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IN FRESH VEGETABLE CONSUMPTION, WHAT FOOD LABELS MATTERS MORE FOR CONSUMERS?

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Abstract

This study determines which labels should be used to differentiate vegetables products cultivated in Aragon in the local market. The aim is to analyse the importance attached by consumers when buying fresh vegetables to different labels. The labels analysed were "Protected Designation of Origin (PDO)", "C'Alial regional brand", "Direct sales", "Organic", "Km0", "Local variety" or "Landrace", and "Collective producer brand". A Best-Worst method in which the respondents had to indicate which label is the most and least important was used. Data was gathered using an online survey of vegetable consumers in Aragon. The sample was stratified by age, gender, and province of residence. Label importance for consumers was assumed heterogeneous and a Random Parameters Logit (RPL) with correlated errors model was estimated. Results indicated that the most important label was "Direct sales", followed by "Km0", "Local variety", "PDO" and "Organic". The least value labels were "C'Alial", and "Collective producer brand". Therefore, according to the obtained results, producers should focus on proximity markets using local varieties. In general, consumers' heterogeneity can be explained by socio-demographic characteristics and vegetables purchase behaviour being the most relevant factors the importance consumers give to the taste of vegetables and the level of education.

Keywords: Best-worst method, proximity markets, local variety, organic, Spain

1. Introduction and objectives

In the agri-food market, an increasing number of quality labels are being used to differentiate products based on additional quality characteristics. Quality labels are an important tool for consumers when purchasing fresh vegetables (Ahrens et al., 2021). In addition, these labels help to promote more sustainable production methods, contribute to the conservation of biodiversity and the unique features of rural spaces (landscape, culture, traditions...) and represent an important tool for achieving sustainable development in rural areas. This development contributes to maintaining the rural population and diversifying its economy. These labels provide information on the production methods (organic), geographical origin (Protected Designation of Origin), environmental sustainability (local products), promotion of biodiversity (traditional or local varieties), among others. In recent years, there has been an increasing interest in studying the importance of these labels and their impact on consumer behavior (Šicáková et a., 2021). Thus, the aim of this study was to assess the importance consumers attached to different quality differentiation through labels for fresh vegetables to help producers in the definition of their marketing strategies related to quality labels that meet consumers' preferences. The different quality labels measured were: the Protected Designation of Origin (PDO), the regional brand C'Alial (awarded by the Government of Aragon), the direct sales (Aragon Regulation on direct sales and short marketing channels), the organic certification, zero kilometer (Km0), local variety, and collective producer brand.

2. Materials and methods

To measure the importance of quality labels, a Best-Worst (BW) scaling method was used to identify the most and least important quality labels for consumes of fresh vegetables. This method is a choice valuation method based on the random utility theory of decision making in which respondents are presented with a series of sets containing different combinations of the quality labels and are asked to choose the best (most important) and worst (less important) label from each set (Lee et al., 2007). As we are measuring seven quality labels, seven combinations of three of the quality labels (seven choice sets) were obtained by 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.

If we assume that respondents simultaneously solve the best-worst choice task and choose the one that maximised the utility difference in the best-worst pair chosen, the best-worst choices for the labels can be exploded into all 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), the utility depends on the labels and is assumed to be a random variable that, for our case, can be represented as:

$$U_{nkt} = \beta_{1n} PDO_{nkt} + \beta_{2n} C'ALIAL_{nkt} + \beta_{3n} DIRECTSALES_{nkt} + \beta_{4n} ORGANIC_{kt} + \beta_{5n} KMO_{nkt} \qquad (1)$$
$$+ \beta_{6n} LOCALVARIETY_{nkt} + \varepsilon_{nkt}$$

$n = 1, \ldots, 571$ is the respondent; $k = 1, \ldots, 6$ is the pair-wise choice within the choice set; $t = 1, \ldots, 7$ is the choice set; β_n is a random vector of individual parameters; ε_{nkt} is the extreme value error term N(0, Ω). Collective producer brand was the variable used as reference.

To account for heterogeneity in respondent preferences, we allow the parameters of the model to vary across all the individuals and a random parameter logit model with correlated errors (RPL-CE) was specified and estimated using the NLOGIT 6.0 software. To explain this heterogeneity, the estimated parameters for the different labels (β_{1n}, β_{2n}, β_{3n}, β_{4n}, β_{5n} and β_{6n}) for each of the respondents were used and regressed on the socio-demographic consumers characteristics, the fresh vegetables consumption, the shopping place for vegetables and the importance consumers attached to the taste of the vegetable when shopping. The Ordinary Least Squared (OLS) estimations of these regressions were done using the STATA 17.0 software.

Data were collected through an online survey conducted in March 2021 by a specialized market research company in Aragon, a representative region situated in the northeast of Spain formed by the provinces of Huesca, Zaragoza, and Teruel. The survey was stratified by gender, age, and province of residence, and a final sample size of 571 respondents was obtained.

3. Results and conclusions

This sample was representative of the population in terms of gender and province of residence. However, the percentage of respondents older than 65 years were lower than the population and participants with only elementary studies were under-represented, while those with secondary education were slightly over-represented.

Table 1 shows the estimation of the RPL-CE of equation (1) where the estimated parameters has been ordered by descending order of the means to provide the ranking of importance of the different labels. The "Collective producer brand" was used as the reference because it was found the least important attribute in a preliminary aggregated analysis. The means of the estimated coefficients for the random parameters in the utility function were positive and statistically significant at 1% level indicating that the consumers' importance of the estimated labels was statistically higher than the importance attached to the "Collective producer brand" label (reference). The average consumer gives more importance to "Direct sales", followed by "Km0", "Local variety", "PDO" and "Organic". On the other hand, the least value labels were "C'Alial", and "Collective producer brand".

Table 1. *Estimates for the random parameters logit with correlated errors model (RPL-CE)*

Labels	Random parameters in utility function			Standard deviation of parameters distribution		
	Mean	Standard error	Z-ratio	Coefficient	Standard error	Z-ratio
DIRECTSALES	2.2795***	0.1045	16.18	1.5106***	0.1098	13.76
KM0	2.2361***	0.1138	19.64	1.9070***	0.1270	15.01
LOCALVARIETY	1.8032***	0.0929	19.39	1.2546***	0.1016	12.35
PDO	1.7276***	0.1036	16.68	1.6960***	0.1162	14.59
ORGANIC	1.1761***	0.1191	9.88	2.2524***	0.1258	17.90
C'ALIAL	0.7451***	0.1213	6.14	2.4010***	0.1423	16.87

Reference attribute: Collective producer brand
Number of observations: 3997; Number of participants: 571
Log likelihood at convergence: -5,809.17; McFadden Pseudo R-square: 0.19
*** significance at 1% level

Since the estimated coefficients for the standard deviation were also positive and statistically significant at 1% level, the importance of the labels differed among consumers, and preferences for these labels were heterogeneous. Table 2 shows the estimated parameters for the different regressions and the corresponding robust t-tests that explain this heterogeneity. The results of the study indicate that consumers' heterogeneity was primarily driven by the importance they placed on the taste of vegetables when shopping, as this factor influenced the estimated parameters for the labels "Direct sales," "Local variety," "PDO," and "C'Alial". For the "Local variety" label, this factor was the sole determinant of consumers' heterogeneity. The positive value indicates that as the importance attached to the taste of vegetables increases, the valuation of these labels also increases. In addition, the level of education for the consumers with only elementary studies also affected the estimated parameters for the labels "Km0", "PDO" and "C'Alial". The influence on the "Km0"

label was negative, while it was positive for the "PDO" and "C'Alial" labels, indicating that consumers with only elementary studies valued "PDO" and "C'Alial" more highly, but valued "Km0" less. The province of residence and the number of members in the household were also found to explain consumers' valuation of the "PDO" label. In particular, the valuation for the consumers living in the province of Huesca was lower than for those living in the Zaragoza province and as the number of members in the household increases, the valuation of the "PDO" label decreases. For the "Organic" label, the factors determining consumers' heterogeneity were their age, the number of members in the household, their income level, and the place of purchase of vegetables. As the age and size of the household increased, the valuation of this label decreased, while low-income consumers and those shopping in green grocery stores had a higher and lower valuation of the "Organic" label, respectively. The place of purchase of vegetables also influenced the valuation of the "Direct sales" label, with people shopping in green grocery stores valuing this label more. Finally, for the "C'Alial" label, in addition to the taste of vegetables, the level of education and income explained consumers' heterogeneity. While people with elementary studies value this label more, those with low-income value the "C'Alial" label less.

Table 2. *OLS estimates for the random parameters.*

	DIRECT SALES	KMO	LOCAL VARIETY	PDO	ORGANIC	C'ALIAL
Constant	1.460 (4.05)***	1.437 (2.78)***	1.064 (3.93)***	1.713 (3.97)***	2.89 (5.27)***	-0.186 (-0.29)
Huesca[1]	-0.009 (-0.07)	0.145 (0.85)	-0.078 (-0.84)	-0.296 (-2.02)**	0.120 (0.55)	-0.048 (-0.21)
Teruel[1]	-0.083 (-0.55)	-0.184 (-0.82)	-0.053 (-0.45)	0.102 (0.52)	0.292 (1.20)	-0.164 (-0.59)
Elementary Studies[1]	-0.207 (-1.55)	-0.301 (-1.78)*	-0.129 (-1.18)	0.419 (2.74)***	0.044 (0.20)	0.498 (2.00)***
Female[1]	0.036 (0.36)	0.012 (0.09)	0.085 (1.12)	-0.015 (-0.12)	0.050 (0.29)	0.040 (0.22)
Age[2]	-0.002 (-0.40)	0.005 (0.87)	0.002 (0.65)	-0.005 (-1.05)	-0.022 (-3.17)***	0.001 (0.20)
Nmember[2]	0.041 (0.99)	0.023 (0.42)	-0.008 (-0.28)	-0.126 (-2.41)***	-0.135 (-1.86)*	-0.060 (-0.83)
Lowincome[1]	-0.263 (-1.33)	-0.434 (-1.50)	-0.019 (-0.14)	-0.145 (-0.56)	0.664 (1.90)*	-0.768 (-2.03)***
Green grocery[1]	0.172 (1.68)*	0.058 (-0.41)	0.100 (1.26)	-0.156 (-1.27)	-0.312 (-1.76)*	-0.242 (-1.30)
Taste importance[2]	0.166 (2.70)***	0.150 (1.54)	0.139 (2.98)***	0.172 (2.31)***	-0.042 (-0.42)	0.272 (2.44)***

Note: [1] They are dummy variables where 1 indicates Huesca, Teruel, Elementary studies, Female, Low-income and Green grocery, and 0= otherwise. [2] They are continuous variables indicating the age of respondents, the number of members of the household and the importance of taste in one scale 1 to 5 from lower to higher importance.

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