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A Dual Response Choice Experiments (DRCE) design to assess rabbit meat preference in Catalonia: A Heteroscedastic Extreme-Value Model

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Abstract

Our paper analyzes consumer preferences toward fresh rabbit meat and alternative marketing formats for rabbit meat. The empirical analysis uses consumer-level questionnaires to elicit information regarding consumer attitudes toward rabbit meat in Catalonia (Spain).

We use the Dual Response Choice Experiment (DRCE) design which allows for analyzing forced and unforced options in choice experiments using the same sample. The Heteroscedastic Extreme-Value (HEV) model is used due to its relaxation of the restrictive assumption made in the Multinomial Logit Model regarding the identically distributed error term across alternatives.

Our results demonstrate a higher preference for rabbit meat from “Catalan” origin followed by higher quality certification information. Convenience and “ready to eat” products made from rabbit meat may help bolster increased consumption. An effective communication campaign is needed to educate individuals regarding the health characteristics of rabbit compared to other types of meat. Furthermore, results demonstrate that the ordering of attributes is not significantly different from forced and non-forced choices obtained from the DRCE design. However, significant differences on the magnitude of the preferences for some attributes’ levels are found.

1. Introduction and objectives

In recent years, the rabbit meat sector in Spain, and especially in Catalonia, has undertaken some important changes. The number of farms has decreased dramatically between 1993 and 2007 for both Catalonia (78%) and Spain (54%). This crisis has been coupled with a significant decrease in the rate of average rabbit meat consumption per capita/year from 1999 to 2009 by 33.87% for Spain and 21.51% for Catalonia (MARM, 2010). As a result, the local authority in Catalonia approved a strategic plan to evaluate the consumption of the rabbit meat in 2004. The assessment included a SWOT analysis (Weaknesses, Threats, Strengths and Opportunities) of the sector in order to identify their advantages and disadvantages along its marketing stages (DAR, 2007).

One of the main identified weaknesses was that rabbit meat was defined as a homogenous product without differentiation for quality or geographical area (DAR, 2007). In response, stockholders within the rabbit meat commercial chain have considered the possibility of introducing a certified brand based on its region of origin (Catalonia) to provide a premium to its value. Currently, rabbit meat is commonly sold as a whole carcass or a cut-up carcass, which is not very attractive. However, since consumers, especially younger consumers are influenced by the presentation of a product, different convenience and attractive new products could have a potential in increasing demand for rabbit meat. Examples of these new products might include: a) entire carcass pre-roasted rabbit meat (ready to eat), b) hamburger and c) mortadella both made from mixed rabbit and turkey meat.

Rabbit is a micro-livestock animal producing on average about 47 kg of meat per doe year (Kalio *et al.*, 2008). Rabbit meat has low fat and cholesterol level comparable to poultry, turkey, beef or pork (Cheeke, 1986 and Lukefhar *et al.*, 1986). In spite of current consumer preferences for convenience products, additional consumer concerns about pesticide residues, chemical additives, saturated fats, cholesterol, sodium and preservatives in food products (McLean-Meynsse, *et al.* 1994), the consumption per Spanish resident hardly reached 1.23 kg per capita/ year and 2.08 kg per capita/year in Catalonia in 2009 (MARM, 2010). Compared to other meats, rabbit meat is the least important from a consumer point of view. In 2009, poultry was the most consumed meat per capita/year in Spain (12.72 kg) and Catalonia (13.36 kg) followed by pork (11.43 kg and 12.01 kg respectively), bovine (6.60 kg and 7.20 kg respectively) and finally ovine (2.19 kg and 2.65 kg respectively) (MARM, 2010). Consumption data show an opportunity to increase the market share of the rabbit meat if it can be shown to be a substitute meat.

In analyzing the literature of consumers’ preferences for rabbit meat, there are clearly two different approaches: a) the first focuses on consumer acceptance for the intrinsic quality cues (cut,

colours, fat content, marbling, fat lumps,...) and the impact of different treatments on such quality (feed, rearing conditions,...), b) the second analyzes consumer preferences toward the hedonic or extrinsic quality cues of rabbit meat and their decision to buy the product (origin, information, production, brand, format, presentation, price...). Our literature review has focused on the second approach due to its relevance in our study. In this context, several studies have analyzed consumers' preferences, attitudes and perception toward rabbit meat in different countries (Table 1).

To our knowledge there are no published studies that analyze consumer attitudes and perceptions towards rabbit meat in both Spain and Catalonia. As shown in Table 1, almost all authors focus their studies on the analysis of the association between consumption and consumer demographics and socioeconomic variables. Rabbit meat consumption has been shown to be significantly linked to socioeconomic characteristics, price and particularly to the cultural background of consumers.

Table 1: Consumers' preferences for rabbit meat studies

<i>Authors</i>	<i>Methods</i>	<i>Object</i>	<i>Sample</i>	<i>Country</i>	<i>Main results</i>
Bodnar and Horvath (2008)	Descriptive statistics	Consumers' opinion about rabbit meat	1,274 face to face consumers	Hungary	1. Availability is the most limiting factor
Hoffman <i>et al.</i> (1992)	Descriptive statistics	The market potential of Rabbit meat	118 face to face consumers	Burkina Faso	2. Price is the main limiting factor
Hoffman <i>et al.</i> (2005)	Descriptive and bivariate statistics	Ethnicity effect on rabbit meat consumption	304 face to face consumers	South Africa	3. Cultural beliefs are an important factor for rabbit meat consumption
Kalio <i>et al.</i> (2008)	Descriptive statistics	Rabbit meat preference	200 face to face consumers	Nigeria	4. Preferred attributes are : taste, cheapness and tenderness
Kallas <i>et al.</i> (2011)	CE and AHP	Rabbit meat preferences	50 face to face restaurateurs	Spain	5. Format presentation and origin of the rabbit meat are the most important attributes
McLean-Meynsse <i>et al.</i> (1994)	Descriptive and bivariate statistics	Perception and attitudes toward Rabbit meat	1,002 Tf. Interview Consumers	United States	6. Preferred characteristics: Taste, appearance and nutritional att.
McLean-Meynsse, (2000)	OP model	Shopper's attitude toward rabbit meat	1,002 Tf. Interview Consumers	United States	7. Positive attitude toward rabbit meat is associated with gender, religion and employment status.
Szakály <i>et al.</i> (2009)	Descriptive and bivariate statistics	Rabbit and beef consumer behaviour	300 face to face consumers	Hungary	8. Price is not important. Dietary habits is the most limiting factors

CE: choice Experiments, AHP: Analytical Hierarchy Process, OP: Ordered Probit.

Using our literature review as a guide for setting relevant questions, a structured questionnaire was designed to assist with the objectives of this study. Our main objective is to analyse consumer attitudes, behaviours and perceptions toward rabbit meat in Catalonia. Secondary objectives include the following: a) to assess consumer preferences and willingness to pay for rabbit meat attributes, especially for origin and quality brands and b) to measure consumer willingness to pay for new rabbit meat products as alternatives of the traditional entire carcass format. Choice Experiment (CE) and Contingent Valuation (CV) methodologies are commonly used to analyze the stated willingness to pay for food attributes. CE is used due to its suitability for simultaneously evaluating several product descriptors (i.e. attributes and levels) in 'complex goods.' CV is used due to its capacity to obtain the holistic or aggregated value for a specified hypothetical product. There is currently no published paper that uses CE and CV to assess consumer preferences for rabbit meat.

This paper is structured as follows: Section 2 discusses the methodological framework considered for CE and CV. The empirical application is commented in section 3. The main results are discussed in Section 4 and the paper ends with some concluding remarks.

2. Methodological framework

2.1. The Choice Experiment, CE

The CE method involves the characterization of the object of study through a series of descriptors (i.e. attributes and their levels) that can be combined using experimental design to create different hypothetical scenarios of the product (alternatives). The scenarios are grouped, constructing “choice sets” which represent changing one or more attributes. Respondents are faced with several choice sets and are asked to select their preferred product while implicitly making a trade-off between descriptors. One of the attributes is usually defined in monetary terms (frequently the price) allowing the researcher to obtain the monetary values associated with attributes and attribute levels. Further details of the method can be found in Hensher *et al.* (2005) and Louviere *et al.* (2001) among others.

Researchers usually face two approaches in the construction of choice sets: The first relies on excluding the no-choice option from choice sets by forcing participants to select a product from the defined choice set as done by Enneking (2004) who analyzes consumers’ preference in the German meat sector. In the second approach, a “fixed alternative” is included in the choice set allowing for a non-forced choice task. In meat preference studies, several works have used this approach mainly in three ways: a) by introducing a *status quo* alternative (Mørkbak *et al.*, 2011), b) by including the “buy-my own brand” alternative (the usually purchased product) which represent the current levels of attributes with zero additional cost (Kontoleon and Yabe, 2003) and c) the “opt-out option” (the null-option or outside option) where neither of the offered products is preferred (no-choice or no-purchase) as in Unterschultz *et al.*, 1998; Loureiro and Umberger 2007 Kallas *et al.*, 2011.

The issue of including or excluding the opt-out alternative in choice experiments has been addressed by several studies from which we summarize the main implications and results in Table 2. We focus on answering 4 questions: 1) why include a fixed option?, 2) why respondents select the fixed alternatives as their preferred option?, 3) what are the general implications? and 4) what are the econometric implications? From this literature review, the implications underlying the no-choice option in CE design usually leads to the use of a split-sample, as in Dhar and Simonson (2003); Enneking (2004) and Carlsson *et al.* (2007) among others. The first sample is faced by the traditional single-stage free Choice Experiment (i.e. with opt-out option), while the second sample is faced with a forced choice. However, other studies have used the within-sample approach which allows us to obtain both forced and non-forced choices from a unique sample (Brazell *et al.* (2006), Boyle and Özdemir (2009), among others). The latter approach is known as the Dual Response Choice Experiment (DRCE) design (Brazell *et al.*, 2006).

Table 2: forced versus non-forced choice: results and implications

▪ <i>Why including a fixed option?</i>
▪ Depends on the objective of the study (Dhar, 1997; Dhar and Simonson, 2003; Bech and Gyrd-Hansen, 2005; Carlsson <i>et al.</i> , 2007).
▪ The non forced choice increases the realism of the hypothetical simulated market (Batsell and Louviere, 1991; Carson <i>et al.</i> , 1994).
▪ Including an opt-out option allow to be consistent with the demand theory and enhance the theoretical validity of the welfare estimates (Bateman <i>et al.</i> , 2003; Adamowicz and Boxall, 2001; Bastell and Louviere, 1991).
▪ A “no-purchase” alternative could be recommended when the researcher seeks to measure market penetration (Carson <i>et al.</i> , 1994).

- A fixed alternative allow knowing the shift from the usually purchased product to the new ones (Carlsson *et al.*, 2007). However, compared to no-choice it could be less realistic and more restrictive (Haaijer, *et al.*, 2001).
- The forced choice could be applied when: a) the interest of the study is to compare levels and attributes or alternatives (Carlsson *et al.*, 2007), b) the procrastination of the choice is damaging, i.e. the cost of delay is high or the product is needs urgently (Dhar and Simonson, 2003) and c) to avoid potential “greater easy way out” (Blamey and Bennett, 2001).

▪ ***Why respondents select the fixed alternatives as their preferred option?***

- According to rational theory it happen when there is no compelling rationale for choice, either because the difficulty to select the best alternatives or because neither alternative stands out in comparison (Dhar and Simonson, 2003; Dhar, 1997; Baron and Ritov, 1994) or due to the desire to save time and effort (Dhar and Simonson, 2003).
- According to the psychological theory, in a high uncertainty context, respondents tend to select the fixed alternative since it is less likely to be seen as errors (Simonson and Tversky, 1992). Consumers prefer bearing the consequences of inaction rather than those of wrong action (Baron and Ritov, 1994).
- When the choice task is difficult, thus respondents use it as an easy way to answer, distorting the incentive for a true preference revelation (Carson *et al.*, 1999; Vermeulen *et al.*, 2008).
- When the choice set does not contain enough different options from their *status quo* where the choice set contains relatively homogeneous options (Huber and Pinnell, 1994).
- When options in the choice set are not attractive and do not meet a minimum acceptable standard for respondents (Huber and Pinnell, 1994).
- When no clear best alternatives exist revealing “preferences uncertainty” (Carlson *et al.*, 2007; Dhar, 1997).

▪ ***What are the general implications?***

- The “no-choice” makes the decision situation with less conflict and negative emotion (Luce, 1998). It reduces the psychological discomfort (Dhar and Simonson, 2003).
- The presence of a fixed alternative allow to modelling the choice between attributes and levels as well the participation decision (Batsell and Louviere, 1991; Carson *et al.*, 1994).
- A fixed alternative may facilitate aggregating different data sets (Louviere and Woodworth, 1983; Haab and McConnell, 2002).
- Non-forced choice makes easier the experimental design and more efficient (Anderson and Wiley, 1992; Brazell, *et al.*, 2006).
- The fixed alternative is not varying across alternatives, thus there is no information about attributes and levels preferences.
- With forced choice, preferences results could be biased. Individual true preference could be masked (Dhar and Simonson, 2001; Dhar, 1997; Huber and Pinnell, 1994). In addition if choice is difficult, respondent behave by selecting a) a “compromise alternative”, b) “asymmetrically dominated alternative” and c) high quality high price alternative.
- Forcing respondent to select can affect the magnitude of context effects that is the salience of attributes relative to real market choice (Dhar and Simonson, 2001; Huber and Pinnell, 1994).

▪ ***What are the econometric implications?***

- The fixed alternative may cause the utilities of alternatives to be correlated, violating the IID (error term is distributed independently and identically) assumption underlying the Multinomial Logit Model.
 - The IIA (Independence of Irrelevant Alternatives) assumption tends to be violated when the opt-out alternative is introduced since it tends to take away greater share from certain options rather than others that individuals tend to select under forced choice (Dhar, 1997; Dhar and Simonson, 2001; Brazell, *et al.*, 2006).
 - Excluding the fixed alternatives, may overstate the likelihood that individuals would actually choose one alternative from a choice set. Thus, the estimates of Hicksian surplus could be biased upward (Boyle *et al.*, 2001, Banzhaf-Ruby *et al.*, 2001). Implication on the marginal trade-off between attributes and levels, especially on the implicit price calculation (Kontoleon and Yabe, 2003).
 - The non-forced choice improves the statistical efficiency of the estimated choice parameters (Louviere *et al.*, 2000; Anderson and Wiley, 1992).
 - The optimal designs for CE with and without no-choice option are equal (street and Burgess, 2004)
-

2.1.1. The Dual Response Choice Experiment design (DRCE)

In the DRCE, respondents are first asked to choose from the set of available alternatives in a forced choice task (without a no-choice option). Then, in a second task an opt-out option is included and the selection exercise is repeated. Brazell *et al.*, 2006 have empirically compared the DRCE to the traditional Single-Stage Free Choice Experiment design showing more efficient coefficient¹. In our study we follow the DRCE design. However, in spite of repeating the choice exercise in the second task, respondents are asked if they are willing to buy their selected alternative from the previous forced task (Figure 1), simulating the “no-choice” alternative of the traditional single-stage free CE. This approach has been recently applied in Boyle and Özdemir (2009) who analyzed different conservation programs. In the first step they ask respondents which program do they prefer (A or B), and in the second step they ask them to vote between programs or doing nothing.

Choice set # 1	Alt. “A”	Alt. “B”
Attribute 1 (A ₁)	Level 1 (L _{1,1})	Level 2 (L _{1,2})
⋮	⋮	⋮
Attribute n (A _n)	Level 3 (L _{4,3})	Level 1 (L _{4,1})

Step 1

Step 2

1. Considering that “A” and “B” are the only available products, which product would you choose? “A” ☐ “B” ☐

2. Would you purchase your chosen product? Yes ☐ No ☐

Figure 1: Within-sample approach to analyse forced and non-forced experiments

2.1.2. Choice experiment: econometric modelling

Independent of the decision to include or exclude an “opt-out option”, the usually applied model for dealing with the generated data fall within the standard Multinomial Logit (Haiijer *et al.*, (2001). Possible models for CE include the Multinomial Logit model (MNL), the Random Parameter Logit model (RPL), the Latent Class model (LC) and the Heteroscedastic Extreme Value model (HEV) among others. These models can be estimated in the presence of the no-choice option by adding an Alternative Specific Constant (ASC_{no-choice}) representing the no-choice option in the design. Another way to model the no-choice option is by specifying a Nested Multinomial Logit model (NMNL). In this case two nests are specified, one containing the no-choice option and the other the real profiles. The idea is that respondents face two interdependent decisions. First they decide whether or not to choose an alternative and second to decide which real alternative prefer (Haiijer *et al.*, 2001).

Several assumptions underlie the formulation the standard Multinomial Logit model (McFadden, 1974). One of the most important is that the random components of the utilities of the different alternatives are independent and identically distributed (IID) with a type I extreme-value (or Gumbel) distribution. The assumption of independence implies that there are no common unobserved factors affecting the utilities of the various alternatives. The assumption of random utility terms identically distributed across alternatives implies that the extent of variation in unobserved factors affecting utility is the same across all alternatives. Another important assumption is that the error variance-covariance structure of the alternatives is identical across individuals (Bhat *et al.*, 2008).

Several models have been defined to overcome some of the limitations mentioned above. Among them, we mention the heteroscedastic models that relax the assumptions on the error term. Among this class of models, Bhat (1995) developed an extension of the conditional Logit model that works around

¹ Efficiency has been measured by the root mean squared error of the individual coefficients (Brazell, *et al.*, 2006).

the IIA (Independence of Irrelevant Alternatives) constraint. This model arises from the assumption that the alternative error term has a Heteroskedastic extreme value (HEV) distribution. It simply relaxes the assumption of equal variances and the variances of the alternative error terms are allowed to be different across all alternatives. In other words, the HEV model relaxes the restrictive IIA property of the MNL model by allowing different scale parameters across alternatives. Such circumstances are used to normalize the error terms of one of the alternatives having a scale parameter of unity for identification. The HEV model has been used as a methodological tool to identify appropriate tree structures in hierarchical choice models (Hensher, 1999), to analyze individual environmental consciousness for transport mode choices (Shen *et al.*, 2008) and to measure the economic value of cultural heritage (Mazzanti, 2003). To our knowledge this is one of the first applications of such a procedure in agro-food economics to analyze consumer preferences for rabbit meat in Catalonia.

As it is well-known, in CE, subjects choose among alternatives according to a utility function with two components: a systematic (observable) component and a random term (non-observable) as follows:

$$U_{in} = V_{in}(X_i, S_n) + \varepsilon_{in} \quad [1]$$

where U_{in} is the utility provided by alternative i to subject n , V_{in} is the systematic component of the utility, X_i is the vector of attributes of alternative i , S_n is the vector of socio-economic characteristics of the respondent n , and ε_{in} is the random term.

the probability that an individual n will choose alternative i (P_{in}) among other alternatives ($i = 1$ to I) of a set C_n is formulated according to the Multinomial Logit Model as follows (McFadden, 1974):

$$P_{in} = \frac{e^{\mu V_{in}}}{\sum_{i=1}^I e^{\mu V_{in}}} \quad \forall i \in C_n, \quad [2]$$

where V_{in} is the systematic component of the utility provided by alternative I which is given by the following expression:

$$V_{in} = \sum_k \beta_k X_{kin} \quad [3]$$

$i = 1 \dots I$, representing the selected alternative i within the set of alternatives (C_n);

$k = 1 \dots K$, representing the attributes which characterise alternative j ;

β_k = model parameter of attribute k ;

X_{ki} = value of attribute k in alternative i ;

μ is a scale parameter which is inversely proportional to the standard deviation of the error terms and is assumed to be equal to one among all alternatives (Ben-Akiva and Lerman, 1985).

For the HEV model, the probability that individual n will select alternative i is similar to the model in equation [2], with the exception that the scalar parameter μ is different across alternatives (μ_i). This scale parameter represents the uncertainty associated with the expected utility (the observed part of utility) of an alternative. Therefore, a lower scale parameter results in higher uncertainty (Louviere *et al.*, 2000). For the estimation of the HEV model, we assume a linear-in-parameters specification for the systematic utility of each alternative given by [3]. The parameters to be estimated are the parameter vector β and the scale parameters of the random component for each of the alternatives (one of the scale parameters is normalized to one for identifiability)². By estimating the HEV model, implicit prices (IP) can be obtained for each attributes and levels as follows:

$$IP_{\text{Product_attribute}} = - \left(\frac{\beta_{\text{Product_attribute}}}{\beta_{\text{monetary_attribute}}} \right) \quad [4]$$

² For more information about the HEV model please see Annex 1.

2.2. The contingent valuation

The CV is a monetary valuation method based on simulating real market responses in order to analyze the stated preference of individuals toward hypothetical products. It is a direct technique where respondents are asked to set their willingness to pay (WTP) for the analyzed product. CV was initially applied as an environmental monetary valuation technique. It is applied when no relationship can be identified between a hypothetical non-market product and other marketed alternatives, enabling an overall value to be obtained. Further details of the method can be found in Arrow *et al.* (1993) and Carson (2006) among others.

Several formats are available to elicit WTP in CV. In our study, we use the “payment card” format as it combines the advantages of both open-ended formats (elicitation of point information of WTP) and of close-ended formats (ease of cognitive burden on interviewees) while minimising the risk of “starting price bias”. The prices included in the payment card were chosen using information provided from the pilot survey implemented that used an open-ended format in order to cover the central 90% of the observed WTP distribution (Kaninen and Kriström, 1993; Cooper, 1993).

3. Empirical application

3.1. Sample selection

The data used in this study was obtained from 114 face-to-face questionnaires with consumers during June 2009 in the Barcelona Province. The survey collects extensive information on the socio-economic characteristics of consumer attitudes, preferences, and opinions toward rabbit meat consumption. We have used the Quota sampling procedure where consumers are selected in a representative way in accordance to the Catalan population. The sample was stratified by age and gender following the distribution of Catalan population (INE, 2009). The Sample distribution by age and gender are shown in Table 3.

Table 3: Sample distribution by gender and age

<i>Age categories</i>	<i>Population</i>			<i>Sample</i>		
	<i>Total</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>	<i>Male</i>	<i>Female</i>
18-39 years	44,06%	51,92%	48,08%	42,11%	52,08%	47,92%
40-59 years	31,02%	49,52%	50,48%	33,33%	52,63%	47,37%
>60 years	24,92%	42,78%	57,22%	24,56%	50,00%	50,00%

The sample was selected from a consumer panel intended to represent the Catalan population. The only restriction is that respondents are responsible for buying food and fresh meat within their household. The sample included 114 consumers. Since in a previous pilot questionnaire 71% of respondents consume rabbit meat occasionally or habitually, our sample error is 7 % and a 90% confidence level.

3.2. Choice Experiment application

A key element in choice experiments is a robust experimental design. The first step is to determine the main attributes and levels that consumers take into account when purchasing rabbit meat. To tackle this issue we used the results of the literature review summarized in Table 1. The initial attributes identified were purchasing format, processing method, size of the animal, packaging, visual and physical attributes, labelling, and price. These identified attributes were subsequently discussed in a focus group involving university lecturers in the field of marketing as well as representatives from producer, wholesaler and consumer associations in Catalonia. All participants agreed over the need to include or eliminate some of the above mentioned attributes. The final set of attributes included origin,

presentation format, brand and price. A pilot questionnaire was implemented to check for consistency³. The final attributes and levels are shown in Table 4.

Table 4: Attributes and levels for rabbit meat preference of restaurateurs

Attributes	symbols	Levels
Origin	A ₁	Catalonia (regional), Spain (national), Imported (international)
Format	A ₂	Entire, Pieced, Boneless
Brand	A ₃	Quality brand (PDO,...), Manufacturer brand, Generic brand
Price	A ₄	€5.50 , €6.00, €6.50

*: are base levels of the attributes. PDO: Protected Designation of Origin.

As can be observed, a total of 81 hypothetical products can be generated by combining the above mentioned attribute levels generating a potential $3^4 \times 3^4$ (6,561) possible combinations. To make the analysis more efficient, we used an orthogonal fractional factorial design considering only all attributes' main effects. This decision was based on the evidence that main effects explained from 70% to 90% of the variance of the choice model. Interaction effects explained only the remaining variance, which is usually considered irrelevant (Dawes and Corrigan, 1974). The above design enables us to reduce the number of choice sets from the initial 6,561, in the full design, to only nine choice sets. Figure 3 shows one of these sets. To implement the DRCE approach to compare forced and non-forced CE, each choice proceeds using two steps: the first step requires consumers to choose one option from only two available products (A and B), simulating a forced choice approach, while the second step asks consumers if they would purchase the previously chosen product. Answers obtained from the second step are codified as dummy variables and introduced into the model as an opt-out option, representing in this case the non-forced choice.





ELECTION # 1		Option "A"	Option "B"
Origin		Catalonia	Spain
Format		Boneless	Entire
Brand		Generic Brand	Quality brand
Price		€6.50	€5.50
<p>1. Considering that "A" and "B" are the <u>only</u> available products, which product would you <u>choose</u>? "A" <input type="checkbox"/> "B" <input type="checkbox"/></p> <p>2. Would you <u>purchase</u> your chosen product? Yes <input type="checkbox"/> No <input type="checkbox"/></p>			

Figure 3: Example of a Dual Response choice set

3.3. Contingent Valuation application

Following the strategic plan of the local authority several alternative formats to the traditional entire carcass rabbit meat were analyzed. Due to the limited time available for meal preparation, the

³ We have realized 20 questionnaires representing all age categories and gender distribution. It addresses issues of wording, framing, survey length, sampling procedure. It allows to verify the consistency of the questionnaire and to ensure that the selected attributes and level are intelligible for normal consumers.

demand for quick and easy foods is increasing. Consumers are more oriented towards “ready to cook” or “ready to eat” meals. In this context, the selected alternatives were based on product diversification to better satisfy the needs of real consumers. Respondents were asked about their WTP for: a) roasted entire rabbit meat, b) hamburger and c) mortadella both made from mixed rabbit and turkey meats. The CV was applied using the card format as follows:

- Given that the average price of one kilo of entire carcass of rabbit meat is about 6 € how much are you willing to pay (€/Kg) more for one kilo of roasted entire rabbit meat? (select from list below).
- Given that the average price of one kilo of entire carcass of rabbit meat is about 6 € how much are you willing to pay (€/Kg) more for one kilo of hamburger made from mixed turkey and rabbit meat? (select from list below).
- Given that the average price of one kilo of entire carcass of rabbit meat is about 6 € how much are you willing to pay (€/Kg) more for one kilo of mortadella made from cooked mixed turkey and rabbit meats? (select from list below).

The price list in the CV card format is:

0	0.25	0.50	0.75	1.00	1.25	1.5	1.75	2	2.25	2.50	2.75	3
€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg	€/Kg

The empirical evidence strongly suggests that participants in most hypothetical studies exaggerate their WTP for private as well as public goods (Alfnes and Steine, 2005). To minimize such bias, we apply the recommendation of Carlsson *et al.* (2005) to include a “Cheap Talk” which involves the use of an entreaty to the respondent prior to presenting the valuation question as follows:

Previous studies indicate that individuals in general respond to surveys differently from the way they act in real life. It is quite common to find that individuals say they are willing to pay higher prices than those that they are really willing to pay. We believe that this is due to the difficulty in calculating the exact impact of these higher expenses on the household economy. It is easy to be generous when in reality one does not need to pay more in the shop.

4. Results

4.1. Dual Response Choice Experiment results

Results of the estimated HEV models obtained from the first step of the DRCE (without the opt-out option) and from its second step (with the opt-out option) are shown in Table 5. Overall, both models are highly significant and show a good fit with highly significant likelihood ratios. Results demonstrate that, in both models, all parameters (variables coefficients and scale parameters) are statistically significant with the exception of the level “pieced format”, indicating that all the attributes considered are significant determinants of consumer welfare. The positive (negative) sign of the attributes implies a positive (negative) contribution to utility function. Thus, all levels contribute positively to the utility function with the exception of “entire format” which is not preferred by consumers and, as expected, the price attribute.

Scale parameters are significantly different from 1.0 at 1% showing heterogeneous variability among alternatives. In addition, it implies that the assumption of independently and identically distributed (IID) across alternatives is violated, confirming an appropriate specified model. The lower values of the scale parameter in the non-forced model suggest the presence of a higher uncertainty level in the expected utility derived from the opt-out alternative. Results demonstrate that the estimate of the no-choice option is relatively big, negative and statistically significant, showing a low overall utility of this alternative. This suggests the presence of a higher likelihood that people would buy the proposed products offered within the choice sets (Haaijer, *et al.*, 2001 and Kontoleon and Yabe, 2003).

Table 5: Results of the HEV model obtained from the DRCE design.

<i>Forced Choice (first step of DRCE)</i>				<i>Non-forced Choice (including the second step of DRCE)</i>			
<i>Variables</i>	<i>Coeff.</i>	<i>Std. error</i>	<i>p-value</i>	<i>Variables</i>	<i>Coeff.</i>	<i>Std. error.</i>	<i>p-value</i>
Spain (origin)	0.7118	0.1568	0.0000	Spain (national)	0.3549	0.1141	0.0019
Catalonia (origin)	1.2338	0.1977	0.0000	Catalonia (regional)	0.5729	0.1605	0.0004
Pieced (format)	0.1508	0.0950	0.1124	Pieced (format)	0.0773	0.0602	0.1991
Entire (format)	-1.2195	0.4235	0.0040	Entire (format)	-0.6643	0.2490	0.0076
Quality (brand)	1.1522	0.3392	0.0007	Quality (brand)	0.6728	0.2206	0.0023
Commercial (brand)	0.1271	0.0756	0.0924	Commercial (brand)	0.1009	0.0492	0.0401
Price	-1.6784	0.6549	0.0104	Price	-0.9798	0.3755	0.0091
				No-choice option (C)	-6.4815	2.3546	0.0059
<i>Scale Parameters of Extreme Value Distribution</i>				<i>Scale Parameters of Extreme Value Distribution</i>			
θ_A	0.8780	0.1370	0.0000	θ_A	1.7683	3.316	0.0009
θ_B	1.0000	Fixed Parameter		θ_B	2.1848	3.132	0.0017
				θ_C	1.0000	Fixed Parameter	
<i>Std Dev for HEV distribution</i>				<i>Std Dev for HEV distribution</i>			
σ_A	1.4607	0.2278	0.0000	σ_A	0.7253	3.316	0.0009
σ_B	1.2825	Fixed Parameter		σ_B	0.5870	3.132	0.0017
				σ_C	1.2825	Fixed Parameter	
<i>N</i>	2,052 (114 consumers \times 2 alternative \times 9 choice sets)			<i>N</i>	3,078 (114 consumers \times 3 alternative \times 9 choice sets)		
<i>LL(0)</i>	-711.169	<i>LL(0)</i>	-497.565	<i>LL(0)</i>	-1,127.176	<i>LL(0)</i>	-987.938
<i>LLR</i>	427.20 (0.000)	<i>pseudo R²</i>	0.2944	<i>LLR</i>	278.475 (0.000)	<i>pseudo R²</i>	0.1208

For economic interpretations, we calculated the implicit prices (IP) for each attribute level as well as their confidence intervals using Krinsky and Robb's (1986) simulation procedure. As commented before, including an opt-out option within the choice design allows for consistency with the demand theory and enhances the theoretical validity of the welfare estimates (Bateman *et al.*, 2003; Adamowicz and Boxall, 2001; Bastell and Louviere, 1991). Further, when IP estimates are obtained from the non-forced choice, they can be considered a valid measure of the welfare estimates. Almost all valid IPs in Table 6 are statistically different from zero. Results show that consumers are willing to pay 0.585 €/kg, for the Catalan origin and 0.362€/kg for the Spanish origin of the rabbit meat respectively. Regarding the format attributes, the "boneless" meat is the most preferred with a WTP equal to 0.599 €/kg. Finally, consumers give more value for the branded meat by a quality certification with a WTP equal to 0.687€/kg. The negative willingness to pay values are interpreted as the discount in the price needed to accept the attribute' level. Thus, consumers ask for 0.947€/kg to compensate "imported" meat, and 0.678€/kg for the "entire" format and 0.790 €/kg for the "generic" brand. We conclude that rabbit meat with the Catalan origin, boneless format and with a quality brand certification is the most preferred by consumers.

Table 6: Implicit price of attributes and levels

<i>Attributes levels</i>	<i>Forced Choice (Step 1 of the DRCE)</i>	<i>Non-forced Choice (Step 2 of the DRCE)</i>	<i>% of IP difference from forced to non forced choice</i>	<i>P-value of IP difference</i>
	<i>Implicit Price</i>	<i>Implicit Price</i>		
Imported (origin)	-1.159***	-0.947***	-22.39%**	0.0203
Spain (origin)	0.424***	0.362***	-17.13%	0.6120
Catalonia (origin)	0.735***	0.585***	-25.64%*	0.0995
Boneless (format)	0.637**	0.599**	-6.34%	0.7925
Pieced (format)	0.090	0.079	-13.92%	0.4239
Entire (format)	-0.727***	-0.678***	-7.23%	0.7475
Generic (brand)	-0.762***	-0.790***	3.54%	0.8247
Quality (brand)	0.686***	0.687**	0.15%	0.8197
Commercial (brand)	0.076	0.103*	26.21%	0.2571

Note 1: IP are measured in €/kg. Highlighted IPs from forced choice are not considered in interpreting welfare estimates. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Comparing results obtained from the step 1 of the DRCE (forced choice) and step 2 (non-forced choice), attributes have the same ranking score, as obtained by Carlsson *et al.* (2007) and Boyle and Özdemir (2009) who suggest that excluding the no-choice option did not affect significantly attributes rank. In most cases IPs are relatively similar with the exception of two attribute' levels: the "imported" and the "Catalan" origin of the rabbit meat. In both cases the values obtained from the non-forced choice are 22.39% and 25.64% lower than those obtained from the forced choice. This result is consistent with those obtained by Carlsson *et al.* (2007) whose results show a significant difference between IP for one attribute. This might occur because the no-choice option takes away a greater share from other options rather than others that individuals tend to select under forced choice. Thus, utility associated with certain attributes in real profiles tend to decrease in the presence of no-choice alternative (coefficient magnitude is smaller) as commented by Dhar (1997), Dhar and Simonson (2001) and Brazell *et al.* (2006).

4.2. Contingent Valuation results

In analyzing the WTP for different alternatives to the traditional entire carcass rabbit meat, results show that the highest WTP value is for the entire roasted rabbit meat with 0.89 €/kg. It is followed by 0.61 €/kg for the hamburger and 0.54€/kg for the mortadella both obtained from a mixed rabbit and turkey meat. These results confirm and identify how much consumers are more attracted to the way a product is presented. As mentioned before, rabbit meat is commonly sold as a whole carcass or a cut-up carcass, which is not very attractive. Thus, different convenience-oriented products may have the potential to increase demand for rabbit meat. This result suggests that meat industries should invest in new technologies and new product concepts to minimize the negative impact from the presence of small bones in rabbit meat and to increase the ease of consumption. However, industry managers may still be averse to heed this advice since the production costs associated with boneless meat are still very high and the majority of consumers are not likely to pay a large enough premium to offset this cost.

5. Conclusions and discussion

Our paper focuses on assessing consumer preferences for rabbit meat and to measure willingness to pay for new products as alternatives to the traditional entire carcass format. We used consumer-level data collected through a questionnaire to a sample of consumers of rabbit meat in Catalonia (Spain) in order to conduct an empirical study to evaluate tastes and preferences for rabbit meat. The Dual Response Choice Experiment design (DRCE), which allows forced and unforced options in the same

sample, was used to solicit willingness to pay for attributes and attribute levels. This design had shown more efficient estimates than the Traditional Single Free CE design (Brazell, *et al.*, 2006). We estimate a HEV model which relaxes the IIA assumption of consumer choices and allows for different scale parameters across alternatives. Since the IIA assumption is rejected, the Multinomial logit model is shown to not be appropriate.

Our results show that consumers have a high preference for the local (Catalan) origin of rabbit meat, revealing the importance of the Catalonian identity in food consumer behaviour. The second highest preference refers to the “Certified Quality” brand. This result is consistent with previous literature indicating the prevalence of this attitude after the occurrence of food scares mainly affecting meat products (Kallas and Lambarraa, 2010). Consumers also revealed a higher preference for the “boneless” rabbit meat format showing their preference for convenience products. The absence of this type of product in the market and its high price are considered as limitations for consumer acceptance of rabbit meat. This result suggests that meat industries need to invest in new technologies and new product concepts to minimize the negative impact of the presence of small bones in rabbit meat. However, industry managers state that the production costs associated with boneless meat are still very high and that the majority of consumers do not compensate for the additional costs.

The results point out that for consumers of rabbit meat the price is considered less important than other factors. However non-consumers stated the economic factor as the main limiting factor, meaning that a discount campaign could be helpful in increasing consumption. Marketing tools should be more focused on highlighting the origin of the product with an emphasis on regional quality brands. It would also be important to underscore the extrinsic quality cues and the healthy characteristic of the rabbit meat. Thus, any promotional effort should target the meat’s nutritional attributes, rather than price. Convenience products made from rabbit meat can help in increasing consumption. In this line, an effective communication campaign through hosting and catering (dishes, recipes) can also help to increase demand. Efforts are needed to educate individuals regarding the benefits of rabbit meat, that can be achieved by planning a long-term consumer education campaign to familiarize them with rabbit meat benefit. By forcing consumers to select products, as in the DRCE approach, and exclude the “opt-out” alternative in the “choice sets” has several implications affecting the calculation of the implicit prices for levels’ attributes and on the welfare measure of alternatives. When comparing results from forced versus unforced choices, this study has shown that both alternatives generate similar preferences for product attributes (i.e. attributes are ranked similarly in both approaches applied). Implicit prices obtained from the unforced choices are slightly lower than those obtained in the other approach in almost all attributes’ levels. Only in two cases do preference intensities differ significantly in the case of the levels of “Catalonia” and “imported”.

Empirical studies have shown that the no-choice option takes away a greater share from certain options rather than others that individuals tend to select under a forced choice (Dhar, 1997; Dhar and Simonson, 2001; Brazell, *et al.*, 2006). Thus, the utility associated with certain attributes in real profiles tend to decrease in the presence of no-choice alternatives (coefficient magnitude is smaller). As a consequence their implicit prices tend to be smaller than those obtained from the forced choice. This has been confirmed by Boyle *et al.* (2001), and Banzhaf-Ruby *et al.*, (2001) who stated that excluding the no-choice option may overstate the likelihood that individuals would actually choose one alternative from a choice set. Thus, the estimates of Hicksian surplus could be biased upward. This study could be extended in the future in different ways. The DRCE design applied in our paper could be compared with both the traditional DRCE design and the Traditional Single-stage Free Choice Experiment design. This will allow CE practitioners to know how the no-choice option could be included in the most efficient way. In addition, it is relevant to carry out similar analysis to evaluate the sensitivity of price attributes using different choice designs. Finally, it would be interesting to introduce consumer heterogeneity in assessing their willingness to pay.

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Annex 1. The HEV model

Based on Bhat (1995), in the HEV model, the random components in the utilities of the different alternatives follow a type I extreme value distribution with a location parameter equal to zero and a scale parameter equal to θ_i for the i^{th} alternative. The probability density function and the cumulative distribution function of the random error term for the i^{th} alternative are:

$$f(\varepsilon_i) = \frac{1}{\theta_i} e^{-\varepsilon_i/\theta_i} e^{-e^{-\varepsilon_i/\theta_i}} \text{ and } F_i(z) = \int_{\varepsilon_i=-\infty}^{\varepsilon_i=z} f(\varepsilon_i) d\varepsilon_i = e^{-e^{-z/\theta_i}} \quad [5]$$

The probability that an individual will choose alternative i from the set C of available alternatives is:

$$P_i = \Pr(U_i > U_j) = \Pr(\varepsilon_j \leq V_i - V_j + \varepsilon_i) \quad \text{for all } j \neq i, j \in C \quad [6]$$

$$= \int_{\varepsilon_i=-\infty}^{\varepsilon_i=+\infty} \prod_{j \in C, j \neq i} \Lambda \left[\frac{V_i - V_j + \varepsilon_i}{\theta_j} \right] \frac{1}{\theta_i} \lambda \left(\frac{\varepsilon_i}{\theta_i} \right) d\varepsilon_i$$

where $\lambda(\cdot)$ and $\Lambda(\cdot)$ are the probability density function and cumulative distribution function of the standard type I extreme value distribution, respectively and are given by Johnson and Kotz (1970): $\lambda(t) = e^{-t} e^{-e^{-t}}$ and $\Lambda(t) = e^{-e^{-t}}$. Substituting $\omega = \varepsilon_i/\theta_i$ in equation [6], the probability of choosing the alternative i can be re-written as follows:

$$P_i = \int_{\omega=-\infty}^{\omega=+\infty} \prod_{j \in C, j \neq i} \Lambda \left[\frac{V_i - V_j + \theta_i \omega}{\theta_j} \right] \lambda(\omega) d\omega \quad [7]$$

If the scale parameters of the random components of all alternatives are equal, then the probability expression in Equation (6) collapses to that of the MNL.

The log likelihood function to be maximised is:

$$L = \sum_{n=1}^{n=N} \sum_{i \in C_n} y_{ni} \log \left\{ \int_{w=-\infty}^{w=+\infty} \prod_{j \in C_n, j \neq i} \Lambda \left[\frac{V_{ni} - V_{gj} + \theta_i w}{\theta_j} \right] \lambda(w) dw \right\}, \quad [8]$$

where y_{ni} is equal to 1 if the n^{th} individual choose alternative i and zero otherwise