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Internal preference mapping of cured ham with consumer's segmentation in Spain

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Abstract— The overall acceptability of 202 consumers has been analysed by ANOVA, multiple means comparison, cluster analysis and internal preference mapping (MDPREF). Three clusters are found with different preference criteria. These clusters can also be characterized according to actual purchase behaviour, declared consumption habits and socio-demographic characteristics. This study demonstrates the importance for the agro-food industry of examining consumers' individual preferences as well as average ones, to obtain relevant information including not only the consumers' preference trends, but also the most suitable segment to target a new product.

In this way, the MDPREF shows that although consumers' preferences tend to Iberian hams over white-breed hams, there is a cluster of consumers which prefers PDO Teruel ham over one of the Iberian hams. This cluster shows also some socio-demographic and purchase and consumption habits peculiarities.

Keywords— internal preference mapping, acceptability, cluster analysis

I. INTRODUCTION

The preference mapping technique [1] has been applied to investigate the consumers' acceptability of a wide range of food products, although only a limited number of applications focus on cured ham (eg. [2] and [3]). On the other hand, consumers' choice behaviour has usually been investigated on the basis of scanner data or experimental auctions, but only a few studies, combine hedonic and consumer choice behaviour (eg. [4]; [5] and [6]).

This paper investigates consumers' acceptability of cured ham in Spain using internal preference mapping and aims at exploring to what extent hedonic preferences are coherent with revealed preferences through actual purchase behaviour.

II. MATERIALS AND METHODS

2.1. Consumers hedonic tests

202 consumers participated in the hedonic tests which took place in Zaragoza (Spain) at the end of 2004. Participants had purchased cured ham at least once in the period April 2003 to March 2004 in one of the main chain of hypermarkets in Spain. Consumers' actual purchase information was obtained from the scanner database provided by the retailer. Consumers tasted blindly ten cured

ham samples corresponding to different 7 Spanish and 3 French brands (see Table 1). The order of presentation changed randomly across different groups of assessors. Acceptability was measured on an unstructured continuous scale (0-100mm) with hedonic references ranging from "I do not like it at all" to "I like it very much". After the hedonic test, consumers were asked to fill a questionnaire about their socio-demographics characteristics and their consumption habits of cured ham.

Table 1. List and description of cured ham samples used in the blind test

Code*	Region of origin and breed**	Quality Certification	Type of Brand
s07	Unspec. -White	No	Producer's
s17	Teruel-White	No	Producer's
s16	Teruel-White	PDO Teruel	Producer's
s21	Unspec.-White	TSG Jamón Serrano	Producer's
s20	Unspec.-White	No	Distributor's
s18	Huelva-Iberian	No	Distributor's
s19	Huelva-Iberian	PDO Huelva	Producer's
f17	Bayonne-White	PGI	Distributor's
f16	Aveyron-White	No	Producer's
f15	Auvergne-White	PGI candidate	Producer's

* Codes starting with an 's' stand for Spanish samples, and with 'f' for French; **Unspec.: Unspecified origin

2.2. Internal preference mapping and statistical analysis

The internal preference mapping (MDPREF) has been applied in order to show hedonic preference patterns and differentiated consumers' segments. Clusters are identified applying, first, an agglomerative hierarchical clustering to select the number of clusters, and second, by k-means cluster. These clusters are crossed with information on actual purchases, socio-demographic characteristics and consumption habits of consumers, to test for significant associations by means of chi-squared. Two-way ANOVA and one-way ANOVA are also applied to consumers' ratings, followed by pair-wise comparison test: the Fisher's least significant difference (LSD) if the variances are found homogeneous through the Levene statistic or the Games Howell otherwise. The statistical analysis is carried out with XLSTAT 2007 and SPSS 14.00.

III. RESULTS

Preliminary analysis on the 10 cured-ham samples led to unclear segmentation, and accordingly, the MDPREF was re-run for the 5 samples found to be the most preferred. The MDPREF map is shown in Figure 1¹. Consumers are spread over the map, with a higher concentration in the direction of Iberian samples (S18 and S19), followed by PDO Teruel (S16). Clusters 1 (44% of consumers) and 2 (27%), prefer relatively more Iberian hams, with cluster 1 moving relatively more in the direction of S18 and cluster 2, into the direction of S19. Cluster 3 (29% of consumers), on the contrary, shows a preference towards Teruel ham, closer to the sample with PDO (S16), but moving on the vertical direction as well towards one of the Iberian ham samples (S18).

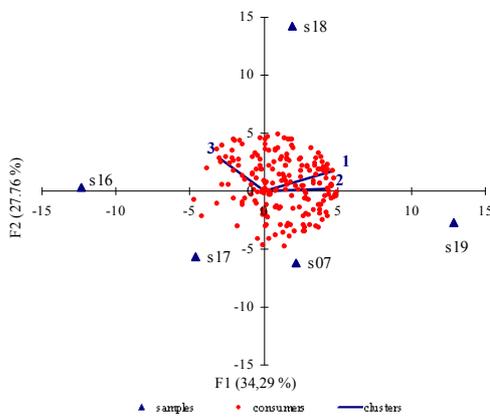


Figure 1. Internal Preference map based on the 5 most preferred ham samples

First, a two-way ANOVA test shows that the valuation of each ham sample differs across consumers' segments (Fisher ratio test: 55.290; p-value: 0.000). Next, one-way ANOVA indicates significant differences within each cluster for the five samples (F-ratio test: 45.538 (p-value: 0.000), 5.926 (p-value: 0.000) and 3.976 (p-value: 0.000), respectively). Third, the pair-wise t-test (see Figure 2) shows that, in general terms, consumers discriminate among groups of ham samples rather than among individual products with the exception of cluster 1. Based on the differences across segments, we identify: cluster 1 as "hedonically discriminant", cluster 2, as "hedonically

demanding" (the lowest rates), and cluster 3 as "hedonically PDO Teruel prone".

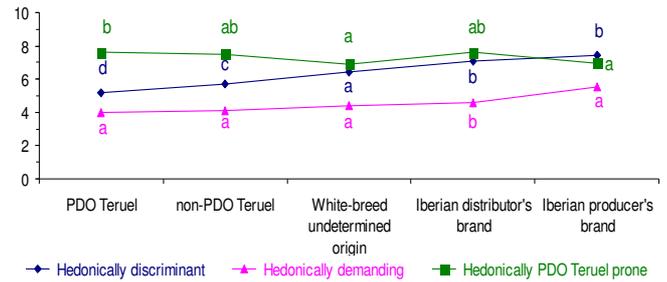


Figure 2. Mean hedonic ratings for the five preferred ham samples*

*The mean rate for products with the same letter are not significantly different according to Fisher's LSD statistic (clusters 1 and 2) and Games-Howell statistic (cluster 3), at 5% significance level.

In Table 2, the chi-square test reveals a significant association between the cluster membership, defined in terms of acceptability, consumption and purchase habits. Thus, the more 'hedonically discriminatory' cluster seeks for variety (actually buys from a wider range of cured ham categories) and a good relationship between quality and price (this segment is prone to the relatively cheaper white breed cured ham with no quality certification and the distributor brand). Purchasing behaviour reveals that the 'hedonically demanding' cluster spends relatively more on cured ham and purchases more frequently than the other two consumers' segments, whereas consumers in the 'hedonically PDO Teruel prone' cluster, occupy an intermediate position in terms of expenditure, quantity purchased and number of purchases, although with the highest frequency of consumption. Interestingly, this segment is formed by a significantly larger proportion of older consumers (65% are older than 51 years old versus 40-50%) and households in the lowest net income interval (19% are lower than 900€ versus 5-4%).

¹ A MDPREF for the ten samples was previously obtained but the clusters were almost superimposed, making complicated the task of finding clear differences in terms of acceptability across segments. In order to gain some more insight into the explanation of heterogeneous preferences, we concentrate on those ham samples which are clearly preferred by the majority of consumers

Table 2. Segment's profiles

Actual purchase behaviour and declared consumption habits	% of consumers within each cluster			N=202
	Hedo. discri. 44%	Hedo. dema. 27%	Hedo. PDO Teruel prone 29%	Total
Intervals of expenditure***				
Less than 20€	63	40	62	56
Between 20 and 60€	26	35	21	27
More than 60€	11	25	17	17
Total quantity of cured ham purchased**				
Less than 1 kg.	48	36	54	46
Between 1 kg. and 2 kgs	18	11	10	14
More than 2 kgs.	34	53	36	40
Total number of purchases**				
More than one	58	73	53	61
Number of different categories purchased	7	5	5	7
They only purchase the distributor brand	30	24	19	25
They only purchased white non-certified ham	81	67	78	76
Consumption frequency of cured ham***				
Daily	18	34	36	27
Some days within the week	82	66	64	73

*** and ** indicate significant differences across segments at 5% and 10% significance level, respectively.

IV. CONCLUSIONS

In this study, the internal preference map shows certain degree of heterogeneity among consumers' preferences towards cured ham, while the general trend favours Iberian breed hams over white-breed. However, some relevant differences can be obtained from the three identified segments. Remarkably, certain degree of coherence between acceptability and actual choice is found, although further investigation in this direction is needed. Thus, those consumers who are able to discriminate more across products, are more inclined to purchase from a wider range of product categories, while those who spend more and purchase more frequently, have a more demanding palate. We also find an interesting local market segment for regional producers, and in particular, for the Teruel ham with PDO, although the income restriction may act as a break for actual demand. Hedonic results show that PDO Teruel is even preferred over Iberian.

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