

BEST- WORST SCALING AND MARKET SEGMENTATION ACCORDING TO ATTRIBUTES OF PDO CALANDA PEACHES

ETIÉNNE GROOT¹

Centre for Agro-Food Research and Technology of Aragón

LUIS MIGUEL ALBISU

Centre for Agro-Food Research and Technology of Aragón

SUMMARY

Calanda is a municipality of province of Zaragoza, Spain. Every year since mid September until beginnings of November Calanda's zone, which aggregate 44 municipalities, produce a famous high quality peach with Protected Denomination of Origin (PDO) "Calanda". To warrant quality would need to be compensated by high price to be sustainable. The aim of this study is to value by Best-Worst scaling which of ten attributes are more important to consumer when they purchase the product and divide the market in behavioural groups using latent class. As main results the most important characteristics of PDO Calanda are, respectively, flavour and ripeness and the least are packing and fuzziness of the skin. Considering family income of respondents price is an important characteristic for 82.4% of them who income is below to 3,000 €/month. When sample was divided by behavioural groups the number of respondent that consider price as an import attribute decreased to 28.6% of sampling but they are more sensible for price.

KEYWORDS

Latent class, choice experiment, consumer behaviour, Zaragoza, attribute impact

¹ *Agro-Food Economics and Natural Resources Unity. Avda. Montañana, 930 – 50059 Zaragoza, egroot@aragon.es and lmalbisu@aragon.es*

1. Introducción

Peaches from Calanda have been recognized for its excellent quality since the XIX century. The Regulatory Council (RC) for the Protected Denomination of Origen (PDO) peaches from Calanda, was set up in 1999, and it controls the fruit production process as well as the quality norms for marketing purposes. Since the beginning, both the registered cultivated area and total production are increasing. In 2006 the registered area was 1,283.00 hectares with an estimated production of about 3,002.35 tons (CRDOMC, 2006) and, in 2008, production increased to 4,419.00 tons (CRDOMC, 2009).

Peaches with this PDO can be found in the market since the beginning of September until the beginning of November, the end of the marketing season for peaches coming from the Northern Hemisphere. According to 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 kg/0.5 cm² and sugar content superior to 12 Brix degree.

The norms also demand the accomplishment of several specific peach production techniques to reach a high fruit quality standard. Maybe, the most relevant techniques for the consumers are the fruit bag production and the “aclareo”. Thus, in June, July and August, farmers wrap peaches with paraffin bags to protect fruits against the Mediterranean Fly (*Ceratitis capitata*). This action implies not using pesticides and more protection for fruits against injuries and it means a greater environmental quality, less exposition to chemical products, no chemical residues on fruits’ skin and better fruit appearance. The “aclareo” consists of removing 70% of all fruits in their initial developing stages with the final aim of having bigger size for the remaining fruits. As consequence, it is lost 40% of the potential productivity and yields diminish from standard amounts of 25 tons/ha to around 15 tons/ha for PDO Calanda peaches (Barbacil, 2004).

In 2004, it was estimated that approximately 100 million bags were used to produce the PDO Calanda peaches and since a person wraps 3 thousand bags per day (Barbacil, 2004), more than 505 persons were working in the field between June and August. From 2004 to 2008 the PDO peach production increased 47.2% and all inputs also increased in similar magnitudes. The bag production and “aclareo” techniques account for 50% of the labour force and represent 25% of agricultural production cost (Mainar, 2006).

The production of PDO peaches has a strong impact on the rural development of the Calanda area. Identifying market segments and the most relevant peach attributes for consumers are very important to produce optimum fruits. In this paper a best-worst analysis has been undertaken to sort out the preferred consumers’ peaches attributes. The work is structured as follows. The next section deals with the methodology Best-Worst scaling and latent class. Third section shows the results, first connecting the socio-demographics characteristics with attributes score and after doing marks about behavioural groups. The last section presents the conclusions.

2. Methodology

2.1. What is and why to use the Best-Worst experiment

The Best-Worst (BW) approach, also known as maximum difference scaling, was developed by professor Louviere and Woodworth as an extension of Thurstone’s random utility theory (RUT). Respondents are invited to choose one most and one least preferred item in each choice set, as proposed in the table 1. This approach avoids some problems presented by others measurements and rating methodologies.

For Likert-type scale consumers need to tick their ratings for each attribute. Some times respondents may have difficulty to use scale categories (e.g. “important”, “very important”) and just delimit the endpoints. Also, across the respondents, understanding meanings of categories may be different. These responses do not provide adequate discriminations among attributes to identify the real consumers’ priorities.

TABLE 1

Example of a BW choice set in an experiment

CARD 1		
LEAST IMPORTANT	CHARACTERISTIC	MOST IMPORTANTE
()	COLOUR	()
(x)	SIZE	()
()	SKIN FUZZINESS	()
()	BAG PRODUCTION	()
()	FLAVOUR	(x)

Source: own elaboration

Studies carried out across countries show that scale usage may be different as responses might be concentrated at different scale ranges, and this consistent human behaviour can be reproduced when respondents move from one country to other. In the case of Zaragoza city, with almost 12.5% foreign population (Ayuntamiento de Zaragoza, 2009), it is very likely to introduce biases when foreigners are part of the respondents. Ranking is another method to evaluate the relative importance of an attribute. The task is relatively easy if the number of attributes is small otherwise, when the number of attributes is large, this task become exhaustive for the respondents. When there are many attributes, the ranking task can be simplified by paired comparisons.

However pair comparisons may get unadvisable with large number of attributes. Assuming n items, the number of possible pairs is $n(n-1)/2$. For example, for 10 items it would be necessary 45 pairs to be compared and with 13 items the number would be 78.

One alternative to solve this problem is to increase the number of alternatives for each comparison or choice set, as it happens in the Best-Worst methodology. In this case each choice set might include more than three alternatives, which decreases considerably the number of total comparisons or choice sets. Other advantages are better discrimination among alternatives, which overcomes the usage limitations and misinterpretation of scales.

The Best-Worst methodology has been recently used in the social sciences as well as in food and health care analyses. Cohen (2009) valued the influence of thirteen wine attributes on consumers' perceptions on wine quality. Auger et al. (2007) used Best-Worst scale to examine the consumers' attitude toward ethical products in six countries. Vick and Scott (1998) measured the relative value to patients of various attributes of general practical consultation and Flynn et al. (2006) studied the patient's preferences between quality of care and waiting time.

2.2. Latent class

Latent class analysis, through the evaluation of respondent's utility finds groups of respondents with similar preferences. In contrast with a cluster analysis, respondents are not assigned to different segments in a discrete manner, but by the probability of them belong to this segment.

The basic latent class estimation process works is: first, select random estimates of each group's utility values; with these values, the second step is to estimate the relative probability of each respondent belonging to each group by his/her data set. The third step is to value log weights for each group using the individual probabilities as weights. The second and third steps repeat until the log-likelihood fails

to improve by more than small amount (Sawtooth, 2007). This repetition is called interactions and in this analysis were calculated 100 interactions.

2.3. Survey and data

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

The 25th of September 2008, a focus group experiment was performed with employees at the Mediterranean Agronomic Institute of Zaragoza. The group had 9 persons with a homogeneous education level and ages varying between 40 and 55 years old. From the 20th of August until the 9th September, in 2008, 7 managers from 4 different establishments at Zaragoza retail chains were interviewed. On average, they spent 30 minutes answering 11 questions about the quality characteristics of PDO Calanda peaches.

The main results of this section were that PDO Calanda peaches are considered late season fruits, of big size and high prices. The two most important organoleptic features are the flavour and the smell. The big size of the fruit was interpreted as a good characteristic for some participants because they can satisfy their hunger with just one piece of fruit. Others think that they were not able to eat such a big fruit on their own and they would prefer to share it with another person. For both groups a very small fruit (less than 73 mm of diameter) is considered as low quality product.

In their opinion peaches with PDO are 30 to 80% more expensive than similar peaches without PDO. The first figure is similar to findings reported by Polo (2007), as 40% of wholesalers dealing with PDO Calanda peaches thought that they had prices 20% greater than the same peaches without the PDO.

Ripeness was also stated as an important factor on consumers' decisions. If they would like to stock the fruit for a longer time they would buy more unripe peach but for immediate consumption they prefer a ripened peach. Ripeness cues are colour, texture and smell.

According to Wolf *et al.* (2003), Florkowski *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 misevaluate ripeness and they get later on disappointed with the fruit taste. Texture is one indicator to know if peaches are or are not ready to eat (Crisosto, 2006; Crisosto *et al.*, 2003) but, apparently, it is not considered when the consumers purchase peaches.

Enterprises are concerned about having 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, 2001; Nerín, 2008; Akbudak and Eris, 2003; Malakou, 2005; Wang *et al.*, 2004). The introduction of new developments to increase the maturing and stocking period has some negative effects on the fruit condition which losses freshness and appearance. Wrapping as well prevents consumers from touching and smelling the fruit before buying it, which are usual practices quite valued by many consumers.

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, essentially for the young people, nectarines are gaining market share from peaches because the advantage of having smooth skin.

At the end, 10 attributes have been selected: flavour (1), colour (2), price (3), bag production practice (4), smell (5), size (6), packing (7), ripeness stage (8), skin fuzziness (9) and texture (10). After choosing which items or attributes are relevant to analyze, it is required to determine the number of times each attribute will be presented to respondents, the number of items per choice set and the number of choice sets.

Orme (2005), employing a choice computer simulation, determined that the hit relative index increases proportionally to the numbers of items per choice set, although the minimum number is three items with best-worst analyses, when the numbers of choice set increase and with the times that each attribute is presented to respondents. If one attribute is shown more than 5 times to the respondent the effect on the hit relative index is low, and it is recommended that an attribute should be repeated from 3 to 5 times in the choice sets.

The number of items per choice set must be less than half of total attributes. Otherwise results in lower precision for items of middle importance preference (Orme, 2005). Orme (2005) recommends using 5 items, because 5 items per choice set give much more information than 3 and the hit relative index increase is small, when the number of items changes from 5 to 7 items. Chrazn and Patterson (2006) considered the time employed giving the answers by respondents as a proxy of cognitive effort, and they advised using 4 or 5 items per choice set. For them it was preferable to have 20 choices sets, with 4 items each one, than 15 with 7 items.

In this paper the total number of attributes is 10, repeating 4 times each one, and choice sets include 5 items, so the total number of choice sets is 8 ($10 \times 4 / 5$). It can be considered as a small task and it does not demand a hard effort for the respondents. The next step of the choice experiment design was the distribution of the attributes though choice sets.

The software “Sawtooth MaxDiff Designer” was used to do simulations with different combinations of the attributes to get 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 first, second, ..., fifth 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 but not two-way frequency balanced (when one-way and two-way frequencies are balanced it is called orthogonality) and with a positional frequency mean of 0.8 and standard deviation of 0.4. Latent class methods do not require orthogonality to get unbiased parameters' estimates (Orme, 2006).

TABLE 2

Distribution of 10 attributes in the choice set experiment

Choice set	Attribute position				
	1 st	2 nd	3 rd	4 th	5 th
1	2	6	9	4	1
2	6	3	10	5	8
3	8	4	1	10	7
4	5	9	3	8	4
5	9	8	2	6	10
6	1	7	6	3	2
7	7	10	5	2	9
8	3	1	4	7	5

Source: own elaboration

In the questionnaire, besides the best-worst design, there are questions about PDO Calanda peaches related to consumption habits, storage, where they buy the peaches, competitive fruits, perception of risk, PDO peaches benefits, skill to identify ripe peaches, ethnocentrism and socioeconomic data.

Consumption habits questions tried to distinguish between occasional and usual consumers, if they eat peaches since their child and how they behave when the fruit is too big.

The period and storage facilities were asked to check the hypothesis that people who have the fruit for a longer time in their house they also give more importance to ripeness and packing.

The place where respondents buy PDO Calanda peaches can give information about shopping behaviour and if they prefer more or less personal purchasing or they have less time to go to retail chains and may be related to their skills to identify a good ripened fruit.

Knowledge about other substitute fruits, which the consumer buys when there are not PDO peaches in the market, is a good proxy variable to value brand consumer loyalty. If a person buys a peach without PDO he would be considered less loyal than one who would buy a nectarine and both of them would be less loyal than another who would prefer an orange or an apple.

Two questions were introduced in the questionnaire to value the perception of risk. The first one is about the respondent feelings when other people touch the fruits without gloves. The second question is guided to the consumers who state, in the first question, that they have objections to those practices. They were asked if they still had objections if other people were wearing gloves to handle the fruits. The interpretation of these questions is that when people don't have objections they have a low risk perception. If objections are high, in the first question, but their attitudes were different in the second question then this person is only worried about product damages. Those who have high objections in both situations probably are worried about their health by possible contamination from dirty hands.

The data was collected in two hypermarkets, in Zaragoza city, between the 30th of October and the 8th of November, which puts an end to PDO peaches season. The period was chosen because the consumers were more familiar with present PDO peaches at markets and so they could perform a better product valuation. Each respondent got one kilogram of peaches with PDO Calanda to compensate his collaboration.

3. Results

Table 3 shows the number of responses and their socio-demographic characteristics in both hypermarkets. In total, there are 318 answers, of which women represent 59.1% of sample. Both sexes have a similar proportion of age and education level. However a greater proportion of respondents are female belonging to family with income between 1,500 and 3,000 euros. Another difference across gender is their activity, women work more inside and partially outside home than men.

The activity is linked also with the age, people who are 65 years old or more are retired and have their activity at home. This segment of people has lower family income and less education level, representing a great part of elementary education.

The impact value of each attribute was calculated first by the software Sawtooth Latent Class considering just one behavioral group in the sample. The parameters of most important (best) – least important (worst) scores are calculated by Multinomial Logit Model (MNL) and the texture received the score of zero. Even the results were getting by different way than traditional best-worst scaling, the interpretation is the same. As each attribute appear 4 times to the respondent in the questionnaire, its range values vary from -4 to +4. A positive value means that the attribute was chosen more often as most important than least ($B - W > 0$) and if the value is +4 implies that it always was the most important option for all the choice sets.

TABLE 3

Respondent's socio-demographics characteristics

Gender	Age (n° of persons)		
	<=30	>30 and <=50	>50
Male	18	60	52
Female	32	87	69
Gender	Education level (n° of persons)		
	Elemental	Medium	University
Male	33	54	43
Female	54	77	57
Gender	Income (n° of persons)		
	<=1500 euros	>1500 and <=3000	>3000
Male	48	57	25
Female	60	97	31
Gender	Activity (n° of persons)		
	Inside	Outside partially	Outside full
Male	45	12	73
Female	80	25	83

Source: own elaboration

The parameters or the importance score of each attribute of peaches with PDO Calanda is presented in figure 1a. There is possible to see that the most important attribute is “flavour” and it is followed by “ripeness”, “smell” and “price”. And “packing”, “fuzziness”, “size” and “bag production” were stated, respectively, as least important quality. The middle scaled attributes (“texture” and “colour”) were not chosen very often and have index around zero.

These values converge to the results of Uva et al. (2004) who checked that consumers consider the most important feature of peaches the flavour. In that case consumers linked good ripeness to good taste, what bring out the flavour importance.

When attributes are compared by gender (figure 1b) the ranking order doesn't change in relation to general data. The women have a more extreme positioning because they give higher weigh to the most and least important. Just for fuzziness, that is a no important feature, women give more importance than men.

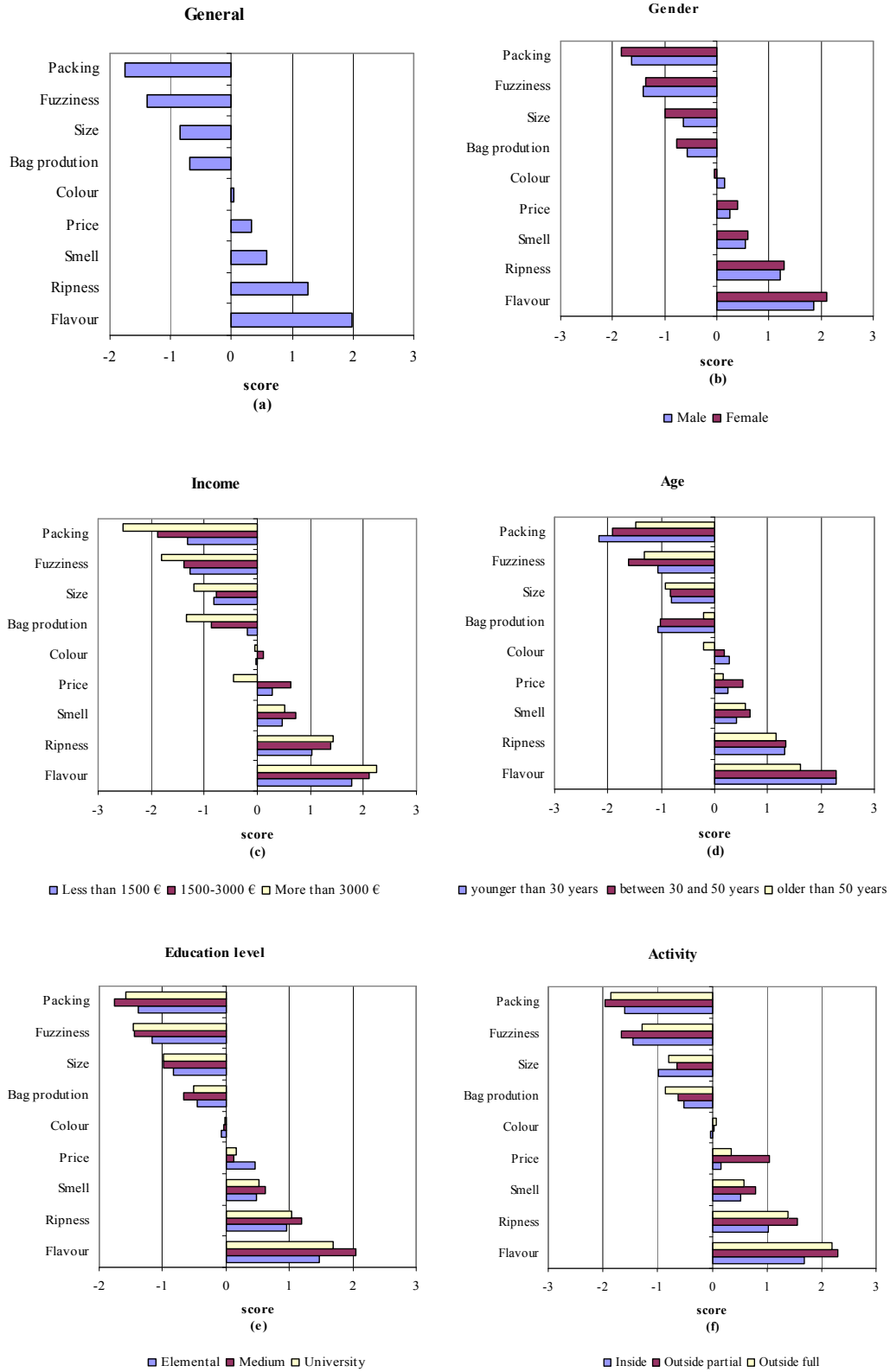
The family income influence the attributes score (figure 1c). Only 17.6% of respondents who are from families with incomes over 3,000 euros per month, stated price more often as the least important attributes than the most and other respondents stated opposite.

The income is also affecting the packing score. Packaged fruits save time to purchase because consumers avoid taking line to weigh the fruit but are more expensive. According to the economic point of view, people with higher time opportunity cost would rather packaged fruit but in this case it doesn't happen with richer people, probably because, they don't consider price an important attribute. May be the lower income families consider packing more important than others because they have an opportunity to save money buying bulk peaches.

The peach size is more important to families with an income lower than 3,000 euros. Even large fruit size is a desirable quality, may be these families are considering small fruits more convenient because with fewer kilos they can offer peaches for all family.

Figure 1

Attribute importance by using Best-Worst scaling



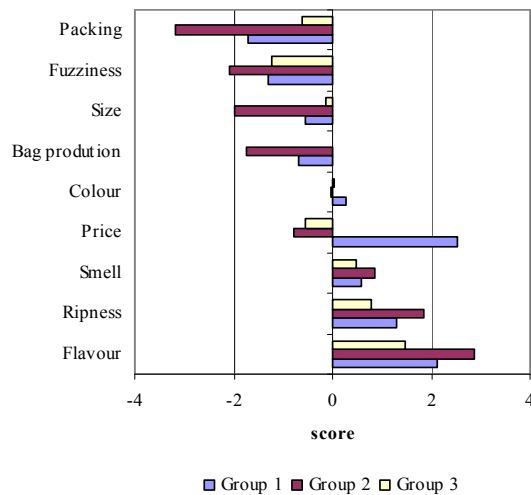
Source: Owen elaboration

Age affects packing score as well bag production (figure 1d). People who are older than 50 years old give much more importance to bag production than younger. Given that older people have a stronger country filing and have more knowledge about the benefits of bag production (less chemical contamination and more protection against injuries) they consider it more important.

Figure 1.e shows the attributes score by the respondent education level. The ranking order of the attributes doesn't change in relation to general estimation. Elemental education consider price more important than people with upper education level. A possible explanation is by their incomes which are lower.

Figure 2

Three market segment behavior



Source: Owen elaboration

Respondent activity has also influence in the attribute score (figure 1.f). People who only have inside activity (retired and homemaker) have a similar ranking than people from general sample. However, persons with a partial activity in home consider price more important than other respondents. Again the possible explanation is the income. Families with persons working partially outside have less economic sources and so they can get more sensitive to prices.

TABLE 4

Respondent's groups characteristics

Characteristics	Percentage		
	Group 1	Group 2	Group 3
(AGE)			
Less than 30 years	11,0	18,9	15,5
Between 30 and 50 years	38,5	49,0	50,0
More than 50 years	50,5	32,2	34,5
(INCOME)			
< 1500 euros	46,2	26,6	33,3
1500 - 3000 euros	44,0	46,9	56,0
> 3000 euros	9,9	26,6	10,7

Source: Owen elaboration

The second step of the analysis is the estimation of attribute impact by latent class estimation. For an easier interpretation it was considered three behavioural groups (figure 2). Table 4 provides a description, by age and income, of components of each group. Group 1 is made up for oldest people and the family income is lower than in the other two groups. Between group 2 and 3 the age are similar but group 2 has a greatest proportion of people from higher family income.

The group 1 is formed by 91 respondents (28.6% of sample) they consider price as the most important attribute. This evidence converges to the same direction that previous graphics in which economic factor determine the price impact. The second group is the largest with 143 respondents (71.4% of sample) and they could be considered as the less worried by price and confer more extreme scores to the PDO peaches attributes. Size is an attribute few important to the components of second group.

If compared with group 3, group 2 has a similar preference ordering to positive scored attributes and price. Although, for them fruit size and packing are two important attributes when compared to group 3 preferences. As said before, these groups have the income as the main difference and it may explain why they give unequal weights to the attributes.

4. Conclusions

Aragon has demographics problems, especially in the rural area. PDO products have a strong regional influence by promoting the regional economy and it might mitigate this imbalance. Peaches with PDO Calanda have high quality and it is guaranteed to consumers by its norms and Regulatory Council inspections.

The fruits are big size, good appearance and flavour and such characteristics may provide greater prices to the product, which was checked by Polo (2007) at wholesalers' level. Until now no information was get at consumers' levels and we wish this paper can contribute for that.

In October were get 318 valid questionnaire in two hypermarkets of Zaragoza. The main aim is to value the impact of ten attributes when consumer is purchasing PDO peaches and identify markets segments by socio-demographic characteristic of respondent and by behavioural groups. To reach to the objectives we used Best-Worst scaling and Latent Class analysis.

Best-Worst task showed to be a good toll do state the attributes importance. Flavour, ripeness, smell and price were, respectively, the most important attributes and have a positive score (they were stated more often as important attributes than least). The least important attribute is packing, followed by fuzziness, size and bag production. Attributes like texture and colour are medium important, receiving few statements or equally often as most and least important.

The family income has relation to price impact. A large part of the sampling (82.4%), which get less than 3,000 euros per month, consider price an important attribute. This sign maintain in others comparisons. In latent class analysis the group with lowest income responded to price as the most important attribute, but these kinds of consumers represent 28.8% of total sample.

Respondent age is linked to family income, for oldest people lowest income. It cans say why they give importance to price. Another peach feature that has relation to economics restrictions is the packing. Even desirable when one want save time, where higher time opportunity cost should increase the packing importance. However, it doesn't happen. Perhaps the main cause is that persons with lower incomes give more importance to them because they see an opportunity to save money when they chose a chipper type of packing.

Acknowledgements

This project has been support by INIA project, PET 2007-09_C5, financed with FEDER founds.

References

- Auger, P.; Devinney, T.M. and Louviere, J.J. (2007). "Using Best-Worst scaling methodology to investigate consumer ethical beliefs across countries", *Journal of Business Ethics*, nº 70, pgs. 299 – 326.
- Ayuntamiento de Zaragoza, 2009. "Población extranjera: 1 de enero del 2008", *Zaragoza en Cifras*.
<http://www.zaragoza.es/contenidos/estadistica/11/Cifras11.pdf>.
- Akbudak, B. and Eris, A. (2004). "Physical and chemical changes in peaches and nectarines during the modified atmosphere storage", *Food Control*, nº 15, pgs. 307 – 313.
- Barbacil, J. (2004). *El melocotón de calanda*, Prensa Diaria Aragonesa, pgs. 1-148.

- Cohen, E. (2009). "Applying best-worst scaling to wine marketing", *International Journal of Wine Business Research*, vol. 21, nº1, pgs. 8-23.
- Chrzan, K. and Patterson, M. (2006). "Testing for the optimal number of attributes in MaxDiff questions". *Sawtooth Software Research Paper Series*.
- Consejo Regulador DO Melocotón de Calanda (CRDOMC, 2006). Informe campaña 2006. Información no publicada.
- Consejo Regulador DO Melocotón de Calanda (CRDOMC, 2009). Récord de volumen en la campaña del "Melocotón de Calanda". http://www.melocotondecandalanda.com/respuesta_busqueda_noticias.php
- Crisosto, C.H.; Crisosto, G. and Bowerman (2003). "Understanding consumer acceptance of peach, nectarine and plum", *Acta horticulturae*, nº 604, pgs.115-119.
- Crisosto, C.H (2006). "Peach quality and postharvest technology", *Acta horticulturae*, nº 713, pgs. 479 – 486.
- Florkowsky, W.; Park, T. and Bilgic, A. (2003). "External and internal index in fresh peach marketing", *Acta Horticulturae*, nº 604, pgs. 219 – 224.
- Flynn, T.N.; Louviere, J.J.; Peters, T.J. and Coast, J. (2006). Best-Worst scaling: What it can do for health care research and how to do it, Sensoc working paper, nº 06-001.
- Mainar, M.A. (2006). "Calanda en una bolsa", *Surcos de Aragón*, nº 99, pgs. 40-43.
- Malakou, A. (2005). "A combination of hot water treatment and modified atmosphere parking maintains quality of advanced maturity 'Caldesi 2000' nectarines and 'Royal Glory' peaches", *Postharvest Biology and Technology*, nº 38, pgs.106 – 114.
- Nerón, C. (2008). "Desarrollo de envases activos que prolonguen el tiempo de vida útil del melocotón de Calanda en condiciones de calidad", Informe primer año Proyecto INIA – Plan Teruel, Mejora del Melocotón de Calanda, subproyecto 08. Not published.
- Orme, B. (2005). "Accuracy of HB estimation in MaxDiff experiments", *Sawtooth Software Research Paper Series*.
- Orme, B. (2006). *MaxDiff Designer v2*, Sawtooth Software, Inc. Sequim, WA.
- Oria, R. (2001). *Mantenimiento postcosecha de la calidad del Melocotón de Calanda*. Dirección General de Tecnología Agraria. Informaciones técnicas, nº 96, pgs. 20.
- Polo, M. C. (2007). *La comercialización del melocotón de Denominación de Origen Calanda*, Tesis de Master IAMZ (Instituto Agronómico Mediterráneo de Zaragoza).
- Predieri, S.; Ragazzini, P.; and Rondelli, R. (2006). "Sensory evaluation and peach quality", *Acta Horticulturae*, nº 713, pgs. 429 – 434.
- Sawtooth, (2007). *Latent Class v4: Software for latent class estimation for CBC data*. Sawtooth Software, Inc. Sequim, WA.
- Uva, W.-F.; Cuellar, S. and Cheng, M.L. (2004). "Consumer preferences and marketing opportunities for "Tree-repened peaches" in New York State". Department of Applied Economics and Management, College of Agriculture and life Sciences. Cornell University, working paper nº BR 2004 – 10.
- Vick, S. and Scott A. (1998). "Agency in health care. Examining patients' preferences for attributes of the doctor – patient relationship", *Journal of Health Economics*, nº 17, pgs. 587 – 605.
- Wang, Y.S.; Tian, S.P. and Xu, Y. (2005). "Effects high oxygen concentration on pro- and anti-oxidant enzymes in peach fruits during postharvest periods", *Food Chemistry*, vol. 91, pgs. 99 – 104.
- Wolf, M.; Martin, A. and Cagianut, T. (2003). "An analysis of the importance of ripeness to consumers in the United States when making a purchase decision of peaches, plums and nectarines", *Acta horticulturae*, nº 604, pgs. 61-65.