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CIHEAM ZARAGOZA

cita

Facultad de Economía y Empresa Universidad Zaragoza

ia2 Instituto Agroalimentario de Aragón

WHAT ATTRIBUTES DETERMINE CONSUMER PREFERENCES FOR OLIVE OIL? A BEST-WORST & LATENT CLASS APPROACH

Luis Pérez y Pérez [a,b,*] **Azucena Gracia** [a,b],

[a] *Unidad de Economía Agroalimentaria. Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Avda. de Montañana 930, 50059, Zaragoza; lperez@aragon.es*

[b] *Instituto Agroalimentario de Aragón – IA2 (CITA-Universidad de Zaragoza)*

Abstract

Through a Best-Worst method and latent class (LC) analysis, the aim of the paper is to measure the importance consumers attached to some attributes when shopping olive oil. The attributes considered were: i) *price*; ii) geographical *origin* of production; iii) Protected Designation of Origin (PDO) label; iv) olive *variety*; v) *organic* certification; vi) package *size*; and vii) *packaging* material. Data come from an online survey conducted in Aragon, a region representative of the Spanish population. The final sample of 402 people was stratified by age, gender, and province. Results show that consumers attached the highest importance to the *price*, the geographical *origin*, and the *pdo* label. On contrary, *variety*, *organic*, *size*, and *packaging* were the least important attributes. We found five groups of consumers with different perceived importance for olive oil attributes. Three of the groups gave the highest importance to *price* but differed in the importance attached to the other attributes. A fourth group valued only *organic* certification and in the fifth group the most valued attributes were quality (*pdo*), *origin* and *organic* certification.

Keywords: heterogenous preferences; organic; PDO; price; Spain

1. Introduction and objectives

Olive oil is a widely consumed and highly valued food product worldwide, and it is an emblematic product of the "Mediterranean diet," which is recognized globally as one of the most sustainable and healthy diets. However, with numerous options available in the market, it is challenging for consumers to decide which olive oil to purchase. This decision depends on the evaluation of different attributes of this product. Consumers may value attributes specific to each olive oil, such as taste, colour, and flavour, as well as common attributes shared among different olive oils, such as price, production method, and geographical origin. Understanding which of these attributes are most important to consumers can help producers tailor their products to better meet customer needs and preferences. This paper aims to study the relative importance consumers give to different attributes in their olive oil shopping decisions using the Best Worst (BW) method. Based on previous literature on consumers' preferences for olive oil (Del Giudice *et al*., 2015; Latino *et al*., 2022), seven attributes are analysed: i) *price*; ii) geographical *origin* of production; iii) Protected Designation of Origin (*pdo*) label; iv) olive *variety*; v) *organic* label; vi) package *size*; and vii) *packaging* material.

2. Materials and methods

To reach our aim, we apply the BW method that is a choice valuation approach that prompts participants to indicate the most (best) and least (worst) important attribute among a sub-set of alternatives, following an experimental design of the selected attributes. In our case, seven alternatives of three attributes were designed using a balanced incomplete block design, where each attribute appears three times across all sets (Louviere *et al*., 2010), and were presented consecutively to each participant.

We assume that respondents simultaneously solve the BW choice task and choose the one that maximised the utility difference in the BW pair chosen. Then, these BW choices can be exploded into the six implicit pair-wise choices getting 42 “pseudo-observations” for each respondent. According to the Lancaster model (Lancaster, 1966) combined with the random utility model by McFadden (1974), this utility depends on the attributes and is assumed to be a random variable that for the n_{th} individual choosing alternative i in the t choice sets can be represented as:

$$U_{njt} = \beta X_{njt} + \varepsilon_{njt} \qquad (1)$$

where β is a vector of coefficients of the attributes (X_{njt}) and ε_{njt} is an independent identically distributed error term. As consumer preferences were assumed heterogeneous, a LC model was used. The assumption of this model is that preferences are different for several groups or classes of individuals while are homogeneous within each class. For our empirical application and attributes, the utility function is defined as:

$$U_{njt/s} = \beta_{1s}Price_{njt} + \beta_{2s}Origin_{njt} + \beta_{3s}PDO_{njt} + \beta_{4s}Variety_{njt} + \beta_{5s}Organic_{njt} + \beta_{6s}Size_{njt} + \varepsilon_{njt/s} \quad (2)$$

where n = 1,…, 402 are the respondents; j = 1,…, 6 are the pair-wise choice; t = 1,…, 7 are the choice sets; s are the number of classes; β_{js} is the vector of class attribute coefficients and $\varepsilon_{njt/s}$is the error term N(0, σ^2). *Packaging* was used as reference.

The coefficients are estimated jointly with the number of classes using NLOGIT 6.0. To assess for the differences among classes, using STATA 17.0 we conducted bivariate analyses (χ^2 or Bonferroni tests) between the classes and the respondents' socio-demographic characteristics, the frequency of extra virgin olive oil (EVOO) consumption and their EVOO knowledge.

Data were collected through an online survey conducted in March 2021 in Aragon. Respondents were stratified by gender, age, and province of residence and the final size of the sample was 402. The questionnaire consisted of different parts. The first contained questions on olive oil consumption and purchasing habits. An "objective knowledge" question was used to assess consumers' knowledge of the EVOO. Respondents were asked to indicate whether six statements about EVOO were true, false or did not know: i) EVOO is a natural product, ii) EVOO has similar health benefits as olive oil, iii) EVOO is obtained from olives of lower quality, iv) EVOO is extracted mechanically, v) EVOO taste is the same as the regular olive oil and vi) EVOO is obtained through a refining process. When an answer was correct it received the value 1, and 0 when wrong. A summary index of the respondents' knowledge of EVOO was compiled. The second part contained questions on consumption and purchase habits of EVOO and olive oil with PDO, and the BW questions. Finally, sociodemographic characteristics were asked.

3. Results and conclusions

Half of the respondents were female (51%), with an average age of 50 years and number of members of 2.8. The average monthly net income per capita was 1,350 € and about 49% of the interviewees had an income higher than this average. On contrary, 32,8% of households received a net per capita income below 1,076 € per month. Most respondents lived in the Zaragoza province.

Table 1 shows the results of the estimation of the LC model for five classes and the one-segment. All estimated coefficients in the one-segment model were statistically different from zero at the 1% significance level and positive indicating that all the attributes were more valued than *packaging* used as the reference. The value of the estimated coefficients indicated that the order of importance of the attributes are: *price, origin, pdo, variety, organic, size* and *packaging*.

We observe that the importance of the attributes differs across classes that were named looking at the values and signs of the estimated βj. Class 1 accounts for 24,3% of the sample and taking into account that the rating of the attributes practically coincides in order and intensity with the one-segment model, this class could be considered as representative of the average olive oil consumer and named as the "standard consumers" of olive oil. They value above all the *price*, the geographical *origin* of the production and its quality (*pdo*). Class 2, with the 11,3% of respondents, can be labelled as "organic seekers" because they attached the highest valuation to the *organic* label in relation to the rest of attributes. Class 3 is the largest group with 27,3% of the sample and named "Quality & origin lovers" because the most important attributes were the quality (*pdo*) and the *origin* of production, and, to a lesser extent, the attributes *organic* and *variety*. In Class 4 with 14,2% of the sample, all attributes were found statistically significant, with *price, origin, variety*, and quality (*pdo*) being the most important. However, the high significance and negative sign of *organic* indicates that this certification was the least important and we labelled it as "organic haters". Class 5 comprises 23% of consumers and is mainly characterized by the importance of *price* and, to a much lesser extent, *size*, and *origin*. This indicates that it consists of consumers looking for olive oil sold in bulk and at the best price. Consequently, we call them "best price-buyers".

To profile the classes of consumers, table 2 presents the results of the bivariate tests for the socio-demographic characteristics, the frequency of EVOO consumption and the knowledge on EVOO found statistically different, at least at the 10% significance level.

"Standard consumers" were found more like the general sample for the consumers characteristics. "Organic seekers" and "Best-price buyers" included younger people with less knowledge on EVOO. However, consumers in these two classes differs in the province of residence because "Organic seekers" consists of higher proportion of consumers from Huesca and lower from Teruel, and "Best-price buyers" a higher proportion of consumers from Zaragoza. "Organic haters" were the more knowledgeable on EVOO with a higher proportion of respondents with lower income. "Quality & origin lovers" consisted of older people and included a higher proportion of high-income consumers and lower of people living in Zaragoza.

Table 1. Estimated coefficients of the olive oil attributes for the five classes.

Attribute	One-segment	Standard consumers	Organic seekers	Quality & origin lovers	Organic haters	Best price buyers
Price	1.475 (25.50)***	4.142 (11.38)***	-0.235 (-1.01)	0.998 (5.65)***	2.279 (7.80)***	3.094 (11.19)***
Origin	1.343 (23.72)***	2.709 (10.15)***	-0.119 (-0.52)	2.565 (11.20)***	1.863 (7.43)***	1.019 (6.78) ***
PDO	1.043 (19.13)***	2.575 (9.23)***	-0.412 (-1.77)*	2.608 (11.45)***	1.320 (5.28)***	0.146 (0.94)
Variety	0.875 (16.20)***	1.693 (7.09)***	0.008 (0.04)	1.951 (9.71)***	1.772 (6.85)***	0.167 (1.12)
Organic	0.757 (14.15)***	1.900 (7.08)***	0.609 (2.86)***	2.021 (10.24)***	-0.770 (-2.30)**	0.207 (1.47)
Size	0.338 (6.30)***	0.534 (2.81)***	-0.470 (-2.58)***	-0.024 (-0.17)	0.481 (2.28)**	1.227 (7.91)***
Class Size (%)	100	24.3	11.3	27.2	14.2	23.0

***, ** statistical significance at 1%, and 5% level, respectively. Note: the model was estimated from 2 to 6 classes and the optimal number of classes selected was 5 according to several statistical measures (AIC: Akaike information criterion; AIC3: Bozdogan AIC; BIC: Bayesian information criterion; and $\bar{\rho}^2$: Akaike likelihood ratio index).

Table 2. Characterization of consumer preference classes (%, unless stated).

Consumer characteristics	Standard consumers	Organic seekers	Quality & origin lovers	Organic haters	Best price buyers	Test (p-value)[a]
Socio-demographics						
Age (average)	50.9 a	47.7 b	54.1 a	51.6 a	45.3 a	6.4 (0.00)***
Income						
Less than 1,076 €	36.1	34.1	24.1	45.6	31.6	14.4 (0.07)*
Between 1,076 and 1.350 €	15.5	14.6	22.3	7.0	14.2	
More than average (1,350 €)	48.5	51.2	53.6	47.4	44.2	
Province						
Huesca	15.5	24.5	19.6	10.5	16.8	13.9 (0.08)*
Teruel	11.3	2.4	15.2	12.3	4.2	
Zaragoza	72.2	73.2	65.2	77.2	79.0	
EVOO consumption frequency						
Daily	51.5	43.9	72.3	65.2	48.4	28.8 (0.00)***
Several times a week	14.4	14.6	8.0	17.5	20.0	
Sometimes a week	11.3	7.3	10.7	3.5	10.6	
Sometimes a month	22.7	34.1	8.9	15.8	21.0	
Knowledge on EVOO (average)	3.2 a	2.3 b	3.3 a	3.6 b	2.7 b	4.6 (0.00)***

[a]The chi-square test was used for income, province and EVOO consumption frequency and the Bonferroni for age and knowledge on EVOO. Letters a,b in a raw indicate that means were statistically different among classes.***. * Statistical significance at 1% and 10%, respectively.

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