What comes first, origin or production method?
An investigation into the relative importance of different attributes in the demand for eggs

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Abstract

This paper analyses consumer preferences for different eggs attributes to assess the importance placed by consumers on the origin and method of production when shopping. The data comes from an experiment conducted in Spain during 2009. An Error Component Random Parameter Logit model is used to estimate the effect of different eggs characteristics on consumers' utility and derive their willingness to pay. Results suggest that consumers positively value the free-range and organic method of production and the local and regional origin and that they are willing to pay an additional € 0.85 for each package of six free-range or organic eggs, € 0.77 for locally produced and € 0.27 for regional produced eggs. Hence, the least valued eggs for consumers are those produced in cages and outside the region. Relative to this product, the highest willingness to pay corresponds to free-range or organic eggs followed by locally produced eggs and finally, by the regional eggs. Thus, we can conclude that Spanish consumers give more importance when shopping for eggs to the method of production than to the origin of production.

Additional key words: Aragon; consumers; preferences; random parameters; Spain; willingness to pay.

Introduction

Consumer food demand is not only driven by food product prices and consumer income as stated by traditional economic theory but increasingly by four classess of quality attributes for food products being those of sensory, health, process and convenience. Moreover, recent changes in consumer behavior have made consumers' demands more dynamic, complex and heterogeneous which are subject to cultural differences (Grunert, 2006). As a consequence, different consumer segments can be found in the food market with a different interpretation and preference for the four quality attributes (Grunert, 2006). Because of these differing segments a product differentiation strategy within the food market may provide producers a way to compete in the competitive and saturated food market.

One of the quality attributes for which consumers are increasingly showing an interest are process attributes, the way and where a food product has been produced (Pouta et al., 2010). The reason behind this growing interest is related to the series of food scares in Europe, bovine spongiform encephalopathy (BSE) being the most prominent (Grunert, 2006). These have increased consumer interest in food production particularly in specific aspects such as the method of production and the origin (geographic) of production. In this paper, we focus on consumer preferences regarding the method and origin of production to better understand consumer demand in order to understand added value and differentiate food products that meet those consumers' demands.

The literature studying consumer preference for different methods of production such as organic pro-

Abbreviations used: ASC (alternative specific constant); BSE (bovine spongiform encephalopathy); ECRPL (error component random parameter logit); EU (European Union); RPL (random parameter logit); WTP (willingness to pay).

duction, improved animal welfare production, genetic modification, etc. has grown significantly. In particular, numerous papers analysed consumers' preferences for organic food products[1] and for products with improved levels of animal welfare[2]. Findings from these studies indicate that consumers are willing to pay a positive premium for both organic and other enhanced animal welfare production. In the same way, consumer preference for production in relation to its origin have been investigated in several papers covering different approaches to origin such as country of origin[3], regional origin[4] and local origin[5]. Those findings indicate that consumers positively value the country of origin but it is one of the least important aspects among other product characteristics. However, the regional origin and overall the local origin are also positively valued and more valued compared to other aspects.

Finally, several empirical papers analyzed preferences for both attributes, method of production and origin of production (Loureiro & Hine, 2002; Scarpa *et al.*, 2005, 2007a; Hu *et al.*, 2009; James *et al.*, 2009; Yue & Tong, 2009; Pouta *et al.*, 2010; Wolf *et al.*, 2011; Hu *et al.,* 2012) using different levels for both attributes[6]. These studies used a choice experiment to assess consumers' willingness to pay (WTP) for different products (potatoes, oranges, grapes, olive oil, poultry, tomatoes, carrots, applesauce, blueberry products and milk) in USA and Europe (Finland and Italy). The results of these studies suggest that consumers positively value the method of production and the origin of production but while Loureiro & Hine (2002), Pouta *et al.* (2010) and Hu *et al.* (2012) found that the importance for consumers of the origin of production is higher than the importance of the method of production, the other papers indicated that the importance of each attribute depends on consumer segments and on the analysed product. Building on this non-conclusive evidence, the objective of this paper is to further assess the value of both attributes, the method and the origin of production, for a fresh product (eggs) in two regions of a European country (Spain). Using a choice experiment of Spanish consumers, this paper identifies the way the method and the origin of production are ranked by consumers. While the importance for consumer preferences of both attributes for eggs have been studied in isolation (see discussion section), to our knowledge this is the first attempt to assess them simultaneously.

Eggs were chosen for this study as they are an important fresh product in terms of supply and demand for Spain, as well as a market where origin and production method labels have been widely used. In as far as supply is concerned, Spain is the second most important egg producer in the European Union (EU) after France accounting for 12% of the EU total egg production. Egg production represented 7% of the Spanish animal production and 2.3% of the total agricultural production in 2010 (MERCASA, 2011). With regards to demand, annual per capita consumption in 2010 stands at 131 eggs with an associated expenditure of 16.2 Euros, 99% of which corresponds to hen eggs. In particular, the per capita annual consumption of organic eggs accounts for 15 eggs (MERCASA, 2011). However, consumption of eggs in Spain is falling sharply (41% from 2000 to 2010) (MAGRAMA, 2012) notwithstanding the fact that the eggs market is one of the fresh product markets where more innovation is seen, particularly through enhancement with nutritional benefits (*e.g.* omega 3, vitamin E).

Material and methods

To achieve our objective we have included a series of choice experiment tasks in a questionnaire containing also questions on socio-demographic consumer characteristics (*i.e.* gender, family size and composi-

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[1] Batte *et al.,* 2007; Didier & Lucie, 2008; Ureña *et al.,* 2008; Tranter *et al.,* 2009; Bernard & Bernard, 2009, 2010; Olesen *et al.,* 2010; Van Loo *et al.,* 2011; Mesias *et al.,* 2011a,b; Akaichi *et al.,* 2012.

[2] Carlsson *et al.,* 2005, 2007a,b; Lagerkvist *et al.*, 2006; Chilton *et al.,* 2006; Liljenstolpe, 2008; Tonsor *et al.,* 2009; Olesen *et al.,* 2010; Olynk *et al.,* 2010; Mesias *et al.,* 2011a; Andersen, 2011; Gracia *et al.,* 2012; Kehlbacher *et al.,* 2012.

[3] Hoffmann, 2000; Alfnes & Rickerten, 2003; Loureiro & Umberger 2003, 2005, 2007; Ehmke *et al.,* 2008.

[4] Bonnet & Simioni, 2001; Van der Lans *et al.,* 2001; Fotopoulus & Krystallis, 2003; Scarpa & del Guildice, 2004; Resano *et al.,* 2010.

[5] Giraud *et al.,* 2005; Schneider & Francis, 2005; Bond *et al.,* 2008; Darby *et al.,* 2008; Carpio & Isengildina-Massa, 2009; Campbell *et al.,* 2010; Costanigro *et al.,* 2011; Hu *et al.,* 2012.

[6] All of them, except for Scarpa *et al.* (2007a) and Hu *et al.* (2012) used only two levels for the methods of production, but while Scarpa *et al.* (2005), Hu *et al.* (2009), James *et al.* (2009), Yue & Tong (2009) and Pouta *et al.* (2010) defined organic and non-organic, Wolf *et al.* (2011) used rbST/rbGh hormone-free and conventional milk.

tion, age, educational level and income range) that was delivered to a representative sample of consumers in two Spanish cities. We selected a choice experiment to assess consumer preferences for different egg attributes because of its capacity to value multiple attributes simultaneously. The choice experiment questions asked consumers to choose between alternative products that contain a number of attributes with different levels, following the basics of the Lancaster (1966) maximization utility model and to allow specifying a model consistent with the Random Utility Theory of McFadden (1974). Finally, the choice experiment has the advantage that the choice tasks asked to participants are similar to the typical shopping decision that consumers face when buying products in the market. This similarity with actual consumer shopping decisions can explain the high number of empirical papers on valuing food products using this technique.

Choice experiment design

The first step to implement a choice experiment is to select the specific product to be analysed, in our case a package of half a dozen of eggs, and second to choose the attributes and levels to be used. The selection of the three attributes considered in our study was straightforward. Price was included because it allows the calculation of the WTP, and the method and the origin of production are the attributes that define the different products offered because they are the aim of the study. Other important attributes affecting egg demand such as size or nutritional benefits (*i.e.* omega 3) were fixed (size was extra-large and the eggs offered to consumers had no added functional ingredients) as they were not the objective of this research. Table 1 shows the attributes and levels used.

The price attribute was included with four levels. The lowest level corresponds to the minimum price for half-dozen of extra large eggs that could be found in the Spanish market at the time of the survey (€ 0.75/ half dozen). The next level was set at the average price of eggs (€ 1.25/half-dozen) and the other two levels were set at € 2.0/half-dozen and € 2.5/half-dozen, respectively, with the highest price corresponding to the average organic prices in the market.

Table 1. Attributes and levels used in the choice design

Attributes	Levels[1]
Price (euros per half dozen)	0.75; 1.25; 2.0 and 2.5
Method of production	**Caged** Barn Free-range Organic
Origin of production[2]	Local (Province) Regional (Autonomous Community) Country (Spain) **Europe**

[1] Levels in bold are reference levels in the model estimation.
[2] As the field work was carried out in two different locations (Cordoba and Zaragoza), province and region varied across location; Zaragoza and Aragon for the Zaragoza sample and Cordoba and Andalucia for the Cordoba sample.

To set the levels for the method of production we follow the European regulation on the marketing of eggs instead of using some of the definition used in the previous empirical papers on the methods of production (see footnote 6). The Commission Regulation EEC 589/2008 (EEC, 2008) implementing the marketing standards of eggs (OJ, 2008) and the Spanish Royal Decree 226/2008 established four types of egg production systems which can be used to label eggs: caged, barn, free-range and organic. We have used these four egg production methods as levels of the production methods attribute[7].

Last, four levels were set for the origin of production attribute to cover the different possible geographical origins (local, regional, national and imported). Then, the local origin corresponds with the NUTS3 definition (province) and the regional origin with the NUTS2, (autonomous community). Finally, the third and the fourth levels correspond with eggs produced within the country (Spain) or imported from Europe (Europe).

Each of the choice sets included three alternatives: two unlabelled designed alternatives (Option A and Option B) combining the different levels for the eggs attributes and a non-buy option (Option C). A non-buy option was included to better simulate purchase decisions by consumers as they are not forced to buy a specific product if they do not find it matching their preferences (Louviere & Street, 2000). Choice sets were

[7] Mesias *et al.* (2011a) analysed consumer preferences for eggs in Spain using two methods of production variables (type of fed and rearing conditions) with two levels each of these variables (organic feed *versus* conventional feed; and battery *versus* free range).
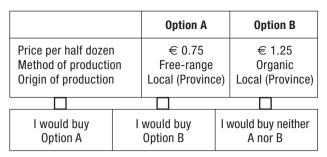
	Option A	Option B
Price per half dozen	€ 0.75	€ 1.25
Method of production	Free-range	Organic
Origin of production	Local (Province)	Local (Province)

I would buy Option A	I would buy Option B	I would buy neither A nor B

Figure 1. Example of a choice card.

designed following Street & Burgess (2007). We started from a full factorial design with 64 profiles. The second option in the choice sets were then created using one of the generators deriving from the difference vector (1, 1, 1) for three attributes with four levels each and two alternatives (Street & Burgess, 2007). We obtained a choice set design that included 128 pairs which was 96.4% D-efficient compared to the optimal. To avoid fatigue effects associated with multiple scenario valuation tasks, respondents were asked to make six choices and the total number of choice sets were randomly split into 21 different blocks. An example of a choice card is included in Fig. 1.

Data collection

Data were collected using this questionnaire in two Spanish regions (Andalucia and Aragon) during January 2009. The regions were selected to cover the south and the north of Spain and because their organic products per-capita consumptions are higher than the Spanish average as well as the per capita consumption of organic eggs that are higher or similar to the Spanish average[8]. Within the regions, Cordoba and Zaragoza were selected because both cities present similar socio-demographic profiles to the Spanish population census [Suppl. Table 1 (pdf)]. Target population was the primary food buyer in the household[9] and interviews were carried out face-to-face. A stratified random sample by district and age was used as the sampling method.

Then, sample size was determined for a confidence level of 95.5% (k = 2), a sampling error of ± 5% when estimating proportions (p = q = 0.5). Then, the sample size in both cities was a set of 400 but finally 403 interviews in Cordoba and 400 interviews in Zaragoza were carried out with a total sample size of 803 individuals.

A number of representative grocery stores and supermarkets were selected in each district, and shoppers were randomly selected outside these food outlets. In order to take into account the change in shopper characteristics that occur between different times and days of the week, interviews covered the full range of opening hours from Monday to Saturday at each food outlet.

As mentioned above, the final questionnaire contains the choice experiment question together with questions on economic and socio-demographic characteristics. Before the final questionnaire was administrated, a pilot survey was conducted to a small sample of respondents (N = 20) in each town to test for understanding and interview length.

A description of the experiment was presented to participants, indicating the selected attributes and levels. In addition, before asking the choice experiment question, a cheap talk script was read to the participants to encourage and motivate respondents to reveal their real preference and thus, minimize the possible hypothetical bias. We used a generic, short and neutral cheap talk inspired by the one utilized by Cummings & Taylor (1999), which we modified and translated into Spanish [the English translation can be found in the Suppl. Table 1 (pdf)].

Summary statistics for the characteristics of the full sample are presented in Table 2. More than a half of respondents were female (55%) with an average age of 45 years old leaving in households of 3 members on average. Approximately 61% of respondents stated that their household monthly net income was between € 600 and € 2,500 and around one third of the sample belongs to each of the three different educational levels considered.

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[8] In Spain, in 2010, the average per-capita consumption of main three organic products (olive oil, fresh fruit and vegetables) was 15.4 kg while in Andalucia and Aragon this figure stood at 17.3 and 20.5 kg, respectively (MAGRAMA, 2011, *pers. com*). In the same way, the per-capita consumption of organic eggs in Spain was 15 eggs while in Andalucia and Aragon this figure stood at 18.8 and 15.1 eggs, respectively.

[9] The questionnaire started with a screening question where interviewees were asked whether they always, almost always, occasionally, hardly ever and never buy the food for the household. In the case that they never buy the food, the interviewer selected another customer randomly belonging to the same age group, and asked the screening question until a participant matching this requirement was found.

Table 2. Socio-demographic characteristics of the sample

Characteristic	% unless stated
Sample size (individuals)	803
Age (mean years of age)	45.5
20 to 34 years old	28.3
35 to 50 years old	31.1
51 to 65 years old	26.0
More than 65 years old	14.6
Household size (mean number of members)	3.3
Net household income	
High (≥ € 2,501/month) (1 = yes)	34.0
Medium (between € 600 and € 2,500/month)	61.4
Low (≤ € 600/month)	4.6
Educational level	
Elementary education	25.8
High school education	37.9
Higher education (1 = yes)	36.3
Gender	
Male	45.5
Female (1 = yes)	54.5

Model specification

The utility function to be estimated with the data gathered in the choice experiment is derived from the Lancastrian consumer theory of utility maximization (Lancaster, 1966), and consumers' preferences for attributes are modeled within a random utility framework (McFadden, 1974). Lancaster (1966) proposes that the total utility associated with the provision of a good can be divided into separate utilities for their component attributes. However, this utility is known to the individual but not to the researcher. The researcher observes some attributes of the alternatives but some components of the individual utility are unobservable and are treated as stochastic (Random Utility Theory). Thus, the utility is taken as a random variable where the utility from the nth individual is based on the choice among *j* alternatives in each of *t* choice occasions. In our empirical specification, the utility function includes as explanatory variables the product attributes in the choice experiment, as well as an alternative-specific constant (ASC) representing the A and B choice options. The utility function in this case is specified as follows:

$$U_{njt} = ASC + \beta_1 PRICE_{njt} + \beta_2 BARN_{njt} + \beta_3 FREERANGE_{njt} + \\ + \beta_4 ORGANIC_{njt} + \beta_5 LOCAL_{njt} + \beta_6 REGIONAL_{njt} + \quad [1] \\ + \beta_7 COUNTRY_{njt} + \varepsilon_{njt}$$

where *n* is the number of respondents, *j* denotes each of the three options available in the choice set and *t* is the number of choice occasions. The ASC is a dummy variable[10] indicating the selection of Alternative A or Alternative B with respect to the non-buy option. It is expected that the constant ASC is positive and significant, indicating that consumers obtain greater utility from the designed alternatives (A and B) than from the non-buy option. PRICE represents the price levels faced by consumers for each egg product. Price is expected to have a negative impact on utility. As the other two exogenous variables have four levels, three effect coded variables were created. The method of production attribute result in three variables, BARN, FREE-RANGE and ORGANIC, considering the battery caged as the reference level. For the origin of production also three variables, LOCAL, REGIONAL and COUNTRY were created leaving the European origin as the reference level. Each of these variables takes the value +1 when the product posed the corresponding attribute level, −1 when the reference level is present and 0 otherwise. Finally, ε_{njt} is an unobserved random term that is distributed following an extreme value type I (Gumbel) distribution, i.i.d. over alternatives and is independent of β and the attributes that is known by the individual but unobserved and random from the researcher's perspective. Consumers are assumed to choose the alternative which provides the highest utility level from those available. Instead of assuming homogenous preferences, which results in the classic conditional logit model, we assume that preferences are heterogeneous[11], and thus we seek to obtain estimates of the means and standard deviations of each random taste parameter. Then, we employ a Random Parameters Logit Model (RPL) considering a panel structure to take into account the fact that several choices were made by each individual (Train, 2003). An additional modification to the standard RPL was needed as in our application, the choice experiment design consists of two designed alternatives and a non-buy option. Contrary to the designed alternative, the non-buy option is actually experienced by the consumer and is constant across choice tasks. Due to this,

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[10] Takes value 1 for alternative A and B and 0 otherwise.
[11] Several empirical studies have demonstrated that consumers' preferences for food products are heterogeneous (*i.e.* Burton *et al.,* 2001; Loureiro & Umberger, 2007; Barreiro-Hurlé *et al.*

the utilities of the designed alternatives are likely to be more correlated between them than with the non-buy option and to have a higher variance than the utilities of the non-buy alternative. To take this into account we consider that the experimental designed alternatives share an extra error component, which is missing in the utility of the experienced alternative (Scarpa *et al.,* 2007b) thus estimating an additional error component in the mixed random parameter logit model (Error Component Random Parameter Logit ECRPL) (Scarpa *et al.,* 2005) that has been used in several empirical applications (Campbell, 2007; Scarpa *et al.,* 2007b, 2008; Hess & Rose, 2009; Jacobsen & Thorsen, 2010). This model has been very successful due to its parsimoniousness (it only requires one extra parameter) and it has empirically been found to substantially improve model fit. Thus, we also estimated an ECRPL model to test whether correlation across utilities exist.

Results

Estimations of Eqn. [1] were conducted using NLOGIT 4.0. The coefficient for price was assumed to be non-random in all specifications while in the specifications incorporating preference heterogeneity the coefficients of the other effect coded variables were allowed to be random following a normal distribution.

Table 3 presents the estimation results for the different specifications. The first model presented in Table 3 is the Conditional Logit model (Model 1) assuming that consumers' preferences were homogeneous for comparison purposes. Model 2 relaxed this assumption and considered that preferences are heterogeneous and thus we obtained estimates of the means and standard deviations of each random variable using a Random Parameters Logit Model (RPL). Last, to take into account that the designed alternatives may have larger utility variance than the non-buy alternative, an ECRPL was also estimated (Model 3). For the estimation of the last two models, we used 100 Halton draws rather than pseudo-random draws since the former provides a more accurate simulation for the RPL model (Train, 1999, 2003).

The estimation procedure was as follows. First, the utility function depicted in Eqn. [1] was changed following the results of the estimation. Because some of the attributes levels coefficients (BARN and SPAIN) in the utility function were not statistically significant, Eqn. [1] was redefined to include only the variables found significant at the 5% significance level. Also, as the standard deviations in Models 2 and 3 for the REGIONAL variable was also not significant, this attribute was considered to be fixed.

Second, we identified which model better fitted the data. For this we look first at the log-likelihood and

Table 3. Parameter estimates for the random parameter models and mean willingness to pay (WTPs). The Wald statistics are in parentheses

	Model 1 (CL)	Model 2 (RPL)	Model 3 (ECMRPL)
Mean value			
ASC	3.07 (41.13)***	3.88 (29.14)***	12.25 (17.03)***
PRICE	−1.59 (−38.05)***	−2.08 (−28.72)***	−2.48 (−49.06)***
FREERANGE	0.242 (5.20)***	1.094 (4.18)***	1.054 (5.24)***
ORGANIC	0.121 (2.80)***	1.376 (5.90)***	1.049 (6.51)***
LOCAL	0.48 (11.20)***	0.68 (11.40)***	0.96 (9.54)***
REGIONAL	0.12 (2.54)***	0.21 (3.51)***	0.33 (3.51)***
Standard deviation of parameter distributions			
FRERANGE		8.46 (13.61)***	3.74 (16.99)***
ORGANIC		4.72 (12.73)***	3.41 (14.79)***
LOCAL		0.50 (5.08)***	0.76 (5.70)***
Standard deviation of the latent random effect			
σ			12.74 (14.14)***
N	803	803	803
Log likelihood	−3,988.60	−3,102.44	−2,361.04
χ^2		4335.97***	5837.78***
Pseudo R^2	0.21	0.41	0.55

the pseudo R^2 values. The log-likelihood value and the pseudo R^2 improved remarkably from the conditional logit model (Model 1) to the RPL model (Model 2) indicating that consumers' preferences were indeed heterogeneous. Additionally, the standard deviations of the estimated random parameters for the variables FREERANGE, ORGANIC and LOCAL were statistically different from zero. Although Models 2 and 3 are both statistically significant (Wald tests reject the null hypothesis that all estimated parameters are equal to zero at the 5% significance level), the log-likelihood and the pseudo R^2 reached their best value in Model 3 compared to Model 2. Moreover, the σ for the alternative specific constant was statistically significant which indicated that an error component model must be specified. Thus, all the discussion on results was based on the Model 3 which was selected as the best fitting option.

The alternative specific constant (ASC) was found to be positive and significant indicating that the respondents prefer any of the two designed eggs option than the non-buy option. As expected, the coefficient for PRICE was negative and statistically different from zero at the 1% significance level in accordance with the economic theory. The estimated coefficients for the FREERANGE and ORGANIC variables were positive and statistically significant indicating that the utility for eggs coming from free-range or organic production methods was higher than the utility derived by caged eggs. In the same way, the estimated coefficients for the LOCAL and REGIONAL variables were positive and statistically significant indicating that the utility for eggs locally produced or produced in the region was higher than the utility derived by eggs produced outside the region. The fact that the variables BARN and SPAIN were found not to be significant means that these attributes levels would not influence consumer utility and thus barn or Spanish eggs would be considered equivalent in utility terms to caged eggs or European eggs.

On the other hand, the Wald statistics for the derived standard deviation parameters shows that the dispersion around the mean estimate was statistically different from zero for two of the methods of production (FREERANGE and ORGANIC) and for the local origin of the eggs (LOCAL). Consequently, this result indicates that the effect of these attributes on the utility function differed across individuals and therefore consumer preferences were heterogeneous. On the other hand, the standard deviation of the variable REGIONAL

Table 4. Mean marginal willingness to pay (WTP) estimates for eggs attributes (euros per half dozen of eggs)

Attributes	FREERANGE	ORGANIC	LOCAL	REGIONAL
WTP	0.85	0.85	0.77	0.27
t-ratio	5.28	6.47	9.58	3.52

was not statistically different from zero which suggests that consumer preference for this attribute is homogeneous.

To assess consumers' valuation for each of the attributes (FREERANGE, ORGANIC, LOCAL and REGIONAL), we calculated their marginal WTPs (Table 4). The WTPs were calculated by determining the price difference that generates utility equivalence between eggs with different attributes levels. Then, mean marginal WTP values for each attributes levels were calculated by taking the ratio of the mean parameter estimated for each non-monetary attribute level to the mean price parameter multiplied by minus two as effect coded variables were used in estimations (Lusk *et al.,* 2003).

The four WTP estimates were positive and statistically different from zero indicating that consumers were willing to pay a positive premium for free-range, organic, locally or regionally produced eggs. Moreover, our results also indicated that consumers presented a higher WTP for the method of production than for the origin of production thus answering the main research question of the paper. In other words, the importance of the method of production showed higher than the importance of the origin of production, at least in the demand for eggs in Spain.

In particular, the WTP for the more environmentally and animal friendly production systems (FREERANGE and ORGANIC) was 0.85 for each of them indicating that consumers were willing to pay an extra premium of € 0.85 for a free-range package of eggs relative to a caged eggs package and also € 0.85 extra for an organic package of eggs relative to a caged eggs package. Second, the WTP for the origin of production (LOCAL and REGIONAL) indicated that consumers were willing to pay € 0.77 more for a locally produced package of eggs than for package of imported eggs. Moreover, consumers were willing to pay € 0.27 more for a package of eggs produced in the region than for an imported package taken into account that this WTP was the same for all consumers because we found that preferences for the regional origin were homogeneous.

However, the WTPs for free-range, organic or local eggs differed among consumers because preferences for those characteristics were heterogeneous. As a first conclusion of the analysis of heterogeneity we found that 73%, 80% and 99% of respondents were willing to pay a price premium for free-range, organic and local eggs respectively (their estimated WTPs were higher than zero). Thus, even when average WTP for free-range or organic were higher than that for local eggs, almost all consumers were willing to pay an extra premium for local eggs and no targeting would be needed to capture the premium for this attribute in the market. In addition, if we take into account that all consumers would pay € 0.27 per package for regional produced eggs, it is interesting to mention that the percentage of consumers that were willing to pay an extra premium higher than € 0.27 for free-range, organic or local eggs were 58%, 66% and 87%, respectively.

Discussion

Consumer interest in the production process characteristics of the food products sold in the market has increased in Europe. In particular, consumers are increasingly interested where and how foods are produced. This interest is captured in two attributes, the origin and the method of production, which consumers consider more often when making purchase decisions. In this paper we have tried to shed some light on how much importance consumers attach to these attributes and to provide a response to the paper's title: what comes first, origin or production method?

While results indicate that consumers positively value method and origin of production, our results also indicate that consumers give more importance to the former. This finding differs from the ones by Loureiro & Hine (2002) and Pouta *et al.* (2010) who found that consumers' WTP for the origin of production was higher than for the method of production for USA and Finnish consumers and for potatoes and poultry, respectively. However, there is substantial evidence that the importance of the method of production and origin of production depends on the consumer segment and on the analyzed products (Scarpa *et al.,* 2005, 2007a; Hu *et al.,* 2009; James *et al.,* 2009; Yue & Tong, 2009; Wolf *et al.,* 2011). Our results reinforce the notion that the relative importance attached by consumers to the method and origin of production attributes when shopping depends on the specific product.

We can conclude that for the specific egg characteristics valuation the least valued eggs for consumers are those produced in cages and outside the region of the consumer. Relative to this product, the highest WTP correspond with the free-range (€ 0.85 per package) or organic eggs (€ 0.85 per package) followed by the locally produced eggs (€ 0.77 per package) and finally, by the regional eggs (€ 0.27 per package). However, the fact that the production method is more valued than the origin does not directly translate into a recommendation to producers to focus on these types of eggs. Two of our results point towards focusing on locally produced eggs as a potentially more profitable business strategy. First the additional costs associated with animal welfare and environmentally friendly methods of production might be higher than the difference between the WTP for local and organic or free range eggs. Thus, marketing eggs as local even when capturing a lower price premium might result in higher profits for the egg producer. Second, the regional attribute appeals to all consumers because all of them are willing to pay € 0.27 more for a package of eggs produced in the region therefore no specific targeted marketing strategies are needed. Moreover, a number of consumers would not be willing to pay even € 0.27 for the other attributes (42% for free-range, 34% for organic and 13% for local) while everyone declares to be willing to pay this extra premium for eggs produced in the region.

These findings show that egg producers could differentiate their products in the market using some of the production process attributes because they are positively valued by consumers. They could market their products as free-range or organic because they are the characteristics more valued for consumers. The decision on what aspect to use in the differentiation strategy would depend on the cost of production (including the certification) of each of the differentiated products. In other words, if the production and certification cost for free-range is lower than that for organic, they should sell free-range eggs because consumers place the same value on free-range and organic eggs. Moreover, depending on the cost of production and certification of local eggs, it would be more beneficial for producers to use this differentiation because the value attached by consumers to the local origin is only slightly lower than for the free-range characteristic and almost all consumers are willing to pay a positive price premium for locally produced eggs. Hence, the decision on whether to sell the eggs undifferentiated or diffe-

rentiated using some of the analysed aspects (free-range, organic, local, regional) will depend on the cost of production (including the cost of certification and other costs) for the different added value products.

If we take into account that the average market price of a package of caged eggs was € 1 per half a dozen at the time of the experiment, our results indicate that consumers were willing to pay a premium price of 85% for free-range or organic eggs. These results are in line with those reported by Mesias *et al.* (2011a) for Spanish consumers in Extremadura and Murcia regions. The main difference being that while Mesias *et al.* (2011a) report slightly different WTP for each production method, € 0.70 and € 0.68 per half dozen for free-range and organic eggs, respectively; in our case WTP for both production methods was the same. Taking into account that Mesias *et al.* (2011a) reported that the average price for half a dozen of caged eggs was € 0.63, the price premium for consumers was 111% and 108%, respectively for free-range and organic eggs in relation to caged eggs. In a similar manner, Goddard *et al.* (2007) found that Canadian consumers (Ontario) would pay Canadian $ 1.72 for a dozen of organic eggs relative to normal eggs and less for a dozen of free-range eggs in relation to normal eggs (Canadian $ 0.99 per dozen). These authors reported an average market price for normal eggs of Canadian $ 1.76 per dozen. Then, Canadian consumers were willing to pay an extra premium of 98% and 56%, respectively for organic and free-range eggs in relation to normal eggs. Finally, Carlsson *et al.* (2007a) estimated that Swedish consumers were willing to pay SEK 8.4 more for a half dozen of free-range eggs, that represents a 120% price increase in relation to caged eggs (average caged eggs price was SEK 7 per half dozen).

Second, our results showed that Spanish consumers were willing to pay a price premium of 77% for locally produced eggs and a 27% premium for regional produced eggs. Comparing these results to those reported by Stolz *et al.* (2010) for organic eggs consumers in five European countries (Austria, Germany, Italy, Switzerland and the UK), we see that our premium for the locally produced eggs is closest to the one for Switzerland (66.3%), higher than for Austria (15.9%), UK (23.2%) and Italy (52.1%) and lower than for Germany (127.5%).

Although our results provide more evidence on the debate on which, origin or method of production attributes is more valued by consumers, the debate looks far from being closed. Our results reinforce the idea

that the relative importance attached by consumers to the method and origin of production depends on the product and market. However, our study has some limitations that should be taken into account in further research. First, although results are similar to previous research conducted in different geographical settings and for other products, our study was conducted in Spain and should be replicated in different European countries as well as for other food products to further validate the results. Second, although we used a model specification that takes into account the possible heterogeneity of preferences future research should further investigate the reasons of this heterogeneity.

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