

# Food Safety and Consumers' Willingness to Pay for Labelled Beef in Spain

Ana M. Angulo, José M. Gil and L. Tamburo<sup>1</sup>

**Abstract.** The objective of this paper is to assess the quality/safety value for beef consumers measuring their willingness to pay a price premium for labelled beef. From a survey conducted among food shoppers within the household, consumers are segmented according to their safety perception of specific food products. For each segment, their willingness to pay for labelled beef is calculated. Finally, the main factors explaining such a decision are considered. The results indicate that food scares, the perception of a negative impact of agricultural production on the environment and health concerns are having a major impact on the food consumer purchasing decisions for beef. However, most consumers are not willing to pay a price premium for labelled beef.

**Keywords:** consumer behaviour, beef, quality label, traceability, willingness to pay.

---

<sup>1</sup> Dr. Ana M. Angulo is Associate Professor at the Department of Economic Analysis. University of Zaragoza. (Spain) (email: [aangulo@posta.unizar.es](mailto:aangulo@posta.unizar.es)). Dr. José M. Gil is Associate Professor at the Department of Agro-food Engineering and Biotechnology (DEAB). Polytechnic University of Catalonia, Comte d'Urgell, 187; 08036-Barcelona (Spain) (email: [chema.gil@upc.es](mailto:chema.gil@upc.es)). Leticia Tamburo is economist at FUNBAPA, Viedma, Río Negro (Argentina) (email: [tecnicaecono@funbapa.org.ar](mailto:tecnicaecono@funbapa.org.ar)). This study was supported by the Instituto Nacional de Investigación y Tecnología Agroalimentarias (INIA) (CAL00-026) and was originally prepared for the 83<sup>rd</sup>.EAAE°Seminar on Food Quality Products in the Advent of the 21<sup>st</sup> Century.

## 1. Introduction

In recent years, both the supply and demand for food products has experienced important changes. On the supply side, a new technological revolution is taking place which has substantially increased the number of food products available to the final consumer. Technological processes have become increasingly complex which have also generated new concerns regarding their long-run effects on the environment and/or the human health (GMO, etc.). On the demand side, food markets in developed countries, especially in Europe (Henson, 2001), are facing marketing problems mainly related to consumers' loss in confidence in the food chain. Recent food scares have led to a significant reduction in the consumption of affected products which, in many cases, were already affected by saturation and decreasing trends. As a consequence, food safety has become an important issue in food consumers' choices, inducing policy makers to increase controls along the food chain.

Partly due to these changes, many authors in recent years have begun analysing consumers' increasing concerns about food safety as well exploring the potential impact of both marketing and policy strategies specially designed to mitigate their loss of confidence in food products. Some authors have designed "ad hoc" surveys to evaluate to what extent consumers took into account food safety issues when making food choices (Wessells et al, 1996; Cowan, 1998; Verbeke and Viaene, 1999, 2001; Porin and Mainsant, 1998; Henson and Northen, 2000, among others).

Food safety concerns have been particularly important in the beef sector in Europe where consumption has been reduced due to the BSE crisis<sup>2</sup>. The recovery of beef consumption to past levels has been a challenge in which producers, manufacturers and policy makers have participated. Product quality systems and controls have been reinforced to guarantee that food products were safe

---

<sup>2</sup> The impact has been different among countries but in all of them the reduction of consumption has been substantial (France (40% of reduction), Germany (60%), Italy (42%), Portugal (30%) and Spain (35%)) (AgraEurope, 2001).

enough. However, food safety is a credence attribute (it cannot be observed by consumers neither before nor after purchasing the product). Thus, certification strategies (traceability and/or quality labels) have been implemented both at European and national levels to communicate to consumers the safety characteristics of the labelled beef. Moreover, the aim of these strategies has been twofold: to differentiate the product in a environment of saturated beef markets and to create a positive consumers' perception towards labelled beef, based on a regular and homogeneous quality, allowing producers to maintain or mitigate beef consumption reduction due to food scares (Cartay, 2001; Latvala and Kola, 2001; Stefani and Henson, 2001).

Reinforced controls or, at least, the stricter application of the already existing regulation, have increased production costs both at the producer, wholesale and retail levels, which ultimately have been transmitted to consumers through higher prices as an indication of a safer/higher quality product. The main objective of this paper is to determine to what extent Spanish consumers are willing to pay a price premium for certified beef, with labels indicating beef traceability. To achieve this objective, a nation-wide telephone survey dealing with different food safety issues from the consumer point of view was conducted among Spanish households.

Several studies have already analysed such issues in meat or other food products (Fisher, 1995; Henson, 1996; Buzby et al., 1998; Caswell, 1998; Latouche et al, 1998; Zanetti, 1998; Sánchez et al, 2001, among others). The novelty of this paper is twofold. First, specific market segments based on consumers' perceptions of food product safety are considered in order to detect differences in consumers' willingness to pay. Second, this paper is one of the first attempts made to determine the main factors explaining consumers' willingness to pay for safer food products, specifying a discrete choice model to tackle with such issue.

The paper is organised as follows. Section 2 shows the survey design as well as some descriptive results on consumers' concerns, changing habits and perceptions on food safety which

have been used to identify market segments. Section 3 specifies the model that has been used to explain consumers' decision to pay or not to pay (and how much) a premium for certified beef. It further discusses consumer segments' willingness to pay for certified beef and outlines potential factors which could explain such a decision. Section 4 presents the main results from estimated models. In the last section, some concluding remarks are made.

## **2. Consumers' concerns and perceptions on food safety in Spain**

As previously mentioned in the introduction, data used in this study come from a nationwide telephone survey conducted in Spring 2002. Only respondents over 20 years of age and responsible for the shopping within the household were selected. A total of 650 valid responses were obtained. The sample was randomly selected, although a quota system was established to guarantee sample representativeness in terms of geographic and age distribution. The questionnaire was structured into four main sections. In the first, questions related to consumers' concerns about food safety, how information had been received and to what extent food habits had change, were included. In the second section, the questionnaire aimed to measure how safe consumers perceived alternative food products (vegetables, meat, ready-to-eat meals, etc), production processes and marketing channels, including food-away-from-home outlets. The third section collected information about consumers' attitudes towards meat certification and labeling and their willingness to pay a premium for certified beef. Finally, some socio-economics as well as psychographic characteristics of respondents were included.

Results from the survey indicate that the food scares that have taken place in Europe in recent years, especially the BSE, have substantially increased consumers' concerns about food safety in Spain. As Table 1 depicts, 63% of respondents declared that they were more concerned than they were five years ago about food safety. If only the problem "per se" is considered, this

result seems somewhat surprising, at least from a rational point of view, and some other factors have to be found to explain it. The most important factor contributing to such attitudes, without doubt, is the mass media coverage of recent food scares<sup>3</sup>. Moreover, 52% of respondents recognize that mass media exerts a high influence in their shopping and consumption habits.

The extent to which increasing concerns about food safety have modified shopping behavior is shown at the bottom of Table 1. It seems that, although positively correlated, consumers' concerns have not been corroborated by changes in food habits of the same magnitude. In any case, almost half of the respondents declared to have changed their shopping habits, which is a relatively high percentage. Respondents, then, were asked in which way they had changed. Around 81% of them had given up buying the product, 40% had started to read food labels more carefully, 28.5% had moved to brands which offered them more confidence and guarantee and, finally, 4% had changed the retail outlet in which they normally did the shopping<sup>4</sup>.

(Insert Table 1 around here)

Results mentioned above indicate that increasing consumers' concerns regarding food safety derived from food scares has also generated a loss of confidence towards food which seems to be more important in the products involved in the corresponding food scare. We have tried to explore this point more thoroughly by asking respondents about their perceived safety of selected groups of products. Results are illustrated in Table 2 (first column). As can be observed along a five point-scale, respondents declare a higher loss of confidence in meat products, canned food, preserved food and ready-to-eat meals. Moreover, the standard deviations associated with such products are higher indicating some variability among consumers' perceptions.

---

<sup>3</sup> As an example, in Spain around 200 people die every year due to Salmonella with no incidence referred to by mass media. On the contrary, recent food scares such as the BSE or the foot and mouth disease have not provoked any human death in Spain. The real incidence of "traditional" diseases and recent food scares is different but it seems now the problem of food safety is a big issue.

<sup>4</sup> It was a multiple choice question (the sum of percentages does not necessarily add to 100).

Taking this result into account, a cluster analysis has been carried out to identify segments with different perceptions about food product safety. A two-step procedure has been carried out. In the first step, the average linkage hierarchical clustering method was used for grouping the respondents. The inspection of the plot of distances between merging clusters at each step of the clustering process indicates the possible existence of two or three clusters, as this measure increases significantly after that. As a second step, and in order to improved results obtained from hierarchical methods, the K-means non-hierarchical method was used, with group centroids from hierarchical method as initial seed points. The root mean square deviation (RMSD) is calculated to discriminate between two and three clusters. As differences were not significant, finally, two clusters have been considered. Results are shown in Table 2 (columns 2 and 3). The first segment (42% of the respondents) includes consumers with higher confidence in food products. The second one (58%) is the less confident group. As can be observed, for all products, the perceived safety is significantly lower (at the 1% level) for Segment 2. These differences are particularly important in beef and chicken (related to BSE and dioxins scares, respectively). As a consequence, the main objective of this paper is to further analyse two segments in order to check if there exist significant differences between groups in relation to their willingness to pay for certified beef..

(Insert Table 2 around here)

### **3. Modelling willingness to pay**

#### **3.1. Model specification**

The methodological approach to calculate the respondents' willingness to pay for certified beef assuring traceability has been conditioned to the question format. In this context, and after a

brief explanation given to respondents about what traceability meant, we asked them to note the maximum amount of money they were willing to pay for certified beef. The respondent had six choices: 1) nothing; 2) up to 0.6 € per kilogram; 3) up to 1.2 €; 4) up to 1.8 €; 5) up to 2.4 €; and 6) more than 2.4 €. As the possible answers are bound by an upper limit, we faced a problem of grouped data. That is, respondents who were willing to pay a premium of, for instance, 1.3 € or 1.5 € would be grouped under the fourth alternative independently of the individual values. A second problem with this approach is that many respondents were not willing to pay anything (i.e. chose the first alternative). In that case, we have a problem of censored dependent variable. Both characteristics of the dependent variable have been taken into account in this paper in order to specify and estimate the appropriate model<sup>5</sup>.

The six alternatives offered to individuals makes the observed dependent variable discrete. The relationship between the observed dependent variable and the maximum willingness to pay is given by the following sequence:

No change:	$y_i = 1$	$y_i^* \leq 0$
Up to 0,6 €/kg.	$y_i = 2$	$0 < y_i^* \leq 0,6$
Up to 1,2 €/kg.	$y_i = 3$	$0,6 < y_i^* \leq 1,2$
Up to 1,8 €/kg.	$y_i = 4$	$1,2 < y_i^* \leq 1,8$
Up to 2,4 €/kg.	$y_i = 5$	$1,8 < y_i^* \leq 2,4$
Other than 2,4 €/kg.	$y_i = 6$	$2,4 < y_i^*$

---

<sup>5</sup> Donaldson et al. (1998) shows the appropriateness of this specification strategy (grouped data) over the consideration of individual values.

where  $y_i^*$  is the non observed premium the  $i$ -th consumer is willing to pay for certified (traceable) and labelled beef, which depends on a set of explanatory variables given by  $x_i$ ; that is,  $y_i^* = \beta' x_i + e_i$ . On the other hand, let  $a_1, a_2, a_3, a_4, a_5$  be the maxima premia offered to respondents (in our case, 0, 0.6, 1.2, 1.8 and 2.4 €, respectively). Under such circumstances, the probability that the  $i$ -th consumer chooses the different alternatives is given by:

$$P(y_i = 1) = \Phi\left[\frac{(a_1 - \beta' x_i)}{\sigma}\right] = 1 - \Phi\left[\frac{\beta' x_i}{\sigma}\right] \quad (1)$$

$$P(y_i = j) = \Phi\left[\frac{(a_j - \beta' x_i)}{\sigma}\right] - \Phi\left[\frac{(a_{j-1} - \beta' x_i)}{\sigma}\right] \quad j = 2, 3, 4 \text{ and } 5 \quad (2)$$

$$P(y_i = 6) = 1 - \Phi\left[\frac{(a_5 - \beta' x_i)}{\sigma}\right] = 1 - \Phi\left[\frac{(2,4 - \beta' x_i)}{\sigma}\right] \quad (3)$$

From (1), (2) y (3), the logarithm of the maximim likelihood function can be expressed as follows:

$$\ln L = \sum_{i=1}^n \sum_{j=1}^6 \ln[P(y_i = j)] \quad (4)$$

where  $n$  is the total number of respondents.

### 3.2 Willingness-to-pay for certified beef in Spain

Before estimating the model given by (1) to (4), in this sub-section, let us briefly describe results obtained from the survey about respondents' willingness to pay for certified beef, while in the next one we will consider the most relevant variables that have been taken into account to explain such a decision.



Table 3 shows the percentage of respondents, for each of the market segments defined in Section 2, who have selected one of the six premium alternatives offered to them. As can be observed, even though consumers are more aware of food safety issues, 72.5 % of consumers are not willing to pay a premium for a labelled beef with a traceability certificate. This result may have different interpretations. First, consumers may consider food safety as an inherent characteristic of food products (it is the minimum requirement food products may satisfy) and, then, they do not find any special reason to pay a premium. Second, food safety is something to be worried about but not such an important consideration as to be willing to pay more for it. Third, consumers may perceive that traceability is not enough to guarantee food safety. Under such circumstances, the 30% decrease in beef consumption that took place in Spain during 2001 (following the web site of the Ministry of Agriculture, Fisheries and Food: [www.mapya.es](http://www.mapya.es)) was mainly the result of the increasing prices (up to 20% as shown in the same web site) and could only be partially explained by the increasing consumers' concerns on food safety. On the other hand, it is, to a certain extent, surprising that the higher percentage of consumers who are not willingness to pay is among segment 2 which represents the sample which has a lower confidence in food.

(Insert Table 3 around here)

Looking at the figures in Table 3, it seems that respondents have concentrated their answers in the intermediate values offered to them. In fact, 14.2% of respondents would be willing to pay up to 1.2 €/Kg for labelled beef, a percentage which is equally distributed between the two segments. The same thing occurred with the alternative response representing a price up to 1.8 €/Kg, although in this case the percentage is only 6.6%. In the extreme values, percentages are lower. Only 3.7% would pay the minimum premium (up to 0.6 €/Kg), 1.7% would pay up to 2.4 €/kg, and 1.4% would pay a higher premium. Given the higher percentage of zero responses, the chosen model specification seems appropriate in our study. In the following sub-section we will

explain what are the most relevant variables that have been considered to explain results from Table 3.

### **3.3. Factors explaining willingness-to-pay for certified beef in Spain**

The complete list of variables included in the model given by (1)-(4) is shown in Table 4. We have considered socio-economic characteristics of respondents (income, age, education level,...), some variables related with beef shopping behaviour (level of beef consumption and prices consumers are actually paying) and consumers' attitudes towards food safety. Finally, as the traceability certificate is included in the product's label, we have included one dummy variable related to the attention consumers pay to labels and their confidence in the information included in them. Actually, this variable is the result of two consecutive questions posed to consumers. In the first one, respondents were asked about how often they read food labels (five-point scale). In the second, they were asked about their confidence in them (five-point scale). This variable takes the value 1, if the respondent reads labels often or very often and is confident or very confident with the information included, and 0, otherwise.

(Insert Table 4 around here)

## **4. Discussion of results**

The estimation strategy adopted in this paper consists of two main steps. In the first, we have estimated the willingness-to-pay model for each market segment defined in Section 2 taking into account the respondents confidence in the perceived safety of different food products. As a second step, we have estimated a single model for the pooled data in order to test for significant differences between market segments. In each step, a heteroskedasticity test has been carried out to check for model adequacy. In such tests we have assumed that the price variable was generating the

problem. Moreover, we have adopted an exponential function for the error term variance as this function has the desirable property whereby standard deviations are strictly positive (Yen and Su, 1995). In the three estimated models (one for each segment and the pooled data model), the null hypothesis of homoscedasticity has not been rejected (the t-ratio of the price parameter in the auxiliary regressions were 0.67, 0.44 and 0.77, respectively). Thus, all models have been estimated assuming homoscedasticity.

Table 5 shows the results from estimating the willingness-to-pay model for each market segment. Estimated parameters as well as standard deviations at t-ratios are included. Moreover, joint significance tests of explanatory variables consisting of more than one dummy variable (age, education level, income and frequency of purchasing) are depicted in table 6. In the latter case, all tests have been carried out using a likelihood ratio statistic.

As can be observed, respondents' overall satisfaction with food safety and with the nutritional content of food (SSAF and SNUT) do not have a significant effect on the consumers' willingness-to-pay for certified beef in any of the two market segments considered in this study. The attention respondents pay to food labels and their credibility in the information included in them has a significant effect if this variable is introduced in a multiplicative way together with the overall satisfaction with food safety (INF\*SSAF). However, this applies only for consumers who perceive food as being less safe (Segment 2). This would indicate that for consumers who read food labels more often and feel more confident about the information shown in them, have higher confidence in food safety and are thus willing to pay a higher premium for labelled beef with a traceability certificate. One might expect the opposite relationship to occur (i.e. less confident consumers of food safety would be willing to pay a higher premium for certified beef) which holds if we only consider the estimated parameter for INF (although it is not significant). However, when we consider the interaction between INF and SSAF, the positive sign would mean that in segment 2,

although consumers are less confident with beef safety, their preventive behaviour of reading labels guarantee them a purchase of safer products when paying a higher price.

(Insert Table 5 around here)

The price consumers are actually willing to pay for beef has a negative effect on their willingness-to-pay for labelled beef. If we assume that higher prices correspond to higher quality, consumers who are paying higher prices already think that they are buying safe enough beef and, then, have no incentive to pay a premium for beef traceability.

Among the socio-economic variables, the household size does not have any significant effect on the willingness-to-pay for labelled beef in any of the market segments. The age of the respondent has only a significant effect in the case where consumers are more confident about food safety. The positive sign indicates that the older the respondent is, the higher premium he is willing to pay for certified beef. The education level is not significant in any of the segments. However, income becomes a key factor to explain consumers' willingness to pay a premium for labelled beef. Moreover, the relationship is positive.

(Insert Table 6 around here)

Experience in beef shopping is also important to explain willingness-to-pay, but only in the case of consumers who are more confident in food safety (Segment 1). The effect is negative thereby indicating experienced consumers are willing-to-pay a lower premium if any. In other words, if after the BSE consumers are still buying beef regularly this is a clear indication that they are confident enough in their safety (or, alternatively, food safety is not a relevant attribute in consumers' behaviour). Then, there is no need to pay a premium for certified beef. Finally, consumers living in the south of Spain and belonging to Segment 2 are willing-to-pay a higher price for labelled beef.

As mentioned at the beginning of this section, the second step in our study has been to estimate a single equation pooling the data from the two segments in order to test for significant differences among them. To do that a dummy variable has been introduced in the model (HCC) which takes the value 1, if the respondent belongs to Segment 1 (Higher Confidence Consumers), and 0, otherwise. The set of explanatory variables includes those already considered in the individual models plus a new set obtained as a product of the former variables and the new dummy HCC. In the new variables, the corresponding parameter will measure the existing differences between groups, while the t-ratio will indicate if such differences are significant at the desired level. The estimated parameters of the model including the pooled data as well as their standard deviations and t-ratios are shown in Table 7. The results from the joint significance tests of explanatory variables consisting of more than one dummy variable are included in Table 8.

(Insert Table 7 around here)

As can be observed, some significant differences have been found regarding the incidence of the different factors explaining market segments' willingness to pay for certified beef, mainly in relation to socio-economic variables. On the contrary, the impact of attitudinal variables (towards food safety or towards the nutritional content of food) is similar in both market segments. Only a positive attitude towards the credibility in the information included in food labels plays an important role in explaining willingness-to-pay for certified beef in Segment 2; this result has been already mentioned above and is confirmed here by the statistical significance of the  $(INF*SSAF)*HCC$  parameter.

Among the socioeconomic characteristics of respondents, the impact of the education level, income, household size and expertise in beef purchasing on the willingness to pay for certified beef is significantly different between market segments. Results from Tables 7 and 8 indicates that the less confident segment on food safety is more homogeneous, in terms of socio-economic

characteristics of respondents, while in the other segment such characteristics have an important role in explaining the potential premium consumers are willing to pay for labelled beef with a traceability certificate.

(Insert Table 8 around here)

## **5. Concluding remarks**

Recent food scares have generated an increasing loss of confidence in food safety among consumers. This has led to a reduction in the consumption of affected products, mainly beef. Several efforts have been made out to mitigate the effects of food scares on beef consumption. One of the most relevant has been the promotion of quality labels either with a traceability certificate or with an Protected Geographical Indication. More exhaustive controls have been applied which has increased production costs and, consequently, consumer prices. The aim of this paper has been to measure to what extent Spanish consumers value food safety. In other words, if they are willing to pay a premium for labelled beef with a traceability certificate. Additionally, we have tried to determine the main factors affecting such a decision.

A nation-wide survey has been carried out in which specific questions were asked to achieve the mentioned objective. As a first step, the sample was segmented into two groups taking into account the respondents' perceptions about the safety of different food products. The methodology used to estimate the respondents' willingness to pay for certified beef has been conditioned to the question format. Among the different alternatives, in this paper we have offered respondents several upper limits of maximum price premiums they are willing to pay among which they have to choose one. In this context, all respondents who were willing to pay a premium between two of the offered limits were assigned the upper limit. Thus, we faced to a problem of

grouped data. The resulting model, which has also taken into account the large number of zero responses has been estimated by maximum likelihood. Alternative question formats would have generated different model specifications. We have considered that the format used facilitated respondents' answers as they did not have to think of a specific premium. In any case, further research could be done in the future on the sensitiveness of question formats on consumers' willingness to pay.

Results obtained from this study show that although consumers are increasingly concerned about food safety issues, they are not willing to pay more for labelled beef with a traceability certificate. In fact, three-out-of-four respondents declare they are not willing to pay anything. This result, to a certain extent, allows us to assess both the real impact that food scares have had in Spain and the instruments that have been used to recover consumers' confidence in food. In Spain, the mass media coverage of the BSE crisis generated a reduction of beef consumption, due to the increasing consumers' concerns on food safety issues, but also provoked substantial beef price increases which, from our point of view, were not fully justified taking into account the slight reduction of supply. Results from estimated models indicate that consumers have perceived beef price increases, that have been generated by more rigorous controls implied by traceability, as a quality strategy and not as a safety strategy. In other words, traceability "per se" is not going to be able to recover beef consumption except for very specific market segments who are actually used to reading food labels and are confident with the information included in them. As a complementary strategy, beef price reductions, as those implemented in the UK, are expected to provoke a positive answer in consumers. Spanish consumers perceive food safety as a minimum responsibility producers have and do claim that producers should guarantee safety without consumers being obliged to pay a premium for it.

**References**

- Buzby, J.C., J.A. Fox, R.C. Ready and S.R. Crutchfield (1998), "Measuring consumer benefits of food safety risk reductions". *Journal of Agricultural and Applied Economics*, 30 (1), 69-82.
- Cartay, R. (2001), "Soupçon, panique et risque dans la chaîne agroalimentaire". Le cas des vaches folles. *V Symposium AIAE2. Bologna (Italy), September*
- Caswell, J.A. (1998), "Valuing the benefits and costs of improved food safety and nutrition". The *Australian Journal of Agricultural and Resource Economics*, 42 (4), 409-424.
- Cowan, C. (1998), "Irish and European consumer views on food safety". *Journal of Food Safety*, 18 (4), 275-295.
- Donaldson, C., A.M. Jones, T.J. Mapp and J.A. Olson (1998), "Limited dependent variables in willingness to pay studies: applications in health care". *Applied Economics*, 30, 667-677.
- Fisher, A. (1995), "Thoughts about different methods to value food safety and nutrition". In: *Valuing food safety and nutrition*, (ed. J.A.Caswell). Boulder CO: Westview Press.
- Henson, S. (2001), "Food safety and the European Consumer", *Proceedings of the 71<sup>st</sup> EAAE Seminar: The food consumer in the early 21<sup>st</sup> century, Zaragoza, (Spain), April*.
- Henson, S. and J. Northen (2000), "Consumer assessment of the safety of beef at point of purchase: a pan-European study". *Journal of Agricultural Economics*, 51 (1), 90-105.
- Latouche, K., P. Rainelli and D. Vermersch (1998), "Food safety issues and the BSE scare: some lessons from the French case". *Food Policy*, 23 (5), 347-356.
- Latvala, T. and Kola, J. (2001), "Measuring consumers benefits of credence characteristics of beef: ex ante valuation". *Proceedings of the 71<sup>st</sup> EAAE Seminar: The food consumer in the early 21<sup>st</sup> century, Zaragoza, (Spain), April*



Porin, F. and P. Mainsant (1999), "Quelles stratégies pour les concurrents de la filière bovine dans le contexte de l'après ESB?". *Cahiers d'économie et Sociologie Rurales*, 50, 78-103.

Sánchez, M., A. Sanjuán and G. Akl (2001), "El distintivo de calidad como indicador de seguridad alimenticia en carne de vacuno y cordero". *Economía Agraria y Recursos Naturales*, 1 (1), 77-94.

Stefani, G. and S.H. Henson (2001), "Assessing the value of labels about food safety attributes". *Proceedings of the 71<sup>st</sup> EAAE Seminar: The food consumer in the early 21<sup>st</sup> century, Zaragoza, (Spain), April*

Verbeke, W. and J. Viaene (2001), "Impact of the dioxin scare on consumer perception of fresh meat in Belgium". *Proceedings of the 71<sup>st</sup> EAAE Seminar: The food consumer in the early 21<sup>st</sup> century, Zaragoza, (Spain), April.*

Wessells, C.R., J. Kline and J.G. Anderson (1996), "Seafood safety perceptions and their effects on anticipated consumption under varying information treatments". *Agricultural and Resource Economics Review*, 25, 12-21.

Yen, S.T. y S.J. Su (1995), "Modelling U.S. butter consumption with zero observations". *Agricultural and Resource Economics Review*, 24, 47-55.

Zanetti, C.M. (1998), "La disponibilità a pagare dei consumatori per prodotti alimentari sicuri". *La Questione Agraria*, 72, 133-168.

Table 1. Consumers' concerns about food safety and behavioral changes after food scares in Spain

Consumers concerns about food safety	
Lower than five years ago	2%
The same as five years ago	35%
Higher than five years ago	63%
Influence of mass media in shopping behavior	
Yes	52%
No	47%
No answer	1%
Have you changed your food shopping behavior after the recent food scares?	
Yes	49%
How?	
Not buying the product affected by the food scare	80.7%
Reading more carefully food labels	39.2%
Changing towards well known and more confident brands	28.5%
Changing the retail outlet where I do my shopping	4.1%
No	51%

Table 2. Market segmentation based on the perceived safety of different food products<sup>a</sup>

	Perceived safety <sup>b</sup>	Segment 1 (42%)	Segment 2 (58%)
		Higher confidence in food	Lower confidence in food
Fresh fruits*	4.53 (0.62)	4.77 (0.52)	4.53 (0.66)
Fresh vegetables*	4.52 (0.73)	4.70 (0.60)	4.39 (0.79)
Beef*	2.61 (1.43)	3.73 (1.22)	1.80 (0.94)
Lamb*	3.45 (1.13)	4.34 (0.76)	2.81 (0.89)
Pork*	3.66 (1.05)	4.47 (0.72)	3.08 (0.85)
Chicken*	4.00 (0.96)	4.73 (0.47)	3.46 (0.87)
Fish*	4.53 (0.70)	4.81 (0.48)	4.33 (0.75)
Seafood*	4.45 (0.78)	4.74 (0.59)	4.24 (0.83)
Milk products*	4.32 (0.79)	4.59 (0.58)	4.13 (0.85)
Ready-to-eat meals*	2.58 (1.21)	3.12 (1.17)	2.19 (1.08)
Preserved food*	3.32 (1.23)	4.18 (0.95)	2.69 (1.00)
Canned Food*	3.36 (1.27)	4.29 (0.96)	2.68 (1.02)
Eggs / Mayonnaise*	4.10 (0.87)	4.62 (0.50)	3.73 (0.89)
Rice*	4.50 (0.70)	4.87 (0.34)	4.23 (0.76)
Pasta*	4.55 (0.61)	4.88 (0.33)	4.31 (0.66)
Wine*	4.57 (0.66)	4.80 (0.56)	4.41 (0.68)
Oil*	4.66 (0.57)	4.85 (0.43)	4.51 (0.62)

<sup>a</sup> \* Indicates the existence of significant differences between groups at the 1% level of significance.

<sup>b</sup> A five-point Likert scale has been used with 1 indicating the minimum safety value. Values in parentheses are standard deviations.

Table 3. Willingness-to-pay for labelled beef with a traceability certificate by market segments in Spain

	All respondents	Segment 1 Higher confidence in food	Segment 2 Lower confidence in food
No Premium	72.5 %	66.6 %	76.7 %
Up to 0.6 €/kg.	3.7 %	3.3 %	4.0 %
Up to 1.2 €/kg.	14.2 %	17.9 %	11.4 %
Up to 1.8 €/kg.	6.6 %	8.1 %	5.5 %
Up to 2.4 €/kg.	1.7 %	1.9 %	1.5 %
Other than 2.4 €/kg.	1.4 %	2.1 %	0.9 %

Table 4. Definitions of variables to explain willingness-to-pay for labelled beef with traceability certificate in Spain

Variable	Definition and measurement
Respondent's overall satisfaction with food safety (SSAF)	Five-point Likert scale (low=1; high=5)
Respondent's overall satisfaction with food nutritional quality (SNUT)	Five-point Likert scale (low=1; high=5)
Respondent's attention paid to labels and confidence in information included in them (INF)	Dummy variable which takes the value 1, if the respondent reads labels often or very often and is confident or very confident with the information included, and 0, otherwise.
Average price paid for beef (PRICE)	Continuous
Household size (HS)	Continuous
Age <sup>a</sup>	(A2034) Dummy variable which takes the value 1 if the respondent is between 20 and 34 years old, and 0, otherwise (A3549) Dummy variable which takes the value 1 if the respondent is between 35 and 49 years old, and 0, otherwise (A5065) Dummy variable which takes the value 1 if the respondent is between 50 and 65 years old, and 0, otherwise
Education level <sup>a</sup>	(LE) Dummy variable which takes the value 1, if the respondent only has primary school, and 0, otherwise (ME) Dummy variable which takes the value 1 if the respondent only has secondary school, and 0, otherwise
Income level <sup>a</sup>	(LI) Dummy variable which takes the value 1 if the household's income is lower than 1500 €/month, and 0, otherwise (MI) Dummy variable which takes the value 1 if the household's income lies between 1500 and 2100 €/month, and 0, otherwise
Living in the south (SOUTH)	Dummy variable if the respondent lives in the South, and 0, otherwise
Frequency of buying beef <sup>a</sup>	(FBC) Dummy variable which takes the value 1 if the respondent buys beef very often, and 0, otherwise (OBC) Dummy variable which takes the value 1 if the respondent buys beef occasionally, and 0, otherwise

<sup>a</sup> One category has arbitrarily eliminated to avoid multicollinearity problems when estimating the model

Table 5. Estimated parameters from the willingness-to-pay model for both market segments

	Segment 1 Higher confidence in food			Segment 2 Lower confidence in food		
	Estimated parameter <sup>a</sup>	Sstandard Deviaton	T-ratio	Estimated parameter <sup>a</sup>	Standard deviaton	T-ratio
$\sigma^2$	1.21	0.11	1.64	1.38**	0.10	3.14
Constant	3.93**	1.69	2.33	0.92	1.65	0.56
SSAF	-0.12	0.34	-0.36	-0.14	0.18	-0.81
SNUT	0.24	0.30	0.80	0.04	0.17	0.27
INF	1.22	1.19	1.02	-1.15	0.95	-1.21
INF*SSAF	-0.34	0.34	-1.00	0.71**	0.34	2.08
PRICE	-0.30**	0.,09	-3.19	-0.15*	0.09	-1.72
HS	0.20	0.14	1.43	-0.18	0.15	-1.19
A2034	-1.01*	0.56	-1.81	0,68	0.49	1.38
A3549	-0.60	0.53	-1.14	0.32	0.47	0.67
A5064	-0.03	0.54	-0.06	0.85*	0.47	1.81
LE	0.57	0.81	0.70	-0.84	0.79	-1.05
ME	1.08**	0.44	2.45	-0.42	0.39	-1.08
LI	-2.68**	0.79	-3.41	0.19	1.16	0.16
MI	-2.14**	0.63	-3.40	-0.05	1.08	-0.04
FBC	-2.08**	0.37	-5.65	-0.37	0.45	-0.81
OBC	-0.87**	0.32	-2.70	-0.01	0.33	-0.04
SOUTH	0.26	0.68	0.38	0.77**	0.31	2.50

<sup>a</sup> \*\* indicates that the corresponding parameter is significant at the 5 % level; \* indicates that the corresponding parameter is significant at the 10 % level.

Table 6. Joint significance tests of explanatory variables involving more than one dummy variable

	Segment 1 Higher confidence in food		Segment 2 Lower confidence in food	
	LR <sup>a</sup>	Degrees of freedom	LR <sup>a</sup>	Degrees of freedom
Age	7.20*	3	3.48	3
Education level	4.27	2	1.33	2
Income	185.73**	2	74.00**	2
Frecuency of buying beef	27.88**	2	0.59	2

<sup>a</sup> \*\* indicates that the corresponding variables are jointly significant at the 5 % level; \* indicates that the corresponding variables are jointly significant at the 10 % level. Critical values are  $\chi^2(2) = 5.99$  and  $\chi^2(3) = 7.81$ , for a 5% level of significance, and  $\chi^2(2) = 4.60$  and  $\chi^2(3) = 6.25$ , for a 10% level of significance.

Table 7. Estimated parameters from the willingness-to-pay model for the pooled data

	Estimated parameter <sup>a</sup>	standard Deviaton	T-ratio		Estimated parameter <sup>a</sup>	Sstandard Deviaton	T-ratio
$\sigma^2$	1.30**	0.08	3.39				
Constant	0.92	1.57	0.59	Constant* HCC	3.15	2.38	1.32
SSAF	-0.14	0.17	-0.82	SSAF* HCC	0.01	0.39	0.02
SNUT	0.04	0.16	0.26	SNUT* HCC	0.21	0.36	0.59
INF	-1.11	0.91	-1.22	INF* HCC	2.37	1.55	1.53
INF*SSAF	0.68**	0.32	2.08	(INF*SSAF)*HCC	-1.03**	0.49	-2.13
PRICE	-0.14*	0.08	-1.72	PRICE* HCC	-0.18	0.13	-1.36
HS	-0.17	0.14	-1.18	HS* HCC	0.37*	0.20	1.84
A2034	0.64	0.46	1.38	A2034* HCC	-1.71**	0.75	-2.28
A3549	0.30	0.45	0.67	A3549* HCC	-0.93	0.71	-1.30
A5064	0.80*	0.44	1.81	A5064* HCC	-0.84	0.72	-1.16
LE	-0.80	0.76	-1.05	LE* HCC	1.42	1.14	1.24
ME	-0.41	0.38	-1.10	ME* HCC	1.55**	0.59	2.62
LI	0.16	1.11	0.15	LI* HCC	-2.96**	1.38	-2.14
MI	-0.06	1.03	-0.06	MI* HCC	-2.16*	1.22	-1.77
FBC	-0.36	0.43	-0.83	FBC* HCC	-1.82**	0.57	-3.20
OBC	-0.01	0.32	-0.04	OBC* HCC	-0.90*	0.47	-1.94
SOUTH	0.73**	0.30	2.48	SOUTH* HCC	-0.44	0.78	-0.56

<sup>a</sup> \*\* indicates that the corresponding parameter is significant at the 5 % level; \* indicates that the corresponding parameter is significant at the 10 % level.



Table 8. Joint significance tests of explanatory variables involving more than one dummy variable in the model estimated with pooled data

	LR <sup>a</sup>	Degrees of freedom
Age	4.81	3
Education level	4.81*	2
Income	4.61*	2
Frequency of buying beef	7.61**	2

<sup>a</sup> \*\* indicates that the corresponding variables are jointly significant at the 5 % level; \* indicates that the corresponding variables are jointly significant at the 10 % level. Critical values are  $\chi^2(2) = 5.99$  and  $\chi^2(3) = 7.81$ , for a 5% level of significance, and  $\chi^2(2) = 4.60$  and  $\chi^2(3) = 6.25$ , for a 10% level of significance.