

Preferred attributes of peaches with Protected Designation of Origin Calanda

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DOI: 10.30682/nm1802f

JEL codes: M31, C35, Q13

Abstract

Calanda is a municipality in the province of Zaragoza, Spain. Every year since mid-September until beginnings of November this area produces a famous high quality peach with Protected Denomination of Origin “Calanda” (PDO Calanda peach). The aim of this study is to value by Best-Worst scaling which of the ten PDO Calanda peaches attributes are more important for consumers and to find out the market segments. Main results show that the most important characteristics of PDO Calanda peaches are taste and ripeness and the least are packaging and fuzziness of the skin. Some preferences differences were found matching consumers’ socio-demographic characteristics.

Keywords: *Consumer Behaviour, Zaragoza, Attribute Impact, Pdo, Calanda Peaches.*

1. Introduction

Growing peaches in the Aragon region has been occurring for centuries. A specific area of Aragon – Calanda – has been recognized to have peaches with excellent qualities. The Protected Denomination of Origin (PDO) Calanda was set up in 1999 as a response to the request of Calanda Peach Producer Association. The Regulatory Council is responsible for maintaining and increasing the product prestige and the quality differentiation, by controlling the fruit production process as well as the quality norms for marketing purposes. In 2015, its total production was 2,600.00 tons (CRDOMC, 2016).

Peaches with this PDO only can be found in the market since the beginning of September

until the beginning of November, which is the end of the marketing season for peaches cultivated in the Northern Hemisphere. According to the Regulatory Council norms, those fruits must be produced by three clones (Jesta, Evaisa and Calante), and they should have some common characteristics such as good appearance (no injury, clean, etc.), uniform yellow cream to straw-coloured skin, minimal size of about 73 mm diameter, toughness between 3.5 to 5.0 kg/0.5 cm² and sugar content superior to 12 Brix degree (CRDOMC, 2016). The norms also demand the accomplishment of several specific peach production techniques to reach a high fruit quality standard.

In order to control the Mediterranean fly (*Ceratitis capitata*), growers have to protect the fruits

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with paraffin bags. This operation is expensive, demands a great labour force and it has consequences on fruit ripeness and taste. To increase fruit size, growers have to undertake thinning techniques, after the physiological fall period, which remove about 70% of the existing fruit in the tree. This process also demands great labour force. The hand thinning cost was estimated by Romero-Salt (2006) in 0.140 euros/kg, which represents 24.56% of total cost. The costs of hand thinning and labour add up 0.273 euros/kg and it embodies 47.89% of total cost. This productive technique to reach greater peach sizes has not been checked with consumers' perception and its relative importance in comparison to other attributes.

Growers are struggling every day to produce high quality fruit, but up to now they do not know which attribute of PDO Calanda Peaches is most appreciated by consumers. Thus, this work aims to study consumers' preference toward PDO Calanda peaches' attributes in Zaragoza, Spain, with the view to suggest marketing strategies to improve PDO Calanda peach production chain. Lists with priority aspects of PDO Calanda peaches quality, from the market as a whole and from market segments, were elaborated. Improving the attributes of quality, especially the most important in the eyes of consumers, the final product will leave the consumer more satisfied, which give to the PDO Calanda peaches more market competitiveness.

Cicia *et al.* (2012) studied the existence of segments of peach consumers in Germany and the impact of different Country of Origin Labelling, organic certification and PDO/PGI on buying decision. They found three market segments. First segment (48% of consumers) with clear preference for the Italian products, second segment (41%) with preference to Spanish products and the last with the particular preference for Turkish peaches. All segments prefer peaches with PDO/PGI and produced under organic system.

The "ideal" peach is that fruit with the best quality attributes combination. It was studied by Olmstead *et al.* (2015). The top attributes of the "ideal" peach include good flavour, texture, size and firmness. Consumers prefer sweet, juicy, round characteristics. Young consumers (ages

18-24) prefer crisp, firm peaches with good flavour, whereas older consumers (ages 51-64) prefer sweet and melting peaches. Thus, it is expected that consumers appreciate PDO Calanda peaches taste, smell, size and texture. Different segments of preference are also expected.

In this work a Best-Worst analysis has been undertaken to sort out the preferred consumers' peaches attributes. The Best-Worst Choice Experiment (BWCE) overcomes some problems presented by others measurements and rating methodologies. Indirect measures provided by discrete choice experiments provide richer insights into trade-offs and, as they have a natural link with actual choices, they should be more valid than direct measures, like Likert scale (Louviere and Islam, 2006). An advantage of BWCE, over a traditional "most-preferred" choice question, is the extra information about individuals' preference. It provides greater amount of information of individuals per choice set with less cognitive burden on respondents (Louviere *et al.*, 2009).

The BWCE was used in many fields of research. The BWCE has been used to study patient preferences (Lancsar *et al.*, 2013; Krucien *et al.*, 2016), residential location (Balbontin *et al.*, 2015), transportation (Beck *et al.*, 2017) and consumers preferences toward food (de Magistris and Gracia, 2017; Lagerkvist, 2013).

The work is structured as follows. The next section deals with the methodology Best-Worst scaling, the approach followed for the survey and proposed econometric model. The third section shows the results, firstly presenting the average preferences and then consumers' socio-demographics characteristics are taken into account. The last section presents the conclusions.

2. Methods and Data

2.1. Best-Worst Choice Experiment and the econometric approach

The Best-Worst Choice Experiment (BWCE), also known as MaxDiff question, was proposed by professor Louviere and Woodworth as an extension of Thurstone's random utility theory (RUT) in 1990. There are 3 cases of BWCE.

Here it is employed the BWCE of case 1, in which alternatives are objects/items (Louviere *et al.*, 2013). In this experiment individuals are invited to choose the most and the least important objects/items in each choice set. Thus, consumers had to state the most and the least important attributes of PDO Calanda peaches in different choice sets.

Marley and Louviere (2005) proved that the BWCE shares a common theoretical framework with the Random Utility Theory (Thurstone, 1927; McFadden, 1973). This theory determines that the indirect utility (in this case, importance) of alternative q for respondent i (U_{qi}) can be decomposed in two parts: the deterministic element (V_{qi}), which is observed by the researcher; and a stochastic element (e_{qi}), which is the unobserved influence on individual choice (equation 1).

$$U_{qi} = V_{qi} + e_{qi} \quad (1)$$

The probability of individual i states alternative “ g ” as the most important attribute over any alternative “ h ”, can be expressed as the probability that the importance associated with alternative “ g ” exceeds that association with all other alternative (equation 2). On the other hand, the probability of individual i states alternative “ g ” as the least important over any alternative “ h ”, can be expressed as the probability that the importance associated with alternative “ g ” not exceeds that association with all other alternative.

$$P[(U_{ig} > U_{ih}) \forall g \neq h] = P[(V_{ig} - V_{ih}) > (e_{ih} - e_{ig})] \quad (2)$$

In order to derive an explicit expression for this probability, it is necessary to know the distribution of the error terms (e_{ig}). A typical assumption is that they are independently and identically distributed with an extreme-value (Weibull) distribution. It implies that the probability of any particular alternative “ g ” be chosen as the most important can be expressed in terms of the logistic distribution (McFadden, 1973). This specification is known as the conditional logit model (equation 3):

$$P[(U_{ig} > U_{ij}) \forall g \neq h] = \frac{\exp(\mu V_{ig})}{\sum_j \exp(\mu V_{ij})} \quad (3)$$

Where μ is a scale parameter, which is inversely proportional to the standard deviation of the error distribution. This parameter cannot be identified and is therefore assumed to be one. This model can be estimated by conventional maximum likelihood procedures, with the respective log-likelihood function indicated in the equation 4. In this equation, y_{ij} is an indicator variable which takes value 1 if respondent i chooses option j and zero otherwise.

$$\log L = \sum_{i=1}^N \sum_{j=1}^J y_{ij} \log \left[\frac{\exp(V_{ij})}{\sum_j \exp(V_{ij})} \right] \quad (4)$$

Equation 5 represents the consumers mean preference. It is specified as a linear equation of attributes. Variables were coded as dummy. In the Logit model one estimates the intercepts or “alternative-specific constants” (Louviere *et al.*, 2013). So if alternative j is the attribute taste, x_1 takes the value of 1 and all other variables takes zero value. As texture (10th attribute) is taken as the attribute of reference, β_1 represents the relative utility or importance of taste in relation to texture.

$$U_j = \beta_1 X_1 + \dots + \beta_9 X_9 + e_j \quad (5)$$

It is recognized that the specific behaviour and taste may be conditioned by individual factors. Modelling observed interaction in choice models, allow identifying personal characteristics that focus on certain attributes only in decision making. In order to reflect the heterogeneity, mean parameters were decomposed in interaction effects (equation 6). This model estimates main effect (from beta one to beta 9) and interaction effects with m covariates (all other betas).

$$U_j = \beta_1 X_1 + \dots + \beta_9 X_9 + \beta_{10} X_1 Y_1 + \dots + \beta_{18} X_9 Y_1 + \dots + \beta_n X_1 Y_m + \dots + \beta_{n+9} X_9 Y_m + e_j \quad (6)$$

It was estimated two models with main and interactions effects. The first measured the interactions among attributes’ importance and gender, age, education and income. In coding, gender has value 1 if the consumer is female and zero if he is a man; age assumes value 1 when consum-

er is older than 50 years and zero otherwise; education assumes value 1 if consumer has not studied in college and zero otherwise; and income has value 1 when consumer's family income is less than 1,500 €/month and zero otherwise. The second model considered the interaction among attributes' importance and consumption frequency and the preference for products substitute to PDO Calanda peach. In this model, if consumer is sporadic the variable is coded 1 and 0 otherwise and if consumer would buy a no stone fruit when PDO Calanda brand wouldn't be available at market the variable takes value 1 and 0 if consumer would purchase a stone fruit.

The estimations of the relative importance of attributes (equation 5) as well as the relative importance of attributes for different kind of consumers (equation 6) were estimated with the software Biogeme, version 1.7 (Bierlaire, 2008), which makes Multinomial Logit Model (MNL) estimations. The attribute "texture" was considered as the reference; hence it received a zero score.

2.2. Survey and data

The survey elaboration had three steps: the first was the selection of the most important attributes of PDO Calanda peaches, the second was to design the choice sets and the last one was to get the data. The selection of the most important attributes of PDO Calanda peaches was backed by the specialized literature, which was complemented with a focus group and face-to-face interviews to fruit managers working at four retail companies.

For the first step a focus group and interviews with the responsible of fruit and vegetables sessions were undertaken. The idea was to obtain the attributes according to their criteria so they could be, later on, included and fully understood at the consumers' survey. The 10 most relevant PDO Calanda peaches attributes for marketing strategies were selected: (1) taste, (2) skin colour, (3) price, (4) production in bags, (5) smell, (6) peach size, (7) packing, (8) ripeness, (9) skin fuzziness and (10) texture.

The experimental design was elaborated following the recommendations of Orme (2005)

Figure 1 - The illustration of the first choice.

Card 1		
Least important	Characteristic	Most important
	Colour	
	Size	
	Skin fuzziness	
	Produced in bags	
	Taste	

and Chrazn and Patterson (2006). Each attribute was repeated 4 times through choice sets and choice sets included 5 attributes (Figure 1), so the total number of choice sets was 8 ($10 \times 4 / 5$). The choice can be considered that it does not demand a hard effort for the respondents. The next step of the choice experiment design was the distribution of the attributes through choice sets.

The software "Sawtooth MaxDiff Designer" was used to do simulations with different combinations of the attributes to obtain the best experimental design properties. According to Orme (2006) this program, by default and in order, considers the following properties: one-way frequency (how many times each attribute appears across the entire design), two-way frequencies (how many times each pair of items appears within the same set across the entire design), positional frequencies (report how many times each item appears in the 1st, 2nd, ..., 5th position) and connectivity (all items are linked directly).

As a result of one million interactions, the final outcome is a design with no lack of connectivity and is a one-way frequency balanced and with a positional frequency mean of 0.8 and standard deviation of 0.4.

In the questionnaire, besides the BWCE, there were questions about PDO Calanda peaches related to consumption habits, competitive fruits and socio-economic data. Consumption habits questions tried to distinguish between occasional and regular PDO Calanda peaches consumers

The data was collected in 2008 in two hypermarkets, in the city of Zaragoza – Spain, between the 30th of October and the 8th of November, at the end of PDO peaches season. The period was chosen because consumers were more familiar

with the presence of PDO peaches at markets and so they could perform better their product valuation. People were invited to participate in the survey randomly. Each respondent got one kilogram of PDO Calanda peaches to compensate the collaboration.

In total, information from 316 PDO Calanda peaches consumers was collected by face-to-face interviews. Consumers were randomly invited to the interviews when they were entering or leaving the hypermarkets. Sampling error was estimated in 5.6%. It was calculated considering Trespalacios *et al.*, (2005) for a finite population (Zaragoza had less than 1 million people), a same probability of selecting a target and a no target individual with 95% of confidence.

3. Results and discussion

3.1. Sampled consumers' profile

Table 1 shows sampled consumers' socio-demographic characteristics. 59.2% of total consumers were women. A greater proportion of women is a desired characteristic in this kind of study because it is closer to the real percentage of women buying peaches in the market. According to Cerdeño (2006) and Cámara Madrid (2005), women are to a great extent responsible of fruit and vegetable purchases in Spain.

Age is another characteristic that influences fruit consumption in Spain. For children and adolescents, consumption tends to decrease with age. For adults, this relation is the opposite (Cerdeño, 2011). It happens as a consequence of a higher income and knowledge with age, but also it is a consequence of social habits and stimuli. The average age of sampled consumers is 45.5 years old and ages are more concentrated between 26 and 65 years old.

In the sample, 27.5% of consumers had elementary education while 31.3% had college backgrounds. In 2008, in Zaragoza city those values were 31.1% and 24.4%, respectively. Hence, on average, sampled consumers have higher education level than the entire population. The positive relation between education level and income may explain why sampled consumers have higher in-

Table 1 - Consumers' socio-demographics characteristics.

Characteristics	N° of people	%
<i>Consumers' gender</i>		
Male	129	40.8
Female	187	59.2
<i>Consumers' age</i>		
Younger than 25 years old	21	6.6
From 26 to 35 years old	63	19.9
From 36 to 49 years old	105	33.2
From 50 to 65 years old	88	27.8
Older than 65 years old	39	12.3
<i>Consumers' education level</i>		
Elemental	87	27.5
High School	130	41.1
College	99	31.3
<i>Consumers' family income</i>		
Until 900 €/month	23	7.3
901-1,500 €/month	84	26.6
1,501-2,100 €/month	72	22.8
2,101-3,000 €/month	81	25.6
3,001-4,000 €/month	32	10.1
More than 4,000 €/month	24	7.6
<i>Total</i>	<i>316</i>	<i>100.0</i>

come than the average population. Family income of 7.3% sampled consumers is less than 900 €/month while 12% of population's family income is lower than 750 €/month (IAEST, 2010).

PDO Calanda peaches are consumed with different frequency (Table 2). Around 1/3 of consumers consume it more than twice a week and almost 1/3 eat 1 or 2 times a week. The rest of them consume PDO Calanda peaches less often during the marketing season. In this study regular consumers have been considered those who consume PDO Calanda peaches at least once a week. All other consumers are assigned as sporadic consumers.

Table 2 still presents which product consumer would purchase if PDO Calanda peach wouldn't be available at market. Initially, it was assumed that consumer would purchase a similar product,

Table 2 - PDO Calanda peaches consumption frequency in the city of Zaragoza in 2008 and Consumers' loyalty degree toward PDO Calanda peaches.

Characteristics	Percentage of consumers
<i>Consumption frequency</i>	
More than 2 times/week	33
1-2 times/week	32
1 time/2 week	15
1 time/month	10
1 time/season	10
<i>Substitute product</i>	
Peach	23
Nectarine	4
Other stone fruit	6
No stone fruit	67
Total	100

like another peach, with high degree of substitutability, but results show contrary behaviour. It was found that 23% of consumers would buy another peach, but 67% would purchase a no stone fruit, which are little resembling peach.

3.2. Average preference

On average, consumers consider that the most important PDO Calanda peach attribute, at purchase time, is taste followed by ripeness and smell (Table 3). The least important attribute is packaging and the second least is skin fuzziness. Ripeness is associated with sweetness and this result converge with other studies, such as Delgado *et al.* (2013) who find that sweetness is the main driver of consumer purchase intent and willingness to pay by California consumers. In the case of PDO Calanda peaches, they have to be harvested at least with 12° Brix, to guarantee its sweetness (CRDOMC, 2016).

Apparently, the PDO Calanda peaches market strategy is more appropriate than the common strategy adopted by other peach producers as they specify a minimum sweetness degree. It is worth noting that the main improvement of new cultivars, in the peach industry, has been focused on fruit appearance, in particular size and colour. The

second significant gain has been the increase of fruit quality throughout fruit taste diversification (Cantín *et al.*, 2010; Llacer *et al.*, 2012). Thus, even with the difficulty to achieve the minimum required level of sugar, the market has recognized this commitment of PDO Calanda peaches by increasing their appreciation and value.

The second most important PDO Calanda peaches attribute is ripeness (Table 3). Harvesting ripened peaches may guarantee peaches with good taste and smell. Flesh firmness is the best indicator of ripening and one predictor of shelf life (Crisosto, 2007). The Regulatory Council is concerned with this attribute and it determines that PDO Calanda peaches have to be harvested when their flesh reaches at least 3kg/0.5 cm². It avoids peaches bruising as well as reduces physical damage during transportation and handling, although flesh hardness should be lower when peaches are consumed. According to the Sterling Rice Group for the PPN Network: 2005 National Eating Trend – NPD Eating Trend (SRG, 2005), the best peach/nectarine firmness, to sell peaches in USA, is whenever their flesh is firm. Hard or soft peaches may influence purchase negatively. Our findings support such concepts of “ready to eat” and “tree ripe” proposed by Crisosto (2006) to increase consumer satisfaction and consequently increase peach consumption.

PDO Calanda peaches have retail prices 30 to 80% higher than similar peaches without PDO. Polo (2007) reports that 40% of wholesalers dealing with PDO Calanda peaches estimate that they have prices 20% greater than the same peaches without PDO. According to consumers, price is the 4th most important attribute.

According to Wolf *et al.* (2003), Florkowsky *et al.* (2003) and Predieri *et al.* (2006), buyers normally pay more attention, when purchasing fruit, on its appearance (colour and size) than others cues. Maybe, for this reason, they miscalculate ripeness and they get disappointed when fruits are consumed. Texture is one indicator to know if peaches are ready to eat (Crisosto, 2006; Crisosto *et al.*, 2003) but, apparently, it is not considered when consumers purchase peaches.

Bruhn (1995) and Groot and Albisu (2015) relate a positive relationship between peach size and purchase intention. PDO Calanda peach size

Table 3 - The relative PDO Calanda peaches attributes importance¹.

Attributes	Parameter value ²	Std. err.	t-test
Taste	1.99***	0.082	24.42
Ripeness	1.26***	0.074	17.17
Smell	0.59***	0.076	7.73
Price	0.33***	0.082	3.99
Skin colour	0.04 ^{ns}	0.080	0.45
Produced in bags	- 0.68***	0.084	- 8.10
Peach size	- 0.85***	0.076	- 11.11
Skin fuzziness	- 1.41***	0.077	- 18.39
Packaging	- 1.76***	0.078	- 22.66
Number of estimated parameters			9
Number of observations			5,056
Final log-likelihood			- 5,958.5
Adjusted R ²			26.7%

Notes: (1) the attribute importance is in relation to the texture importance. (2) The sign (***) means that the estimated parameter is statistically different from zero at 1% probability and that parameter without statistical significance is represented by (^{ns}).

has, at least, 73mm of diameter, nevertheless it was considered as its third least important attribute. Why didn't consumer give importance to this attribute? Probably because there was similar big size peaches in the Zaragoza market during the PDO Calanda peaches marketing season. Groot (2011) observes that the smallest peaches from the Calanda area (with or without PDO) in this market were bigger than 73mm.

The fuzziness of the skin has been incorporated in this work because it is a crucial characteristic that distinguishes peaches from nectarines (Uva *et al.*, 2004). Many articles support the idea that nectarines are gaining market share from peaches, especially young people, because the advantage of having smooth skin. In our case, skin fuzziness is the second least important attribute on consumers purchase decision. During the interviews, many consumers said that they don't bother to peel the skin. Our results are not surprising because most consumers eat peaches at home, where they require less convenient products.

Table 4 - Probability of choosing price in comparison to other attributes.

Attributes	Probability (%)
Taste	16
Ripeness	28
Smell	44
Skin colour	57
Texture	58
Produced in bags	73
Peach size	76
Skin fuzziness	85
Packaging	89

Enterprises are concerned on selling products matching consumers' needs. Product convenience is an important consideration for consumers to mitigate their lack of shopping and eating time. Special packaging and technical treatments are ways to increase peaches shelf live, at distribution outlets, and to compensate for their short maturing period (Oria-Almudí, 2001; Nerón, 2008; Akbudak and Eris, 2004; Malakou, 2005; Wang *et al.*, 2005). Traditionally, PDO Calanda peaches are presented in one layer box that maintains fruit quality. However, results show that consumers consider packaging as the least important attribute on their purchase decision. It might have to do with the price they have to pay and the economic circumstances Spain was going through at the period the survey was undertaken.

Another way to present results is shown in Table 4. The graphic shows the probabilities, expressed in percentages, that consumers consider price more important than each attribute on their purchasing intention. Equation 3 was used for this purpose. The probability may be considered as market share. Hence, only 16% of consumers would say that price is more important than taste and 84% of consumers would say the opposite. However, the probability of considering price more important than peach size will be for 76% of consumers.

3.3. Preference heterogeneity

Table 5 shows the main effect and interaction effect among attributes' importance and gen-

Table 5 - The relative importance of PDO Calanda peaches attributes for different consumers' socioeconomic characteristics.

Attributes	Main effect ¹	Interaction effect			
		Gender	Age	Education	Income
Taste	2.29***	0.27 ^{ns}	-0.61***	-0.54***	0.03 ^{ns}
Ripeness	1.50***	0.04 ^{ns}	-0.14 ^{ns}	-0.31*	-0.23 ^{ns}
Smell	0.64***	0.03 ^{ns}	0.13 ^{ns}	-0.14 ^{ns}	-0.20 ^{ns}
Price	0.34***	0.13 ^{ns}	-0.42**	0.38*	-0.04 ^{ns}
Skin colour	0.32**	-0.21 ^{ns}	-0.42**	0.01 ^{ns}	0.03 ^{ns}
Produced in bags	-1.08***	-0.17 ^{ns}	0.74***	-0.15 ^{ns}	0.57***
Peach size	-0.59***	-0.38***	-0.29*	0.15 ^{ns}	0.07 ^{ns}
Skin fuzziness	-1.60***	0.01 ^{ns}	-0.00 ^{ns}	0.30 ^{ns}	0.16 ^{ns}
Packaging	-2.05***	-0.19 ^{ns}	0.17 ^{ns}	0.28 ^{ns}	0.57***
Number of estimated parameters:					45
Number of observations:					5,056
Final log-likelihood:					-5,841
Consistent Akaike Information Criteria (CAIC)					12,110.4
Adjusted R ² :					27.7%

Note: (1) The sign (***) means that the estimated parameter is statistically different from zero at 1% probability and that parameter without statistical significance is represented by (^{ns}).

der, age, education and income. The main effect represents the preference of a man, younger than 50 years old, with high education level (college) and with high family income (more than 1,500 €/month).

The interaction effects parameters indicate that women give less importance to peach size than men on their purchase decision. Men and women prefer different physical size. In the Focus Group, carried out before the survey, it was mentioned that men are able to eat much larger peaches than women and that people prefer to eat few large pieces instead of many small ones. Hence, peach size is more important for men than for women.

Age influences quality perception of PDO Calanda peaches. Consumers who are older than 51 years old give less importance to taste, price, skin colour and fruit size than other consumers. However, they give more importance to produce them in bags, i.e., to the production system. The survey had no questions about consumers' working experience in the Calanda area. The PDO Calanda peach industry is sensitive to this mar-

ket preference because there were many shops selling peaches in bags.

Education also influences PDO Calanda peaches quality perception. Consumers without college education give less importance to PDO Calanda peaches taste and ripeness, and more importance to price. Similar result is found by Delgado *et al.* (2006) with meat taste perception.

Packaged fresh products are convenient. However, in Spain, consumers know that packaged fruits have higher prices at market place (Cerdeño, 2006). It is also known that low income families are more sensitive to price when they purchase fresh products (Leibtag and Kaufman, 2003). Thus, it is understandable to observe that consumers with low family income give more importance to how PDO Calanda peaches are packaged than for consumers from families with high income.

Table 6 shows consumers preferences with respect to different attitudes toward PDO Calanda peaches. In this model, the main effects parameters represent the average preference of a

Table 6 - The relative importance of PDO Calanda peaches attributes for different consumer attitudes.

<i>Attributes</i>	<i>Main effect</i> ¹	<i>Interaction effect</i> ²	
		<i>Regular</i>	<i>Wouldn't buy another stone fruit</i>
Taste	2.7***	-0.51***	-0.45**
Ripeness	1.7***	-0.39***	-0.23 ^{ns}
Smell	0.79***	-0.26 ^{ns}	-0.03 ^{ns}
Price	0.01 ^{ns}	-0.39**	0.83***
Skin colour	0.42**	-0.46**	-0.11 ^{ns}
Produced in bags	-1.10***	0.42**	0.21 ^{ns}
Peach size	-0.71***	-0.25 ^{ns}	0.03 ^{ns}
Skin fuzziness	-1.09***	-0.19 ^{ns}	-0.31*
Packaging	-1.88***	-0.00 ^{ns}	0.16 ^{ns}
Number of estimated parameters:			27
Number of observations:			5,056
Final log-likelihood:			-5,896.7
Consistent Akaike Information Criteria (CAIC)			12,051
Adjusted R ² :			27.2%

Note: (1) The sign (***) means that the estimated parameter is statistically different from zero at 1% probability and that parameter without statistical significance is represented by (^{ns}). (2) All variables are categorical. The variable regular assumes value 1 if consumer consumes PDO Calanda peaches at least once a week in this season; Loyal has value 1 if consumer would purchase a no stone fruit when PDO Calanda Peach wouldn't be available in the market.

consumer who consumes PDO Calanda peaches regularly and would purchase no stone fruits if PDO Calanda peaches would not be available in the market. This model also shows that taste, ripeness, price and fruit skin colour are more important for sporadic than for regular consumers, but producing peaches in bags is less important on their purchase decision. In order to improve consumption frequency within this group it is advisable to promote DOP Calanda peaches at selling points with the slogans, such as, "ready-to-eat" and "unsurpassable taste".

Results indicate that those consumers who would purchase another stone fruit when PDO Calanda peaches weren't available give more importance to taste and skin fuzziness of PDO Calanda peaches than other consumers. However, price is less important for them. An appropriate market strategy to increase PDO Calanda peaches consumption among them is to improve PDO Calanda peaches convenience, although it

would have higher prices. PDO Calanda peaches could be sold sliced with no skin in special packages, ready to eat.

4. Conclusion

Peach production and consumption has a long tradition in Spain. Peach producers have undertaken special efforts to develop new cultivars to enlarge the productive season as well as to improve fruit appearance. They have also adopted expensive productive techniques in order to improve peaches quality. However, lack of market information about consumers' reactions limits peaches marketing and productive efficiency.

This work deals with consumers' preferences toward PDO Calanda peaches in the city of Zaragoza (Spain). Those peaches are produced with high quality standards and they are certified by the Regulatory Council with a label that can be recognised by consumers. Consumers are

close to the production area so their concerns about local products fully apply.

According to our results, consumers consider that attributes linked to sensory quality are the most important. In order to improve sales, it is advisable to promote peaches at market selling points with messages strengthening that only PDO Calanda peaches guaranty a great taste and smelling experience, and it is harvested at the best maturing moment in order to reach the most appropriate ripeness. There are technical characteristics supervised by the Regulatory Council conducive to reach the optimum levels for those attributes. Consumers should be aware of the technical and marketing controls that PDO Calanda peaches go through to assure differences with other peaches.

However, not all consumers have the same perception. Thus, for old people, who give less importance to taste, it is important to reinforce that PDO Calanda peaches are produced using bags to protect fruits against the Mediterranean fly. Probably old people are also more attached to local products and they take for granted that they are produced following traditional methods. They assume the quality of those peaches and they have greater concern about the local environment and rural development as they understand better the peculiarities and culture behind peaches production in the area. The packaging practice of using only one layer in each box mainly influences this kind of consumers.

There are different market segments for PDO Calanda peaches, which imply possibilities for specific marketing strategies. There is a tendency among consumers to use different commercial channels according to their age and income, so the PDO Calanda peach industry should take account of these results to follow differentiated marketing approaches reinforcing different messages.

Packing is another feature that has economic connotations. Packing is desirable to save time but, in our case, average consumers do not appreciate it. However, high income consumers give more importance to it because its convenience. It is important to point that Spain had an economic crisis at the time the survey was undertaken and consumers were more sensitive about their spending.

Although this work provides good insights about PDO Calanda peaches market, there are some limitations that have to be mentioned. First, sampling was carried out with consumers of PDO Calanda peaches in the city of Zaragoza (Spain). Zaragoza is close to PDO Calanda peaches production area. Probably, if the study was carried out in another further away area, consumers' knowledge and reactions about this specific product would be quite different. Another aspect of sampling is that only PDO Calanda peaches consumers participated in the survey. Although few people said that they didn't consume PDO Calanda peaches, the survey can't make observations about why people do not eat this product.

The Best-Worst method is appropriate to measure attributes importance. It is an easy choice for consumers and it provides a good trade-off among attributes. It performs better discrimination among attributes, which allows determining a priority list of PDO Calanda peaches attributes. Best-Worst models allow estimating efficient empirical models to deal with the preference heterogeneity.

In relation to the research method, Best-Worst model generate information of relative and not the absolute importance of attributes. There are investigations to overcome this limitation. Some people suggest using an anchoring system. It is not difficult to be implemented in the choice task, but there exist difficulty to relate it with purchase intention. More research has to be done in this sense.

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