

1 Consumer preferences for food labeling: what ranks first?

2
3 Azucena Gracia* and Tiziana de-Magistris

4 Unidad de Economía Agroalimentaria, Centro de Investigación y Tecnología Agroalimentaria
5 de Aragón (CITA). Instituto Agroalimentario de Aragón – IA2 – (CITA-Universidad de
6 Zaragoza), Zaragoza (Spain). agracia@aragon.es; tmagistris@aragon.es

7 **Abstract:**

8 In the EU food market, different food labeling schemes co-exist with the aim of
9 informing customers and providing trust on different quality characteristics of food
10 products. To understand which food labeling schemes are the most and the least
11 important for consumers is very relevant because a labeling strategy will be useful for
12 food companies if consumers, or at least one segment of consumers, value food
13 labeling. The aim of this study was to measure the importance consumers attach to
14 different labeling schemes available in the food market. Seven different food labeling
15 schemes, some regulated by the EU (the EU organic logo, the Protected Designation of
16 Origin (PDO) indication and the nutritional fact panel) and some of them not yet
17 regulated at the European level (the food miles indication; the local origin; the carbon
18 footprint information; and an improved animal welfare indication), were assessed by
19 consumers. To do this, the direct ranking preference method was used and a rank-
20 ordered mixed logit model was estimated with the data from a survey conducted with
21 food shoppers in a medium-sized Spanish town. The results indicate that the most
22 preferred labeling scheme was the PDO indication, closely followed by the nutritional
23 fact panel and the EU organic logo. In other words, consumers clearly valued labeling
24 schemes that are regulated by EU law. Moreover, consumer preferences for food
25 labeling were heterogeneous and three segments of consumers based on preferences
26 were found: PDO lovers, organic EU logo lovers and the nutritional information lovers.

27
28 **Keywords:** animal welfare, carbon footprint, food miles, **guarantee, labeling schemes,**
29 local, nutritional fact panel, organic, PDO, Spain

30 Corresponding author: Azucena Gracia
31 Unidad de Economía Agroalimentaria. CITA. Avda Montañana 930, 50059 Zaragoza (Spain)
32 Phone: ++34976716350; Fax: ++34976716335. e-mail: , agracia@aragon.es
33

34 We are thankful for funding from FOODLABELS_PIOF-GA-2009-253323

Consumer preferences for food labeling: what ranks first?

1. Introduction

During the last two decades, numerous food crises have emerged in the EU food system, including a large outbreak of bovine spongiform encephalopathy. Consumers are increasingly concerned about the apparent lack of control and the safety of agri-food products (García and Jukes, 2004). As a consequence, European food policy, the European food chain and consumers have changed substantially. A new food policy and regulatory framework was established based on risk assessment, control, management and communication with the aim of providing food products with greater food safety and health standards. This new integrated approach to providing safer and healthier food products has forced companies in the food chain to adapt their production systems to provide higher safety guarantees (Falguera *et al.*, 2012). However, at the same time, increasing consumer demands for higher quality products and more information and trust in these qualities may also be an opportunity for companies to build a competitive advantage. To get this advantage, they should offer consumers differentiated quality food products with the required information to allow consumers to make more informed product choices. This quality differentiation is mainly done using food labeling because these quality food product characteristics are credence attributes that cannot be revealed to consumers before purchase and consumption, unless additional information is provided (Caswell *et al.* 2002). Thus, the use of credible labels allows food companies to signal quality or the presence of specific unobserved desirable attributes (McCluskey and Loureiro, 2003).

As a result, different food labeling schemes are proliferating in the EU food market with the aim of informing consumers and providing trust on different quality characteristics of food products. A recent study funded by the European Commission on the functioning of voluntary food labeling schemes for consumers in the European Union (Ipsos - London Economics EAHC, 2013) found a total of 901 food labeling schemes operating in Europe. This study pointed out that more food labeling schemes were found in Spain than any other country (20% of all food labeling schemes were found in Spain), with Germany second (12.5%), and Italy, the Czech Republic, France, and Portugal having the next greatest number of schemes. These food labeling schemes were classified by the attribute claimed in the label, and the results indicated that the most claimed characteristic was the origin of production, which was covered by 60% of

69 all schemes (540 schemes out of 901 schemes identified). The second most prevalent
70 characteristic on labels was organic certification (234 schemes), followed by
71 traceability, traditional methods, taste/smell, environmental methods, safety and animal
72 welfare.

73 However, this large amount of information may mislead consumers, mainly for the
74 food characteristics that are more difficult to understand (Falguera *et al.*, 2012). To
75 solve this problem, the EU has launched different food labeling regulations that food
76 companies can adopt on a voluntary basis. The aim of these food labeling schemes is to
77 establish the requirements of use and the control procedures of the labeled quality
78 products to protect consumers from being misled. Two examples of these regulations
79 are EEC Regulation No. 834/2007 on organic production and labeling of organic
80 products and EEC Regulation No. 1151/2012 on a quality scheme for agricultural
81 foodstuffs. These regulations lay down stringent requirements guaranteeing the
82 standards of all higher-quality products in Europe. In addition, EU quality schemes
83 ensure that food products are produced to exacting specifications by establishing control
84 requirements. The EU also regulates the conditions and requirements for food
85 information through EEC Regulation No. 1169/2011 on the provision of food
86 information to consumers, which has established common definitions, principles,
87 requirements and procedures for food information. This regulation also includes new
88 requirements for nutritional labeling in response to the conclusions of the Commission
89 reported in the white paper on A Strategy for Europe on Nutrition, Overweight and
90 Obesity Health-related Issues. This white paper pointed out that nutrition labeling is an
91 important method of informing consumers about the composition of foods, helping
92 them to make an informed choice. This regulation established that the nutritional fact
93 panel will be mandatory as of 2016.

94 Moreover, empirical studies on consumer preferences for several types of food
95 quality labeling in Europe have indicated that the most prevalent food labeling schemes
96 in Europe were also the most analyzed and found to provide the most value to European
97 consumers. Most empirical studies conducted in Europe have focused on assessing
98 consumer preferences for processed methods (organic, animal welfare) and the origin of
99 production (regional, local) (Andersen, 2011; Aprile *et al.*, 2012; Denver and Jensen,
100 2014; Gracia *et al.*, 2014; López-Galán *et al.*, 2013; Olesen *et al.*, 2010; Pouta *et al.*,
101 2010; Resano *et al.*, 2012; Yangui *et al.*, 2014 to name only few of the most recent
102 ones). However, several empirical studies have also analyzed preferences for these two

103 claims together with other attributes such as health (nutritional information, health
104 claims) and environment/sustainability (food miles, footprint) (de-Magistris and Gracia,
105 2014; Koistinen *et al.*, 2013; Øvrum *et al.*, 2012). These papers used different choice-
106 based experiments (hypothetical and non-hypothetical) to assess consumers' willingness
107 to pay for the different attribute signals. Their results indicated that, in general terms,
108 European consumers positively value labels informing about the method of production,
109 origin and health benefits because they are willing to pay extra for food products with
110 these attributes. In addition, it was also pointed out that consumer preferences for these
111 labeling schemes are heterogeneous across consumers. However, none of these papers
112 provided evidence on which of several food labeling schemes are the most and least
113 preferred by consumers. To understand which food labeling scheme is the most and
114 least important for consumers is very relevant because a labeling strategy will be useful
115 for food companies if consumers or at least a segment of consumers value the food
116 labeling scheme they are using or intent to use.

117 The aim of this paper was to determine which of different labeling schemes are most
118 relevant for consumers; in other words, to measure the importance consumers attach to
119 different labeling schemes available in the food market. In particular, we assessed
120 consumer preferences for the most prevalent food labeling schemes in the food market,
121 previously determined to be relevant to consumers in empirical studies.

122 Apart from the previously described food labeling schemes regulated by the EU, the
123 EU organic logo¹, the Protected Designation of Origin (PDO) indication² and the
124 nutritional fact panel³, we included other food labeling indications that have emerged on
125 the European food market and have being studied in previous empirical papers on food
126 labeling preferences, i.e. the food miles indication⁴; the local origin⁵; the carbon
127 footprint information⁶; and an improved animal welfare indication⁷. In this study, seven
128 different food labeling schemes, some regulated by the EU and some not yet regulated
129 at the European level, were assessed by consumers. Because we expected, based on
130 previous research, that consumer preferences for different food labeling schemes would

¹ Regulated by EEC No. 834/2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91

² Regulated by EEC No. 1151/2012 on quality scheme for agricultural and foodstuffs.

³ Regulated by EEC No. 1169/2011 on the provision of food information to consumers

⁴ Indicating the kilometers that the food product travel from the production to the consumption area

⁵ Informing that the food product is locally produced and directly sold by the farmer

⁶ Indicating the CO₂ emissions in the production and commercialization of the food product

⁷ Claiming that the animals have been raise, transport and slaughter following improved animal welfare standards than minimum required by the EU regulation

131 be heterogeneous, the source of this heterogeneity was also investigated. Moreover,
132 consumers were segmented into groups with homogeneous preferences for food
133 labeling and the segments were profiled based on the consumers' personal
134 characteristics, label use and beliefs, food-related lifestyles and environmental and
135 ethical beliefs.

136 To achieve our aim, following Lagerkvist (2013), the direct ranking preference
137 method was used. Lagerkvist (2013) utilized two different methods, i.e. direct ranking
138 and best-worst scaling, to measure attributes important to consumers for beef labeling.
139 He concluded that the ranking of attribute importance derived by both methods was
140 similar, as was the participants' understanding of the task required by the methods.
141 Thus, we selected direct ranking, as respondents needed only to rank seven different
142 food labeling schemes, which is not a complicated task. Moreover, one of the stated
143 shortcomings of this method was that when aggregate measures (such as probabilities of
144 first rank, second rank, etc., and/or rank means) are used to analyze the data,
145 consumers' heterogeneity in preferences cannot be studied. However, if the direct
146 ranking for each of respondents are re-coded as sequential choices, new data could be
147 used to estimate choice models and account for heterogeneity (Train, 2003). This
148 approach was used in this study.

149 Data from this study comes from a survey administrated in a mid-sized town in
150 Spain. This town was selected to be representative of Spain because their socio-
151 demographics are similar to those of the Spanish Census of Population. The target
152 population was food buyers in the household and the final sample was randomly
153 selected stratified on the basis of gender and age. The survey was conducted through
154 personal interviews using a structured questionnaire.

155 The paper is structured as follows. The next section describes the materials and
156 methods and section 4 presents the results. Finally, section 5 presents a summary of the
157 conclusions, a discussion of the implications and suggested further research.

158 2. **Materials and methods**

159
160 To assess consumer preferences for different food labeling schemes, a direct
161 ranking method was used. Direct ranking is a non-forced choice method by which
162 preference intensity is obtained by directly comparing the different alternatives. This
163 method provides the respondent with different products and they are asked to rank-order
164 them from most preferred to least preferred. This method has been recently used in

165 several applications to measure preferences for different food products (Hein *et al.*,
166 2008; Lagerkvist, 2013). To measure the importance of the products with the
167 information obtained using this method, different aggregate indicators of product
168 importance can be used such as *i*) probabilities of first rank, second rank, etc., and, *ii*)
169 rank means. These indicators allow for identifying the order of preferences, but because
170 of their aggregate nature, they are not able to address heterogeneity across respondents.
171 To avoid this disadvantage, rank ordering can be broken into different choice situations
172 making some *ad hoc* assumptions. This transformation into a sequence of choice
173 behavior allowed for using the information to estimate choice models that account for
174 heterogeneity (mixed logit). Then, the source of consumer preference heterogeneity
175 could be investigated.

176 In this study, we first calculated from the original data the probabilities and means
177 of ranks to investigate consumer preferences for different food labeling schemes. Next,
178 data were re-coded by treating each rank as a sequential choice process where
179 respondents make a discrete choice between alternatives. Then, rank orderings were
180 broken down into sequences of choice situations as defined by Train (2003) and a rank-
181 ordered mixed logit was estimated. Finally, estimated parameters of the importance of
182 the different food labeling schemes for each of the respondents were used to segment
183 consumers into groups. These consumer segments were characterized using personal
184 consumer characteristics, label use and beliefs, food-related lifestyles and
185 environmental and ethical beliefs.

186

187

188 2.1. Utility theory framework

189

190 In the direct ranking, respondents are asked to rank the alternatives from the most to
191 the least preferred; therefore, we obtained a ranking of the alternatives that presumably
192 reflects the utility that the respondent obtained from each alternative. To use this
193 ranking information within the usual utility theory framework defined by the random
194 utility model (RUM), each individual n faces a choice among J alternatives, and he/she
195 obtains utility (U_{nj}) from choosing alternative j over other specific alternatives. First, we
196 have to transform the original full ranking of the different alternatives into
197 “pseudochoices” or “pseudo-observations” to maximize information on preferences
198 (Train, 2003). Thus, for the first pseudo-observation, the choice set includes J ($J = 7$)
199 alternatives, and the dependent variable identifies the alternative ranked as the most

200 preferred; for the second pseudo observation, the alternative ranked first is discarded,
 201 leading to a choice set composed of J-1 alternatives, and the option ranked second
 202 becomes the chosen alternative. The process continues until the choice set is comprised
 203 only by two alternatives. Therefore, the ranking of J alternatives can be represented as J-
 204 1 independent choices, and the new dataset will include J-1 choices for each individual.

205 Then, utility (U_{nj}), has two components: one, observed by the researcher (V_{nj}) and
 206 another unobserved and random (ε_{nj}) distributed iid extreme value (as for a logit model).

207

208 2.2. Rank-ordered mixed logit

209

210 The data was then analyzed by estimating a mixed rank-ordered logit (MRL), which
 211 combines the statistical flexibility of the mixed logit and its ability to investigate
 212 heterogeneous preferences, with the adequacy of the rank-ordered logit for ranking
 213 observations.

214 Under the assumptions of a standard logit, the probability of individual n ranking J
 215 alternatives from best to worst as $j_1; \dots; j_m; \dots; j_J$, where j_m represents the alternative
 216 chosen at the ranking order m, can be expressed as the product of logit choice
 217 probabilities:

$$218 \quad \text{Pr ob}(\text{ranking } j_1, \dots, j_m, \dots, j_J) = \text{Pr ob}(U_{j_1} > \dots > U_{j_m} > \dots > U_{j_J}) = \prod_{m=1}^{J-1} \frac{e^{V_{nj_m}}}{\sum_{k=m}^J e^{V_{nj_k}}} \quad (1)$$

219

220 where $V_{nj} = \beta'_n X_{nj}$

221

222 The β'_n coefficients represent heterogeneous preferences across individuals by
 223 specific coefficients or taste parameters in β for each individual. Rather than being
 224 fixed, as occurs in a standard logit model, the vector of parameters β is random, with a
 225 density $g(\beta/\theta)$ where θ represents the parameters of the distribution (i.e. mean and
 226 standard deviation). Expression (1) still provides the probability for an individual n of
 227 choosing a specific ranking, but is conditional on β . The unconditional probability is the
 228 integral of that product of probabilities over the density of β :
 229

230

$$231 \quad \text{Pr ob}(\text{ranking } j_1, \dots, j_m, \dots, j_J) = \int \prod_{m=1}^{J-1} \frac{e^{V_{nj_m}}}{\sum_{k=m}^J e^{V_{nj_k}}} \times g(\beta|\theta) d\theta \quad (2)$$

232

233 Then, the mixed logit model on ranked alternatives is estimated using the
234 transformed data set-up as described above where the $J-1$ pseudo-observations for each
235 ranking are treated as $J-1$ choices in a panel. The mixed logit incorporates the fact that
236 each respondent has his own coefficients and, importantly, that the respondent's
237 coefficients affect his entire ranking such that the pseudo-observations are correlated
238 (Train, 2003).

239 In our application, the consumer's utility (V_{nj}) is a function of the characteristics
240 ranked by respondents and the estimated parameters are assumed to be random
241 following a normal distribution.

242

243 2.3. *Preference heterogeneity*

244

245 Estimated parameters for the rank-ordered mixed logit for each of the participants
246 were then utilized to segment consumers using a cluster k-means procedure. The
247 obtained segments were characterized by consumer personal characteristics, label use
248 and beliefs, food-related lifestyles and environmental and ethical beliefs. This
249 characterization was done using a chi-square or Bonferroni test (Hair et al., 1998),
250 depending on the nature of the variable.

251

252 2.4 *Data gathering and variable definition*

253

254 Survey data were collected through personal face-to-face interviews using a
255 structured questionnaire in a medium-sized Spanish town in 2011. This town was
256 selected to be representative of Spain because its socio-demographics are similar to
257 those of the Spanish Census of Population (Table A in the Appendix). In order to ensure
258 that respondents had shopping experience, the target population included the primary
259 food buyer in the household.

260 The sample of participants was randomly selected and stratified on the basis of
261 gender and age. Interviewers randomly selected the individuals and first asked them
262 whether they were the main household food shopper⁸. In the case that the consumer
263 never bought food, the interviewer selected at random another consumer belonging to
264 the same age group, and asked the screening question until a participant matching this

⁸ We questioned whether interviewees always, almost always, occasionally, hardly ever or never buy the food for the household; consumers who indicated never were not selected.

265 requirement was found. A total of 540⁹ consumers were interviewed, which, for an
266 infinite population and assuming a confidence level of 95.5% (k=2) and p=0.5, the
267 sampling error is lower than the usual $\pm 5\%$.

268 The questionnaire included one question to measure consumer preferences for
269 different food labeling schemes. Respondents were asked to rank the seven schemes
270 from most to least preferred (1 indicate the most preferred and 7 the least preferred). To
271 explain consumer preferences, several questions on *i*) label use and beliefs, *ii*) food-
272 related lifestyles and *iii*) environmental and ethical beliefs were included. Finally, some
273 personal consumer characteristics (gender, age, household size, education and income),
274 the frequency of buying food and whether they follow a food diet were also questioned.
275 Prior to the final administration of the questionnaire, it was validated using 20
276 consumers for understanding and interview length. We were aware of whether the
277 respondent knew of the different labeling schemes, so respondents were informed about
278 the main characteristics of the labeling schemes.

279 To measure label use, respondents were asked two questions, to determine if
280 they pay attention and read labels when shopping (Table 1). To know consumers
281 attitudes (beliefs) towards the labels on food products, the items of the scale used by
282 Loureiro *et al.*, (2006) for the nutritional label were adapted and used. Respondents
283 were asked the level of agreement or disagreement with different sentences related to
284 food label information (see Table 1 for the definition of the statements).

285 Some items of the scale validated by Brunsø and Grunert (1995) were used to
286 measure food-related lifestyles and the validated scale by Lindeman and Vaänänen
287 (2000) was used to measure environmental and ethical beliefs (see Table 1 for the
288 definition of the statements).

289 Respondents were also asked about their frequency of food shopping, from
290 always to hardly ever and whether they or other people in the household followed a
291 special food diet (Table 1).

292 INSERT TABLE 1

293

294 Summary statistics for the socio-demographic and economic characteristics of
295 the sample are presented in Table 2 together with the population information for some
296 demographic profiles for comparison. Around half of the respondents were female

⁹ Some respondents did not answer to the ranking question of interest and were discarded, then finally only 522 interviews were used in this paper.

297 (53%), living in households of 2.9 members on average. In addition, the average age
298 was around 46 years and nearly 20% had completed primary studies while more than
299 40% had completed university studies (this group is slightly over-represented, which is
300 a common characteristic of surveys). Around 25% of the respondents belonged in each
301 of the four income categories.

302

303

INSERT TABLE 2

304

3. Results

305

306

307

308

309

Table 3 shows the percentage of respondents that ranked the different labeling schemes as first, second, third, fourth and fifth, together with the mean of the ranks. Because we asked participants to order from most preferred to least preferred, a lower value of the mean indicates the highest preference for this labeling scheme.

310

311

312

313

314

315

316

317

318

319

The results from the probability of ranks first shows that the most preferred labeling schemes were the nutritional fact panel information, the PDO indication and the EU organic logo because most of the respondents ranked these labels first. In particular, 35% of respondents ranked the nutritional fact panel first, 30%, the PDO indication and 25% the organic logo. However, if we take into account the second and third rankings and the rank means, the most preferred label was the PDO indication (2.51), very closely followed by the nutritional fact panel information (2.59) and the organic logo in third position (2.85). On the other hand, the two sustainability labels, more recently introduced in some EU countries, the food miles and carbon footprint labels were the least preferred.

320

321

322

323

324

325

326

As mentioned above, we expected that the consumer preferences for food labeling schemes would be heterogeneous. However, this heterogeneity was not observed in the aggregate results in Table 3. Then, we estimated a ranked-order mixed logit as described in section 3 to test if heterogeneity in consumer preferences for food labeling exists. The estimation of the ranked-order mixed logit was done using NLOGIT 5.0 (the carbon footprint indication was used as the reference and not included in the final specification of the model to avoid multicollinearity).

327

328

329

330

Table 4 presents the mean and the standard deviation of the estimated parameters for the ranked-order mixed logit. The standard deviations of the mean estimated coefficients were statistically significant at the 5% significance level, indicating that consumer preferences for food labeling schemes were indeed

331 heterogeneous. The mean of the estimated parameters were statistically significant and
332 positive, indicating that these six labeling indications were more preferred than the
333 carbon footprint used as the reference. Related to this, the most preferred label was the
334 PDO indication, followed very closely by the nutritional fact panel information and the
335 organic logo ranked third (similar results as when using the rank means). The order of
336 preference for local origin and animal welfare was similar and they ranked in the
337 middle, while the food miles and the carbon footprint indications were in the last
338 position in terms of consumer preferences. These results indicate that consumers prefer
339 having information on the geographical origin (PDO indication), the nutritional content
340 of the product (nutritional fact panel), and on the production method (organic logo), in
341 this case a more environmentally friendly production system.

342 This rank of preferences corresponds to the average consumer, but as mentioned
343 before, heterogeneity exists across consumers. Thus, we used the estimated coefficients
344 for each of the participants (β'_n) to segment them into homogeneous groups using a k-
345 means cluster analysis (Hair *et al.*, 1998). From the cluster analysis, we obtained three
346 segments of similar sizes. Segment 1 consisted of 36.6% of respondents, segment 2 of
347 38.3% and segment 3 of 25.1%. First, we checked if the three segments really differed
348 in terms of estimated parameters using ANOVA (Bonferroni test)¹⁰. Table 5 indicates
349 that, except for the food miles indication and the local origin, the estimated parameters
350 were statistically different across clusters. The mean values of these parameters were
351 used to name the different clusters according to consumer preferences for the food
352 labeling scheme. Thus, cluster 1 was named “PDO lovers” because this segment
353 attached more value than the other two segments to this indication. In the same way,
354 cluster 2 was named “organic lovers” because they ranked the organic logo and the
355 animal welfare higher than the rest of the segments. It must be taken into account that
356 the EU organic regulation was established as a requisite to certify that an animal product
357 is organic, meaning that it should follow specific animal welfare standards. Finally,
358 cluster 3 was named, “nutritional information lovers”, because they attached the highest
359 importance to the nutritional fact panel. Table 5 also presents the ANOVA and chi-
360 square test results for the three clusters for the different consumer characteristics to
361 profile them (personal, label use and beliefs, food-related lifestyles and environmental
362 and ethical beliefs).

¹⁰ The cluster analysis and the ANOVA and chi-square tests were performed using STATA 10.0

363 The “PDO lovers” segment consisted of a higher proportion of older male
364 consumers who had completed primary studies and had a higher income than the other
365 two segments. Consumers in this segment comprised a greater proportion of frequent
366 shoppers. A higher percentage of consumers in this segment stated that they read labels
367 while shopping and they highly believe that labels provide useful information and to
368 lesser extent that labels prevent fraud, guarantee quality and safety, are not easy to
369 understand and provide too much information. They considered to greater extent that
370 labels are useful and a source of easy information. However, they believed to lesser
371 extent that labels prevent from fraud and are means of guarantee the quality and safety
372 of the food product. According to food-related lifestyles, consumers in this segment
373 considered to greater extent that they need to know the nutrition content of their food,
374 check prices when shopping and plan their shopping in advance more often than
375 consumers in the other two segments. Finally, they were less concerned about animal
376 welfare and the environmental aspects of producing and packaging the food products
377 than the other two segments.

378 The “organic lovers” and the “nutritional information lovers” segments consisted
379 of a higher percentage of younger women who had completed university studies and
380 had a lower income level than cluster 1. Fewer of them stated that they read labels when
381 shopping and they considered labels to greater extent to be a way of preventing fraud
382 and guaranteeing quality and safety than consumers in cluster 1. However, they believed
383 to lesser extent that food labels provide useful information but to a greater extent that
384 there is too much information and it is not easy to understand. According to food-related
385 lifestyles, they usually decide what to buy in the shop and they check prices to a lesser
386 extent than consumers in cluster 1. However, they usually take more time in the kitchen.
387 Cluster 2 and cluster 3 differed in terms of their environmental and ethical beliefs. Both
388 clusters were more concerned with animal welfare and the environmental aspects of
389 producing and packaging the food products than consumers in cluster 1, but consumers
390 in cluster 3 were more concerned than consumers in cluster 2.

391

392 **4. Conclusions and discussion**

393

394 In the EU, a great number of food labeling schemes exist (901) with the highest
395 prevalence in Spain (accounting for 60% of all schemes). However, food labeling will
396 be useful for food companies only if they are relevant to consumers or at least for a
397 group of consumers. The results from this study provide evidence as to which food

398 labeling schemes are most preferred for consumers in one European country (Spain), the
399 one with the highest prevalence of schemes. Moreover, it gives information on the
400 heterogeneity among consumers and the relevance they attached to the different food
401 labeling schemes.

402 It was found that the most preferred labeling scheme was the PDO indication,
403 closely followed by the nutritional fact panel and the EU organic logo. The other four
404 labeling schemes were much less preferred, as the local origin and animal welfare
405 ranked in the middle while the two sustainable indications (food miles and carbon
406 footprint) occupied the last positions in consumer preference.

407 The findings show that consumers highly value labeling schemes that are
408 regulated by EU law. The results indicate that if the food labeling is based on
409 regulations that lay down stringent requirements to guarantee the standards of the
410 labeled food product and ensures that those standards match specifications by
411 established control requirements, consumers will prefer products carrying these labels.
412 In fact, the labeling schemes not already regulated at the EU level, perhaps also because
413 they are less known by consumers, received less consumer valuation. Based on these
414 results, we could speculate that if the EU decides to include in their regulations new
415 food labeling schemes such as local farming and direct sales, it can be expected that
416 consumer valuation for local food products directly marketed by farmers will increase.
417 This is an important result, considering that EEC Regulation No. 1151/2012 on the
418 quality for agricultural and foodstuffs established in their final provisions that the
419 Commission shall present a report, no later than 4 January 2014, on a new local farming
420 and direct sales labeling scheme to assist producers in marketing their produce locally.
421 That report shall, if necessary, be accompanied by appropriate legislative proposals on
422 the creation of a local farming and direct sales labeling scheme. The results from this
423 report show that a voluntary labeling scheme on local farming could be a helpful
424 additional tool for protecting locally produced food products and for informing
425 consumers about them (ECC, 2013).

426 Moreover, from our results, we can suggest that food companies should be
427 willing to differentiate their products by using one of the regulated labeling schemes
428 because they are more valued by consumers. However, and this is not our objective,
429 they should take into account the extra cost of implementing the stringent production
430 and control requirements established by the regulation. Moreover, because we found
431 that consumer preferences for food labeling were heterogeneous and we detected three

432 segments of consumers, we can give food companies information on the consumer
433 characteristics of the three segments that they could use in the design of their
434 communication campaign to consumers. One of the segments valued the PDO
435 indication, while another segment valued the organic EU logo and the third one valued
436 the nutritional fact panel. However, because the nutritional fact panel is now mandatory
437 (in a few months' time), only the first two segments of consumers are important for
438 food companies.

439 The “PDO lovers” were characterized by being older males who had completed
440 primary studies and had a higher income level than the other two segments. They are
441 frequent food shoppers who considered to a greater extent that food labels are useful
442 and a source of easy information and to lesser extent that they prevent fraud and are
443 means of guaranteeing the quality and safety of the food product. Consumers in this
444 segment highly believed that they need to know the nutrition content of the food, check
445 prices when shopping and plan their shopping in advance. Finally, they were less
446 concerned about animal welfare and the environmental aspects of producing and
447 packaging the food products than the rest of the consumers. The “organic lovers” were
448 characterized as having a lower income, and considered to a greater extent that food
449 labels guarantee the quality and safety, are not easy to understand and provide too much
450 information. Thus, although food labels provide more confidence in the food product,
451 they believed that the label provides too much information as is not easy to understand.

452 The results of this study also show that the new obligation to use a nutritional
453 fact panel on food products is not only a desired tool for the public administration but is
454 also demanded by consumers because this nutritional labeling was one of the most
455 preferred schemes.

456 Finally, **it must take into account that the data was collected in 2011 and**
457 **nowadays the scenario could be different. Moreover,** this study has some limitations
458 that constitute areas of further research. The first limitation is that it was carried out in
459 only one European country and should be replicated in other countries to provide more
460 evidence. Another limitation is that only a direct ranking method was applied, so it
461 would be interesting to use other preference valuation methods. Moreover, the ranking
462 question was asked for food products in general, but it would be very interesting to
463 value the different labeling schemes on specific products to see if the ranking of
464 preferences is product-specific. Finally, heterogeneous preferences were analyzed and
465 the different consumer segments were profiled using some characteristics; however, we

466 did not include all the possible characteristics that could explain this heterogeneity. For
467 instance, consumer knowledge on the different labeling systems and consumer lifestyles
468 could also be investigated as sources of preference heterogeneity.

469

470

471

472

473

474

475

476

477

478

479

480

481

482

483

484

485

486

487

488

489

490

491

492

493

494

495

496

497

498

499

500 **References**

501

502 Andersen, L. M. (2011). Animal welfare and eggs - cheap talk or money on the counter?
503 *Journal of Agricultural Economics*, 62, 565-584.

504

505 Aprile, M. C., Caputo, V., & Nayga Jr. R. M. (2012). Consumers' valuation of food
506 quality labels: the case of the European geographic indication and organic farming
507 labels. *International Journal of Consumer Studies*, 36, 158-165.

508

509 Brunsø, K., & Grunert, K. G. (1995). Development and testing of a cross-culturally
510 valid instrument: Food-related lifestyle. *Advances in Consumer Research*, 22, 475-480.

511

512 Caswell, J. A., Noelke, C. M., & Mojduszka, E. M. (2002). Unifying Two Frameworks
513 for Analyzing Quality and Quality Assurance for Food Products. In B. Krissoff, M.
514 Bohman, & J. A. Caswell (Eds.), *Global Food Trade and Consumer Demand for
Quality* (pp. 43-61). New York: Kluwer Academic/Plenum Publishers.

515

516 De Magistris, T., & Gracia, A. (2014). Do consumers care about organic and distance
517 labels? An empirical analysis in Spain. *International Journal of Consumer Studies*, 38,
660-669.

518

519 Denver, S., & Jensen, J. D. (2014). Consumer preferences for organically and locally
produced apples. *Food Quality and Preference*, 31, 29-134.

520

521 EEC No. 834/2007 on organic production and labeling of organic products and
522 repealing Regulation (EEC) No 2092/91. Official Journal of the European Communities
L 189, 1-23.

523

524 EEC No. 1151/2012 on quality scheme for agricultural and foodstuffs. Official Journal
of the European Communities L 343, 1-29.

525

526 EEC No. 1169/2011 on the provision of food information to consumers. Official Journal
of the European Communities L 304, 18-63.

527

528 EEC, 2013. Report from the Commission to the European Parliament and the Council
on the case for a local farming and direct sales labeling scheme.

529

530 [http://ec.europa.eu/agriculture/quality/local-farming-direct-sales/pdf/com-report-12-
2013_en.pdf](http://ec.europa.eu/agriculture/quality/local-farming-direct-sales/pdf/com-report-12-2013_en.pdf) .

531

532 Falguera, V., Aliguer, N., & Falguera, M. (2012). An integrated approach to current
533 trends in food consumption: Moving toward functional and organic products? *Food
Control*, 26 (2), 274-281.

534

535 García, R., & Jukes, D. (2004). The Spanish system of food controls its administration
536 and enforcement. *Food Control*, 15 (1), 51-59.

537

538 Gracia, A., Barreiro-Hurle, J., & López-Galán, B. (2014). Are local and organic claims
539 complements or substitutes? A consumer preferences study for eggs. *Journal of
540 Agricultural Economics*, 65 (1), 49-67.

541
542 INE (Instituto Nacional de Estadística). (2012). Revisión del Padrón Municipal 2011,
543 Available from: [http://www.ine.es/jaxi/menu.do?type=pcaxis&file=pcaxis&path=](http://www.ine.es/jaxi/menu.do?type=pcaxis&file=pcaxis&path=%2Ft20%2Fe245%2Fp04%2F%2Fa2011)
544 [%2Ft20%2Fe245%2Fp04%2F%2Fa2011](http://www.ine.es/jaxi/menu.do?type=pcaxis&file=pcaxis&path=%2Ft20%2Fe245%2Fp04%2F%2Fa2011).

545 Ipsos - London Economics EAHC. (2013). Consumer market Study on the functioning
546 of voluntary food labeling schemes for consumers in the European Union
547 EAHC/FWC/2012 86 04. [http://ec.europa.eu/consumers/consumer_evidence/](http://ec.europa.eu/consumers/consumer_evidence/market_studies/food_labeling/docs/final_report_food_labeling_scheme_full_en.pdf)
548 [market_studies/food_labeling/docs/final_report_food_labeling_scheme_full_en.pdf](http://ec.europa.eu/consumers/consumer_evidence/market_studies/food_labeling/docs/final_report_food_labeling_scheme_full_en.pdf).
549 Accessed January 2015.

550
551 Koistinen, L., Pouta, E., Heikkilä, J., Forsman-Hugg, S., Kotro, J., Mäkelä, J., & Niva,
552 M. (2013). The impact of fat content, production methods and carbon footprint
553 information on consumer preferences for minced meat. *Food Quality and Preference*,
554 *29* (2), 126-136.

555
556 Lagerkvist, C. J. (2013). Consumer preferences for food labeling attributes: Comparing
557 direct ranking and best-worst scaling for measurement of attribute importance,
558 preference intensity and attribute dominance. *Food quality and preference*, *29*, 77-88.

559
560 Lindeman, M., & Vaänäen, M. (2000). Measurement of ethical food choice motives.
561 *Appetite*, *34*, 55–59.

562
563 Loureiro, M. L., Gracia, A., & Nayga, R. (2006). Do consumers value nutritional
564 labels? *European Review of Agricultural Economics*, *33* (2), 1-20.

565
566 Hair, J. F., Anderson, R. E., Tathan, R. L., & Black, W.C. (1998). *Multivariate Data*
567 *Analysis*. Prentice-Hall International. New Jersey.

568
569 Hein, K. A., Sara, R., Jaeger, B., Carr, T., & Delahunty, C. M. (2008). Comparison of
570 five common acceptance and preference methods. *Food Quality and Preference*, *19* (7),
571 651-661.

572
573 López-Galán, B., Gracia, A., & Barreiro-Hurlé, J. (2013). What comes first, origin or
574 production method? An investigation into the relative importance of different attributes in
575 the demand for eggs. *Spanish Journal of Agricultural Research*, *11* (2), 305-315.

576
577 McCluskey, J. J., & Loureiro, M. L. (2003). Consumer preferences and Willingness to
578 Pay for Food Labeling: A Discussion of Empirical Studies. *Journal of Food*
Distribution Research, *34* (3), 95-102.

579
580 OECD. (2014). Education at-a-glance. [http://www.oecd.org/edu/Education-at-a-Glance-](http://www.oecd.org/edu/Education-at-a-Glance-2014.pdf)
[2014.pdf](http://www.oecd.org/edu/Education-at-a-Glance-2014.pdf).

581
582 Pouta, E., Heikkilä, J., Forsman-Hugg, S., Isoniemi, M., & Mäkelä, J. (2010). Consumer
583 choice of broiler meat: The effects of country of origin and production methods. *Food*
Quality and Preference, *21*, 539-546.

584

585 Resano, H., Sanjuán, A. I., & Albisu, L. M. (2012). Consumers' response to the EU
586 Quality policy allowing for heterogeneous preferences. *Food Policy*, 37 (4), 355-365.
587
588 Olesen, I., Alfnes, F., Røra, M. B., & Kolstad, K. (2010). Eliciting consumers'
589 willingness to pay for organic and welfare-labeled salmon in a nonhypothetical choice
590 experiment. *Livestock Science*, 127, 218-226.
591
592 Øvrum, A., Alfnes, F., Almli, V.L., Rickertsen, K. (2012). Health information and diet
593 choices: Results from a cheese experiment. *Food Policy*, 37 (5), 520-529.
594
595 Train, K. (2003). *Discrete Choice Methods with Simulation*. Cambridge University
596 Press.
597
598 Yanguí, A., Costa-Font, M., & GIL, J. M. (2014). Revealing additional preference
599 heterogeneity with an extended random parameter logit model: the case of extra virgin
600 olive oil. *Spanish Journal of Agricultural Research*, 12 (3), 553-567.
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634

635 Table 1. Question descriptions

Question description
<i>Label use</i>
Do you pay attention to labels when shopping?
Do you read labels when shopping?
<i>Label beliefs</i>
Labels prevent fraud in food products
Labels provide useful information
Labels guarantee food quality and safety
Labels are not easy to understand
Labels provide too much information
<i>Food-related lifestyles</i>
I compare labels to select the most nutritious food
I need to know what nutrients the product contains
I used to check prices when shopping for foods
Before I go shopping for food, I make a list of everything I need
I do not usually decide what to buy until I am in the shop
I like to try new foods that I have never tasted before
I like to try out new recipes
I like to have ample time in the kitchen
<i>Environmental and ethical beliefs</i>
Food should be produced in a way that maintains the welfare of animals
Food products should be produced in an environmentally friendly way
Food products should be packaged in an environmentally friendly way
Food products should come from a country I approve of politically
Food products should come from a country in which human rights are not violated
Do you or some people in your household follow a food diet?
How often do you do the food shopping?

636 *Could you please indicate your level of agreement and disagreement with the following statements?

- 637
- 638
- 639
- 640
- 641
- 642
- 643
- 644
- 645
- 646
- 647

648 Table 2. Sample characteristics (% , unless stated)
 649

Variable definition	Sample	Population
Gender ¹		
Male	47.1	49.9
Female	52.9	50.1
Age of respondent ¹		
From 18 to 34 years	29.3	28.0
From 35 to 44 years	21.1	20.5
From 45 to 54 years	18.6	17.4
From 55 to 64 years	13.8	13.3
More than 65 years	17.2	20.8
Household size (average)	2.9 (1.3)	NA
Education of respondent ²		
Primary studies	19.1	17.0
Secondary studies	38.6	50.0
University degree	42.7	33.0
Household net income		
Less than 1,500 €/month	26.8	NA
Between 1,500 and 2,500 €/month	27.6	NA
Between 2,500 and 3,500 €/month	23.8	NA
More than 3,500 €/month	21.8	NA

650 ¹ INE (2012) and ² OECD (2014).

651 Standard deviations are in parentheses; NA: not available

652

653

654

655

656

657

658

659

660

661 Table 3. Probability of ranking and rank means (% , mean)

	Rank1	Rank2	Rank 3	Rank4	Rank5	Mean
Organic (EU logo)	24.33	22.99	23.18	13.6	8.05	2.85
PDO indication	30.27	33.91	13.79	9.00	5.75	2.51
Nutritional fact panel	35.25	18.97	19.16	12.84	7.66	2.59
Food miles (km)	1.53	6.13	11.88	18.01	19.73	4.95
Local origin	2.68	6.51	14.56	22.03	23.18	4.62
Carbon footprint	0.77	1.92	4.02	7.66	17.05	5.88
Animal welfare	5.17	9.58	13.41	16.86	18.58	4.58

662

663

664

665

666

667

668

669

670

671

672

673

674

675

676

677

678

679

Table 4. Estimates for the rank-ordered mixed logit

	Coefficient	Z-ratio
<i>Mean value</i>		
Organic (EU logo)	2.949	16.75
PDO indication	3.454	17.6
Nutritional fact panel	3.353	17.34
Food miles (km)	0.843	8.31
Local origin	1.108	10.66
Animal welfare	1.134	9.86
<i>Standard deviation</i>		
Organic (EU logo)	1.459	9.51
PDO indication	1.665	10.65
Nutritional fact panel	1.700	10.37
Food miles (km)	0.709	4.10
Local origin	0.504	2.28
Animal welfare	1.097	6.98

680 Number of observations: 3,132; Number of participants: 522

681 Log likelihood at convergence: -3,732.8; McFadden Pseudo R-square: 0.3875

682

683

684

685

686

687

688

689

690

691

692

693

694

695

Table 5. Segmentation of consumer preferences: characterization

	Cluster1	Cluster2	Cluster3	Total
<i>Estimated coefficients</i>				
Organic (EU logo)**	2.98 ^a	3.59 ^b	2.50 ^c	2.96
PDO indication**	4.43 ^a	2.50 ^b	3.10 ^c	3.45
Nutritional fact panel**	2.95 ^a	2.25 ^b	4.55 ^c	3.36
Food miles (km)	0.83	0.88	0.82	0.83
Local origin	1.12	1.13	1.10	1.12
Animal welfare**	0.93 ^a	1.50 ^b	1.03 ^a	1.12
<i>Personal characteristics</i>				
Gender				
Female	48.74	55.30	55.50	52.9
Age**	51.13 ^a	47.56 ^a	39.08 ^b	45.8
Household size**	2.71 ^a	2.83 ^a	3.07 ^b	2.9
Education level**				
Primary studies	30.65	24.24	3.66	19.1
Secondary studies	39.20	34.85	39.27	38.6
University degree	30.15	40.91	57.07	42.7
Household Net Income **				
Less than 1,500 €/month	32.16	38.64	13.09	26.8
Between 1,500 and 2,500 €/month	29.65	23.48	28.27	27.6
Between 2,500 and 3,500 €/month	19.10	18.18	32.46	23.8
More than 3,500 €/month	38.12	19.7	26.18	21.8
Respondent follows a food diet	23.12	30.30	27.23	26.4
Respondent always does the food shopping**	38.19	34.09	25.13	32.4
<i>Label use and beliefs</i>				
Consumers				
pay attention to labels when shopping	86.43	87.12	85.34	86.21
read labels when shopping	23.62	20.45	17.28	20.50
Labels				
prevent fraud in food products**	3.89 ^a	4.07 ^b	4.05 ^b	4.00
provide useful information**	4.41 ^a	4.23 ^b	4.26 ^b	4.31
guarantee food quality and safety**	3.98 ^a	4.20 ^b	4.08 ^b	4.09
are not easy to understand**	3.26 ^a	3.46 ^b	3.11 ^a	3.30
provide too much information**	2.76 ^a	3.23 ^b	3.01 ^b	3.00
<i>Food-related lifestyles</i>				
I compare labels to select the most nutritious food	4.03	4.07	4.05	4.05
I need to know what nutrients the product contains**	4.04 ^a	3.78 ^b	3.78 ^b	3.88
I use labels check prices when shopping for foods*	4.58 ^a	4.44 ^b	4.41 ^b	4.48
Before I go shopping for food, I make a list	4.08	3.95	3.93	4.00
I do not usually decide what to buy until I am in the shop*	2.89 ^a	3.13 ^b	3.12 ^b	3.04
I like to try new foods that I have never tasted before	3.64	3.5	3.40	3.52
I like to try out new recipes	3.91	3.78	3.74	3.82
I like to have ample time in the kitchen**	3.40 ^a	3.70 ^b	3.76 ^c	3.60
<i>Environmental and ethical beliefs</i>				
Food should be produced in a way that maintains the welfare of animals**	4.23 ^a	4.27 ^b	4.49 ^c	4.31
Food products should be produced in an environmentally friendly way**	4.47 ^a	4.50 ^b	4.74 ^c	4.54
Food products should be packaged in an environmentally friendly way**	4.21 ^a	4.34 ^b	4.56 ^c	4.35
Food products should come from a country I approve of politically	3.76	3.86	3.88	3.83
Food products should come from a country in which human rights are not violated	4.24	4.26	4.34	4.28

698 **Appendix. Population in Spain and in the town**

699

700 Table A. Population by sex and age in Spain and in the town (%)

	Total	Sex		Age				
		Female	Male	0-19	20-34	35-54	55-64	More than 64
Spain	46,148,605	50.99	49.01	19.88	20.80	31.10	11.05	17.14
Town	952,383	50.90	49.10	18.46	19.63	30.83	11.64	19.42

701 Source: INE (2012).

702

703

704

705