" (17.5%), "Olive oil from a tree of fertility" (17.7%), "Olive oil from a spirit-dwelling tree" (13.7%), and "Olive oil from a pilgrimage site" (9.9%) in multiple-choice, indicating that 64.2% of the respondents were interested in some of the religious attributes. It was also found that the respondents' interest in

religious attributes was related not only to Greco-Roman or Abrahamic religious culture but also to elements of folk beliefs such as fertility and spirits. In addition, when asked about their interest in each of the characteristics of longevity of olive trees, the respondents selected "Olive oil from an old tree of Roman times" (45.0%), "Olive oil from a tree that is 1000 years old" (38.7%), and "Olive oil from a tree that is a family heirloom" (28.8%) in multiple-choice, indicating that 74.1% of respondents are interested in long-lived trees with some cultural background. Such diversity of responses underscores the complexity of consumer perceptions of cultural content with food and the need for a nuanced understanding of their preferences.

Concerning religious and cultural knowledge about olives, only 19.6% of the participants knew the use of olives in rituals, but 62.7% knew the dove and olive branches as a symbol of peace or promise. They also knew that olive wreaths as a symbol of peace and victory (34%), olive oil as a symbol of holiness and purification (29.2%), the trees as a symbol of sacredness and good fortune (20.8%), the leaves and branches as a symbol of victory and peace (20.8%), the fruit as a symbol of prosperity and abundance (19.8%), indicating that consumers had a wide range of knowledge about the symbolic meaning of olives. These results showed that the survey participants had some religious and cultural knowledge of olives, that olives were strongly associated with cultural images, that there was diversity in their content, and that they were interested in olive oil with cultural and religious characteristics.

CONCLUSION

Although previous research gave little attention to olive oil's religious and cultural values, the choice experiment results showed that the respondents preferred olive oil with religious and cultural added value. While the additional religious and cultural information about olive oil did not influence the preferences for the attributes in this study, the supplementary questionnaire results revealed that the respondents were interested in the cultural background of olives and olive oil. These findings suggest that religious and cultural values labeling of olive oil products can meet the potential needs of global consumers seeking diverse foods related to cultures and thus increase their willingness to purchase olive oil. Olive oil has the potential to make an essential contribution to developing rural economies in developing countries around the Mediterranean, and improving its reputation in new markets could bring fair returns to local farmers. Religious and cultural labeling and disseminating information about the religious and cultural background or traditional foodways of production areas are considered essential strategies to differentiate a product and compete in nontraditional production areas, where the olive oil experience could be further developed. The significance of this research is that by understanding the evaluation of consumers in different cultures towards the cultural background of olive-producing regions, it has become possible to discover the process by which the cultural significance of each region embedded in foods is diffused and positively accepted in the global market.

Since our sample was limited to consumers in Northern California, this exploratory study underscores the need for further, more comprehensive research on the significance of religious and cultural cues in consumer choice.

LIST OF ABBREVIATION

ASC = Alternative Specific Constant

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

The authors acknowledge that this research is financially supported by the JST-JICA Science and Technology Research Partnership for Sustainable Development Project, Grant Number JPMJSA1506: Valorization of Bio-resources in Semi-Arid and Arid Land for Development, and by JSPS KAKENHI Grant Number JP19K12954: Veneration of Edible and Medicinal Plants and the Multilayered Cultural System of North Africa.

AUTHOR CONTRIBUTIONS

Funding acquisition, HI and TK.; Conceptualization of the idea, HI and TK; Supervision, HI and KU; Methodology and Model, KU and YM; Statistic estimation, TK and UK; Original writing and draft preparation, TK, UK, and YM; Review and Editing, UK and TK.

INSTITUTIONAL REVIEW BOARD STATEMENT

According to the Rule for the Ethical Review Board of the University of Tsukuba Involving Humans, this study is exempted and does not require the approval of the institutional review board. In this study, the subjects were fully informed of the necessary matters concerning the study.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study. The subjects were de-identified during data collection and analysis.

DATA AVAILABILITY STATEMENT

The raw data supporting this study's findings are available from the corresponding author, TK, upon reasonable request.

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Received: February 10, 2025

Revised: February 13, 2025

Accepted: February 15, 2025

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