Exploring consumers' beef preferences using a stated method approach: Disentangling differences throughout the value chain

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Abstract

It is increasingly important that the extensive livestock systems become more resilient and market orientated to face current challenges. But this can only be achieved by more interconnected supply chains where consumers' expectations are understood and the benefits of the production systems are communicated to the final consumer. This paper focuses on an array of meat attributes and their role in consumers' preferences, from both consumers' own perspective and the opinions of other value chain agents. The former was studied with a consumers' survey and a choice experiment, while the latter was investigated by the Delphi method. The study was carried out in a major beef consuming region in Spain, characterised by the presence of extensive cattle farming systems. Results reveal the existence of a niche market for more differentiated beef, where health qualities and local origin are particularly appealing. The ranking of preferences elicited through the rating-scale and the choice experiment are mostly consistent. We also find a certain degree of divergence between the agents' valuations, being wider with those placed farther from the consumer, as is the cattle farmer.

Keywords*: Beef chain, Credence attributes, Labelling, Delphi, Rating, Choice experiment, Consumer.*

1. Introduction

The Farm to Fork strategy initiated by the EU, aims at achieving healthier, fairer and more environmentally friendly food systems (European Commission, 2021), highlighting the need for further collaboration and communication at every step of the food chain, the adaptation to consumer demand, and the reinforcement of the farmer's position in the value chain. In this context, extensive livestock farming, especially that based on agroecological systems, may play a relevant role. The extensive livestock farming not only provides public goods related to the ecosystem services (e.g. preservation of autochthonous endangered breeds or the provision of habitats for biodiversity) (Rodríguez-Ortega *et al.*, 2018), but it can also bestow upon meat with a more adequate fatty acid profile and other health benefits (Domaradzkia *et al.*, 2017) and may enhance sensory characteristics, such as tenderness (Serrano *et al.*, 2017). Consequently,

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if well communicated through the supply chain, these characteristics would help to mitigate current consumers' concerns on beef production, including ethical, environmental and health concerns (Aboah and Lees, 2020; Sans and Combris, 2015; Verbeke *et al.*, 2010). Furthermore, the use of autochthonous breeds in extensive livestock systems, reinforce the benefits of the system, preserving biodiversity while simultaneously contributing to the cultural and gastronomic heritage (Coutinho *et al.*, 2021).

The Northwest region of Spain (Cantabria), where this study was carried out, is one of the major consuming regions of beef meat in Spain. In 2019, the average per capita consumption at home was 7.41kg compared with the average for Spain of 4.85kg (MAPA, 2020). Cantabria is characterised by the presence of extensive cattle farming systems using two autochthonous endangered breeds (Monchina and Tudanca) mainly located in rural mountain and Less-Favoured Areas (OECD, 2002; European Environment Agency, 2012). These systems appear to be less vertically integrated and more vulnerable than intensive ones to the emergence of new challenges, such as the consequences of Covid-19 pandemic (Lecegui *et al.*, 2021). Therefore, their continuity in the near future depends on becoming more resilient (Darnhofer, 2021). At the same time that they protect the natural resources, meeting new market and society requirements, may help to increase their resilience. Previous relevant studies have detected the necessity of fulfilling consumer's needs (Coutinho *et al.*, 2021), investigating the differences between consumers and producers in judging meat quality (Sepúlveda *et al.*, 2011; Verbeke *et al.*, 2005). Nevertheless, it is crucial that the actions of the different actors in the value chain are tuned to meet consumer's requirements.

As a general point, differences in quality perception along the value chain have been highlighted in the food literature (Wandel and Bugge, 1997; Djekic *et al.*, 2018). The existence of a certain degree of disconnection between these actors could make consumers not to fully trust in farmers (Cruz *et al.*, 2021). Effective communication should therefore be promoted, which may also strengthen trust and transparency throughout the value chain (Fisher, 2013; Macready *et al.*, 2020).

In this study, we followed a conceptual framework of interrelated categories explaining the sequence of information transference from the cattle farmer to the consumer. As Figure 1 shows, it considers mainly a vertical transference of information through the different stakeholders (Schrobback *et al.*, 2023). However, the farmer may also share information directly with the consumer using alternative channels (e.g., direct sales). The level of complexity of the distribution channel depends on the number of intermediaries. Moreover, a short supply chain may help to diminish the presence of information asymmetry (Schrobback *et al.*, 2023; Cruz *et al.*, 2021), which occurs when the cattle farmer or other actor in the value chain does not effectively share information with consumers about production processes or the beef attributes.

Figure 1 shows a simplified version of the supply chain with a small-medium number of them. In our empirical application, the consumer plays the major role in this framework, and we focus on explaining dark grey areas in Figure 1. We obtained information regarding perceived consumer preferences from all the actors in the value chain aiming at revealing the presence of what can be considered as a perception gap. This gap may exist when there is a difference between own consumers' preferences and what other actors in the supply chain consider consumer preferences are. To the best of the authors' knowledge, there is still a lack of studies in the literature evaluating which are the main beef attributes for consumers at purchasing using this comparative approach.

The right panel in Figure 1 illustrates the dynamic process of consumer perception of food quality (Grunert, 2005). Following Lancaster (1966), consumer perception of food quality is based on their attributes. They have been found to influence this process through the formation of quality expectations at the moment of purchase (Figure 1). This phase can be developed either at the retailer's shop or at a restaurant. Within this step, consumer purchasing motives (including socio-demographics or environmental factors) affect how the

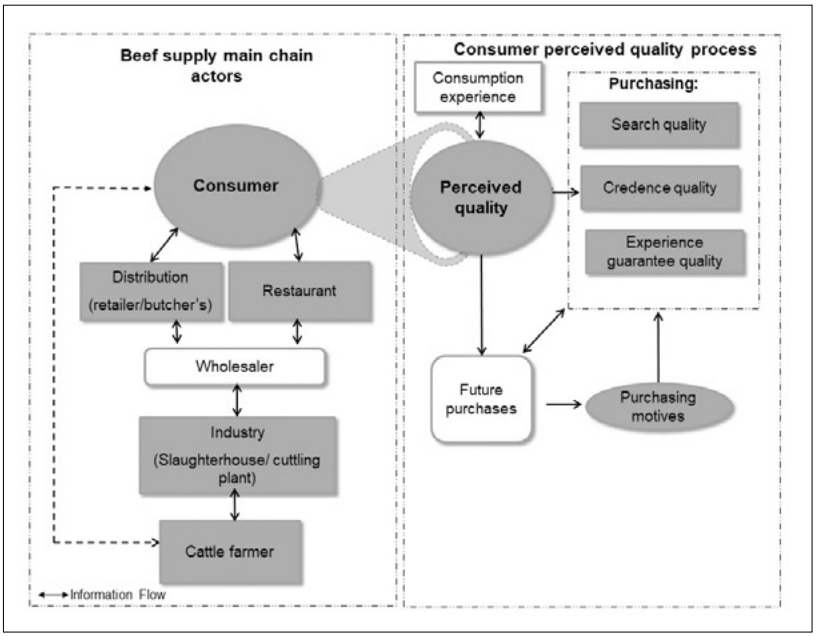

Figure 1 - Simplified conceptual framework to explain the main actors of beef value chain and consumer's perceived quality process.

Source: author's own elaboration based on Grunert (2005), Resano et al. (2018), and Schrobback et al. (2023).

different attributes are perceived. After purchasing, consumers evaluate food by means of the consumption experience (at home/ at a restaurant). A satisfactory result, consistent with the previous expectations, can trigger a future purchase, until becoming loyal to the food product and the establishment.

Food attributes can be classified into search, experience or credence (Nelson, 1970; Darby and Karni, 1973), depending on whether the attribute is evaluated prior to consumption (e.g. price), post consumption (e.g. tenderness), or neither of the above, respectively. However, other actors in the value chain may play a valuable role providing information to the consumer on credence attributes through a certification label, turning the credence attribute into a search attribute. This fact may be useful to diminish the existence of information asymmetry.

Despite its importance (Grunert, 2006), empirical evidence on meat experience attributes is still scarce, as they are more complex and difficult for consumers to evaluate (Aboah and Lees, 2020). Credence attributes, on the other hand have received more attention in the consumer preferences literature (Aboah and Lees, 2020). More specifically, Fernqvist and Ekelund (2014) stated that health-related information and origin are among the main credence attributes valued by consumers. Concerning origin, the sense of belonging to a particular territory may influence how this and other more distant areas are evaluated at the moment of purchasing (Resano and Sanjuán, 2018). In this sense, a strand of the literature deals with 'local' food products (Bernabéu *et al.*, 2020; Fernández-Ferrín *et al.*, 2019; Martínez-Carrasco *et al.*, 2015; Migliore *et al.*, 2017) in the context of geographical and also emotional proximity to the consumer. The interaction of origin and autochthonous breeds, however, is not yet well understood (Resano and Sanjuán, 2018).

The identification of the most relevant beef attributes for consumers at the point of purchase can be obtained through stated and revealed preference methods. Analysing consumers' revealed preferences is costly and infeasible for developing new food products. Therefore, stated preferences have been widely applied (Aboah and Lees, 2020). A rating scale question is the most used stated method. However, in the last decade, choice experiment applications (combining a purchasing context with a controlled experimental setting) have arisen (Hensher *et al.*, 2015). Choice experiments involve the analysis of a smaller number of attributes

to diminish the cognitive effort faced by the consumer, in a more specific choice situation. Despite their peculiarities, it may be interesting to investigate consumer's responses under both approaches, rating and choice experiment, to ensure providing reliable information. The combination of both, may be especially useful for investigating some specific attributes related to key marketing tools; in particular, those whereas the budgetary constraint may be more present in a real purchasing situation.

The main aim of this paper is to identify which are the most important attributes that distinct stakeholders consider that consumers use when purchasing beef, and compare this with consumers' own valuations in order to reveal possible discrepancies or the existence of a perception-gap. For this purpose, consumer preferences are examined under two stated approaches: i) a more convenient rating question and ii) a purchasing context approach within a choice experiment; while consumer preferences according to the different supply chain agents, are examined through a Delphi method. The rest of the paper is structured as follows. Section 2 describes the methodology, whilst the results are discussed in Section 3. Finally, section 4 is devoted to conclusions.

2. Material and methods

2.1. *Consumers' survey*

A face-to-face interview was conducted at the respondents' home. It was carried out in different localities in the Cantabria region in 2015. Out of the 733 participants, 600 fully completed the survey and met the following requirements: they were regular consumers of beef, involved in food shopping and older than 18 years old. A subsample of 504 consumers also participated in the choice experiment. Both samples were representative in terms of age, gender and geographic location (see later Table 4) of the regional population. Further details on the choice experiment can be consulted in Resano *et al.* (2018). The questionnaire was structured in the following order: first, purchasing and consumption habits of beef, and attributes influencing at the moment of purchasing; second, the choice experiment; third, consumer socio-demographics.

The attributes selection criterion in both the questionnaire and the choice experiment was assessed by experts in meat science, on a pilot study with consumers and the relevant scientific literature, as well as based on previous results carried out in the same region (Serrano *et al.*, 2018). In particular, one of the aims of the previous study

Table 1 - Attributes used in the rating question addressed to consumers and experts.

Consumers: At the moment of purchasing beef, how important are the following aspects? Experts or supply chain actors: At the moment of purchasing beef, how important do you consider the following aspects are for consumers? *Please, rate your answers on a scale from 0 (Not at all relevant) to 10 (Very important)*	
Attributes	*Description*
Origin	National production; regional production; regional production with autochthonous breeds
Health-related information	The guaranty of more heart-healthy meat (recommended % saturated/ unsaturated fat and omega-3/6 fatty acids)
Tenderness	The guaranty of a very tender meat
Price	Being cheap or low price
Slaughter age	Beef comes from a young calve (8-10 months)
Colour	The colour is light red/pink
Place of purchase	Establishment appearance
	The butcher's advice

was to obtain meat from a regional origin and autochthonous breed with healthier specific nutritional characteristics, and also very tender.

The full list of attributes evaluated by consumers and experts is shown in Table 1. From this, a subset was used in the choice experiment (see later).

2.2. *Delphi study*

A Delphi survey was conducted to key actors along the beef value chain which we denote as well as "experts". This method has been widely used in social sciences (Landeta, 2006). It has also been demonstrated as especially useful for evaluating the suitability of implementing policy plans and marketing strategies in the agro-food sector. Some relevant applications in the meat sector include Olaizola *et al.* (2012), Chamorro *et al.* (2012) and Tiberius *et al.* (2019).

The Delphi method consists of allowing experts to express their opinion through rounds of interviews in an interactive process employing a feedback system. Thus, the mean results of the first round are revealed to the respondents during the following round to confirm their valuations. The use of two rounds is considered as satisfactory in the literature (Olaizola *et al.*, 2012; Djekic *et al.*, 2018), as it helps getting a certain degree of convergence across the expressed opinions, guaranteeing more the panel participation than with a higher number of rounds (Landeta, 2006; Novakowski and Wellar, 2008).

In our application, the Delphi survey entailed two rounds and was carried out face to face. The second-round questionnaire included a summarized statistical report with both individual and global responses from the first round and invited experts to revise their initial valuation. Finally, the total number of participants was 38, being this number in line with previous Delphi studies (Olaizola *et al.*, 2012; Tiberius *et al.*, 2019). The participating actors can be grouped into four types: cattle farmers (18), industry (3 slaughterhouses and 5 cutting plants), retailers (2 distribution chains and 6 butchers') and restaurants (4). The cattle farmers were recruited in order to capture the diversity in herd sizes (3 had less than 100 Livestock Units (LU), 8 between 50 and 100 LU, and 7 had more than 50 LU) and localisation across the region. Considering the remaining actors, all the slaughterhouses in the region were recruited, the main retailer chain in the region was included as well as a local retailer chain more specialised in local food products; and the butchers and restaurants were recruited upon the condition of distributing local labelled beef. Therefore, we can consider the sample of these actors as representative of the regional value chain idiosyncrasy.

A questionnaire was developed to collect the experts' opinions. This questionnaire enquired among other aspects, which are the main attributes influencing consumers at the moment of purchasing. The proposed attributes were the same as in the consumer questionnaire to ease the comparison between actors (Table 1).

2.3. *Univariate and bivariate non-parametrical analysis*

Respondents (consumers and the remaining actors) were asked to value the degree of importance that the consumers attached to a set of ten attributes at the moment of purchasing beef, using a continuous scale ranging from 0 (Not at all important) to 10 (Very important). Citizens are widely familiar to this scale, since it has been traditionally used in the education system in Spain. Each consumer sample and the population were crossed with information on socio-demographics to test for significant associations through the Chi-square statistic.

The Kolgomorov Smirnov test confirmed that both consumers' and experts' ratings were not following a normal distribution. Then, non-parametrical statistics were used.

The Kruskal Wallis test was performed to investigate whether the ratings differed significantly across attributes, when valued by consumers, and by experts. The Spearman correlation was applied to test the relationship between consumers' and experts' ratings. Finally, the U-Mann Whitney pair-wise comparison test was used to determine which means between consumers and each actor of the beef value chain were different. Analyses have been conducted applying IBM SPSS 26 and Stata 17.

2.4. *The choice experiment*

2.4.1. *The design*

Attributes were selected as explained in subsection 2.1, while only a subset of those presented for evaluation and described in Table 2 were selected for the choice experiment. Note that, in a choice experiment, only a limited number of attributes can be evaluated simultaneously by consumers and that the complexity and number of choice sets to evaluate increases exponentially with the number of attributes. Price levels were obtained from representative retailers, both off and online. The attributes and levels considered in the choice experiment are presented in Table 2.

A sequential and iterative D-efficient experimental design, using a Bayesian approach was applied using Ngene software. A 2-alternative unlabelled design (options A and B) was used and a non-purchase option was also included. A 'pick-one response' was asked, trying to mimic a real-life situation.

Finally, 24 choice sets or cards were obtained split into 3 blocks such as each participant had to make 8 choices. Information on the meaning of the attributes/levels and a description of a purchasing context was read and provided with the cards. Further details on the design can be obtained in Resano *et al.* (2018).

2.4.2. *The econometric model*

The presence of consumers' preference heterogeneity has been captured through a Mixed Logit model (Random Parameters Logit-RPL).

In our specification, the utility obtained by individual n from alternative j (j = 1,…, 3) is modelled as follows (see Table 3 for a description of variables and their abbreviations):

$$U_{jn} = \beta_0 + \beta_{1,n}{}^* HI_j + \beta_{2,n}{}^* CP_j + \beta_{3,n}{}^* CPB_j + \\ + \beta_{4,n}{}^* QT_j + \beta_{5,n}{}^* VT_j + \beta_{6,n}{}^* Pr_j + \varepsilon_{jn} \quad (1)$$

Where β_0 and ε_{jn} are a specific constant (SC) for capturing the average impact of the non-choice, and the residual, respectively. The non-purchase alternative has no specific attribute/levels and its choice is only explained by the specific constant β_0. $\beta_{i,n}$ (i= 1,..., 6) are the random variable coefficients. The researcher has to specify the distribution for these coefficients. In this application, a normal distribution has been chosen, allowing for opposite preferences towards a particular attribute or attribute level. Conditional Logit (CL) is a specific case of a RPL, where coefficients are fixed instead of random. Further details on the RPL and CL models can be obtained from Train (2003) and Hensher *et al.* (2015). Attributes levels have been included in the model as dummies, while price has been incorporated as a continuous variable in (1). Analysis was conducted using NLOGIT 6.0.

Table 2 - Attributes and levels used in the choice experiment.

Attributes	*Levels*
Origin	Other origin; Regional production without autochthonous breeds; Regional production with autochthonous breeds
Health-related information	Absence of information; Recommended % saturated/ unsaturated fat and omega-3/6 fatty acids
Tenderness	Tender; Quite tender; Very tender
Price (Euro/kg)	12, 15 and 18

Table 3 - Description of the explanatory variables estimated in the model.

Name	*Description*
Health_ Information (HI)	1 if the alternative has suitable levels of saturated and unsaturated fat and an adequate proportion omega 3/6; 0 otherwise
Regional_ Production (RP)	1 if the alternative *j* comes from the own region, but is a non-autochthonous breed
Regional_Productionautochthonous Breed (RPB)	1 if the alternative *j* comes from the own region, and is an autochthonous 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
Price (Pr)	Price in alternative *j* with linear effect = 12, 15 or 18 (€/kg)

3. Results and discussion

3.1. *Consumers' profile*

As Table 4 shows, consumers in the survey and the subsample that participated in the choice experiment were mainly living in one out of the six localities with more than 10,000 inhabitants within the Cantabria region (65%), living in a multi-person household (88-91%), mainly female (51%), between 35 and 64 years old (54%), without having reached university studies (79-80%), and with households whose net income was located in the low-medium interval (64-67%).

With regards to some purchasing and consumption habits, consumers interviewed were regular eaters of beef in general, and in particular, 76-78% had consumed beef steak at least once a week at home. Around half of them considered themselves as expert purchasers, ranging from fairly to extremely (51-52%). They purchased beef mainly at the butcher's traditional shop (65%), followed by the butcher's section in the super/hypermarket (24%), and the self-service section in the super/hypermarket (10%). Interestingly, the direct selling channel appears to be marginal. Probably, and among other factors, due to the still low degree of development of this alternative system in Spain compared with other European countries, such as France (Sanjuán *et al.*, 2012). Respondents were also asked to value in a scale ranging from 0 ("I do not trust at all") to 10 ("I totally trust") the degree of confidence they assigned to different sources of information concerning beef origin, production and quality. In particular, more than two thirds of participants assigned a high level of confidence to the butcher's advice. In this sense, 67-69% of participants rated 8 or more out of 10 to this trusted source. This percentage declined to around half of respondents in the case of the producer or distributor source through the label or brand (52-53%), and was slightly lower towards the official bodies through the quality label (48%).

Moreover, approximately half of respondents spontaneously knew endangered autochthonous cattle breeds (46-50%).

The Chi-square statistic did not reveal the presence of statistical differences between-samples ($p<0.05$). Therefore, we may consider that both the full sample and the subsample are statistically homogenous in terms of the main socio-demographics, as well as beef consumption, purchasing habits, trust on information sources and knowledge of local breeds. Furthermore, as Table 4 shows, both samples were not only representative of the population in terms of age, gender and the geographic location, but also in terms of single households and higher education, while the choice experiment subsample is also representative in terms of income. Therefore, both the full and the choice-experiment samples are viewed as fully representative of the Cantabrian population.

3.2. *Main beef attributes influencing consumers' purchase: Consumers' and experts' evaluations*

The results of the Kruskall Wallis test (not presented) revealed statistically significant differences among attributes when valued by consumers (statistic: 389.040; p-value: 0.000) and experts (statistic: 144.935; p-value: 0.000). Considering jointly the ten attributes, the non-parametric Spearman's correlation between consumers' and experts' valuations is weak but positive and statistically significant (statistic: 0.122; p-value: 0.018), what can be interpreted as a sign of certain degree of convergence between the opinions of both groups of actors.

Results presented in Figure 2 (boxplot) and in Figure 3 (average ratings) distinguish between consumers' and experts' ratings.

As Figures 2 and 3 show, statistically significant differences have been found between value chain actors and consumers' valuations in six out of the ten attributes through the Mann-Whitney test ($p<0.05$).

Findings are also revealing the presence of a certain degree of heterogeneity in valuations, especially among consumers. Thus, Figure 2 depicts clearly the presence of a wider range and interquartile range (IR) in consumers' valuations. More specifically, notice that the box, which represents the IR is much longer for consumers than experts. The same occurs with the whiskers, which indicate the range of scores.

Table 4 - Description of the consumer samples and population (Cantabria region).

%	*Full Survey*	*Choice*	*Pop.*[a]	*Chi-square statistics (p-value)*		
				Full Survey vs Choice	*Population (Pop.) versus:* *Full Survey*	*Choice*
Size of the municipality: >10000 inhabitants	65	65	66	0.000 (1.000)	0.022 (0.882)	0.022 (0.882)
Age:				0.000 (1.000)	0.302 (0.860)	0.302 (0.860)
18-34	23	23	25			
35-64	54	54	55			
≥65	23	23	20			
Gender: Female	51	51	51	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)
Household size: One-person	9	12	10	0.479 (0.489)	0.058 *(0.809)*	0.204; (0.651)
Net income:				1.686 (0.430)	11.984 *(0.002)*	5.537 (0.063)
<1150€/month	30	29	26			
1150-3000€/month	67	64	56			
>3000€/month	3	7	18			
Higher education	20	21	18	0.031 (0.861)	0.130 *(0.718)*	0.287 (0.592)
Higher frequency (at least once a week) of beef steaks consumption at home	78	76	-	0.113 (0.737)		
Experience at beef purchasing: Extremely or fairly expert	51	52	-	0.020 (0.887)		
Place of beef purchasing:				0.055 (0.997)		
Butcher's	65	64				
Butcher's super/hypermarket	24	24				
Self-service super/hypermarket	10	11				
Direct selling	1	1				
High degree (8 out of 10) of confidence to the source of information:				0.092 (0.762) 0.000 (1.000)		
Who? How?				0.020 (0.887)		
Butcher's Oral advice	69	67				
Producer/distributor Brand/label	48	48				
Official bodies Quality label	52	53				
Spontaneous knowledge of endangered autochthonous cattle breed	50	46	-	0.321 (0.571)		
N. individuals	600	504	591,888			

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

The consumers distribution appears to be more negatively skewed. In some cases, even the top whisker is not displayed as it coincides with the third quartile. Moreover, statistical results show that the standard deviation is lower in the case of experts (2.22 versus 1.45 for the joint attributes), and the same occurs with the interquartile range (2.98 versus 1.21). In comparison to experts, consumers' ratings are also more extreme (average range of 10.00 versus 5.20 of experts). More specifically, five percent of consumers (percentile 5) did not consider relevant an attribute, as occurred with young calve, while for other five percent (Percentile 95), it appeared to be crucial determining their purchases. Considering these results, in section 3.4 (choice experiment results) we are going to explore the presence of heterogenous preferences in more detail.

From the supply chain actors' perspective, main discrepancies with consumers in terms of ranking occurred with the health-related attribute, butcher's advice, and the low price. Turning to other attributes with a closer ranking across supply chain actors but still with significant mean differences, experts considered that the establishment appearance, as well as the origin, are more important for consumers than what own consumers report. More specifically, heath-related information appeared to be crucial for consumers, whilst it was ranked in the eighth position by experts. This finding is not surprising, as in recent years beef consumers are becoming more health-concerned (Hocquette *et al.*, 2018; Liu *et al.*, 2020). Previous literature supports that the provision of health information is more effective in influencing choice for consumers more health-concerned (Resano *et al.*, 2018). However, value chain actors may not be so conscious of the influence of this attitudinal characteristic on consumer's choice.

Results suggest that attributes related with the beef purchasing establishment (which in our case was mainly referred to the butcher's) were very relevant. This result is at least partially supported; first, by the fact that around two thirds of the consumers who participated in the survey regularly purchase beef at the butcher's, and they stated that they trusted on the advice provided by the butcher; second, by the findings obtained by Resano and Sanjuán (2017), who also found that consumers conferred a high importance to these attributes. However, in our study, the experts expected that establishment attributes were even more important for consumers. Interestingly, the butcher's advice played the most relevant role in consumers' decision from the experts' point of view, while it occupied the fifth position in consumer's mind.

Remarkably, the low price also played an important position (fourth) for experts, but got the last position in consumers' ranking. This result can be specially interesting for determining the suitable pricing strategy. In this sense, Resano and Sanjuán (2017), using a similar rating approach, found that "a higher price" is not perceived as a relevant quality cue at beef purchasing. In our case, despite we were asking for the main attributes, and not the attributes acting as quality cues, results also indicate a low impact of price on preferences. Considering these rating results, and in contrast to value chain actors' opinion, it appears that consumers are not so price sensitive. However, we need to be cautious with this result, since price has been considered within the literature one of the most important search attributes at beef purchasing (Henchion *et al.*, 2014; Aboah and Lees, 2020). Figure 2 also shows the presence of heterogeneous preferences towards price (with a high interquartile range). Therefore, at least some consumers may be prone to purchase a more expensive and differentiated beef (e.g. with the guaranty of very tender beef). Considering its relevance, we are going to further investigate price, since it may exert a higher influence in a purchasing context and when considered simultaneously with other attributes.

Interestingly, both consumers and experts agree on the higher importance of the regional origin over the national one, while value chain actors do not consider this regional origin as important as the consumers claim. The predominant role of the regional origin is well documented in consumer research literature, which is explained by ethnocentrism or cultural-social embeddedness in the territory (Resano and Sanjuán, 2018; Henchion *et al.*, 2014; Aboah and Lees, 2020; Van Ittersum *et al.*, 2003). In our case, the high spontaneous knowledge of endangered autochthonous cattle breed (as shown in Table 4), may

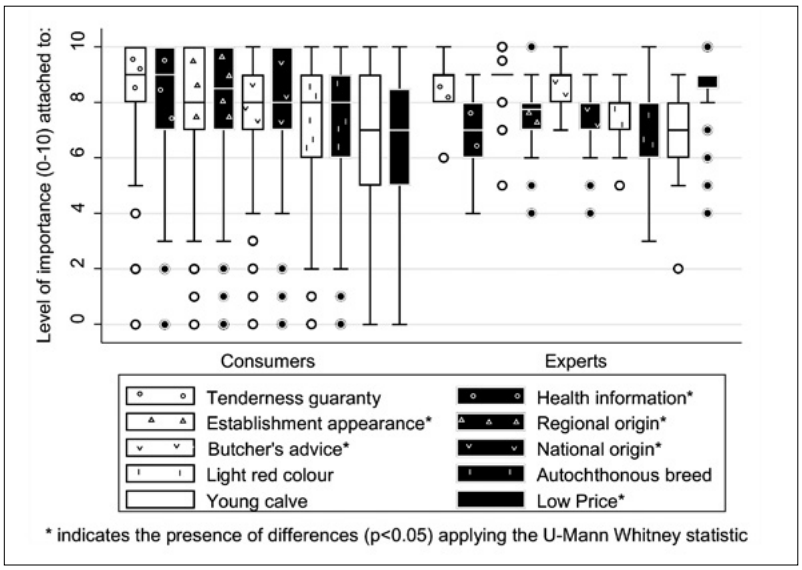

Figure 2 - Importance attached to beef attributes at the point of purchase by consumers, according to consumers and supply chain actors (experts) (boxplot).

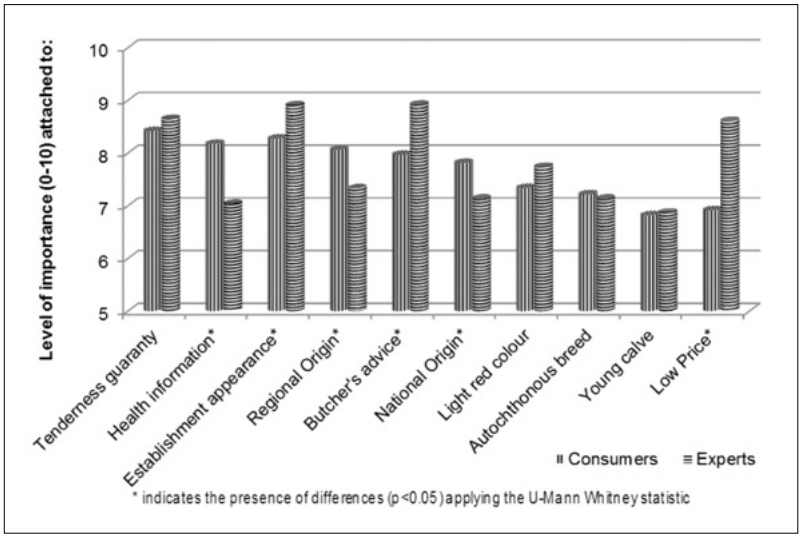

Figure 3 - Importance attached to beef attributes at the point of purchase by consumers, according to consumers and supply chain actors (experts) (mean).

Notes: Items were evaluated through a continuous scale ranging from 0 = Not at all important to 10 = Very important.

be revealing the presence of a strong cultural relationship with the own region. Notwithstanding, specific ethnocentrism indicators could also be evaluated in a future avenue of research.

For the remaining four attributes that do not evoke a distinct response between supply chain actors the total mean can be used as a measure of central position. The tenderness guaranty occupies the first position, followed by the light red colour, autochthonous breed and young calve. Note also that the tenderness guaranty played the most relevant role in determining consumers' choice according to both consumers and experts. This finding agrees with Font-i-Furnols and Guerrero (2014) and Liu *et al.* (2020), who found that tenderness is one of the most valued sensory attributes. The high variability in beef quality makes difficult to assess the eating quality based only on its appearance (Hocquette *et al.*, 2018). The presence of a guaranty may help diminishing the perceived risk that the experienced quality will not match expectations, and the risk of purchasing in general, especially to less expert consumers. Around half of consumers in our study consider

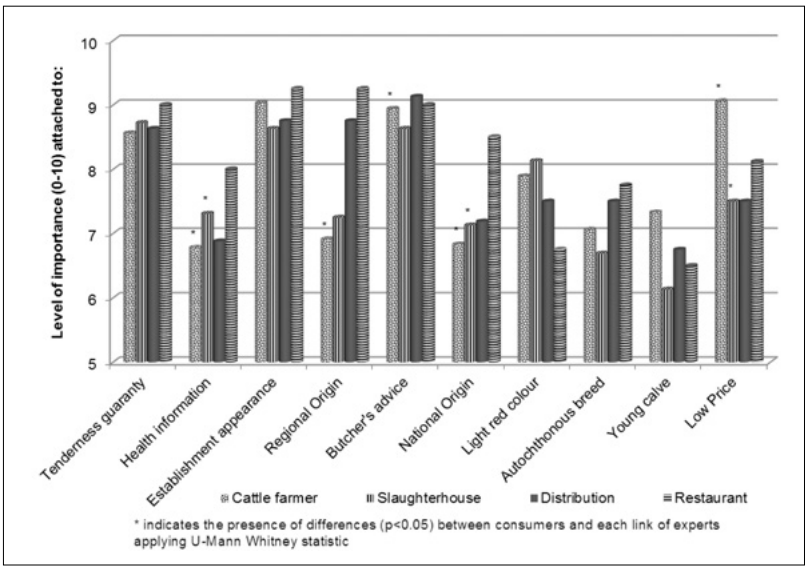

Figure 4 - Importance attached to beef attributes at the point of purchase by consumers, according to different supply chain actors (mean).

themselves as less than fairly experienced (see Table 4), what might explain the high importance attached to the tenderness guaranty, which in turn might increase consumers' confidence at purchasing (Macready *et al.*, 2020).

The remaining attributes with convergent opinions between consumers and experts, the light red meat colour, autochthonous breed and slaughtering young calves played a less prominent role. According to the literature, different shades of red colour may trigger beef freshness perception in a distinct manner (Font-i-Furnols and Guerrero, 2014). In this sense, our result concords with Resano and Sanjuán (2017), who also showed that consumers attached a medium relevance to red colour among a total of 19 quality cues, in particular to a redder one. These authors also reported that consumers assigned a similar importance to the breed and to the slaughter age. Further insights on autochthonous breed are shown in subsection 3.4 when describing the choice experiment results.

3.3. *Main beef attributes influencing consumers' purchase: Different experts' valuations*

After detecting the presence of a certain perception gap, as we have found differences between own consumers valuations and experts' valuations of consumers' preferences, in Figure 4, we are going to analyse which are the most important attributes that distinct actors consider that consumers use when purchasing beef. Following U-Mann Whitney test results, it appears that the closer we move in the value chain to the consumer, the less difference with this actor we find. This result agrees with Cruz *et al.* (2021), who explained that the loss of a direct relationship with the farmer jointly with the current increase in complexity of production and distribution channels, make consumers to obtain relevant purchasing information from actors different from the farmer. Thus, statistically significant differences have been found between cattle farmers and consumers valuations in five out of the ten attributes, while this number decreases to three in the case of slaughterhouses and to zero in the distribution and restaurants stages. In line with our research, Olaizola *et al.* (2012) found the presence of noticeable differences among the different actors of the beef value chain. Nevertheless, they showed the presence of higher convergence between those actors placed farther from the consumer. In particular, differences between consumers and farmers were lower than between others actors of the value chain in some specific attributes, such as animal nutrition and quality certification.

Concerning the ranking, as mentioned in the previous subsection, main discrepancies with

consumers occurred with the attributes related to health-related information, butcher's advice and low price. The former appeared to be crucial for consumers, whilst it was ranked from the fifth position in the case of slaughterhouse to the last position by cattle farmers. As we may expect, the second aforementioned attribute played the most relevant role for distributors, however, no significant differences were found with consumers. In contrast, significant statistical differences were found in the case of cattle farmers, where it occupied the third position versus the fifth position in consumer's mind. The low price played the most relevant role for the cattle farmer, getting the fourth position for the slaughterhouse, and the last one in consumers' ranking.

Similarly to consumers, cattle farmers also conferred a higher utility to the regional origin than the national one (eighth versus ninth position). However, the consumer attached a higher utility in both cases (assigning the fourth and sixth position, respectively).

3.4. *Main beef attributes influencing consumers' purchase: Consumers' choice experiment results*

In this subsection we further examine consumers' preferences. For comparison purposes with the stated questionnaire approach, we investigate the relative importance attached to the different beef attributes obtained from the choice experiment, that is, in a simulated purchase context. Obviously, only that subset of attributes within the choice experiment can actually be compared across methodological approaches.

Estimation results are showed in Table 5. The Adjusted Pseudo R^2 in both models (0.330 and 0.351 in CL and RPL respectively) depicts that the overall fit can be considered as appropriate. Nevertheless, the most flexible model (RPL), which allows capturing consumers' preference heterogeneity, provides a better fit. Similarly, the likelihood ratio test (LLR) favours the random versus the fixed parameters specification.

Mean coefficients are positive and highly significant, except price. This fact implies that providing information about some attribute levels to the consumer at the moment of purchasing increase the probability of choosing a product with these features. Considering the RPL results, standard deviations are significant (apart from regional production and quite tender meat), what is an indication of heterogeneous preferences. Therefore, subsequent analysis will be based on the RPL estimation.

In particular, the price effect is negative and significant with a significant standard deviation. Given the normality assumption, the probability of choice increases when the price is lower for around 52% of the respondents, while the remaining 48% prefer a higher price. This latter result can be indicating that price may be acting as a quality cue (Resano *et al.*, 2012). However, on average, this effect is almost compensated. This result agrees with the high standard deviation and interquartile range found by the low-price evaluation in the consumer survey (see subsection 3.2). It may also help to explain, at least to a certain extent, the last position occupied by low price in the ranking of attributes relevance, suggesting that for some consumers a low price is not so relevant at the moment of purchasing. Previous studies also showed the existence of heterogeneous preferences towards price (Sanjuán and Khliji, 2016), as well as consumers' segments with opposite preferences concerning this attribute (Font-i-Furnols & Guerrero, 2014).

The relative importance of each attribute is shown in Table 6. The health-related information ranks first (33%), followed by origin (31%). The tenderness level occupies the third place (21), and finally, price gets the last place (15%).

The relative importance for the selected attributes obtained from the choice experiment and that one observed with the attribute ratings in the survey are in general consistent, with minor discrepancies. Thus, the relevance of health-related information is highlighted by both methods, occupying the first position in the ranking, while a low price is considered as the least important in both methods. Likewise, the regional origin is preferred over the remaining origins or the national one in both methods used to elicit preferences. The tenderness guaranty, on the other hand, appears to be more important in the rating question than in the choice experiment, whilst the regional autochthonous breed occupies a

Table 5 - Conditional and Random Parameters Logit results.

Variable		*CL*[a]: *Coefficients (Std. Error)*	*RPL*[a]: *Coefficients (Std. Error)*
Health_Information$_j$ (HI)	Mean	0.963***[b] (0.052)	1.380*** (0.093)
	Std.Dev.	-	1.245*** (0.097)
Regional_Production$_j$ (RP)	Mean	0.563 *** (0.050)	0.746***(0.063)
	Std.Dev.	-	0.051(0.130)
Regional_Production_ Autochthonous Breed$_j$ (RPB)	Mean	0.934*** (0.058)	1.286***(0.086)
	Std.Dev.	-	0.969***(0.097)
Quite_Tender$_j$ (QT)	Mean	0.414*** (0.052)	0.614*** (0.065)
	Std.Dev.	-	0.120(0.118)
Very_Tender$_j$ (VT)	Mean	0.634*** (0.056)	0.895***(0.085)
	Std.Dev.	-	0.901***(0.102)
Price$_j$	Mean	-0.057*** (0.008)	-0.107***(0.013)
	Std.Dev.	-	0.163***(0.012)
SC	Mean	1.971*** (0.140)	3.832***(0.242)
LL0[c]		-3368.673	-3368.673
LL[c]		-3136.930	-2867.475
LLR[d]		463,486 (0.000)	538,910 (0.000)
Adjusted Pseudo – R^2		0.330	0.351
N. observations		4032	4032

[a] *Models were estimated using 200 Halton draws.*
[b] **** indicates the presence of statistical significance at 1%.*
[c] *LL0 and LL account for the value of the log-likelihood function evaluated in a model with constant, and with all the explanatory variables, respectively.*
[d] *LLR to test the joint significance of CL model, first versus the model with only a constant, and second, versus the RPL model (p-value in parentheses).*

more relevant position according to the latter experiment. These results appear to indicate that adding degrees of reality to the experiment may not always affect noticeably the ranking of preferences, being consumers' preferences consistent. Nevertheless, further research is still needed to ascertain the suitability of including a purchasing context when evaluating consumer rated preferences.

4. Conclusions

The European public administration is encouraging the development of healthier, fairer and more environmentally friendly beef production systems. In the same line, consumers are becoming more concerned about these characteristics.

Table 6 - Attributes/levels relative importance calculation.

Attributes/levels	*Effect*	*Max e*[a]	*Ri*[b]	*Rank*
Health Information	1.380	1.380	33%	1
Origin	1.286	1.286	31%	2
Tenderness level	0.895	0.895	21%	3
Price	-0.107	0.642	15%	4

[a] *Following Maaya, Meulders, Surmont & Vandebroek (2018), for instance the maximum effect (Max e) of the price in the CL model is the absolute value of its estimate multiplied by the range or difference between the highest and lowest levels of the price: 0.107*(18-12) =0.642.*
[b] *Relative importance (Ri) for each attribute or level is calculated as the ratio between its range and the sum of ranges for all the attributes or levels (see also Sanjuán and Resano, 2020).*

However, some communication failures may exist along the beef chain preventing from a suitable transmission of real consumer requirements to the remaining actors. Thus, the rationale behind our approach responds to reduce the perception gap between the different actors in the value chain in order to meet more efficiently consumer preferences regarding meat attributes at the moment of purchase. Despite its relevance, this issue has still been scarcely analysed within the literature. To accomplish this aim, this paper compares own consumers reported preferences with the opinion that different actors along the value chain have on consumer's preferences. Furthermore, consumers responses are obtained under two stated approaches: a rating scale and a choice experiment.

The main beef attributes at the point of purchase for consumers were tenderness, health information and the regional origin. In general terms, consumers did not appear to search for low-price beef at purchasing, however, heterogenous preferences towards price have been found. These findings may be revealing the existence of a niche market for more differentiated and sustainable beef. This information may be especially interesting for cattle farmers producing local or autochthonous breed calves in extensive livestock farming systems, as they could be more vulnerable to the emergence of the recent challenges. These actors should therefore put a greater effort not only on producing very tender and healthy beef, but also on providing information of this added value along the value chain in order to finally meet consumers' preferences.

However, some discrepancies have been found between the different actors throughout the beef chain. In this sense, results suggest that cattle farmers appear to know less about consumers' preferences than the remaining actors. This finding demonstrates to marketers and policy makers the importance of transmitting consumer needs along the whole supply chain, especially to those actors who are located upstream of the supply chain. Based on the results of the research, local and national institutions should work together with the remaining actors within the chain to improve the communication and promote the consumption of sustainable beef. In this sense, the development of a marketing campaign to promote the use of a voluntary and sustainable labelling, as occurs with the autochthonous breed, and with an EU origin-labelled scheme, could be advisable. This labelling adds utility to the consumer, and it is useful to diminish the existence of information asymmetry about the production processes, and the beef attributes, especially between the cattle farmer and the consumer.

Moreover, encouraging the development of short-supply chains may also help to establish a closer relationship between producers and consumers and shorten the perception gap. This cooperation may enable the participants to strengthen the trust and transparency throughout the value chain.

Furthermore, we have analysed the results obtained using a convenient and easy attributes-rating question and the ones obtained within a choice experiment, which mimics a real purchase, although without an economic incentive. Despite the presence of some differences, which may be explained at least partially by their specificities, preferences elicited through both approaches appear to be mostly consistent. Therefore, we can conclude, that conducting a stated rating approach provides a consistent ranking of relevant consumers preferences, which can be a very useful tool in the comparison of the different actors' valuations throughout the value chain. Moreover, further insights should be provided to assess to what extent hypothetical methodologies may be good predictors of a real purchase.

Future extensions of this study may be based on exploring different markets. For instance, comparing the results obtained in one of the main producing areas with a less producing area. Additionally, investigating different methodological refinements may be also interesting. More specifically, it could be interesting to investigate the effect of turning the stated method into an experiment closer to an actual purchase.

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