



## RESEARCH ARTICLE

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## Beef animal welfare, attitudes and Willingness to Pay: A regional comparison across the Pyrenees

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### Abstract

Attitudes towards beef animal welfare (AW) and Willingness to Pay (WTP) for AW certification are investigated among consumers in two Spanish and two French regions located on both sides of the Pyrenees (n=1213). Attitudes were measured through a scale of 11 animal practices, on which, consumers report their degree of concern and trust on the supply chain compliance. Attitudes significantly differed across regions, especially with respect to those AW practices carried out by farmers, while trust lies behind concerns. Three segments based on individual consumer attitudes are defined by opposing those consumers who are more concerned and who trust more on the compliance with AW standards (n=264, 22%) to those less concerned and who are more uncertain about stakeholders' compliance with AW rules (n=356, 29%). Consumer location, gender, age and education significantly differed across attitudinal clusters. Results from a contingent valuation survey show that WTP for certified animal friendly beef ranged between 20.6% and 22.6% over the average market price of standard beef, in Spain and France, respectively. Both, consumers' socio-demographic characteristics and habits regarding beef meat purchasing and attitudes towards farmers influenced this WTP (the more consumers trust in farmers' involvement in animal welfare, the highest is their WTP), while a negative overall attitude significantly reduced WTP.

**Additional key words:** meat; animal welfare labelling; WTP; cross-regional.

**Abbreviations used:** AW (Animal Welfare); CI (Confidence Interval); CV (Contingent Valuation); EU (European Union); LLR (Log-Likelihood-Ratios); PDO (Protected Designation of Origin); WTP (Willingness to Pay).

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### Introduction

Since the 80's, developed countries have put in place regulations to guarantee an acceptable level of animal welfare (AW). For instance, the European Union (EU) legislation establishes a set of standards, mainly affecting intensive production systems, which cover animal rearing, transportation and slaughtering<sup>1</sup>, while a new strategy for the period 2012-2015 has been designed in order to better address detected weaknesses in the legislation and their enforcement, as well as to better inform the consumer

(EC, 2012). These regulation initiatives aim at matching increasing consumers' concerns, impelled by communication campaigns carried out by animal protection organisations, food scares, and the frequent presence of animal welfare issues on the media. Several papers argue that animal welfare play an increasing role in consumers' purchasing behaviour of food equivalent to health, environmental and other ethical concerns (Napolitano *et al.*, 2010b; Fernqvist & Ekelund, 2014). Nevertheless, to what extent these concerns affect the purchase decisions is an empirical question.

<sup>1</sup> EU legislation on animal welfare can be consulted at <http://ec.europa.eu/food/animal/welfare>.

A classical way to evaluate consumers purchasing behaviour is to measure their willingness to pay (WTP) a premium for food products that guarantee a superior level of AW than that provided by the standard regulation (Lagerkvist & Hess, 2011). Bennett (1997) and Bennett & Blaney (2003) estimate WTP on the ban of battery cages in egg production in the UK; Moran & McVittie (2008) on changes in stocking and other husbandry practices in broilers production in the UK; Tonsor *et al.* (2009) on the ban of pig gestation crates in US; and Taylor & Signal (2009) on compliance with generic farm AW standards in Australia. All these studies have used the contingent valuation (CV) method, while alternative methodological approaches include hypothetical choice experiments, where either different levels of AW are jointly considered (Carlsson *et al.*, 2005, 2007a,b; Lagerkvist *et al.*, 2006; Liljenstolpe, 2008; Bennett *et al.*, 2012) or AW relieving practices enter as an additional attribute into a set of product or production characteristics, such as organoleptic characteristics and organic production process (Scarpa *et al.*, 2013).

Animal welfare is credence good as the consumer cannot be certain about the production, transport and slaughter conditions even after consuming the food product. In this context, a label or certification becomes a useful tool of information and guarantee to the final consumer. Currently, there is not an EU global AW certification in place although its creation is envisaged (EC, 2012). A few papers have studied WTP towards the hypothetical EU Animal Welfare label in order to assess the benefits of the labelling proposal. Gracia *et al.* (2011) applied an experimental auction method to dry-cured ham in Spain, and estimated that WTP for an hypothetical EU-certification scheme that guarantees superior AW standards varies between 19% and 23% with respect to a non-labelled product, depending on the way the information is delivered. Kehlbacher *et al.* (2012) conducted a study in the UK for generic AW, and found that 94.3% of consumers would like a 'welfare scoring system' to label food products. Depending on the level of AW guaranteed, willingness to increase the monthly expenditure on meat varies between 26 and 34%. Van Loo *et al.* (2014) applied an hypothetical choice experiment to investigate preferences and WTP for an array of sustainability labels (*i.e.* organic, carbon footprint) in chicken amongst Belgium consumers and found that the EU animal welfare label ranks second in terms of WTP after free range claims, with *premia* of 26% for lower income and 39% for higher income consumers.

Provided that consumers rely on the certification or labelling scheme of AW, the information conveyed by the certification is a way to transform this credence

attribute into a search attribute (Darby & Karni, 1973). Trust on the information delivered relies not only on the credibility of regulatory authorities but also on the perceived commitment of meat chain stakeholders in complying with AW superior standards (de Jonge *et al.*, 2008; Vanhonacker & Verbeke, 2014). This latest aspect has been studied by Nocella *et al.* (2010, 2012) who, in their cross-country study, found that WTP for AW labelling is more influenced by trust toward farmers' compliance with AW practices than other stakeholders (*i.e.* transporters).

Interestingly, the pan-European study by Nocella *et al.* (2010, 2012) also highlights differences in terms of attitudes and WTP for animal welfare certification schemes between Northern (Germany, UK and France) and Southern EU countries (Italy and Spain), where the former group manifest a higher level of trust in stakeholders. However, this 'better' attitude in the Northern countries does not translate into a higher WTP. Likewise, Ipsos-LE (2013) also provides different WTP estimates for AW certification in different countries in the EU. In particular, they report 24% and 28% *premia* for broilers and eggs, respectively, in France, and 27% and 30% in Spain. On the contrary, some other studies consider that the country of residence is not among the most influential variables (Vanhonacker & Verbeke, 2014). Although cross-regional studies are encouraged by some authors to better account for regional patterns in consumer purchasing behaviour (Mittal *et al.*, 2004; Thelen *et al.*, 2006), these are scarce in the literature - an exception is Sanjuán *et al.* (2012) - while to the authors knowledge there are not regional studies in the AW field.

This paper investigates consumers' WTP for animal friendly labelling in beef production with a contingent valuation study, focusing on cross-regional/country comparisons and the role of attitudes towards AW and trust in stakeholders. The locations are two Spanish regions (Aragón and Catalonia) and two French regions (Midi-Pyrénées and Languedoc-Roussillon) contiguous to the Pyrenees mountains. Beef rearing is an important economic activity in the mountain regions, and the Pyrenees in particular, accounting for 24 and 17% of domestic beef sales, in Spain and France, respectively (Santini *et al.*, 2013). Despite the economic importance of this sector, but probably due to its relatively more extensive production system, AW of cattle has not been analysed as much as other species but still 18% of EU citizens consider that beef cattle conditions should improve remarkably (Eurobarometer, 2007). Previous research on beef AW has been conducted by Carlsson *et al.* (2005) in a multi-attribute context, and Benett *et al.* (2012) in a multi-species basket, both applying hypothetical choice experiment techniques. To the

authors' knowledge, however, WTP for the EU-AW labelling on beef has not investigated yet. An important result of Carlsson *et al.* (2005) is that the relative importance of AW attributes is animal specific, which justifies focusing on one particular species. In order to make comparisons across countries feasible, WTP is expressed as the premium over the price of beef meat currently available at the market, and which does not carry any AW labelling or claim. Special emphasis is also put on the identification of relevant personal traits that help to define the most receptive consumers' segment toward AW labelling in beef.

## Material and methods

### The survey

A representative sample of the regional population in terms of gender and age was recruited between September 2010 and April 2011, in the main cities of four regions located on both sides of the Spanish-French border: in Spain, Zaragoza in Aragón and Barcelona in Catalonia; in France, Toulouse in Midi-Pyrénées, and Montpellier and Perpignan in Languedoc-Roussillon<sup>2</sup>. The survey was addressed to regular consumers of beef and involved in food shopping. The final sample was composed by 1213 consumers: 294 in Aragón, 304 in Catalonia, 317 in Midi-Pyrénées and 298 in Languedoc-Roussillon. The AW attitudes and contingent valuation questions were complemented with information on socio-demographics and consumption and purchasing habits of beef. The survey was administered face-to-face, in a closed environment, where no more than 12 respondents participated simultaneously.

### Measurement of attitudes towards animal welfare

The approach we follow in this paper to measure attitudes towards AW follows closely Nocella *et al.* (2010), which in turn is inspired by the expectancy value model (Fishbein & Ajzen, 1975). The expectancy value model states that a person's attitude towards an object depends on the 'outcome belief' or evaluation of the attributes associated with the object, and the 'belief strength' or subjective probability that the object possesses that attribute. Thus, for example,

the first component of the attitudes or the 'outcome belief' can be interpreted as the importance attached to an array of AW issues (I) and the second component or 'belief strength', as the trust in stakeholders to comply with the AW rules (T).

As a result, a multiplicative formula between both components is applied to measure attitudes:

$$A_i W = \sum_{i=1}^W I_i \cdot T_i \quad [1]$$

where the sub-index  $i$  stands for each attribute or practice that compose the AW concept ( $i=1, \dots, W$ ).

In our application, consumers were informed that farmers and other stakeholders involved in rearing and transport of cattle can improve the AW in different ways, while compliance with these animal friendly practices could be guaranteed through a certification or a label issued by public authorities. A total of 11 practices or attributes (Table 1) were considered, from which 8 coincide with those employed by Nocella *et al.* (2010). After verifying this list with experts in AW personally involved in their implementation<sup>3</sup>, two additional items were added ('avoid that the animal suffers from fear and stress' - STRESS - and 'allow the animal to manifest its natural behaviour' - NATBEH), one was dropped because of difficulties to be understood by a focus group ('focus on the selection of animals to get a better productivity'), and one ('prohibit mutilations') was divided in two: MUTI ('prohibit mutilations, such as cutting horns or ears') and CAST ('prohibit castration'), to differentiate practices that may evoke a different degree of rejection among consumers.

For each of these items, both, the degree of importance or concern and trust in stakeholders to comply with those standards were investigated. Concerns were evaluated asking the consumer about the degree of importance assigned to the guarantee of each AW item, in a three point scale ("How important is it for you that..."), from 1 'Not at all important' to 3 'Very important'. Trust was evaluated asking the consumer about how likely they consider that the stakeholders involved in each stage will comply with those standards ("To what extent do you think is likely or unlikely..."), in a three point scale, from 1 'Very unlikely' to 3 'Very likely'. Due to the low variability observed by Nocella *et al.* (2012) with a five point scale, a three point scale was chosen to simplify the questionnaire.

<sup>2</sup> Urban locations were selected to facilitate the recruitment of large samples of respondents in each region. With the exception of Zaragoza (Spain), specialized marketing companies were involved in the recruitment and samples were gathered to be representative also of the regional occupation.

<sup>3</sup> We thank Gustavo A. María for his valuable input in this issue.

**Table 1.** Items used in the scale to measure attitudes towards Animal Welfare

	Variable	Description
1	STRESS	Avoid that the animal suffers from terror and stress
2	NATBEH	Allow the animal to manifest its natural behaviour
3	FREE	Guarantee freedom of movement in stables and sheds
4	INSP	Inspect animals at least once a day
5	DIET	Avoid an unbalanced diet
6	MUTI	Prohibit mutilations, such as cutting horns or ears
7	CAST	Prohibit castration
8	TRAN	Provide sufficient space during transportation
9	PERS	Employ qualified staff to transport the animals to the slaughterhouse
10	VEIC	Use vehicles with special mechanical and technical characteristics
11	SLAU	Allow animals to rest before slaughtering

### The contingent valuation method

Contingent Valuation (CV) is one of the stated preference methods available to assess the value of goods or characteristics that either have a public utility and/or are not available in the market. In comparison to other stated preference methods, like choice experiments, CV is especially suitable in the case of bans on certain characteristics or labelling (Carlsson, 2013). This probably explains the number of studies that apply the CV approach in relation to AW, either to value AW enhancing practices, including bans (*e.g.*, Bennett & Blaney, 2002); or to get the economic value of a certification to guarantee animal friendly practices superior to the legal minimum standards (Bennett & Blaney, 2003; Nocella *et al.*, 2010).

Among the different formats to apply a contingent valuation study, the double-bounded approach (Hanemann *et al.*, 1991) has become the workhorse as is recognized as more efficient asymptotically (Hanemann *et al.*, 1999). In this approach, each respondent faces two bids (*i.e.* price) and elects whether he/she is willing to pay the specified price. If the first bid is accepted, then a second one is offered of higher value. Conversely, if the first bid is rejected, the second is of lower value.

The latent (*i.e.* only partially observed) WTP of individual  $n$  is represented as a linear function of the last bid faced by individual  $n$  ( $Bid_n$ ) and optionally some additional explanatory variables ( $X_{k,n}$ ), such as attitudes or socio-demographics:

$$WTP_n = \beta_0 + \beta_1 Bid_n + \sum_{k=1}^K \beta_k X_{k,n} + \varepsilon_n \quad [2]$$

where  $\beta_0$ ,  $\beta_1$  and  $\beta_k$  are parameters to estimate and  $\varepsilon_n$  are random errors, collecting the non-observable influences on WTP. With a double bounded approach, four outcomes or sequences of responses are possible, each one, with a probability that depends on the statistical distribution assumed for the errors, being the logistic one of the most commonly employed (Markosayan *et al.*, 2009). Estimation is then carried out by maximum likelihood.

In order to avoid the starting point bias (Flachaire & Hollard, 2007), five different initial bids were employed in this study with a gap of  $\pm 5\%$ . The subsequent bids were modified by  $\pm 10\%$ , except when the subsequent bid would result in a price lower than market price, in which case the bid was reduced by 5%. Specific market prices were used for each location as a reference: 12.76 €/kg in France (MAAPRAT, 2009); 9.25 € in Aragón and 9.85 € in Catalonia (MAGRAMA, 2010). Nevertheless, WTP estimates may still be upward biased as a result of the presence of the ‘warm glow’ and ‘part hole’ biases (Bennett & Blaney, 2003). Warm glow means that the respondent is willing to pay for moral satisfaction (*i.e.* contributing to a good cause), not for the good itself (Andreoni, 1990; Kahneman & Knetsch, 1992), and ‘part hole’ bias implies that the respondent is not only answering for the good under consideration (*i.e.* beef AW) but for a larger category (*i.e.* farm AW) (Carson & Mitchell, 1995). Likewise, in order to mitigate the hypothetical bias consumers need a reminder of their budget constraint (Sans *et al.*, 2011), which was included in the text of the question and remarked orally. Suppl Fig S1 [pdf online] indicates, as an example, the WTP question formulated in Aragón.



## Results

### Sample profile<sup>4</sup>

The consumers interviewed are regular eaters of beef: 88% consume beef at least once a week at home. Besides, 34% of respondents also consume beef away from home on a regular basis, with percentages up to 41-43% in France. Consumers interviewed are mainly

women (53.6%), ranging between 51.7% in Aragón and 59.4% in Languedoc-Roussillon (Table 2). People older than 54 years old account for 26% of the sample, with the highest representation in Aragón (32%) (Table 2). With respect to education levels, 36% of the respondents have a university degree, ranging between 28.6% in Catalonia and 49.6% in Aragón (Table 2), while 8.3% and 56% of the total number of respondents have reached primary and secondary studies, respectively.

**Table 2.** Description of explanatory variables in WTP estimation

Variable	Description	Mean or Proportion (%) in the sample			
		Aragón	Catalonia	Midi-Pyrénées	Languedoc-Roussillon
		N=294	N=304	N=317	N=298
$\beta_{\text{Arag}}, \beta_{\text{Cat}}, \beta_{\text{Midi}}, \beta_{\text{Lang}}$	Specific regional intercepts	—	—	—	—
Bid	Last bid offered to the respondent (% over mean market price)	20.0%	19.9%	19.7%	19.8%
Female	1 if respondent is female; 0 otherwise	51.7%	52.0%	52.0%	59.4%
OldAge	1 if the respondent is older than 54 years old; 0 otherwise	32.0%	25.6%	24.9%	23.1%
HighEduc	1 if the respondent has a university degree; 0 otherwise	49.6%	28.6%	32.8%	33.6%
HighInc	1 if the respondent's household has a net income > €3000 month; 0 otherwise	19.7%	16.1%	19.9%	25.2%
DirectPur	1 if the respondent's purchases beef meat directly from the producer; 0 otherwise	8.5%	13.1%	25.5%	27.2%
Experience	1 if the respondent considers herself as extremely or fairly expert in at least two of the following: purchasing, cooking or eating; 0 otherwise	61.2%	77.0%	85.8%	84.2%
Fav_Att <sup>a</sup>	1 if the respondent belongs to the segment with relatively more favourable attitude towards AW; 0 otherwise	20.7%	27.0%	25.2%	13.8%
Unfav_Att <sup>a</sup>	1 if the respondent belongs to the segment with relatively less favourable attitude towards AW; 0 otherwise	32.0%	26.6%	26.8%	32.2%
A <sub>F</sub> <sup>b</sup>	Attitude towards AW practices carried out by farmers	35.9	38.1	36.1	34.7
A <sub>O</sub> <sup>b</sup>	Attitude towards AW practices carried out by other stakeholders	19.6	19.2	19.7	18.4
Fav_Att_c	1 if the respondent belongs to the cluster with relatively more favourable attitude towards AW; 0 otherwise	29.9	29.3	29.9	19.8
Unfav_Att_c	1 if the respondent belongs to the cluster with relatively less favourable attitude towards AW; 0 otherwise	27.9	23.7	22.4	31.2

<sup>a</sup> Definition of segments is explained in the section “Attitudes towards animal welfare: concerns and trust”, and the segment profile is described in Table 4. <sup>b</sup> A<sub>F</sub> and A<sub>O</sub> are described in the section “Measurement of attitudes towards animal welfare”. <sup>c</sup> Clusters definition and profiles are described in the section “Attitudes towards animal welfare: concerns and trust”.

<sup>4</sup> For saving spacing reasons, sample characteristics are not included in a specific table. Some socio-demographics are reported in Table 2, while other purchase and consumption habits can be consulted in Sanjuán *et al.* (2012).

## Attitudes towards animal welfare: concerns and trust

With the exception of the item “Prohibit castration” (CAST), a majority of consumers consider that the proposed AW attributes are very important. Depending on the attribute under consideration, between 77% and 98% of the consumers consider the proposed items “rather or very important”. The highest rates are observed for the items directly linked with the living conditions of the animal (‘avoiding unbalanced diet’ - DIET, ‘freedom of movement in stalls’ - FREE, ‘avoid that the animal suffers from terror and stress’ - STRESS and ‘providing sufficient space during transport’ - TRAN).

In contrast, trust about stakeholders’ commitment with AW is more polarized: no more than 40% of the respondents consider ‘very likely’ that stakeholders will comply with any of the AW attributes. The lowest trust is observed for the ‘transport conditions’ (TRAN), ‘rest before slaughtering’ (SLAU), ‘stress prevention’ (STRESS) and ‘expression of a natural behaviour’ (NATBEH).

Equation [1] is then calculated with all the 11 practices to provide a total measurement of attitudes (A), and also, differentiating between those practices carried out by farmers ( $A_F$ ) (STRESS, NATBEH, FREE, INSP, DIET, MUTI and CAST) and those carried out by other stakeholders ( $A_O$ ) (TRAN, PERS, VEIC and SLAU). The Cronbach’s alpha indicates a satisfactory level of reliability: 0.82, 0.73 and 0.75, for A,  $A_F$  and  $A_O$ , respectively, which are in line with the figures reported by Nocella *et al.* (2010) (0.71 and 0.75 for  $A_F$  and  $A_O$ , respectively).

Using an ANOVA one-way test, attitudes are significantly different across regions in global ( $p < 0.01$ ), and with respect to those practices put in place by farmers ( $p < 0.001$ ) and stakeholders ( $p < 0.10$ ) (Table 3). In particular, consumers in Languedoc-Roussillon have significantly lower A,  $A_F$  and  $A_O$  values, and consumers in Catalonia show the most favourable attitude towards farmers. Attitudes towards stakeholders are very close in both Spanish regions and Midi-Pyrénées.

The multiplicative scores, although well-grounded in the theory, do not allow disentangling the influence of trust, which is one of our main focuses. Thus, two consumers may have the same  $A_F$  value, for instance, but as a result of the combination of high importance/low trust or the opposite. To answer this question, we have defined three groups of consumers as follows: first, individual scores for each of the 11 items for importance (and trust), were added (*i.e.* the total score for importance (trust) of an individual can vary between 11 and 33). Second, the median (29 for Importance and 21 for Trust) was used as a segmenting value. Third, segments were built up: consumers more concerned (with importance scores higher than the median) and who trust more (trust scores higher than the median) on the compliance with AW standards belong to the first segment with “relatively more favourable attitude” ( $N=264$ ; 21.8%). The second segment, identified as “relatively more unfavourable attitude” ( $N=356$ ; 29.3%) groups the consumers that are less concerned (importance score lower than the median) and who also trust less on the compliance with AW standards (trust score less than the median). Finally, remaining respondents belong to the “Mixed attitude” segment ( $N=567$ ; 46.7%), which is mainly composed by people who do not trust as much as they are concerned (*i.e.* more than 50% of the respondents in this segment show a high degree of concern (above the median), while the majority (52%) are below the median trust. We will refer to this segmentation approach as “ad-hoc”.

Complementarily, a k-medians clustering has been applied in order to be more flexible in the definition of the groups. Three clusters were also considered, and the initial centres were chosen randomly. A chi-square test shows a significant association between both segmentation approaches ( $p < 0.001$ ). The sizes of the segments are comparable although with favourable and unfavourable segments less polarized, as expected (“relatively more favourable attitude” 27.3%; “relatively more unfavourable” 26.2%; and “mixed attitude” 46.5%).

**Table 3.** Attitudes towards animal welfare by region: total (A), farmers ( $A_F$ ) and other stakeholders ( $A_O$ ). Standard deviation in parentheses

	Aragón	Catalonia	Midi-Pyrénées	Languedoc-Roussillon	ANOVA one way		
	N=294	N=304	N=317	N=298	F	d.f.	p value
A	55.53 (15.22)	57.29 (15.80)	55.74 (14.42)	53.10 (12.75)	4.23	3	0.005
$A_F$	35.90 (9.59)	38.06 (10.40)	36.07 (9.38)	34.71 (8.78)	6.36	3	0.000
$A_O$	19.63 (7.28)	19.23 (7.19)	19.66 (6.60)	18.39 (5.98)	2.29	3	0.076

By using the Chi-square statistic, we tested for the association between the segment of membership and an array of personal characteristics. Only those variables that are found to be significantly different according to the first segmentation approach are shown in Table 4<sup>5</sup>. In terms of socio-demographics, location, gender, age and education are found to be significantly different across attitudinal clusters. In particular, in the cluster with “relatively more favourable attitude”, there is a higher proportion of respondents with primary studies ( $p<0.001$ ), females ( $p<0.001$ ), older than 35 years old ( $p<0.001$ ), and residents in Catalonia and Midi-Pyrénées ( $p<0.01$ ). Consumers of this cluster consider themselves as more experienced in relation to purchasing beef ( $p<0.05$ ), while they use less supermarkets/hard discount stores ( $p<0.10$ ) for buying beef. Moreover, EU quality labels, such as specific Protected Geographical Indication or Protected Designation of Origin (PDO) in each region, are bought by a higher proportion of members of this cluster than non-members ( $p<0.05$ ).

Interestingly, the clusters defined by k-medians share the same socio-demographic profile, with the only difference that income becomes significant (*i.e.* consumers with a better attitude also enjoy a significantly higher level of income). Minor differences are found in terms of purchasing habits (*e.g.* the place of purchase is not significantly different across clusters), while those consumers with a more favourable attitude not only tend to buy more EU quality labels but also other branded beef meat. Therefore, both segmentation techniques provide segments of consumers, not identical, but very consistent in terms of size and composition.

### Willingness to Pay

In Table 2, the explanatory variables used in the estimation of WTP are described. Originally, additional variables describing the respondent's consumption and purchasing habits of beef meat were also considered to

**Table 4.** Profile of segments based on the degree of importance and trust attached to animal welfare

	Cluster 1 Relatively more favourable attitude N=264	Cluster 2 Relatively more unfavourable attitude N=356	Cluster 3 Mixed Attitude N=593
Region ***			
Aragón	23.1%	26.4%	23.4%
Catalonia	31.1%	22.7%	23.8%
Midi-Pyrénées	30.3%	23.9%	25.6%
Languedoc-Roussillon	15.5%	27.0%	27.1%
Gender ***			
Female	62.1%	45.5%	55.0%
Male	37.9%	54.5%	45.0%
Age ***			
18-24 years	7.6%	19.9%	13.8%
25-34 years	15.5%	23.0%	18.7%
35-54 years	44.3%	37.9%	39.5%
≥ 55 years	32.6%	19.1%	28.0%
Education ***			
Primary	13.7%	3.6%	8.8%
Secondary	56.8%	59.0%	53.1%
University	29.5%	37.3%	38.1%
Purchase of beef at hiper-, super- or discount **	67.8%	75.0%	75.7%
Purchase of beef directly from the producer *	20.4%	16.0%	22.4%
Purchase of EU quality labels **	54.9%	49.2%	45.5%

\*\*\*, \*\*, \*: significant differences between the three segments at 1, 5 and 10% significance level, respectively, based on a Chi-square statistic.

<sup>5</sup> Results on the second segmentation approach are available from the authors upon request.

test if a higher involvement with the meat product translates into a more intense commitment with AW. In particular, the frequency of consumption at home and away from home, quantity consumed, and formats of purchase (carved on request, packaged, frozen) were not significant. Among the alternative distribution channels employed by the respondents to purchase beef (*i.e.* butcher's, specialized supermarkets, super- and hypermarkets, discount shops), only purchasing directly from the producer was found to have a significant effect. Finally, other socio-demographic variables like the presence of children in the household were not significant either.

In Table 5, three different model specifications are presented which only differ in the measurement of at-

titudes towards AW. Model 1 uses the multiplicative formula of importance and trust, segmented into attitudes towards farmers and other stakeholders (variables  $A_F$  and  $A_O$ ). Model 2 includes ad-hoc segments of consumers, defined relatively more or less favourable attitude towards AW according to the total scores on concerns and trust with respect to the median value (segments 1 and 2 in Table 4). Model 3 includes clusters of consumers identified as relatively more or less favourable according to the k-medians clustering technique. A specific constant is included in each model to account for special characteristics of respondents in each location that are not accounted by the remaining explanatory variables<sup>6</sup>.

**Table 5.** Estimation results of the double-bounded model

Variable	Model 1: Segmenting attitudes towards stakeholders		Model 2: Segmenting consumers according to overall attitudes (ad-hoc)		Model 3: Segmenting consumers according to overall attitudes (k-medians)	
	Coefficient	Std err	Coefficient	Std err		Std err
Arag	1.641***	0.261	2.785***	0.191	3.100***	0.195
Cat	1.585***	0.267	2.764***	0.190	3.084***	0.194
Midi	1.520***	0.266	2.638***	0.195	2.943***	0.199
Lang	1.346***	0.259	2.462***	0.196	2.786***	0.201
Bid	-0.126***	0.004	-0.125***	0.004	-0.127***	0.004
Female	0.201*	0.107	0.237***	0.106	0.186*	0.107
OldAge	0.381***	0.124	0.379***	0.124	0.319**	0.124
HighEduc	-0.295***	0.114	-0.283**	0.114	-0.270**	0.114
HighInc	0.249*	0.135	0.257*	0.135	0.300**	0.136
DirectPur	0.452***	0.139	0.427***	0.139	0.428***	0.140
Experience	-0.164	0.131	-0.161	0.131	-0.201	0.131
$A_F$	0.032***	0.007	—	—	—	—
$A_O$	-0.001	0.010	—	—	—	—
Fav_Att	—	—	0.225*	0.136	—	—
Unfav_Att	—	—	-0.327***	0.123	—	—
Fav_At_c					-0.036	0.128
Unfav_Att_c					-0.911***	0.132
N Obs	1213		1213		1213	
LL0 <sup>a</sup>	-1743.610		-1743.610		-1743.610	
LL <sup>b</sup>	-1706.943		-1715.459		-1695.750	
LLR <sup>c</sup>	73.333	(0.000)	56.302	(0.000)	95.72	(0.000)
Wald test <sup>d</sup>	1005.776	(0.000)	1004.255	(0.000)	1007.425	(0.000)

<sup>a</sup> LL0: value of the restricted log-likelihood in a model with intercepts and bids. <sup>b</sup> LL: maximum value of log-likelihood function with all explanatory variables. <sup>c</sup> LLR: Log-likelihood ratio to test for the joint significance of all but the intercepts and bid (*i.e.* uses LL0) as benchmark (Herriges, 1999). Critical value is 15.51 (chi-square distribution with 8 degrees of freedom). *p*-values in parentheses. <sup>d</sup> Wald test on the joint significance of all coefficients except for the intercepts (Harpman & Welsch, 1999). Critical value is 16.92 (chi-square distribution with 9 degrees of freedom).

<sup>6</sup> Alternative specifications where the attitudes variables were interacted with regional dummies were also estimated in order to discern if the influence of attitudes on WTP differ across regions, but no significant results were found.



Both statistics, Log-Likelihood-Ratios (LLR) and Wald test, support the joint significance of the explanatory variables, and the fit is slightly worse in Model 2 (*i.e.* LL is the lowest in Model 2). The coefficient estimates are also very similar in all models. The bid coefficient is significant and negative, thus, the probability of accepting a price diminishes when the bid size increases, as expected in a normal demand function. All the regional specific constants are positive and significant but of a different magnitude, which is confirmed by a Wald test<sup>7</sup>.

Women and older people (> 54) are willing to pay more for animal friendly certification than men or younger consumers. A positive relationship is also found between higher income levels and WTP for beef welfare certification, although this effect is only significant at 10% (5% in Model 3). Education, however, has a negative impact on willingness to pay, and people with university degrees are more reluctant to pay a premium for the certification of AW in beef. Interestingly, purchasing directly from the producer affects positively WTP, while experience with beef preparation stages affects negatively, although not significantly WTP.

With respect to attitudinal variables, a positive and significant effect is found for attitudes towards AW practices accomplished by farmers ( $A_F$ ) while attitudes towards practices implemented by stakeholders ( $A_O$ ) reveal a negative albeit insignificant impact on WTP for animal welfare certification. This result concurs with the pan-European study by Nocella *et al.* (2010) in the general context of farm animals. In contrast with the aforementioned study, however, we found a significant influence of attitudes towards farmers also in the Spanish regions, and not only in France<sup>8</sup>. In Model 2, the segment of consumers more concerned and who places a higher level of trust in stakeholders (variable Fav\_Att) are also willing to pay more, while a negative attitude (variable Unfav\_Att) clearly has a negative and significant impact on WTP. The latter is even sharper in Model 3. Therefore, the results confirm the relevance of attitudes as precursor of purchasing behaviour.

WTP estimates are then calculated using the coefficients of the model as follows (Hanemann *et al.*, 1991):

$$WTP_{Reg} = - \left( \frac{\beta_{Reg} + \sum_{k=1}^K \beta_k X_k}{\beta_{Bid}} \right) \quad [3]$$

where  $X_k$  ( $k=1,...,8$ ) refers to each of the explanatory variables besides the bid and constants (valued at their mean regional levels, reported in Table 2), and  $\beta_k$  the accompanying coefficients. To obtain mean values and a confidence interval (CI), the Krinsky & Robb (1986) parametric bootstrap technique is applied (following Park *et al.* (1991))<sup>9</sup>. Results of WTP for each region are presented in Table 6. Model 1 has been used in the calculations, while Model 3 results are of very similar magnitude<sup>10</sup>.

**Table 6.** Willingness to Pay (WTP) for animal welfare (AW) guaranty across regions<sup>a</sup>

<b>A. Mean estimate of WTP (90% Confidence Interval)</b>	
Aragón	22.53 (21.17, 23.91)
Catalonia	20.61 (19.21, 22.04)
Midi-Pyrénées	22.10 (20.80, 23.54)
Languedoc-Roussillon	20.60 (19.21, 22.04)
<b>B. Mean estimate of WTP across consumers segments</b>	
Female [Male]	22.75 [21.15]
Older Age [Other]	24.26 [21.23]
University Education [Lower Education]	22.84 [25.18]
Direct purchase from the producer	27.25 [23.65]
High Income [Lower Income]	24.34 [22.35]
More Favourable Attitude towards AW [Worse]	24.22 [19.79]
AW attitude towards farmers (AF) <sup>b</sup>	31.17

<sup>a</sup> Based on coefficient estimates in Model 1. Model 3 provides very similar results that are available from the authors upon request. WTP among consumers with 'More favourable attitude towards AW', uses coefficients in Model 2. <sup>b</sup> Evaluated at the maximum value of the scale (63).

Mean WTP for certified animal friendly beef ranges between a minimum of 20.6% in Languedoc-Roussillon and Catalonia, and 22.10 and 22.5% in Midi-Pyrénées and Aragón, respectively, over average market price (regional in Spain and national in France). Thus, we found more similarities among neighbouring regions

<sup>7</sup> In particular, the Wald test (W) finds significant differences between the specific constant for Languedoc-Roussillon and Aragón ( $W=4.201$ ,  $p$ -value=0.040), and Catalonia ( $W=3.93$ ,  $p$ -value=0.048).

<sup>8</sup> Model 1, applied separately to the French and Spanish samples, reveals a positive and significant coefficient for the AF variable.

<sup>9</sup> 500 random draws were taken from a normal distribution, with mean, the estimated coefficient vector, and variance, the estimated variance-covariance matrix. For each draw, WTP is calculated and then, the corresponding 0.05 and 0.95 percentiles are obtained.

<sup>10</sup> Results are available from the authors upon request.

that share an international border, than within the same country. The 90% CI provides a range of variation of about 3% in every region.

Next, WTP for specific segments of consumers was calculated<sup>11</sup>, by replacing mean values in Eq. [3] by the presence (1) or absence (0) of the characteristic. Interestingly, the segmenting variable that triggers a bigger WTP gap between groups of consumers is the attitude towards AW, with a difference in 4.4%. In other words, those consumers with higher concerns and that simultaneously trust more the stakeholders as guarantors of AW, are willing to pay around 24% over the market price, while this premium falls to 20% among those consumers with both, a lower interest and trust. When the AW attitude is measured using the multiplicative score (Model 1), results suggest that a maximum of 31% premium could be achieved from those consumers with a maximum level of trust in farmers. Consumers who use short-circuits to buy beef are willing to pay 3.6% more than those who never use this distribution channel.

From the biggest to the smallest gap across socio-demographic segments, we can sum up the results as follows: older than 54 years old consumers are willing to pay up to 3% more than younger consumers; consumers with university education are willing to pay 2.3% less than those with lower education (around 25%); women are willing to pay up to 2% more than men (21%), and the same difference is found between consumers with higher and lower income (22%).

## Discussion

Voluntary labelling schemes of animal welfare enhancing practices additional to the standard regulation are already in place in the EU using public, private or self-declaration attestations, although their scope and application is still limited, both geographically and by animal species (Ipsos-LE, 2013). In this paper, we have tried to shed light on WTP for such labels, in particular one guaranteed by a public authority, with four main differences with respect to previous literature: we focus on one of the least studied species, beef meat; we carry out a cross-country and cross-regional study; we measure attitudes towards AW using a tested scale that combines the degree of concern and trust in stakeholders towards and array of AW enhancing practices to implement on the farm and at the transportation stages; and we test for the influence of these attitudes on WTP

besides an array of socio-demographic and consumption and purchasing habits.

We found that attitudes not only differ across countries but also across regions within the same country, and that this difference is mainly driven by a different attitude towards farmers' compliance with AW. Results are conclusive in highlighting that there is a general lack of trust in stakeholders' compliance, in particular, practices that take place beyond the farm-gate. In contrast with Nocella *et al.* (2010), however, there is not a clear division North-South with respect to attitudes.

WTP for animal welfare certification is not affected equally by attitudes towards farmers and other stakeholders, where the former have a positive and significant effect and the latter an insignificant effect. This result concurs with the pan-European study by Nocella *et al.* (2010, 2012) but, in contrast with the aforementioned study, we found a significant influence of attitudes towards farmers also in the Spanish regions, and not only in France. Furthermore, WTP are slightly different across regions, ranging between an average of 20.6% and 22.5%, with a maximum gap of about 4% taking into account the empirical distribution, while not a clear pattern across countries emerge (*i.e.* maxima WTP are found in Aragon and Midi-Pyrenees, and the minimum in Languedoc-Roussillon).

Interestingly, despite the hypothetical nature of our methodological approach, our range of results concurs with those of previous studies based on auctions (*e.g.* Gracia *et al.* (2011) report 19-23% *premia* for dry-cured ham), or using a different payment vehicle like increase in the monthly expenditure in meat (Kehlbacher *et al.* (2012) report 26-34% for generic AW). It is also remarkable that our estimates for AW certification in beef move in the range of previous literature despite the different sector coverage (besides the above mentioned examples, Ipsos-LE (2013) estimates in France and Spain move in the range 24-30% for broilers and eggs).

Importantly, attitudes are found to trigger the biggest WTP gap between segments of consumers: the group with higher concern and who exhibit more trust in stakeholders (22% of respondents) is willing to pay up to 4% more than those consumers who exhibit lower trust and concerns (29% of respondents). Consumers in the most favourable attitude segment are mainly women, older than 35 years old, with up to secondary education level, use less big distribution chains, while feel more inclined to buy EU food Quality labels (*i.e.* PDO), and are mainly residents in Catalonia and Midi-Pyrénées. Therefore, the market of animal welfare differentiated products is segmented mainly by attitudes

<sup>11</sup> Regional WTP for specific segments do not change the general findings and are not included in Table 6 to ease the reading. Results are available from the authors upon request.

towards AW measured by the interaction of concern and trust, but indirectly, by some relevant socio-demographic variables and purchasing habits. De Backer & Hudders (2015) recently show that AW attitudes of Belgium consumers can even partially predict the diet choices of meat eaters, flexitarians and vegetarians.

Interestingly, consumers already familiar with other EU certification schemes are also more receptive to animal welfare certification. Likewise, WTP could go up to 31% among those consumers who exhibit the highest concern and trust in farmers' compliance. Thus, trust building would help to foster the mean WTP necessary to compensate for higher costs of implementation, while at the moment, all the weight seems to fall on the farmer, and better communication efforts should be channelled to improve trust on other stakeholders' performance (*i.e.* transporters).

Regarding WTP estimation and the influence of socio-demographics, our results concur with most of the literature, finding a positive relationship with the level of income (Bennett & Blaney, 2003; Lagerkvist & Hess, 2011) and being female (Nocella *et al.*, 2010; Gracia *et al.*, 2011; Toma *et al.*, 2011, 2012). With respect to education and age, however, we find a negative and positive effect, respectively, that contrast with previous research (Nocella *et al.*, 2010; Gracia *et al.*, 2011; Lagerkvist & Hess, 2011; Toma *et al.*, 2011, 2012). That is, older people than 54 years old and with no university degree are willing to pay more for the certification of AW in beef. A different treatment of age (*i.e.* cutting point to select the age segments, continuous versus intervals) as well as a certain upward education bias in our sample, could explain this outcome<sup>12</sup>. Likewise, although a significant gap in WTP was found across socio-demographic groups, this is always lower than the one found by contrasting attitudes. As some authors argue (Kehlbacher *et al.*, 2012), AW has reached a certain overall level of consensus in society, and accordingly socio-demographics have lost influence in favour of attitudes and personality traits. In this sense, personal values, beliefs and life-styles are often claimed as better descriptors of sustainable and/or ethical food consumers (Verain *et al.*, 2012; Vanhonacker & Verbeke, 2014).

This paper also provides some other interesting results rarely treated previously in the literature. First, the place of purchase of beef does not exert any direct influence on WTP, with the exception of purchasing directly from the producer that affects positively WTP. Short circuits are associated with the provision of

higher levels of quality (Sanjuán *et al.*, 2012). The personal contact between the consumer and the producer reduces uncertainty regarding food safety and other quality attributes (Sans *et al.*, 2008). Our results also suggest that short circuits contribute to build up a favourable attitude towards AW, enhance trust on farmers and other stakeholders, and reinforce the commitment with AW by willing to pay a premium for animal welfare enhancing practices and its labelling. Second, experience with beef preparation stages affects negatively, although not significantly WTP. The negative sign of experience may be reflecting a conflict between AW and sensory experience (*i.e.* consumers mainly driven by taste place animal welfare in a second order (Vanhonacker *et al.*, 2007; de Barcellos *et al.*, 2011; Gracia & Zeballos, 2011; Lusk, 2011), while higher welfare meat is more strongly associated with higher quality and better health than with a better taste (Vanhonacker & Verbeke, 2014).

Our study has several limitations. First, the hypothetical nature of the contingent valuation method does not involve money, and accordingly, respondents may overstate their WTP (Napolitano *et al.*, 2010a). The closeness of our results to those obtained with experimental auctions compatible with economic incentives (Gracia *et al.*, 2011), however, may be indicating that, if such an upward bias exist is probably more related to other sources, like 'warm glow' and 'part hole' or other specific details in the experimental design rather than the elicitation method of WTP, as concluded by Lagerkvist & Hess (2011) in their meta-analysis. Anyway, any eventual over-statement is less relevant when the focus lies on identifying the relevant explanatory factors of WTP as well as differences across consumers' segments, which is one of the main purposes of our paper.

Second, stated preferences evaluated with CV may only reveal imperfectly purchasing decisions in a real choice situation where animal welfare issues enter as an additional attribute in a complex and multi-attribute bundle. However, our empirical approach was unidimensional and consumers were not asked to rank AW among other key-decision attributes. Moreover, in real-life, the shopper is often placed in a time-pressed and information-overloaded situation and his/her decision may be different from that stated under more relaxed conditions (de Jonge & van Trijp, 2013).

Finally, we have tried to measure consumers' attitudes towards AW and their WTP for AW certification without actually knowing consumers' prior knowledge

<sup>12</sup> Running the models for each regional sample also produces a negative sign for high education, which however, is of much bigger magnitude and significance in Aragón, where the sample is clearly upward biased. This fact, together with the (inverse) correlation between age and education, cause that in the final estimation it might be difficult to disentangle the impact of both socio-demographic variables.



on the subject. Even though respondents were provided with identical information at the moment of the survey prior knowledge may influence responses. Besides, the question was very specific with respect to the public authorities' endorsement of the certification. Consumers do not usually know much about how farm animals are raised, or the changes (and costs involved) in the production process necessary to accommodate their preferences (Olynk & Ortega, 2013) or new legislation (Blokhuys *et al.*, 2008). Moreover, trust is usually higher when the certification is managed by public authorities than by stakeholders (retailers for example) (Heerwagen *et al.*, 2015) and accordingly, this may have pushed up the premium for labelling.

In summary, this paper investigates consumers' WTP for a label that guarantees compliance with superior animal welfare standards in beef, focusing on trust in stakeholders (farmers and transporters) as a way to transmit reliability of the information conveyed in the label. Our study proposes a cross-regional approach that allows capturing within-country heterogeneity, which otherwise is masked, either by the use of samples representative at the country level (normally in cross-country studies) or the assumption that the results obtained with a local/regional sample can be perfectly extrapolated to the country level. In this sense, this study provides evidence about the difficulties of establishing a North-South dichotomy with respect to AW attitudes, trust, and WTP, as regions in different countries (*i.e.* Aragón and Midi-Pyrénées) seem to be closer than regions within the same country (*i.e.* Midi-Pyrénées and Languedoc-Roussillon).

Results show clearly a need to enhance trust on stakeholders' compliance with AW practices, especially beyond the farm gate, as mistrust is counterweighting a positive influence of a superior degree of awareness and concern. This would lead to a higher level of commitment and actual purchase of AW guaranteed label by a larger proportion of the population. Currently, only around one fifth of the respondents in the selected regions show a distinctive major concern and trust in stakeholders, which translates into a significant WTP differential.

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## References

- Andreoni J, 1990. Impure altruism and donations to public goods: a theory of warm-glow giving. *Econ J* 100: 464-77. <http://dx.doi.org/10.2307/2234133>
- Bennett R, 1997. Farm animal welfare and food policy. *Food Policy* 22(4): 281-88. [http://dx.doi.org/10.1016/S0306-9192\(97\)00019-5](http://dx.doi.org/10.1016/S0306-9192(97)00019-5)
- Bennett R, Blaney R, 2002. Social consensus, moral intensity and willingness to pay to address a farm animal welfare issue. *J Econ Psychol* 23(4): 501-520. [http://dx.doi.org/10.1016/S0167-4870\(02\)00098-3](http://dx.doi.org/10.1016/S0167-4870(02)00098-3)
- Bennett R, Blaney R, 2003. Estimating the benefits of farm animal welfare legislation using the contingent valuation method. *Agr Econ* 29(1): 85-98. <http://dx.doi.org/10.1111/j.1574-0862.2003.tb00149.x>
- Bennett R, Kelhbach A, Balcombe K, 2012. A method for the economic valuation of animal welfare benefits using a single welfare score. *Animal Welfare* 21: 125-130. <http://dx.doi.org/10.7120/096272812X13345905674006>
- Blokhuys HJ, Keeling LJ, Gavinelli A, Serratos J, 2008. Animal welfare's impact on the food chain. *T Food Sci Technol* 19 (S1): S79-S87. <http://dx.doi.org/10.1016/j.tifs.2008.09.007>
- Carlsson F, 2013. Non-market valuation: stated preference methods. In: *The Oxford handbook of the economics of food consumption and policy*; Lusk JL, Roosen J & Shogren JF, eds). New York (USA), pp: 181-214.
- Carlsson F, Frykblom P, Lagerkvist CJ, 2005. Consumer preferences for food product quality attributes from Swedish agriculture. *Ambio* 34: 366-370. <http://dx.doi.org/10.1579/0044-7447-34.4.366>
- Carlsson F, Frykblom P, Lagerkvist CJ, 2007a. Consumer willingness to pay for farm animal welfare: mobile abattoirs versus transportation to slaughter. *Eur Rev Agr Econ* 34(3): 321-344. <http://dx.doi.org/10.1093/erae/jbm025>
- Carlsson F, Frykblom P, Lagerkvist CJ, 2007b. Farm animal welfare—Testing for market failure. *J Agr Appl Econ* 39(1): 61-73.
- Carson RT, Mitchell RC, 1995. Sequencing and nesting in contingent valuation surveys. *J Environ Econ Manage* 28(2): 155-173. <http://dx.doi.org/10.1006/jeem.1995.1011>
- Darby MR, Karni E, 1973. Free competition an optimal amount of fraud. *J Law Econ* 16: 67-88. <http://dx.doi.org/10.1086/466756>
- De Backer CJS, Hudders L, 2015. Meat morals: relationship between meat consumption consumer attitudes towards human and animal welfare and moral behavior. *Meat Sci* 99: 68-74. <http://dx.doi.org/10.1016/j.meatsci.2014.08.011>
- De Barcellos MD, Krystallis A, de Melo Saab MS, Kügler JO, Grunert KG, 2011. Investigating the gap between citizens' sustainability attitudes and food purchasing behaviour: Empirical evidence from Brazilian pork consumers. *Int J Consum Stud* 35(4): 391-402. <http://dx.doi.org/10.1111/j.1470-6431.2010.00978.x>
- De Jonge J, van Trijp HM, 2013. Meeting heterogeneity in consumer demand for animal welfare: A reflection on existing knowledge and implications for the meat sector.

- J Agr Environ Ethics 26(3): 629-661. <http://dx.doi.org/10.1007/s10806-012-9426-7>
- de Jonge J, van Trijp HM, Goddard E, Frewer L, 2008. Consumer confidence in the safety of food in Canada and the Netherlands: The validation of a generic framework. *Food Qual Prefer* 19(5): 439-451. <http://dx.doi.org/10.1016/j.foodqual.2008.01.002>
- EC, 2012. Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee on the European Union Strategy for the protection and Welfare of animals 2012-2015. COM(2012) 6 final/2. Available in [http://ec.europa.eu/food/animal/welfare/actionplan/docs/aw\\_strategy\\_19012012\\_en.pdf](http://ec.europa.eu/food/animal/welfare/actionplan/docs/aw_strategy_19012012_en.pdf) [December 2014].
- Eurobarometer, 2007. Attitudes of consumers towards the welfare of farmed animals - Wave 2. Available in [http://ec.europa.eu/food/animals/docs/aw\\_arch\\_hist\\_sp\\_barometer\\_fa\\_en.pdf](http://ec.europa.eu/food/animals/docs/aw_arch_hist_sp_barometer_fa_en.pdf) [December 2014].
- Fernqvist F, Ekelund L, 2014. Credence and the effect on consumer liking of food - A review. *Food Qual Prefer* 32, Part C: 340-353. <http://dx.doi.org/10.1016/j.foodqual.2013.10.005>
- Fishbein M, Ajzen I, 1975. Belief, attitude, intention, and behavior: An introduction to theory and research. Addison-Wesley, Reading, MA, USA. 578 pp.
- Flachaire E, Hollard G, 2007. Starting point bias and respondent uncertainty in dichotomous choice contingent valuation surveys. *Resour Energ Econ* 29(3): 183-194. <http://dx.doi.org/10.1016/j.reseneeco.2007.05.003>
- Gracia A, Zeballos G, 2011. Animal welfare concern and attitudes towards more animal welfare friendly meat products: characterization and segmentation. *ITEA* 107(1): 33-47.
- Gracia A, Loureiro ML, Nayga RM, 2011. Valuing an EU animal welfare label using experimental auctions. *Agr Econ* 42(6): 669-677. <http://dx.doi.org/10.1111/j.1574-0862.2011.00543.x>
- Hanemann WM, Loomis J, Kanninen B, 1991. Statistical efficiency of double-bounded dichotomous choice contingent valuation. *Am J Agr Econ* 73: 1255-1263. <http://dx.doi.org/10.2307/1242453>
- Hanemann WM, Loomis J, Kanninen BJ, 1999. Statistical analysis of discrete response CV data. In: *Valuing Environmental preferences*; Bateman IJ & Willis KG, (eds). New York (USA), pp: 302-442.
- Harpman DA, Welsch MP, 1999. Measuring goodness of fit for the doublebounded logit model. *Comment. Am J Agr Econ* 81: 235-237. <http://dx.doi.org/10.2307/1244463>
- Heerwagen L, Mørkbak M, Denver S, Sandøe P, Christensen T, 2015. The role of quality labels in market-driven animal welfare. *J Agr Environ Ethics* 28(1): 67-84. <http://dx.doi.org/10.1007/s10806-014-9521-z>
- Herriges JA, 1999. Measuring goodness of fit for the double-bounded logit model. *Comment. Am J Agr Econ* 81: 231-234. <http://dx.doi.org/10.2307/1244462>
- Ipsos-LE, 2013. Consumer market study on the functioning of voluntary food labelling schemes for consumers in the European Union EAHC/FWC/2012 86 04. Final Report. Available in [http://ec.europa.eu/consumers/consumer\\_evidence/market\\_studies/food\\_labelling/docs/final\\_report\\_food\\_labelling\\_scheme\\_full\\_en.pdf](http://ec.europa.eu/consumers/consumer_evidence/market_studies/food_labelling/docs/final_report_food_labelling_scheme_full_en.pdf) [December 2014].
- Kahneman D, Knetsch JL, 1992. Valuing public goods: The purchase of moral satisfaction. *J Environ Econ Manage* 22: 57-70. [http://dx.doi.org/10.1016/0095-0696\(92\)90019-S](http://dx.doi.org/10.1016/0095-0696(92)90019-S)
- Kehlbacher A, Bennett R, Balcombe K, 2012. Measuring the consumer benefits of improving farm animal welfare to inform welfare labelling. *Food Policy* 37(6): 627-633. <http://dx.doi.org/10.1016/j.foodpol.2012.07.002>
- Krinsky I, Robb AL, 1986. On approximating the statistical properties of elasticities. *Rev Econ Stat* 68: 715-719. <http://dx.doi.org/10.2307/1924536>
- Lagerkvist CJ, Hess S, 2011. A meta-analysis of consumer willingness to pay for farm animal welfare. *Eur Rev Agr Econ* 38(1): 55-78. <http://dx.doi.org/10.1093/erae/jbq043>
- Lagerkvist CJ, Carlsson F, Viske D, 2006. Swedish consumer preferences for animal welfare and biotech: A choice experiment. *AgBioForum* 9(1): 51-58.
- Liljenstolpe C, 2008. Evaluating animal welfare with choice experiments: An application to Swedish pig production. *Agribusiness* 24(1): 67-84. <http://dx.doi.org/10.1002/agr.20147>
- Lusk JL, 2011. The market for animal welfare. *Agr Human Values* 28(4): 561-575. <http://dx.doi.org/10.1007/s10460-011-9318-x>
- MAAPRAT, 2009. Consommation de viande. Available in [http://www.agreste.agriculture.gouv.fr/IMG/pdf\\_syntheseviande0910.pdf](http://www.agreste.agriculture.gouv.fr/IMG/pdf_syntheseviande0910.pdf) [September 2014].
- MAGRAMA, 2010. Panel de consumo alimentario. Available in <http://www.magrama.gob.es/es/alimentacion/temas/consumo-y-comercializacion-y-distribucion-alimentaria/panel-de-consumo-alimentario/base-de-datos-de-consumo-en-hogares/consulta10.asp> [September 2014].
- Markosyan A, McCluskey JJ, Wahl T, 2009. Consumer response to information about a functional food product. Apples enriched with antioxidants. *Can J Agr Econ* 57(3): 325-341. <http://dx.doi.org/10.1111/j.1744-7976.2009.01154.x>
- Mittal V, Kamakura WA, Govind R, 2004. Geographic patterns in customer service and satisfaction: An empirical investigation. *J Market* 68(3): 48-62. <http://dx.doi.org/10.1509/jmkg.68.3.48.34766>
- Moran D, McVittie A, 2008. Estimation of the value the public places on regulations to improve broiler welfare. *Anim Welfare* 17(1): 43-52.
- Napolitano F, Braghieri A, Piasentier E, Favotto S, Naspetti S, Zanolini R, 2010a. Effect of information about organic production on beef liking and consumer willingness to pay. *Food Qual Prefer* 21(2): 207-212. <http://dx.doi.org/10.1016/j.foodqual.2009.08.007>
- Napolitano F, Girolami A, Braghieri A, 2010b. Consumer liking and willingness to pay for high welfare animal-based products. *T Food Sci Technol* 21(11): 537-543. <http://dx.doi.org/10.1016/j.tifs.2010.07.012>
- Nocella G, Hubbard L, Scarpa R, 2010. Farm animal welfare, consumer willingness to pay, and trust: Results of a cross-national survey. *Appl Econ Perspect Policy* 32(2): 275-297. <http://dx.doi.org/10.1093/aep/pdp009>



- Nocella G, Boecker A, Hubbard L, Scarpa R, 2012. Eliciting consumer preferences for certified animal-friendly foods: Can elements of the theory of planned behavior improve choice experiment analysis? *Psychology & Marketing* 29(11): 850-868. <http://dx.doi.org/10.1002/mar.20569>
- Olynk NJ, Ortega DL, 2013. Consumer preferences for verified dairy cattle management practices in processed dairy products. *Food Control* 30(1): 298-305. <http://dx.doi.org/10.1016/j.foodcont.2012.07.030>
- Park T, Loomis JB, Creel M, 1991. Land economics. Confidence intervals for evaluating benefits estimates from dichotomous choice contingent valuation studies. *Land Econ* 67(1): 64-73. <http://dx.doi.org/10.2307/3146486>
- Sanjuán AI, Resano H, Zeballos G, Sans P, Panella-Riera N, Campo MM, Khlijji S, Guerrero A, Oliver MA, Sañudo C, et al., 2012. Consumers' willingness to pay for beef direct sales. A regional comparison across the Pyrenees. *Appetite* 58(3): 1118-1127. <http://dx.doi.org/10.1016/j.appet.2012.03.001>
- Sans P, de Fontguyon G, Giraud G, 2008. Value-based labels for fresh beef: an overview of French consumer behaviour in a BSE crises context. *Int J Consum Stud* 32(5): 407-413. <http://dx.doi.org/10.1111/j.1470-6431.2008.00708.x>
- Sans P, Guillot C, Magdelaine P, 2011. Caractéristiques de la consommation des viandes de volaille: une comparaison des données du panel Kantar Worldpanel avec celles de l'enquête «Budget de famille» de l'Insee. 9èmes Journées de la Recherche Avicole, Tours (France), 29-30/03. pp: 24-28.
- Santini F, Guri F, Gomez y Paloma S, 2013. Labelling of agricultural and food products of mountain farming. JRC Scientific and Policy Reports. Available in <https://ec.europa.eu/jrc/sites/default/files/jrc77119.pdf> [December 2014].
- Scarpa R, Zanolli R, Bruschi V, Naspetti S, 2013. Inferred and stated attribute non-attendance in food choice experiments. *Am J Agr Econ* 95(1): 165-180. <http://dx.doi.org/10.1093/ajae/aas073>
- Taylor N, Signal T, 2009. Willingness to pay: Australian consumers and 'on the farm' welfare. *J Appl Anim Welfare Sci* 12(4): 345-359. <http://dx.doi.org/10.1080/10888700903163658>
- Thelen S, Ford JB, Honeycutt Jr ED, 2006. The impact of regional affiliation on consumer perceptions of relationships among behavioral constructs. *J Busin Res* 59(9): 965-973. <http://dx.doi.org/10.1016/j.jbusres.2006.03.007>
- Toma L, McVittie A, Hubbard C, Stott AW, 2011. A structural equation model of the factors influencing British consumers' behaviour toward animal welfare. *J Food Prod Market* 17(2/3): 261-278. <http://dx.doi.org/10.1080/10454446.2011.548748>
- Toma L, Stott AW, Revoredo-Giha C, Kupiec-Teahan B, 2012. Consumers and animal welfare. A comparison between European Union countries. *Appetite* 58(2): 597-607. <http://dx.doi.org/10.1016/j.appet.2011.11.015>
- Tonsor G, Olynk N, Wolf C, 2009. Consumer preferences for animal welfare attributes: The case of gestation crates. *J Agr Appl Econ* 41(3): 713-730.
- Van Loo EJ, Caputo V, Nayga Jr RM, Verbeke W, 2014. Consumers' valuation of sustainability labels on meat. *Food Policy* 49 (1): 137-150. <http://dx.doi.org/10.1016/j.foodpol.2014.07.002>
- Vanhonacker F, Verbeke W, 2014. Public and consumer policies for higher welfare food products: challenges and opportunities. *J Agr Environ Ethics* 27(1): 153-171. <http://dx.doi.org/10.1007/s10806-013-9479-2>
- Vanhonacker F, Verbeke W, Poucke Ev, Tuytens FAM, 2007. Segmentation based on consumers' perceived importance and attitude toward farm animal welfare. *Int J Sociol Agr Food* 15(3): 91-107.
- Verain MCD, Bartels J, Dagevos H, Sijtsma SJ, Onwezen MC, Antonides G, 2012. Segments of sustainable food consumers: a literature review. *Int J Consum Stud* 36(2): 123-132. <http://dx.doi.org/10.1111/j.1470-6431.2011.01082.x>