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Exploring the influence of consumer characteristics on veal credence and experience guarantee purchasing motivators

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Abstract

In Europe, in the last decades, public administration has encouraged extensive livestock farming systems, usually related to high quality meat and the preservation of endangered local breeds. Nevertheless, its continuity in the near future should be based on adapting it to the market requirements. This paper investigates consumers' preferences heterogeneity towards veal attributes, as well as the linkage between a wide range of consumer traits and attributes that motivate purchasing of veal with unique characteristics. Main method of analysis included a choice experiment method.

Findings showed that regional origin and health information play a stronger role than tenderness degree guarantee at the moment of choice. Moreover, regional origin is more relevant when it is linked to a local breed. Nevertheless, heterogeneous preferences have been detected. In contrast to the general trend, one-person households attach greater importance to the presence of a high degree of tenderness guarantee. Furthermore, younger consumers value more this guarantee, while expert consumers do not.
Keywords: choice experiment, mixed logit, heterogeneous preferences, quality perception, veal, consumer

1. Introduction

In the last decades, public administration in Europe has encouraged extensive livestock farming systems based on grazing. These systems can fulfil societal demands related to the provision of public goods, such as landscape, biodiversity, including the preservation of endangered local breeds, or ethical concerns about food production (Bernués, Ruiz, Olaizola, Villalba, & Casasús, 2011). Furthermore, there is a growing need to practice less intensive feeding management in these systems, which could provide meat with more favourable fatty acid profile (Varela *et al*., 2004; Domaradzkia, Stanekb, Litwińczukb, Skałeckia, & Floreka, 2017). Similarly, the adequate management of carcasses in the slaughterhouse may affect to meat tenderness (Serrano, Humada, Gutiérrez, & Castrillo, 2017), given a specific animal characteristic, such as breed or age.

As pointed out by Vieira, García, Cerdeño and Mantecón (2005), there is a demand for veal among European consumers. However, there are still few studies focusing on analysing consumers' demand towards veal in general, and from relatively 'young' calves (e.g. aged 8-10 months) in particular. The Cantabria region in Spain, where the study was carried out, has a long tradition of beef consumption, including veal. For example, in 2015 the average total beef/veal consumption *per capita* was 9.05/6.05 kg over 5.69/4.19 kg in Spain (MAPAMA, 2016). In this Northwest region of Spain, characterised by the abundance of pastures, there are extensive cattle farming systems using local endangered breeds. However, the calves are mainly finished and marketed in other regions (Humada, Sañudo, & Serrano, 2014). Taking this fact into account, the continuity of local livestock systems should be based on developing calves finishing systems according to the new market requirements and developing labelled beef. In this sense, despite fresh meat has been traditionally sold unbranded (Grunert *et al*., 2004), a niche market for differentiated beef has been detected within the literature (Resano, & Sanjuán, 2017). Providing information concerning meat production process appears to play a major role in determining consumers' meat purchasing decision (Grunert, 2006). Its presence in the labelling in combination with other key attributes, such as tenderness could be a successful marketing strategy (Henchion, McCarthy, Resconi, & Troy, 2014).

Lancaster (1966) identified that consumer's perception of food quality is multi-attribute. These attributes can be considered as either search or experience attributes, depending on if they are determined either prior to consumption (e.g. colour) and/or after consumption (e.g. tenderness), respectively (Nelson, 1970). Furthermore, in the case of credence attributes (Darby, & Kerni, 1973), an asymmetric information problem occurs, as information is not available about a product origin or unique attributes, and consumers cannot verify these characteristics even after consumption. Nevertheless, producers or distributors may provide information to the consumer through a certification or guarantee on the label, turning the attribute into a search attribute.

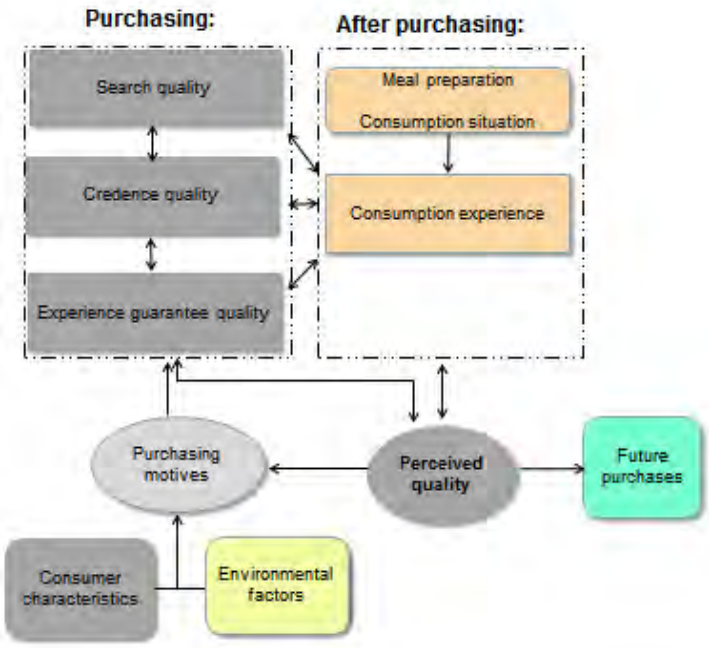
Consumer quality perception is a dynamic process, where credence and search attributes have been found to influence it during the formation of quality expectations at the purchasing stage (Figure 1). Furthermore, experience attributes have been also shown as crucial factors in determining consumers'

meat choices (Resano *et al.*, 2011). The high variability in meat quality make expectations formation a difficult task, however this can be reversed at least partially with the presence of an experience guarantee. Health claims and the origin of beef are considered as two relevant credence attributes. Information about health properties of the product influences consumers' choice (Fernqvist, & Ekelund, 2014), and purchasing intention (Kallas, Realini, & Gil, 2014). In addition, the literature supports the fact that the explicit mention of the region of origin evokes a strong preference on consumers' food choice (Resano, Sanjuán, & Albisu, 2007; Henchion, MacCarthy, & Resconi, 2017). Nevertheless, the impact of adding the geographical origin with cattle breed such as through a local breed has been scarcely analysed within the literature, as far as the authors know. Despite breed information is not considered a crucial attribute in the literature, it may provide relevant information when is attached to a well-known region of origin (Scozzafava, Casini, & Contini, 2014).

At the purchasing step, consumer characteristics and environmental factors (the latter are not directly analysed in this study) determine the purchasing motives (Bernués, Olaizola, & Corcoran, 2003). These factors influence how the different attributes are perceived (Grunert, Bredahl, & Brunsø, 2004). Consumer characteristics include attitudes, which according to the Theory of Planned Behaviour (TPB) (Ajzen, 1991), are key determinants of purchase intention and subsequent actual purchase of the product. Consumer characteristics also include demographics (Steenkamp, 1990), as well as the level of familiarity and expertise of the consumer (Borgogno, Favotto, Corazin, Cardello, & Piasentier, 2015). After the purchasing phase, consumers evaluate the product through the meal preparation and the subsequent consumption experience. When this experience is in accordance to their previous expectations, it can trigger a future purchase and even lead to loyalty towards the product.

The full sequence from consumer characteristics to quality perception forms a complex framework of interrelated cognitive categories. Thus, in this empirical application, following the conceptual map shown in Fig. 1, we focus (dark grey areas) on three main attribute that intervene in the identification of the product at the moment of purchase: two credence attributes (origin and health-related information) and one experience guarantee attribute (degree of tenderness), and on analysing the impact of consumer characteristics as purchasing motivators.

The first aim of this paper is to investigate the presence of consumer heterogeneity towards veal credence and experience attributes, and the second aim is to ascertain the role that consumers' characteristics play on their attribute evaluation, in particular on veal with unique characteristics: from calves aged 8-10 months, a regional origin and local breed, a more cardio-healthy nutritional composition, and with a high degree of tenderness.



Source: authors own elaboration based on Grunert (2005) and Bernués *et al.* (2003)

Figure 1. Simplified conceptual framework to explain veal perceived quality. Note: the dark grey areas are main areas of interest in this application.

2. Material and methods

2.1. The survey

A face-to-face interview was conducted at the respondents' home. It was carried out in different localities through Cantabria region (located in the North-west of Spain) between January and October 2014. Finally, 600 randomly selected participants completed the survey and met the following requirements: they were regular consumers of beef, involved in food shopping and older than 18 years old. Furthermore, among interviewees, 96 participated in a pilot study, and 504 participated in the final design of the choice experiment (see further explanation in the subsection 2.3). Nevertheless, both the definitive sample and the previous one were representative in terms of age, gender and the geographic location. Participants were not economically rewarded. The questionnaire was structured in the following order: first, purchasing and consumption habits of beef, attitudes towards specific health claims, and the spontaneous knowledge of cattle breeds; second, choice experiment; third, consumer socio-demographics. On average, participants took 21 minutes to complete the survey (standard deviation: 11 minutes).

2.2. Factorial and cluster analyses

Respondents were asked to value their degree of agreement or disagreement to a set of statements, using a 5-point Likert scale, where the statements were specifically related to health claims. In particular, the statements indicated the relationship between the beef characteristics, such as the age of the animal, meat colour, the presence of fat on the meat, the fat colour and nutritional composition and these attributes' influence on the prevention of cardiovascular diseases. Consumers' valuations were formerly classified through a factorial analysis using principal components with Varimax

rotation. Subsequently, the factorial loadings were used as an input to the k-means cluster analysis.

2.3. The design of the choice experiment

In this study, a sequential and iterative D-efficient experimental design, using a Bayesian approach (Scarpa, Zanoli, Bruschi, & Naspetti, 2012) has been applied. Firstly, an optimal orthogonal in the differences design has been generated. This design was evaluated by 96 consumers within the pilot study. The data obtained from this representative subsample was used to estimate a Multinomial logit model (MNL) (Bliemer & Rose, 2010), whose estimates were then used as Bayesian 'priors'. These 'priors' (which act as proxies for the unknown parameters) are considered as a starting point for the first iteration through a D-efficient design (Greiner, Bliemer, Ballweg, & 2014). In this step, a representative subsample of 66 individuals was analysed. This process continues, and the subsequent representative subsamples are composed of 126 and 312 consumers, respectively. The iterative process implies that the estimated coefficients (MNL) for each of the iterations are used to update the 'priors' applied in the initial D-efficient design, improving its efficiency (Scarpa, Campbell, & Hutchinson, 2007).

In the choice experiment, a 2-alternative design (options A and B), and a non-purchase option was developed. To represent a real-life purchasing situation, a 'pick-one response' was chosen. The alternatives were unlabelled and with generic titles (Greiner *et al.*, 2014). Figure 2 provides a choice card example.

The selection criterion for the attributes levels was based on i) the experiences carried out and the results obtained in the research project where this work is included. This project analysed among other factors the effects of the diet and the management of carcasses in slaughterhouse on meat quality from local endangered breeds (Serrano *et al.*, 2017). In particular, one of the aims was to obtain meat from a regional origin and local breed with healthier specific nutritional characteristics, and also very tender. Furthermore, a statement about health-related information which could be easily understood by consumers was used to evaluate its potential as a marketing tool; ii) previous literature (Domínguez-Torreiro, 2014, and MSA, 2016) for tenderness levels; iii) experts input in meat science; iv) pricing levels were obtained after observing differentiated veal prices in a representative sample of retail and butcher channels either *in situ* or through the internet within Cantabria region in 2014, leading to average prices of 12€, 15€ and 18€. The attributes and levels used in the choice experiment are reported in Table 1. The final design of the choice experiments was obtained using Ngene software.

Finally, 24 choice sets were arranged into 3 blocks of 8 each. Thus, each participant faces 8 choice cards. This fact implies a considerable decrease in the effort required in the participant's choice, as well as increasing the consistency and reliability in their responses. The following information and context of purchasing was provided with the choice cards, and it was read to consumers:

'If you were in your usual place of purchasing and you had to choose between two veal steaks from calves aged 8-10 months (1ª A commercial category), which one would you choose?'. Note that despite these two labels

may show the same visual appearance, some differences may appear in terms of:

1. ***Origin guarantee**: it is feasible to certify the origin of the cattle breed (Cantabria/other origin); (local/non-local breeds) though the implementation of traceability controls.*
2. ***Health-related information**: When the steak comes from calves reared and fed in a specific way that makes its proportion of saturated and unsaturated fat and also between fatty acids omega-3 and omega-6 is kept within the recommended levels for developing a healthy diet. This fact may contribute to prevent cardiovascular diseases.*
3. ***Degree of tenderness guarantee**: It is feasible to ensure and certify the degree of tenderness of the steak (tender, quite tender and very tender) taking into account a combination of factors related to the animal rearing and slaughter, given a specific breed and geographical origin.*
4. ***Price**: Euros per meat kilogram.*

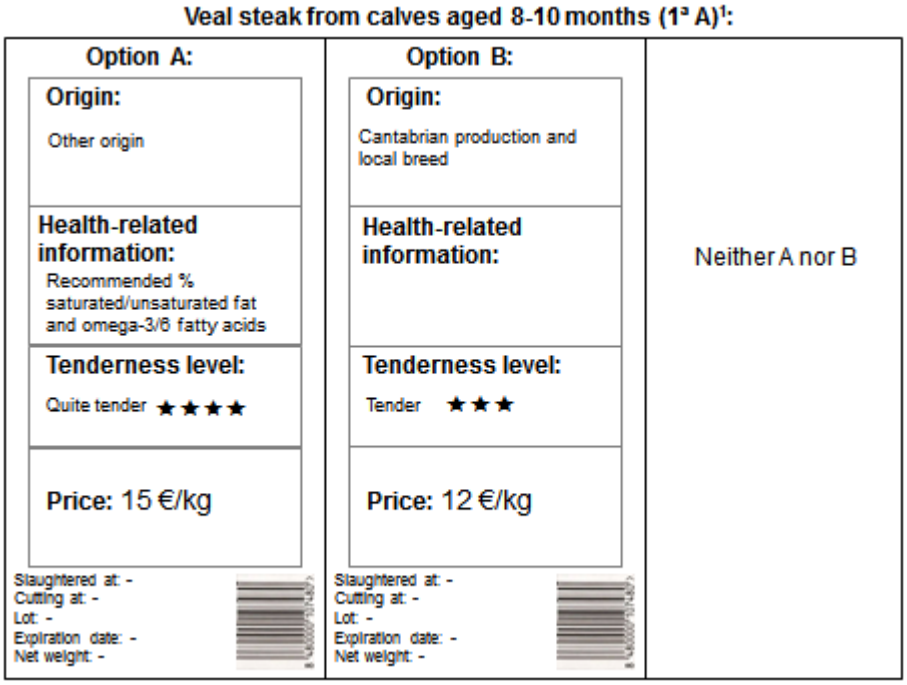


Figure 2. A choice experiment card example

[1] 1ª A: Commercial category based on piece meat quality.

Table 1. Attributes and levels included in the choice experiment design.

Attributes	Levels
Origin	Cantabrian production and local breed; Cantabrian production; Other origin
Health-related information	Recommended % saturated/unsaturated fat and omega-3/6 fatty acids; or the absence of this information
Tenderness level	Tender; Quite tender; Very tender
Price (Euro/kg)	12, 15 and 18

2.4. The econometrical model

2.4.1. The mixed logit model

Consumers' preferences heterogeneity has been analysed through a mixed logit (random parameters model - RPL)[2]. This model has been widely applied within the literature, with some relevant studies exploring some possible sources of this heterogeneity (Reicks *et al*., 2011). We follow the meritorious Resano, Sanjuán, & Albisu (2012) approach, providing the impact of a wide range of characteristics, but on different types of quality indicators (in this case credence and experience) evaluation, and modelling them jointly.

Where individual *n* faces a choice among *J* alternatives, he/she is assumed to choose the alternative *j* over the remaining alternatives reporting the highest utility. This utility can be expressed through the following discrete choice modelling:

$$U_{jn} = \beta'_n * X_{jn} + \varepsilon_{jn} \quad (1)$$

Utility depends on an observed part (X_{jn}) and a random and unobserved component (β_n and ε_{jn}). The former part (X_{jn}) includes an array of variables related mainly to the alternatives under evaluation and the decision-makers' characteristics. The latter component, (β_n[3]) accounts for the variables' coefficient, while ε_{jn} is an independent and identically distributed (iid) extreme value. Furthermore, β_n accounts for consumer heterogeneous preferences, with a density function f (β_n, Θ), including Θ the mean and covariance of β_n in the population. The researcher has to specify the distribution for these coefficients. In this case, a normal distribution has been chosen. This distribution allows for the presence of a coefficient with a different sign for every respondent, and

[2] Note that a MNL model based-design has been demonstrated within the literature to provide consistent estimates also for RPL estimation (Bliemer & Rose, 2010; Vermeulen, Goos, Scarpa, & Vandebroek, 2011).

[3] Standard logit is a specific case of mixed logit, where coefficients are fixed (β) instead of random, and they are observed by the researcher. In contrast to the mixed logit, it exhibits the property of independence from irrelevant alternatives (IIA). Further information concerning this issue can be obtained by consulting Train (2003), and Hensher, Rose, & Greene (2015).

accordingly, consumers may show opposite preferences towards a particular attribute level.

Estimates result from the model shown in (1) and where the standard deviation was significant it confirms the presence of heterogeneity around the mean for a specific attribute level (β_k). In this case, and following Hensher *et al.* (2015), this model may be extended to incorporate the interactions between the mean attribute level estimate and some consumers' characteristics z_n, through a specific coefficient $\beta_{k,n}$:

$$\beta_{k,n} = \beta_k + \delta_k z_n + \eta_{k,n} \quad (2)$$

where $\eta_{k,n}$ is a random term.

2.4.2. The empirical specification

Utility obtained by individual *n* from alternative *j* is modelled as follows (See Table 2 for obtaining information about variables' description and names):

$$U_{jn} = \beta_0 + \beta_{Pr,n} * Pr_j + \beta_{HI,n} * HI_j + \beta_{CP,n} * CP_j + \beta_{CPB,n} * CPB_j + \beta_{QT,n} * QT_j + \beta_{VT,n} * VT_j + \varepsilon_{jn} \quad (3)$$

Where β_0 can be considered as an all-alternatives-specific constant (ASC) for capturing unobserved utility for all alternatives and ε_{jn} is the residual. Attribute levels have been included in the model as dummies, while price has been incorporated as a continuous variable in (3). The latter variable has been considered as non-random to ease the willingness to pay (WTP) calculation, which is obtained by dividing the attribute level coefficient by price estimate and changing the sign.

After exploring the presence of heterogeneity around the mean, some consumers' characteristics have been incorporated through the named "Model 1_Interactions" (M1_I) (See Table 2) to explain the heterogeneity towards veal coming from regional origin and local breed, with specific nutritional characteristics which may contribute to prevent cardiovascular diseases, and also very tender veal. Consumer characteristics include socio-demographics, attitudes, awareness, purchasing and consumption habits, which could be relevant factors to explain possible sources of the previously observed heterogeneity in Model 1 (hereafter referred to as M1). In the next two subsections (3.1 and 3.2) a description of these consumer characteristics is provided. Analysis was conducted using STATA 14.0, IBM SPSS 19, and NLOGIT 6.0.

Table 2. Description of the explanatory variables estimated in the model.

Name	Description
Main attribute levels	
Price (Pr)	Price in alternative *j* with linear effect = 12, 15 or 18 (€/kg)
Health Information (HI)	1 if the alternative has suitable levels of saturated and unsaturated fat and an adequate proportion omega 3/6; 0 otherwise
Cantabrian_Production (CP)	1 if the alternative *j* comes from Cantabria but is a non-local cattle breed
Cantabrian_Production_Breed (CPB)	1 if the alternative *j* comes from Cantabria and is a local cattle breed; 0 otherwise
Quite_Tender (QT)	1 if the alternative *j* is quite tender; 0 otherwise
Very_Tender (VT)	1 if the alternative *j* is very tender; 0 otherwise
Interactions with HI, CPB and VT levels:	
(HI/ CPB/ VT)_1House	1 if the alternative attribute level is HI/ CPB/ VT and is faced by a respondent which belongs to a one-person household; 0 otherwise
(HI/ CPB/ VT)_Locality	1 if the alternative attribute level is HI/ CPB/ VT and is faced by a respondent living in a Cantabrian locality with more than 10,000 inhabitants; 0 otherwise
Specific interaction with HI level:	
HI_Concerned	1 if the alternative attribute level is HI and the respondent belongs to the segment relatively more concerned with the assumption that beef with some characteristics is more cardio-healthy; 0 otherwise
Specific interaction with CPB level:	
CPB_St_Freq.	1 if the alternative attribute level is CPB and the respondent consumes beef steak at least once a week; 0 otherwise
CPB_Kn_Br	1 if the alternative attribute level is CPB and the respondent spontaneously knows at least one endangered local cattle breed; 0 otherwise
Specific interaction with VT level:	
VT_Expert	1 if the alternative attribute level is VT and the respondent considers herself as extremely or fairly expert at beef purchasing; 0 otherwise
VT_18-34	1 if the alternative attribute level is VT and the respondent's age is ranging between18 and 34 years old; 0 otherwise
VT_>65	1 if the alternative attribute level is VT and the respondent's age is higher than 65 years old; 0 otherwise

3. Results and discussion

3.1. Participant profile

As Table 3 shows, participants in the final version of the choice experiment were mainly living in one out of the six localities with more than 10,000 inhabitants within Cantabria region (65%), resided in a multi-person household (91%), they were 51% female, between 35 and 64 years old (54%), where 80% had no university qualifications, and the households net income was located

between 1150-3000€/month (64%), which can be considered a low-medium interval. The questionnaire indicated also some purchasing and consumption habits of the consumers interviewed. This questionnaire showed that most were regular eaters of beef in general, where 76% consumed beef steak at least once a week at home. They considered themselves as experts in purchasing, ranging from fairly to extremely expert (52%). Moreover, almost half of respondents spontaneously knew endangered local cattle breeds (46%). In the specific case of the 504 consumers under analysis the sample was not only representative in terms of age, gender and the geographic location, but in terms of size of household, level of income, and education (see Table 3). Therefore, we may consider them as fully representative of Cantabrian population.

Table 3. Description of the sample and population (Cantabria region).

%	Sample	Population[1]	Chi-square statistic (p-value)
Size of the municipality: >10000 inhabitants	65	66	0.022 (0.882)
Age:			0.302 (0.860)
18-34	23	25	
35-64	54	55	
≥65	23	20	
Gender: Female	51	51	0.000 (1.000)
Household size: One-person	9	10	0.058 (0.809)
Net income:			5.537 (0.063)
<1150€/month	29	26	
1150-3000€/month	64	56	
>3000€/month	7	18	
Higher education	20	18	0.130 (0.718)
Frequency of beef steaks consumption at home: At least once a week	76	-	
Spontaneous knowledge of at least one autochthonous cattle breed	46	-	
Declared experience at beef purchasing: Extremely or fairly expert	52	-	
N. individuals	504	591,888	

[1] Source: Instituto Cántabro de Estadística (2015 a, b, c).

3.2. Attitudes towards health claims concerning beef attributes

As mentioned in subsection 2.2, a factorial analysis was performed on consumers' attitudes towards health claims. Measures of its suitability are reported (KMO and Bartlett's sphericity tests) in Table 4, showing quite good results according to the literature. A two-factor solution was identified which explained 63.4% of the total variance. The first factor was related to meat colour, which was also influenced by the age of the animal, among other factors. Accordingly, it is named Meat colour. This factor explains 39.3% of the total variance. The second factor titled Fat explains 24.1% and is related with different aspects of fat (type, colour, nutritional composition, etc.).

An agglomerative hierarchical cluster analysis revealed the presence of two clusters, whilst k-means clustering separated respondents into those relatively more or less concerned with the assumption that beef with some characteristics is more cardio-healthy. Cluster sizes were 78% and 22% of consumers, respectively.

The mean differences were also reported across segments in all cases through the non-parametric U-Mann Whitney test ($p<0.001$), as Kolmogorov Smirnov test revealed the absence of normality ($p<0.001$) (Table 4).

Table 4. Consumers' concerns towards claims stating the relationship between beef attributes and cardio-health within each cluster.

Statements[1]/Factors[2]/ **Is more cardio-healthy...**			
	[3]Concerned	**Non-concerned**	**Total**
Factor 1: *Meat Colour*	4.19 (+)*4,5*	3.00	3.93
A. Meat from young animals	3.59 (+)	2.91 (-)	3.45
B. Light red/pale meat	3.70 (+)	2.95 (-)	3.54
Factor 2: *Fat*	3.64	2.93	3.49
A. Meat with a lower presence of external fat	4.14 (+)	2.58 (-)	3.81
B. Meat with a lower presence of intramuscular fat	4.22 (+)	2.64 (-)	3.88
C. Meat with less yellow-coloured fat	4.03 (+)	2.70 (-)	3.75
D. Meat with a lower content of saturated fats	4.37 (+)	3.61 (-)	4.21
E. Meat with an adequate proportion of omega-3 and 6 fatty acids	4.16 (+)	3.47 (-)	4.02
Factorial analysis: Total explained variance: 63.4%; Bartlett's sphericity test: 738.979 (p-value: 0.000); Kaiser-Meyer-Olkin (KMO) criterion: 0.754			

[1] Items were evaluated through a five points Likert-scale (1 = Totally disagree and 5 =Totally agree).
[2] Average score across factors has been calculated.
[3] *Concerned* (and *Non-concerned*) refer to the segment named as "Relatively more (less) concerned with the assumption that beef with some characteristics is more cardio-healthy".
[4] (+) and (-) indicate that consumers within this segment agree more or less with the statements than the average, respectively.
[5] Differences between cluster *Concerned* and *Non-concerned* have been found at 1% significance level applying U-Mann Whitney statistic.

3.3. Exploring the presence of consumers' heterogeneity and its possible sources

200 replications using Halton intelligent draws have been performed. This number can be considered as appropriate according to the literature (Hensher *et al*., 2015). Estimates are shown in Table 5. The Adjusted Pseudo R^2 in both M1 and M1_I (0.330 y 0.335, respectively) indicate that the overall fit can also be considered as good. Log-Likelihood-Ratios (LLR) support, first the joint significance of the explanatory variables, and second that the fit is worse in the case of multinomial logit *versus* M1, as well as in M1 *vs* M1_I. These results reveal the suitability of estimates from a mixed logit, in particular one with interactions that help better to explain consumers' choice.

Mean coefficients are positive and highly significant, apart from price, with an inverse relationship with utility (Table 5). This suggests that the provision of information about some attribute levels to the consumer at the moment of purchasing increases the probability of choosing a product with some of these

features. Thus, for instance, the presence of health information indicating that the product may contribute to a cardio-healthy diet is preferred over the lack of this information. Standard deviations are highly significant in Model 1, revealing the presence of heterogeneity. Model 1_I informs about some of the explanatory sources of this heterogeneity (as Table 5 shows). However, results revealed that there is still part of the heterogeneity not captured through this model[4].

Results on mean willingness to pay (WTP) are shown in Table 6. Ranking of consumers' preferences in terms of their WTP (€/kg) (see M1 results), where health-related information ranks first, and consumers are willing to pay a premium of 14.025 €/kg, on average. The positive influence of health-related information on beef choice is supported by the empirical literature (e.g., Kallas *et al*., 2014). The regional origin and local breed information gets the second position (13.701), adding utility to the regional origin (7.998). Similarly, Sanjuán and Khliji (2016), and Scozzafava *et al.* (2014) found that autochthonous breed plays a stronger role in determining consumers' choice than regional origin. Sanjuán and Khliji (2016) also revealed the presence of consumers' heterogeneity in both cases. The guarantee of very tender veal occupies the third place (9.101), whilst quite tender veal does not attract consumers in the same way and comes at the last position (6.221). Furthermore, note that the presence of relatively high WTP for some attribute levels are in line with relevant beef applications dealing with consumers' stated preferences (see for instance Sanjuán and Khliji, 2016).

Results showed in Tables 5 and 6 (M1_I) indicate that household size appears to be an important driver of veal consumers' preferences and WTP. Notwithstanding, these results have identified some differences concerning the direction of this impact, confirming the statement of Menard *et al.* (2012). These authors stated that there is still not a consensus within the literature concerning the sign of this impact. Other characteristics including living in an urban area, age or the frequency of beef consumption and purchasing experience also influence consumer evaluation (Menard *et al*., 2012), but in this case for a particular veal attribute. Gender, income and education level attained do not show a significant interaction impact in the results, and therefore these characteristics were removed from the final estimation.

Regarding the impact of socio-demographics on health claims valuation, one-person households appear not to be in favour of this attribute at the moment of choosing, as they are willing to pay on average less amount of money than the other types of households (-5.286€). The size of locality does not influence the choice of veal with health claim. Similarly, the study by Reicks *et al.* (2011) also reported non-significant impact of locality. This study did however find there was an effect on the nutritional value perception while purchasing. On the other hand, findings indicate that attitudinal characteristics have a positive and powerful impact. Thus, our results show that consumers who are relatively more concerned with the assumption that beef with certain characteristics is more cardio-healthy, they would be willing to pay a premium for getting this associated health information (3.112). These results are in line with other

[4] Note also that heterogeneity may exist even though there are non-significant deviations, and heterogeneity in variance may also be studied. However, it is out of the scope of this paper. See Hensher *et al.* (2015) for further information concerning this issue.

studies, as health concerns are reported to positively influence consumers' food choices (Bialkova, Sasse, & Fenko, 2016), and beef in particular (Menard *et al.*, 2012).

Considering the evaluation of the other credence attributes under study (i.e. origin), results suggest that socio-demographic and behavioural approaches appear to play a more relevant role than other characteristics. In this sense, consumers living in an urban area are more willing to pay a premium for the regional origin and local breed (3.998€/kg). Besides, consumer level of familiarity with beef and the local breed positively influences its quality perception (also shown in Sanjuán and Khliji, 2016). More specifically, consumers with a higher level of beef consumption at home are willing to pay a premium of 4.237€ for the regional origin and local breed. A quite similar effect is reported with those consumers with a higher level of breed awareness (4.309). Thus, results concerning credence attributes evaluation suggest the presence of a certain degree of consistency between consumers' purchasing intention and their level of familiarity.

Results also show that both socio-demographics and behavioural characteristics influence the evaluation of an experience guarantee, but in this case with a different direction of the impact. More specifically, and similarly to Reicks *et al.* (2011), whilst contrary to the previous influence showed on health information evaluation, low household size (one-person) has a significant and positive influence on very tender veal (5.075€). This fact could be especially relevant considering that there has been a high rise of one-person households in the EU-28 in the last years, and this percentage is expected to continue increasing in the near future (Eurostat, 2017). One possible explanation may be that in the case of one-person households, the individual needs to assume the different family roles affecting his/her purchasing decision stated by Engel, Kollat, & Blackwell (1973). The consumer could feel more able to evaluate the different attributes without their guarantee depending on the specific attribute under evaluation. In this way, beef tenderness valuation is considered through the literature a subjective task (Wezemael, Smet, Ueland, & Verbeke, 2014). This fact may imply that individuals belonging to low size households could need more assessment at the moment of evaluating this specific beef attribute.

In addition, results suggest that younger consumers (18-35 years old) are more willing to pay a premium for a high level of tenderness guaranteed than older consumers (>65 years old), in particular, 5.667 *versus* 4.781€/kg, respectively. Concerning the impact of age, there is not a consensus in the literature. Our findings support previous application by Nandonde, Msuya and Mtenga (2013), who argued that consumers younger than 40 years were more prone to value the presence of this information on the label, while Reicks *et al.* (2011) found the opposite preference on consumers. Interestingly, our findings also indicate that those consumers considering themselves as extremely or fairly expert at beef purchasing negatively value the presence of a very tender guarantee (-2.963). The reason behind this fact may be that expert purchasers could consider that they are able to evaluate this characteristic without looking for this information on the label but more so based on their previous experience.

Summing up, these findings suggest that health information and regional origin guarantee attributes play a major role in determining veal choice more so than tenderness guarantee. This result is in line with Brunsø, Bredahl, Grunert

and Scholderer (2005). These authors found that labelling could be a useful tool to help consumers evaluate beef at the point of purchase but only when the label revealed information difficult to ascertain and important for consumers. Moreover, regional origin is more relevant when it is attached to a local breed. Nevertheless, heterogeneous preferences have been detected. Thus, there is a certain degree of consistency between consumers' purchasing intention and their attitudes (health-concerns) or level of familiarity (beef consumption and breed awareness). Furthermore, younger consumers and one-person households are more willing to pay for the guarantee of a very tender veal, while expert consumers do not. Taking into account these findings, it is recommended that a better communication of the product unique attributes (more suited to specific segments of consumers) through labelling should be available at the point-of-purchase.

Table 5. Mixed logit results.

Variable		Model 1 (M1): Coefficients (Std. Err.)	Model 1_Interactions (M1_I): Coefficients (Std. Err.)
$Price_j$	.	-0.100***[1] (0.012)	-0.099*** (0.012)
$Health\_Information_j$ (HI)	Mean St. Dev.	1.391*** (0.102) 1.338*** (0.104)	1.053*** (0.212) 1.280*** (0.100)
$Cantabrian\_Production_j$ (CP)	Mean St. Dev.	0.794*** (0.067) 0.423*** (0.121)	0.789*** (0.068) 0.399** (0.135)
$Cantabrian\_Production\_Breed_j$ (CPB)	Mean St. Dev.	1.360*** (0.102) 1.232*** (0.106)	0.558*** (0.215) 1.172*** (0.106)
$Quite\_Tender_j$ (QT)	Mean St. Dev.	0.617*** (0.075) 0.427*** (0.129)	0.614*** (0.069) 0.370*** (0.146)
$Very\_Tender_j$ (VT)	Mean St. Dev.	0.903*** (0.101) 1.159*** (0.104)	0.582*** (0.176) 1.081** (0.103)
HI_1House	Mean	-	-0.522* (0.271)
HI_Locality	Mean	-	0.238 (0.168)
HI_Concerned[2]	Mean	-	0.308* (0.187)
CPB_1House	Mean	-	0.136 (0.265)
CPB_Locality	Mean	-	0.395*** (0.164)
CPB_St_Freq.	Mean	-	0.419** (0.183)
CPB_Kn_Br	Mean	-	0.426*** (0.156)
VT_1House	Mean	-	0.501** (0.261)
VT_Locality	Mean	-	0.251 (0.159)
VT_Expert	Mean	-	-0.293** (0.153)
VT_18-34	Mean	-	0.560*** (0,192)
VT_>65	Mean	-	0.473*** (0.189)
ASC		2.270*** (0.182)	2.262*** (0.180)
[3]LL	-3136.930	-2955.940	-2932.920
[4]LLR	361,98 (0.000)	46,04 (0.000)	21,03 (0.000)
Adjusted Pseudo – R^2		0.331	0.335
N. observations		4032	4032

[1]***, **, and * indicate the presence of statistical significance at 1, 5 and 10%, respectively

[2] Cluster definition is described in subsection 3.2.

[3] LL accounts for the log-likelihood function evaluated in the model with constant or with all the explanatory variables.

[4] LLR to test the join significance of M1 *versus* the model with a constant, the corresponding multinomial logit, and *versus* the model with interaction variables in M1_I (p-value in parentheses), respectively.

Table 6. Willingness to Pay (WTP) results.

Attribute levels	Model 1(M1)		Model 1_Interactions (M1_I)	
	Mean (St.error)	Confidence Interval (95%)	Mean (St.error)	Confidence Interval (95%)
Health_Information (HI)/ Oth.[1,2]	14.025 (1.607)	10.875 - 17.175	10.658 (2.338)	6.074 - 15.241
Cantabrian_Production (CP)/ Oth.	7.998 (0.983)	6.073 - 9.925	7.979 (0.975)	6.067 - 9.890
Cantabrian_Production_Breed (CPB)/Oth.	13.701 (1.675)	10.418 - 16.983	5.640 (2.248)	1.235 - 10.046
Quite_Tender (QT)/Oth.	6.221 (0.892)	4.473 - 7.968	6.212 (0.882)	4.483 - 7.941
Very_Tender (VT)/Oth.	9.101 (1.241)	6.670 - 11.533	5.891 (1.851)	2.263 - 9.519
HI_1House/Oth.	-	-	-5.286 (2.800)	-10.723 - - 0.202
HI_Concerned /Oth.	-	-	3.112 (1.904)	-0.620 - 6.844
CPB_Locality/Oth.	-	-	3.998 (1.704)	0.657 - 7.338
CPB_St_Freq/Oth.	-	-	4.237 (1.901)	0.512 - 7.962
CPB_Kn_Br/Oth.	-	-	4.309 (1.634)	1.107 - 7.511
VT_1House/Oth.	-	-	5.075 (2.743)	-0.301 - 10.452
VT_Expert/Oth.	-	-	-2.963 (1.580)	-6.059 - 0.134
VT_18-34/Oth.	-	-	5.667 (2.029)	1.689 - 9.645
VT_>65/Oth.	-	-	4.781 (1.979)	0.903 - 8.660

[1]Oth. refers to "Otherwise", i.e. marginal willingness to pay values presented herein are calculated compared to a situation in which the level of the main attribute (or the level of the interacted socio-demographic/behavioural variable) is set at the default (excluded) level described in Table 4.

[2] Note that WTP have only been calculated for those coefficients revealed as significant at least at 10%.

4. Conclusions

In Europe, in the last decades, public administration has encouraged the development of extensive farming practices based on grazing, which not only may provide meat with a higher degree of tenderness, and a more cardio-healthy nutritional composition. It may also contribute to the preservation of endangered local breeds. Nevertheless, the continuity of this extensive local system should be based on developing market-oriented veal and beef with labels, and on adapting this product to the new market requirements. The novelty of this approach lies in the investigation of the possible sources of

consumers' heterogeneity towards two different types of meat attributes evaluation (credence and experience guarantee) from young calves. In contrast, the majority of studies are focused on beef and only on a specific type of attributes. Furthermore, a wide range of consumers' characteristics were also studied. Notwithstanding, consumers in this study elicited their preferences in a familiar setting (at home), but not in a real purchasing environment. On the other hand, decision making may be extremely more difficult to evaluate in a real situation with greater complexity. However, exploring these limitations may constitute a future extension of this avenue of research.

Information about consumers' general trends, and principally their specificities could be especially useful for producers and distributors to develop a successful marketing policy targeting the product to a specific segment of consumer more prone to its purchase. In this sense, health-related information and regional origin may occupy a prominent position in the labelling, as they play a stronger role than tenderness degree guarantee at the moment of choice. Including the voluntary certification through an EU origin-labelled scheme could be advisable, especially when it is well recognised by consumers. Moreover, despite information concerning the breed is still not mandatory in the EU; it could also be advisable to provide this information in the case of a local breed. This is especially important given the fact that the regional origin adds more utility to the consumer when it is attached to a local breed. However, and in contrast to the general trend, one-person households provided a higher importance to the presence of a high degree of tenderness guarantee. Furthermore, younger consumers value more this guarantee, while expert consumers do not. Therefore, a specific labelling more suited to their preferences is advisable, especially considering the rise of single-person households in the last years, and that younger consumers may constitute future loyal consumers.

Purchasing habits of fresh products are changing. The current purchasing trend suggests that the design of market-oriented products with labels are beneficial to commit purchases, even more when considering the current context of a stalled demand for non-differentiated beef. In this sense, boosting the adaptation of the veal and beef industry to the market requirements is crucial, especially due to the fact that this sector may react relatively slower than in other food sectors (according to the relevant literature). Therefore, there is a growing need in the industry for improving the communication with the consumer.

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Highlights

- Health information and regional origin are more crucial than tenderness guarantee.
- Regional origin plays a stronger role when it is attached to a local breed.
- Socio-demographics, attitudinal and behavioural traits influence veal evaluation.
- One-person households consider more relevant the guarantee of very tender veal.
- Younger consumers are more willing to pay for the guarantee of very tender veal.