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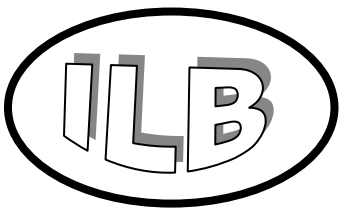

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The Overall Significance of Attributes and Attributes' Levels on Fresh Fruit Choice

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Abstract

Fresh fruits are always recommended as ingredients in healthiest diets. However, there is a tendency for consumers to move their consumption towards transformed fruits, which are integrated in many food products. Quite commonly fresh fruits are difficult to handle and store but they also do not have regular quality when they reach consumers. There are many other elements besides the physical characteristics, which are very important for consumers, and they can be promoted through marketing actions. It is very important to understand why consumers make elections of fresh fruits in order to increase their consumption. The aim of this study is to understand how consumers make their purchasing choices based on the most important peaches' attributes and levels.

In Spain there are 20 fruits with the Protected Designation of Origin (PDO) label. Among those PDOs, only one brand certifies the peaches' origin and it is called "Calanda Peaches". This fruit has been selected to test several hypotheses about consumers' fruits choice. The survey collects information from questionnaires applied to PDO Calanda peaches` consumers that were attending two hypermarkets in Zaragoza city, in 2009. An attribute-level best-worst experiment was undertaken, respondents stated the most and the least important characteristic in their purchasing. Each characteristic, or alternative, is an attribute associated to a level of that attribute. In our case, nine hypothetical products were presented from different combinations of 4 attributes, with 3 levels in each attribute, (price: 1.2 €/kg, 2.4 €/kg and 3.6 €/kg; origin: PDO Calanda, non PDO Calanda and non Calanda; packaging: bulk, conventional packaging and active packaging; and fruit size: small, medium and big) to allow main effects estimation.

Data were analysed using Weighted Least Squares (WLS) by in Best-Worst Paired (BWP) and Best-Worst Marginal (BWM) methods. Both models allow the attribute and attribute's levels impact estimation on consumer purchase decision. They also have similar measurement properties, but as Paired models have more observations per respondent, they present smaller standard errors. Results show that both models have good performance. Consumers give different weights to the attributes when they buy peaches. There is an overriding influence of the origin especially for the attribute-level Calanda in comparison with the rest.

Keyword: *peaches, Protected Designation of Origin (PDO), consumer behaviour, market segments, attribute levels best-worst experiment*

1 Introduction

It is known that regular fresh fruit consumption helps to have good health and it increases consumers' welfare. Fresh fruit consumption is not increasing in Europe and it is, in some countries, even falling. One of the reasons may be that the offer does not fit consumers' expectations. Understanding which factors drive fruit consumption and purchasing how provide important elements to design public health policies and more accurate market strategies.

Increasing fruit consumption is not an easy task because there is a great variability on consumers' behaviour. Fruit consumption is strongly linked to local culture and habits although, in a global world, more information and products from many others are available for consumers. All sort of interactions achieve a great degree of complexity and dynamism.

Nowadays, besides having a high intrinsic quality product that consumers want, products should be environmentally friendly and with more socially fair productive practices. Consumers desire products from sustainable systems coming from farms that maintain the

environmental standards on acceptable levels. Socially fair products are those that the trading price should guaranty reasonable farmers' welfare levels.
The peaches` origin explains purchasing behaviour. Fuller *et al.* (1990) found that consumers prefer peaches coming from closer production areas than from other origins. Consumers believe that peaches should be fresher because their short traveling. Crochon (1985) found that consumers, based on their experiences, know that long traveling peaches must be harvested earlier and, as they are not ripened enough, it can influence negatively their taste. Thus, informing about fruits' origins and guaranteeing a minimum taste satisfaction may represent a good marketing tool. In Spain, there are 288 Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) food products and 20 of them are fruits. Calanda peaches are the only and first PDO for peaches in Spain.
In this study, we estimate consumers preference for PDO Calanda peaches quality in Zaragoza City (Spain) using the Best-Worst Paired (BWP) model and Best-Worst Marginal (BWM) model. We also compare welfare estimates of models, at sample and sub-sample levels (market segments) and measure the relative attribute impacts and attributes` levels utilities on consumer buying decisions.
The rest of this paper is organized as follows: in Section 2, the background of the study is described; in Section 3, the analytical framework and experimental design are introduced; results are presented and discussed in Section 4; and finally, Section 5 summarizes our findings and presents some product marketing recommendations.

2 Peaches with Protected Designation of Origin (PDO) Calanda

Peaches from Calanda have been recognized for their excellent quality since the XIX century. The Regulatory Council (RC) for the Protected Denomination of Origin (PDO) Calanda peaches 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 have been increasing. In 2006 the registered area was 1,283 ha with an estimated production of about 3,002 tons and it reached 5,298 tons in 2009 (CRDOMC, 2009).
Peaches with PDO Calanda 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 coming from the Northern Hemisphere. According to the specified norms, those fruits must be produced by three clones (Jesta, Evaisa and Calante), and they 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 cm^2 and sugar content superior to 12 Brix degree.
The norms also demand the accomplishment of several specific peach production techniques to reach high fruit quality standards. Maybe, the most relevant techniques for 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, more protection for fruits against injuries, greater environmental quality, less exposure 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 a consequence, it is lost 40% of the potential productivity and lower yields from standard amounts of 25 tons/ha to around 15 tons/ha (Barbacil, 2004).
In 2004, it was estimated that approximately 100 million bags were used to produce PDO Calanda peaches. A person approximately wraps 3.000 bags per day (Barbacil, 2004), so 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).
Polo (2007) carried out a study about the commercialization of PDO Calanda peaches in Spain. According to this study, 90% of wholesalers involved with PDO Calanda peaches commercialization recognized that these peaches had higher prices in relation to similar products (with the same quality but without the PDO brand); 40% of wholesalers stated that the price difference was greater than 20%. She also detected that other peaches coming from the area were selling with the PDO Calanda peaches brand.
In summary, growers in Calanda area have a large experience about peaches production and they make a big effort to produce high quality fruits. More than a decade ago they got together to produce the first Spanish PDO peaches to guarantee a minimum standard quality and to make a good use of their reputation.

3 Best-worst experiment

3.1 Theoretical framework

In the beginning of the 90’s, Finn and Louviere (1992) proposed a choice experiment with which respondents should state the best or most important and the worst or least important alternatives of a choice set with more than three options. This experiment is known as *best-worst* or *maxdiff* experiment. The term *maxdiff* is employed because consumers compare all pairs of alternatives and choose that one which maximizes the utility difference. More formally can be expressed with the equation 3.1.

$$Y_{qc,bw} = U_{qcb} - U_{qcw} + \varepsilon_{qc,bw} \text{ for } b,w = 1,...,K \text{ y } b \neq w \quad (3.1)$$

Where the alternatives’ pair, *b* and *w*, are respectively the best and the worst options for person *q*, in choice set *c*, if and only if all others pairs of alternatives combinations (*u,v*) have smaller utility differences, that is $Y_{qc,bw} > Y_{qc,uv}$. This experiment takes advantages of the persons’ propensity to identify and respond more consistently to extreme options.
There are several other advantages to use best-worst experiments that are: if it is compared with single choice tasks (picking just one option), best-worst contains greater information amount about the person ranking options and it seems to be an easy task to people.
According to Flynn *et al.* (2007), there are three types of best-worst choice experiments. One includes asking to consumers the most or best and the least or worst important attributes on their buy decision (Auger, *et al.*, 2007; Cohen, 2009; Muller and Rungie, 2009). This kind of experiments measure the attribute importance or impact – defined as the average utility across attribute levels – on consumers buying decision. It is also used to avoid scale bias, to provide a good discrimination among alternatives and to segment markets by consumers’ choice behavior.
The second best-worst choice experiment is called multiattributes best-worst experiment. In this case each alternative is a hypothetical product that results of different attributes` levels combination. Commonly papers aim to explore the ranking options and determine consumers` ability to answering tasks (Scarpa *et al*. 2009) or individual decision makers modeling (Lancsar and Louviere, 2008; Islam, 2008; Louviere *et al.*, 2009).
The last best-worst choice experiment is known as attribute-level best-worst experiment, or attribute level *maxdiff* experiment. It allows the researcher to measure in a same scaling the

attributes impacts and the attributes` levels utility on purchasing Flynn *et al.* (2007). The contrast between attribute-level and multiattribute best-worst experiments, provides not only the possibility to know about how much the level of an attribute shifts purchasing (for example, how much consumer utility changes if one offers green bananas or yellow), but also provides good known of how important attributes are on consumer purchasing (for example, the magnitude of importance – at same time its ranking – that colour has in relation to the banana's origin, size, etc.).
This kind of information is important because there are many choice experiments where attributes' levels are not statistically significant. Not statistically significant attributes' levels do not mean that there are not important on consumers buying decision, but it should be interpreted that consumers do not distinguish the utility among attribute's levels (Flynn *et al.,* 2007).

3.2 Survey and Experimental design

Four peaches' attributes were selected based on the literature review about fruit quality and market tendencies, a focus group, some interviews with fruit and vegetable section managers of three retails distribution chains in Zaragoza and local market monitoring. Those attributes were product origin, type of packing, peach size and price. Three levels were also considered for each attribute. They are listed on table 1.
The experiment includes two different types of packing, one normal and other active. Respondents were informed that active packing does not imply health effects and it allows keeping stocks 12 days more than with no active packing.

Table 1. Attributes and their levels employed in the experiment

Attribute	Level	Attribute	Level
Origin	From Calanda with PDO	Size	Small
	From Calanda without PDO		Medium
	Other areas without PDO		Big
Packing	Active packing	Price	1.5 €/kg
	No active packing		2.5 €/kg
	Bulk		3.5 €/kg

Source: own elaboration

Effect code was employed to analyze the attribute impact and the attribute levels utility. The reference level for the origin is peaches "from Calanda without PDO". Then the estimated parameter of the level: "from Calanda with PDO" represents the utility, or disutility, that consumer would have if he would change a peach from Calanda without PDO by one from Calanda with PDO. It means how much consumers value the guarantee of peaches with controlled quality linked to the PDO brand. And the difference between parameters of peaches "from Calanda without PDO" and those "produced in other areas" assesses how much consumers value the production of peaches coming from Calanda, but without the guarantees associated to the PDO brand.
Different peaches' sizes were shown to respondents in the experiment. The weight of a small peach was about 160 g, a medium size was around 250 g and a big one was around 380 g. The first weight corresponds to a peach that would be refused by the PDO norms. The second is the minimum peach size accepted by the PDO norms and the largest represents a size that nobody would be able to eat at once. Normally, bigger peaches are related to higher quality,

and moreover there was a market segment that valued positively larger peaches up to the moment of satiating their eating capacity.

The attributes and their levels were distributed based on an orthogonal main effect plan (OMEP), as suggested by Flynn *et al.* (2007). The OMEP provides $2\sum_{i=1}^{K-1}\left\lfloor L_i \sum_{k=i+1}^{K} L_k \right\rfloor$ pairs of alternative combinations – in our case, there are 108 pairs of alternatives combinations and $2\sum_{k=1}^{K} L_k$ alternatives combinations – in this case 24 alternatives, which are necessary to attribute-level *maxdiff* experiment analysis. The attributes levels combinations were expanded from the web site: http://research.att.com/~njas/oadir/, as proposed by those authors.

A balanced design was achieved. When each attribute level appears equally often in the experiment, the experimental is balanced and it does not need to carry weighting corrections to estimate parameters. All consumers answered questionnaires with 9 choice sets and each choice set is a hypothetical peach. They decided which alternative (attribute level) was the most and the least important to justify their purchasing behaviour.

Table 2 shows an example of choice set or hypothetical peach. In this example a consumer decides that the most important aspect that would make him buying this peach would be its origin: from Calanda, and the least important characteristic would be the active packing. Note that he is stating the attribute and the attribute level at same time.

Table 2. An example of a choice set

Least important	Peach 3	Most important
	Low price (1.2 €/kg)	
	From Calanda, and **without** a PDO	X
X	**Active** packing	
	Medium size	

Source: own elaboration

When the questionnaire was ready, it was applied face to face interviews to PDO Calanda peaches` consumers and they spent around 20 minutes to answer the questionnaire. The final the survey included four blocks of questions, one rating task with thirteen evaluations about peaches size, PDO Calanda peaches satisfaction and packing liking, second was an exercise with allocation task that results are not presented in this paper, third was an attribute-level best-worst choice experiment and in the last bock there are socio demographic questions. This information is used to draw different market segments.

The sampling was undertaken in two hypermarkets at Zaragoza city. The data collection started in the middle of PDO Calanda peaches commercial season, that is, from the beginning to the ended of October in 2009. This period was suggested in order that consumers could have enough time to familiarize with PDO Calanda peaches market prices and quality, so they could express their preferences more consistently with reality.

3.3 Empirical model

There are two options to analyze attribute – level maxdiff experiments survey at different levels. At sample level, estimations are performed by weight least squares (WLS) estimations and multinomial logit (MNL) estimations are employed at individual level. In both cases Paired and Marginal models are used (Flynn *et al.,* 2007). Equation 3.3.1 shows the dependent and independent variables of paired model, and equation 3.3.2 for marginal models, that were estimated in this study by WLS.

$$\begin{aligned}\ln(f) &= cnst + \beta_1 price + \beta_2 origin + \beta_3 size \\ &+ \beta_{11} low\_price + \beta_{12} high\_price \\ &+ \beta_{21} from\_Calanda\_with\_PDO + \beta_{23} other\_place \\ &+ \beta_{31} small\_size + \beta_{33} big\_size \\ &+ \beta_{41} bulk + \beta_{43} active\_packing\end{aligned} \tag{3.3.1}$$

$$\begin{aligned}\ln(g) &= cnst + bw\_indic + \beta_1 price + \beta_2 origin + \beta_3 size \\ &+ \beta_{11} low\_price + \beta_{12} high\_price \\ &+ \beta_{21} from\_Calanda\_with\_PDO + \beta_{23} other\_place \\ &+ \beta_{31} small\_size + \beta_{33} big\_size \\ &+ \beta_{41} bulk + \beta_{43} active\_packing\end{aligned} \tag{3.3.2}$$

For paired model the dependent variable (f) is the number of time that one particular pair of alternative (attribute level) combination was selected across the entire sampling plus a constant (0.058824). This sum was necessary because there was possibility that a particular alternative combination would never be chosen. So, suggestions of Goodman (1968) to avoid problems with natural logs then it were followed. The same sum for marginal model dependent variable (g) was done; ($const$) is the constant term; in the marginal model statistically significant constant β_{bw} means that there are differences between the distribution of stating the best and the distribution of the worst options, the β_ks are the attributes weights and β_{kl} is the utility ($\beta_{kl} > 0$) or disutility ($\beta_{kl} < 0$) of moving from the reference attribute level to other level. To avoid saturated models, (*K – 1*) attributes parameters are estimated and (*L – 1*) attributes' levels of parameters for each attribute.

The independent variables matrixes were coded with effect code as suggested by Flynn *et al.* (2007). In both models the attribute value was 1 if it was the best option, -1 when it was the worst option and 0 (zero) if it was not there. This role is the opposite (-1 to best and 1 to worst) only for the reference attribute's level. The advantage of using effect code is that they are correlated within attributes but are uncorrelated with the grand mean, unlike Dummy variables (Louviere *et al.*, 2000).

The same matrix is proposed by Flynn *et al.* (2007) for probit regression models. However, the dependent variable is an indicator variable. For paired models, it takes value one when the pair of alternative is chosen, and for marginals model it takes value one when attribute level is chosen, and zero otherwise. The maximum likelihood estimations are required to make estimations below the sample level which allows having a better explanatory data, such as: socio-demographic characteristics or behavioral information. The formal demonstration

of maximum likelihood estimations on attribute levels *maxdiff* experiment can be found in Marley *et al.* (2008).

4 Results

4.1 Sample profile

The first question of the questionnaire asked respondents if they had consumed PDO Calanda peaches in the least two years. It was a control question and the aim was to interview only respondents who somehow knew the product.
The table 4.1 shows that in both hypermarkets, Carrefour Actur and Augusta, there was the same size is 106 consumers, totalizing 212 interviews. Lancsar *et al.* (2007) mentioned that Coast *et al.* (2006) and Szeinbach *et al.* (1999) had good results with less than 100 interviews and they suggest, that for explanatory studies, it should be 150 interviews and. Larger samples are sufficient to guarantee that the experiment is consistent with the properties of BW of attribute level approach.
The sample in Carrefour Actur has a similar proportion of men (46.2%) than women (53.8%), with similar age (men are 58 years old and women 57 years old) and, on average, are 57.6 years old. In the Carrefour Augusta sample there are more women (67.9%) than men (32.1%), with different ages (women are 46.5 years old and men 61 years old), ensuing in average age about 51 years old.
Table 3 also shows that, when comparing the Zaragoza city census data with sample data, the gender proportions in Carrefour Actur sample is more similar to Zaragoza city population and the Carrefour Augusta sample is more similar to Zaragoza population with respect to age. On average, consumers of total sample can be considered older than Zaragoza city population. It does not represent a limitation because, according to MAPA (2006) data, fruit consumption at home increases with the Spanish housewife age. Then in the study the target consumers was sampled.
Housewife activity also influences fruit consumption. Those families with housewives working outside home consumed 72.3 kg of fruits in 2006 while, families with housewives dedicated only to housework, the fruit consumption increased to 106.8kg. Results are shown in the table 4.

Table 3. Number and percentages (in parenthesis) of consumers, according with their gender and age, in the two hypermarkets and Zaragoza city data

Place	Gender	Age (years old)					Total
		< 25	25 - 34	35 - 49	50 - 64	>= 65	
Carrefour from Actur	Men	1	2	10	17	19	49 (46.2%)
	Women	0	2	11	29	15	57 (53.8%)
	Total (%)	1 (0.9%)	4 (3.8%)	21 (19.8%)	46 (43.4%)	34 (32.1%)	106 (100.0%)
Carrefour from Augusta	Men	2	0	6	9	17	34 (32.1%)
	Women	5	12	24	18	13	72 (67.9%)
	Total (%)	7 (6.6%)	12 (11.3%)	30 (28.3%)	27 (25.5%)	30 (28.3%)	106 (100.0%)
Total sampling	Men	3	2	16	26	36	83 (39.2%)
	Women	5	14	35	47	28	129 (60.8%)
	Total (%)	8 (3.8%)	16 (7.5%)	51 (24.1%)	73 (34.4%)	64 (30.2%)	212 (100.0%)
Zaragoza city data*	Men						(48.2%)
	Women						(51.8%)
	Total (%)	(12.2%)	(19.1%)	(27.3%)	(21.1%)	(20.3%)	(100.0%)

Source: own elaboration and * data from IAE (2009)

Similar proportion of working full time outside home are similar in both genders, although a noticeable proportion of women work partially outside home. In the sample, a great percentage of men are at home and this high value is influenced by the total number of retired men (older than 65 year old).
Age has also a strong influence on consumers' activity. Full time working outside home decreases as well only working at home increases with consumer age. A greater proportion of consumers, especially women between 25 and 49 years, dedicate to working partially out side home. García-Serrano and Toharia (2008) state that, in Spain, families with people working partially outside home have higher probabilities to belong to poor families. Then, working activity is related to family income.

Table 4. Consumers activities, according to gender and age, in the two hypermarkets (in percentage)

	Outside home			Total
	Full time	Partially	At home	(%)
	Gender			
Men	27.7	9.6	62.7	100.0%
Women	30.2	18.6	51.2	100.0%
	Age			
< 25 years	100.0	0.0	0.0	100.0%
25 - 34 years	75.0	25.0	0.0	100.0%
35 - 49 years	47.6	23.8	28.6	100.0%
50 - 64 years	28.3	8.7	63.0	100.0%
>= 65 years	0.0	5.9	94.1	100.0%
Total (nº and %)	62 (29.2%)	32 (15.1%)	118 (55.7%)	212 (100.0%)

Source: own elaboration

Table 5 shows how family income varies with consumers' education level, age and gender. Studying levels seems to be related with family income. A great proportion of consumers with primary education (77.6%) belong to families with less income than 1,500.00 euros per month. People with medium education degrees have higher family income than elementary education, but they get less family income a people with university education.

Table 5. Consumers' education levels, according to family income, age and gender, in the two hypermarkets (in percentage)

	Studying level			
	Elementary	High school	University	Total (%)
Family income (euros/month)				
<= 900	36.8	7.6	3.5	17.0
901 – 1,500	40.8	35.4	15.8	32.1
1,501 – 2,100	15.8	29.1	22.8	22.6
2,101 – 3,000	3.9	22.8	28.1	17.5
3,001 – 4,000	1.3	3.8	22.8	8.0
> 4,000	1.3	1.3	7.0	2.8
Total (%)	100.0%	100.0%	100.0%	100%
Age (years old)				
< 25	2.6	3.8	5.3	3.8
25 -34	3.9	2.5	19.3	7.5
35 - 49	6.6	30.4	38.6	24.1
50 - 64	39.5	35.4	26.3	34.4
>=65	47.4	27.8	10.5	30.2
Total (%)	100.0%	100.0%	100.0%	100%
Gender				
Men	36.8	39.2	42.1	39.2
Women	63.2	60.8	57.9	60.8
Total (%)	100.0%	100.0%	100.0%	100%
Total (nº and %)	76 (35.8%)	79 (37.3%)	57 (26.9%)	212 (100%)

Source: own elaboration

An alternative explanation to family income differences among sample's studying groups is that 47.4% of people elemental studying is older than 65 years, that is, retired people. College studying group has the smallest proportion of possible retired people. As seemed before (table 4) consumer age influence their activity then people with college studying dedicate more time to work and it implies in higher incomes (table 4.3.1). Apparently gender does not affect studying level in the sample.

Some marketing studies, such as Mtimet (2006), classify consumers in different segments by consumption frequency. The questionnaire had also a question about PDO Calanda peaches consumption frequency and the main results, divided by age and gender, are shown in Table 6. Old consumers eat more often PDO Calanda peaches than young consumers. This result was expected because young people consume less fruit, this result was expected. Men stated that they eat less often PDO Calanda peaches than women.

Table 6. Relation between PDO Calanda peaches consumption frequency, age and gender

	Consumption frequency				
	> 1x/week	Once/2 weeks	Once/month	Once/season	Total (%)
Age (years old)					
< 25	12.5	25.0	25.0	37.5	100.0%
25-34	56.3	12.5	25.0	6.3	100.0%
35-49	56.9	23.5	7.8	11.8	100.0%
50-64	74.0	12.3	4.1	9.6	100.0%
>=65	81.3	15.6	0.0	3.1	100.0%
Gender					
Men	61.4	20.5	6.0	12.0	100.0%
Women	72.9	14.0	6.2	7.0	100.0%
Total (%)	68.4%	16.5%	6.1%	9.0%	100.0%

Source: own elaboration

Consumers were asked which fruit would buy is they could not find PDO Calanda peaches in the market. The options were: "other peach", "nectarines", "orange or tangerine", "apple or pear" and "melon". It was considered that low PDO Calanda peaches loyalty consumers chose "other peaches", medium PDO Calanda peaches loyalty consumers chose "nectarines" and high loyalty consumers would prefer a very different fruit when there was not PDO Calanda peaches in the market.

Table 7 shows different loyalty degree to PDO Calanda peaches in relation to consumer age, gender, family income and PDO Calanda peaches consumption frequency. Almost 50% of PDO Calanda peaches consumers have a high loyalty degree and only 20% of them would buy a nectarine if there was not PDO Calanda peaches in the market. Apparently, age and PDO Calanda peaches consumption frequency do not exert influence on consumer loyalty degree to PDO Calanda peaches just the opposite to gender and family income. With the exception of families with higher income than 4,000 euros per month, an income increase tends a loyalty diminishment. With respect to gender, less proportion of women has high loyalty degree to PDO Calanda peaches and they have an expressed preference for nectarines (medium loyalty degree).

There are 13 statements in the questionnaire for consumers to show their agreement or disagreement using a Likert scale. Choosing one in this scale means that consumer has a strongly disagreement and five strongly agreement. The aim of those statements is to outline different consumers' profiles with respect to PDO Calanda peaches satisfaction, big size peaches evaluation and packaged peaches assessment.

Table 7. PDO Calanda peaches fidelity degree according with consumer age, gender, family income and PDO Calanda peaches consumption

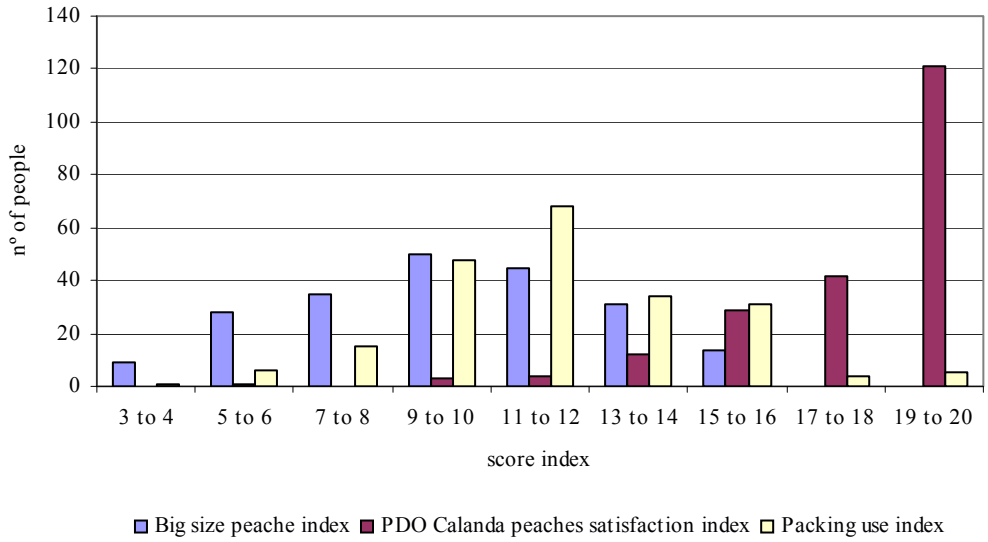
	Fidelity degree			
	Low	Medium	High	Total (%)
Age (years old)				
< 25	12.5	12.5	75.0	100.0%
25 - 34	31.3	25.0	43.8	100.0%
35 - 49	47.1	15.7	37.3	100.0%
50 - 64	21.9	20.5	57.5	100.0%
>= 65	28.1	23.4	48.4	100.0%
Gender				
Men	32.5	12.0	55.4	100.0%
Women	28.7	25.6	45.7	100.0%
Family income (Euros per month)				
<= 900	22.2	16.7	61.1	100.0%
901 – 1,500	23.5	26.5	50.0	100.0%
1,501 – 2,100	35.4	20.8	43.8	100.0%
2,101 – 3,000	37.8	16.2	45.9	100.0%
3,001 – 4,000	47.1	11.8	41.2	100.0%
> 4,000	16.7	16.7	66.7	100.0%
PDO Calanda peaches consumption frequency				
> 1 x/week	25.5	21.4	53.1	100.0%
Once /2 weeks	40.0	25.7	34.3	100.0%
Once/month	30.8	7.7	61.5	100.0%
Once/season	47.4	10.5	42.1	100.0%
Total (%)	30.2	20.3	49.5	100.0%

Source: own elaboration

Calanda peaches satisfaction is valued by an index generated by statements. The statements were: “PDO Calanda peaches taste is unbeatable”, “PDO Calanda peaches smell very well”, “PDO Calanda peaches have optimal ripeness” and “I pay more money by a PDO product because I know that it is authentic”. Three statements were selected to construct the big size peaches index: “I like very big size peaches”, “big size peaches have better taste” and “small peaches could be preserved less time than a big one”. For packing use index, the statements were: “Packaged peaches have the same taste and smell than bulk”, “I suspicious of long live packaged peaches”, “packaged fresh fruit damages health” and “I have no time and then I prefer packaged fruits”. For this last index it was given 5 points when consumer scored 1 and vice versa in the second and third statement. The index results are in graphic 1.

Low, medium and high satisfaction index levels; low, medium and high big size index levels and packing use index levels were determined by dividing the score range by the number of level, which was in this case. A great part of people (85.8%) scored PDO Calanda peaches index above 16 points (high satisfaction level) and 12.3% scored between 11 and 15 points (medium satisfaction level). Major part of consumers agrees or strongly agrees with the four statements about PDO Calanda peaches.

Big size peaches and packing use score index have similar shape distribution but they provided different behavioural answers than PDO Calanda peaches satisfaction index. Around 46% of people gave medium score (8-11 points) to big size peaches and only 28% gave high level scores (more than 11 points). Almost 43% of people strongly agreed that they liked big size peaches and 33% preferred medium size peaches (they neither agree nor disagree with the statement). One third of consumers did not believe that small peaches could be preserved less time than big ones.



Graphic 1. Big size, PDO Calanda peaches satisfaction and packing use index distribution
Source: own elaboration

Two third of consumers scored the packing index between 10 and 14 points (medium index level) and 19% scored more than 15 points (high index level). The statement "I have no time and then I prefer packaged fruits" showed more disagreement. The explanation is that there are many retired people in the sample and they have lot of time to go shopping, so they do not fill advantage saving time by packing use.
The indexes of PDO Calanda peaches satisfaction, packing use and big size peaches evaluation are used to segment the PDO Calanda peaches market. It is also divided by consumption frequency, PDO Calanda peaches fidelity degree and socio-demographic data, such as: gender, age, family income, labor activity and studying level. This information is used to analyze the attributes impacts and to estimate the attribute levels utility on peaches purchase.

4.2 Weighted Least Square estimations

This section presents the results of Weighted Least Square (WLS) for Best-Worst Paired (BWP) and for Best-Worst Marginal (BWM) models. In both cases first estimations are offered of the overall sample and later for some market segments.

4.2.1 Best-Worst Paired (BWP) model

Table 8 provides the regression output for all respondents. The most important attribute for peaches` purchasing is origin. Its coefficient impact is about 0.573 while other attributes has much smaller impact and are not statistically significant. However, it is possible to say that the attributes importance or impact order, from most important to least important, is: origin, peach size, packing and price. It means that consumers are more worried with product quality than price.

Table 8. Estimation of relative attributes impacts and attributes` levels utilities, on PDO Calanda peaches purchasing, with the BW paired method for overall sample

	Coefficients	S.E.	T-Ratio	P> | T |	95% CI*	
Constant	2.671	0.054	49.193	0.000	2.563	2.779
Attribute impacts						
Price	-0.050	0.077	-0.641	0.523	-0.203	0.104
Origin	0.573	0.074	7.763	0.000	0.426	0.719
Size	0.005	0.074	0.066	0.948	-0.141	0.151
Packing	-	-	-	-	-	-
Level scale values						
1.2 €/kg	0.438	0.097	4.515	0.000	0.245	0.630
2.4 €/kg	-0.045	-	-	-	-	-
3.6 €/kg	-0.483	0.088	-5.457	0.000	-0.658	-0.307
From Calanda With PDO	0.721	0.077	9.340	0.000	0.568	0.875
From Calanda Without PDO	-0.242	-	-	-	-	-
Other area without PDO	-0.964	0.095	-10.164	0.000	-1.152	-0.775
Bulk	0.185	0.090	2.057	0.042	0.006	0.363
No active packing	-0.054	-	-	-	-	-
Active packing	-0.239	0.086	-2.759	0.007	-0.410	-0.067
Small size	-0.597	0.085	-7.043	0.000	-0.766	-0.429
Medium size	-0.230	-	-	-	-	-
Big size	0.367	0.084	4.366	0.000	0.200	0.534
Adjusted R^2: 0.734, F: 27.843, Sig.: 0.000, number of observations: 108						

* CI = Confidence Interval
Source: own elaboration

Price is the least important attribute when consumers are buying peaches, although they had disutility with prices equal or higher than 2.4 €/kg. An explanation is that when survey was applied, peaches` price levels in Carrefour (1.75 €/kg) were lower than survey price levels. Good level discrimination is also observed with respect to peaches origin and size levels, but packing levels are considered more similar because they are statistically less significant than other attribute levels.

However, consumers prefer traditional peaches packing format (bulk) over new formats and they dislike longer shelf life packing format (active packing). It means that they value the shelf life gain less than peaches` natural losing.

The sample was segmented by consumers' socio-demographic characteristics in the next estimations. Table 9 presents the parameters for people with different education levels and ages. Origin is statistically significant for all segments and it has the highest impact on consumer choice decision while peaches size is not statistically significant for all consumer classes. Price statistical significance and ranking are different for some segments. People that studied college consider price as second most important attribute and packing as least important, while for people with elementary education price is the least important attribute.

Age also influences ranking of attributes` impacts or importance. In this case, for old people, peach size gains importance while price lose importance on their decision. Peach size utility seems to present the same tendency, old people have higher utility with big size peaches and higher disutility with small size peaches. When the questionnaires were applied a common comment, especially across old people, was that big size peach represents prosperity. In relation to origin levels, PDO peaches increase utility to old consumers as well as producing them in the Calanda area.

Table 9. Estimation of relative attributes impacts and attributes levels utilities, on PDO Calanda peaches purchasing, with BW paired method for education level and respondent age

Variable	Education level			Age (years old)				
	Elementary	High school	University	<25	25 - 34	35 - 49	50 - 64	≥ 65
Constants values								
Constant	1.678***	1.773***	1.423***	-0.037ns	0.485***	1.380***	1.673***	1.503***
Attribute impacts								
Price	-0.365***	-0.018ns	0.305***	0.358**	0.116ns	0.212**	-0.071ns	-0.308***
Origin	0.385***	0.490***	0.806***	0.439***	0.301***	0.693***	0.563***	0.388***
Size	0.006ns	-0.063ns	0.102ns	-0.135ns	-0.146ns	0.054ns	0.004ns	-0.035ns
Packing	-	-	-	-	-	-	-	-
Level scale values								
1.2 €/kg	0.428***	0.321***	0.463***	0.055ns	0.310**	0.255**	0.464***	0.354***
2.4 €/kg	-0.063	-0.071	0.036	-0.121	-0.028	-0.095	-0.055	-0.087
3.6 €/kg	-0.491***	-0.392***	-0.427***	-0.176ns	-0.338***	-0.350***	-0.519***	-0.441***
From Calanda with PDO	0.646***	0.767***	0.657***	0.501***	0.556***	0.581***	0.697***	0.714***
From Calanda without PDO	-0.249	-0.185	-0.227	-0.203	0.051	-0.188	-0.174	-0.348
Other areas without PDO	-0.895***	-0.952***	-0.884***	-0.705***	-0.505***	-0.769***	-0.871***	-1.061***
Bulk	0.223**	0.148ns	0.124ns	0.441***	0.337***	0.127ns	0.174*	0.057ns
No active packing	-0.112	0.049	-0.118	0.307	-0.005	-0.072	-0.126	-0.017
Active packing	-0.336***	-0.099ns	-0.242**	-0.134ns	-0.342***	-0.199**	-0.300***	-0.074ns
Small size	-0.766***	-0.516***	-0.411***	-0.316**	-0.314**	-0.280***	-0.546***	-0.840***
Medium size	-0.380	-0.126	-0.141	-0.056	-0.259	0.012	-0.199	-0.389
Big size	0.386***	0.390***	0.270***	0.261*	0.055ns	0.292***	0.347***	0.452***
Adjusted R^2	0.667	0.686	0.653	0.331	0.359	0.643	0.676	0.661
F	20.523	22.240	19.286	5.814	6.452	18.549	21.300	19.941
Sign.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: own elaboration

In relation to education level, people with higher education level give more weight to origin, although all education levels have similar origin utilities (attributes levels` parameters). Price increases its weight with education level, and peaches with price of 2.4 €/kg give positive utility for the most studied population. Probably it is linked with their higher families' income. Consumers segments' choices were compared by applying a correlation analysis. The correlations were calculated from number of times that each pair of alternative combination was selected by each consumer class. Results of choices correlation among education levels are shown in the table 10 and among different ages are in the table 10. In these tables is possible to note that consumers choices are more similar, with higher correlation, between neighboring classes and this similarity decrease when there are more differences between consumer classes. This choice behaviour is seemed even in education level as respondents' ages.

Table 10. Dependent variable correlation among different education levels

Education levels			
	Elementary	High school	University
Elementary	1.00		
High school	0.84	1.00	
University	0.74	0.86	1.00

Source: own elaboration

Youngest consumers (less than 25 years old) choices have low correlations with other age classes and people, between 25 and 34 years old, have higher correlation than youngest but lower than older ones. This finding does not mean that youngest people have a complete different peaches choice behaviour. It can be explained by the few number of individuals belonging to this class (sub-sample size). Table 3 shows that there are 8 persons youngest than 25 years old in the sample and 16 people that are between 25 and 34 years old.

Table 11. Dependent variable correlation among different ages

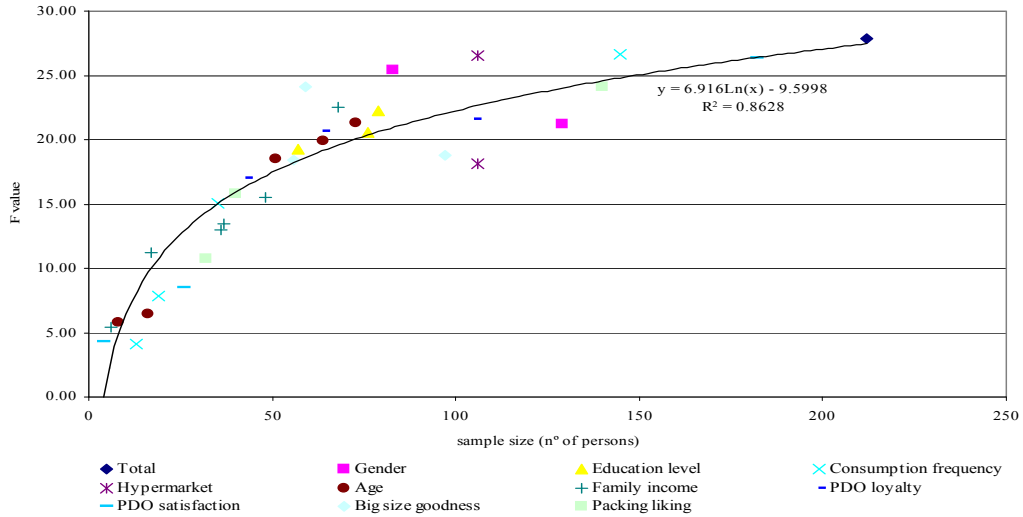
Ages (years old)					
	< 25	25 -34	35 - 49	50 - 64	≥ 65
< 25	1.00				
25 – 34	0.60	1.00			
35 – 49	0.66	0.73	1.00		
50 – 64	0.60	0.74	0.89	1.00	
≥ 65	0.53	0.68	0.77	0.88	1.00

Source: own elaboration

As consequence of the small sample size, the model fit (Table 9) of these two consumers' classes decreased. Their Fisher values (F) are 5.814 and 6.452, respectively, to the first (<25 years old) and the second (25 – 34 years old) classes. Other age's classes and education levels (see also table 5) have more than 51 people in each group and their model fit improved the F value over 18.549.

Graphic 2 illustrates the relation between, the model fit, estimated F (Fisher) values and sample size of different market segment groups. There the sample is divided in sub-samples by gender, PDO Calanda peaches consumption frequencies, education levels, sampling places (hypermarkets), age, family incomes, consumers PDO Calanda loyalty index (PDO loyalty), PDO Calanda peaches satisfaction index (PDO satisfaction), big size peaches goodness index (Big size goodness) and packing liking index (packing liking). The group "total" represent the overall sample with the information of 212 respondents choices information and it has the highest fitting with F value about 27.843 (Table 8).

Fisher value is a function of sample size and, in this case, it increments exponentially. That is, model fitting is very sensible for small sample as the sample size has a smaller impact when it is large. In our case, only sample size with more than 40 people, have F values higher than 17. Just gender, education level, sampling places, hypermarkets, PDO Calanda peaches loyalty index and big size peaches goodness index have all classes (sub-sample) with more than 40 people and with F values greater tan 17.



Graphic 2. Relation between F (Fisher) values and sample size for different PDO Calanda peaches market segments in the BW Paired model
Source: own elaboration

Segments with classes having less than 40 elements may join some neighbor classes. For example, PDO Calanda consumption frequency classes can be joint in the class of routinely consumers (those that consume PDO Calanda peaches more than once a week, with 145 elements) and occasional consumers (those that consume PDO Calanda peaches less than once a week, with 67 elements). But in other segments, such as PDO Calanda peaches satisfaction index, this strategy does not work because joining low and medium satisfaction index levels it reach a total number of 30 and its F value would be small.

4.2.2 Best-Worst Marginal (BWM) model

Table 12 shows the main results of the Best-Worst Marginal (BWM) method for the overall sample. As mentioned earlier, the BWM model provides best-worst indicator and, in this case, it is statistically significant at 1.4% confidence level. It means that best choices frequency differs from worst choice frequency distribution, that is, consumers' statements of best options are different than worst options.
The same table shows that the most important attribute is origin and it is followed by peach size, packing and price. The attribute ranking has not changed, in relation to the attribute impact estimated in the BWP model, as well attribute levels utilities. However, contrasting the estimated parameters of both models, a greater difference is noticed among attributes impacts than attributes` levels utilities.
Some consumers feel a disutility with peaches that have prices over of 2.4 €/kg. They have a high utility if peaches have been certified with the PDO Calanda brand and for those peaches, which were not produced in Calanda, they feel a disutility. Packaged peaches also cause disutility to consumers, but these levels do not have statistical significance.
In comparison to the BWP model, BWM model's attributes levels lose statistical significance. Flynn et al (2007) explain that this difference may be caused by the number of observations of each model. In our study the BWM model has 24 observations while the BWP model has 108 observations. The parameters` confidence intervals are identical in both models.

Table 12. Estimation of relative attributes impacts and attributes levels utilities, on PDO Calanda peaches purchasing, with the BW marginal method for overall sample

	Coeficients	S.E.	T-Ratio	P> | T |	95% CI*	
Best-worst (bw) indicator	-0.240	0.082	-2.927	0.014	-	-
Constant	4.906	0.046	106.135	0.000	2.563	2.779
Attribute impacts						
Price	-0.021	0.119	-0.176	0.863	-0.203	0.104
Origin	0.841	0.114	7.366	0.000	0.426	0.719
Size	0.030	0.112	0.269	0.793	-0.141	0.151
Packing	-	-	-	-	-	-
Level scale values						
1.2 €/kg	0.426	0.129	3.317	0.007	0.245	0.630
2.4 €/kg	-0.025	-	-	-	-	-
3.6 €/kg	-0.451	0.117	-3.872	0.003	-0.658	-0.307
From Calanda with PDO	0.706	0.101	7.022	0.000	0.568	0.875
From Calanda without PDO	-0.236	-	-	-	-	-
Other areas without PDO	-0.942	0.122	-7.749	0.000	-1.152	-0.775
Bulk	0.218	0.119	1.822	0.096	0.006	0.363
No active packing	-0.024	-	-	-	-	-
Active packing	-0.241	0.115	-2.098	0.060	-0.410	-0.067
Small size	-0.635	0.111	-5.700	0.000	-0.766	-0.429
Medium size	-0.290	-	-	-	-	-
Big size	0.344	0.111	3.098	0.010	0.200	0.534
Adjusted R^2: 0.895, F: 17.341, Sig.: 0.000, number of observations: 24						

* CI = Confidence Interval

Source: own elaboration

The BWM model has higher R^2 (0.895) than the BWP model and smaller Fisher value (17.341) than the BWP model. Perhaps, it reflects the total number of observations, 12 best and 12 worst options to be chosen in BWM models over 108 pair of alternative combinations in the BWP model. Fewer number of observation decrease F value (the model fitting). As in the BWM model the number of observation is smaller, responses variability decreases, which can be detected by higher correlations among the segments levels chosen (tables 13 and 14), and then the model can better explain the response variability (R^2 value).

Table 13. Dependent variable correlation among different education levels

	Education levels		
	Elementary	High school	University
Elementary	1.00		
High school	0.90	1.00	
University	0.79	0.93	1.00

Source: own elaboration

This smaller number of alternative induces correlation increase among consumers' age classes. Age classes, such as youngest people than 25 years old with the smallest number of components, proved the highest correlation change in relation to the BWP model

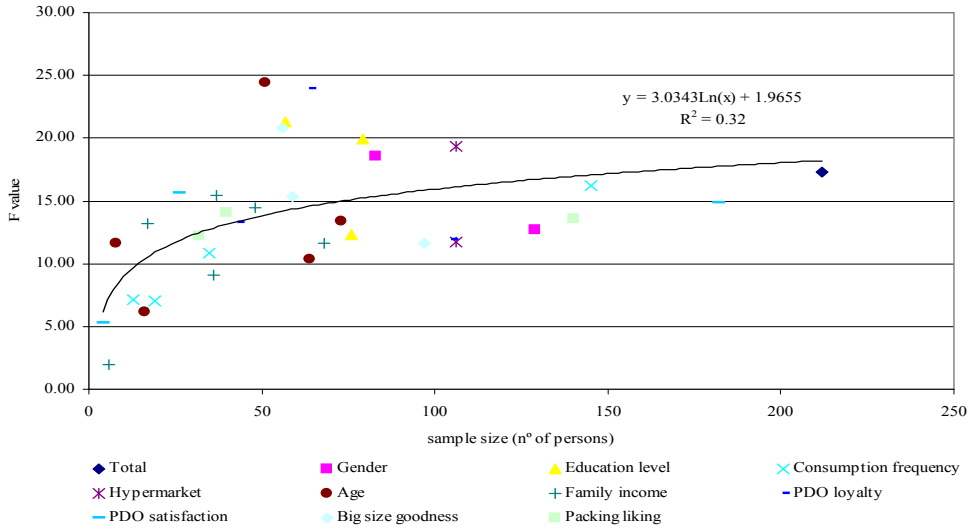
correlations. Now the correlation among age classes are more similar and it reflects the relation between sample size and model fit (F values).

Table 14. Dependent variable correlation among different age's levels

	Ages (years old)				
	< 25	25 -34	35 - 49	50 - 64	≥ 65
< 25	1.00				
25 -34	0.86	1.00			
35 - 49	0.85	0.85	1.00		
50 - 64	0.81	0.87	0.95	1.00	
≥ 65	0.69	0.75	0.82	0.94	1.00

Source: own elaboration

Graphic 3 shows the relation between models fit (F value) and sample size. They have a logarithmic relation. However, the increase model fit when increasing sample size in the BW Marginal model is not so evident than in the BW Paired model. The BW Paired model logarithmic function has a higher R^2 (0.8628) and there don't exist sub-samples with higher F values than the overall sample while in BW Marginal model the opposite occurs.



Graphic 3. Relation between F (Fisher) values and sample size for different PDO Calanda peaches market segments in BW Marginal model
Source: own elaboration

5 Final remarks

Attribute level best-worst experiments or Attribute levels *Maxdiff* experiments seem to be an appropriate procedure to better understand consumers' evaluations. It allows measuring, in the same task and scale, attributes` impacts and attributes` levels utilities on consumer buying decisions.

Best alternatives choices have different distributions than choices of worst alternatives. This behaviour was detected in previous choice experiments as Scarpa *et al.* (2009).

In the experiment, origin is the most important attribute that explain consumers peaches` choices. Estimation of with the overall sample shows that models, BWP and BWM, maintained the attributes importance order. The second most important is the peach size,

followed by packing and price. Attribute impacts can not be compared directly among groups because models attribute weights in related to a reference attribute, in this case packing. Packing may have a different significance for different groups and comparisons can not be performed. However the rank information and relative impact within attribute are useful. In this study, sample was divided in smaller groups and the attribute ranking changed.

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