A cross-cultural perspective on impact of health and nutrition claims, country-of-origin and eco-label on consumer choice of new aquaculture products

Marija Banovic[1,*], Machiel J. Reinders[2], Anna Claret[3], Luis Guerrero[3], and Athanasios Krystallis[4,5]

[1]MAPP Centre, Department of Management, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark

[2]Wageningen University & Research, Wageningen Economic Research, the Netherlands

[3]IRTA. XARTA. Food technology program. Finca Camps i Armet, s/n 17121 Monells, Girona, Spain

[4]American College of Greece (ACG), Department of Management, 6, Gravias str., GR 153 42, Greece

[5]Helenic Research House S.A., Antinoros 42-44, 161 21, Athens, Greece

[*]Corresponding author, e-mail: maba@mgmt.au.dk Present address: MAPP Centre, Department of Management, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark

Abstract

Over the last decade, an increasing number of new value-added aquaculture products made their way onto the European market, as a response to growing demand for healthier diet, and more sustainable and locally produced protein sources. The importance of these drivers of consumer choice for aquaculture products' acceptance paves the way for a relevant reorientation of the European aquaculture industry towards a more consumer-centred approach. This research uses discrete choice experiments to examine the effect of health and nutrition claims, country-of-origin (COO), and eco-labels on consumer choice of new aquaculture products in a cross-cultural context. Three products with different preserving methods have been chosen for the study: fresh (chilled), canned, and smoked

product. Results indicate that COO label "produced in own country" together with ASC eco-label function better than the health and nutrition claims as driver of choice. Results further point to the existence of different segments of "nutrition conscious", "ethnocentric", "price conscious", and "eco-conscious" consumers.

Keywords

Nutrition claims; health claims; country-of-origin; eco-label; choice experiments; aquaculture products

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

1. Introduction

Global growth in per capita seafood consumption, world population, as well as the increased interest in fish as a protein source, brings forth the importance of "blue revolution", and the role of aquaculture in the preservation of marine resources for future generations (EC, 2018; FAO, 2018; Neori et al., 2007). In contrast to other regions of the world, aquaculture production in the EU stagnates, while imports of farmed fish from countries such as China are rising rapidly (FAO, 2018). The EU's Blue Growth Strategy and the reformed Common Fisheries Policy recognise this and aims to promote aquaculture as a sector that could boost economic growth using new aquaculture products (EC, 2015).

The EU's ambition to promote and protect aquaculture production have further prompted aquaculture product labelling policies (D'Amico, Armani, Gianfaldoni, & Guidi, 2016). These include mandatory use of country-of-origin (COO) label, the voluntary information on production practices (i.e., responsibly sourced fish), such as the eco-label Aquaculture Stewardship Council (ASC), and the use of nutrition and health claims (e.g., "rich in Omega 3). Not only that the above policies help consumers make their choices, but they also enhance aquaculture products' added value by increasing consumer-perceived product quality and utility through the transformation of credence (post-purchase assessed) attributes, such as healthiness, nutritional value, and sustainability, into extrinsic "search" (pre-purchase evaluated) attributes (Altintzoglou, Vanhonacker, Verbeke, & Luten, 2011; Pieniak, Vanhonacker, & Verbeke, 2013).

Although previous studies have explored the effect of COO label (Mauracher, Tempesta, & Vecchiato, 2013; Vanhonacker, Altintzoglou, Luten, & Verbeke, 2011) and to some extent of eco-labels (e.g., Marine Stewardship Council –MSC) on seafood product choice (Salladarré, Brécard, Lucas, & Ollivier, 2016; Uchida, Onozaka, Morita, & Managi, 2014), health and nutrition claims received less attention in this specific context (Bi, House, & Gao, 2016). Yet, there have been more

than 12,500 newly launched fish products in general in the EU alone in the period of just five years (2011 - 2015), with most of them carrying health and nutrition claims (Mintel, 2016).

Currently, no known research exists that analyses European consumers' relative perceived value of new aquaculture products and the impact of above-cited "search" attributes as drivers of choice. Accordingly, this research uses a cross-cultural context to determine the relative perceived value (i.e. "utility") consumers place on several labelling policy schemes, namely nutrition and health claims, COO label and ASC eco-label in choice of new aquaculture products. These attributes have been selected based on the above discussion and previous research (see review in the next section). Furthermore, by using cross-cultural European context we can detect whether a particular pattern of product preference is specific to a particular country/culture or act as "universal" (i.e., European-wide). To this end, the present study uses data that comes from five European fish markets (i.e. France (FR), Germany (DE), Italy (IT), Spain (ESP), and the United Kingdom (UK)). Additionally, by using two different methodological approaches, i.e., conditional logit and latent class analysis, to model consumers' choice of fish products with different attributes, the current study also takes into account that, among the investigated countries and products, consumers may belong to different latent class segments with heterogeneous preferences.

1.1 Previous research on labelling of fish and aquaculture products

Although there is an increase in the demand for fish products (depending on their production and preserving method), European consumers are also becoming more selective when it comes to fish and aquaculture products (for a review see Carlucci et al., 2015). The previous studies adopt the common approach in defining product attributes seeing fish products as a bundle of intrinsic and extrinsic cues based on which consumers choose the specific attribute combination that maximizes their utility and perceived product quality (Lancaster, 1966). Further, perceived utility varies at the individual level, depending greatly on psychological and cultural factors, such as beliefs and/or

personal values that actually shape consumer behaviour by boosting or supressing some choices rather than others (Claret et al., 2014; Pieniak et al., 2013).

1.1.1 Production and preserving method: Previous studies related to production method and choice between wild and farmed fish have shown that wild fish is perceived as of superior quality to farmed fish in terms of healthiness, safety, taste and nutritional value (Altintzoglou et al., 2011; Cardoso, Lourenço, Costa, Gonçalves, & Nunes, 2013; Claret et al., 2014; Jaffry, Pickering, Ghulam, Whitmarsh, & Wattage, 2004). These preferences seem to be led mostly by incorrect information and beliefs based on stereotypes (Kole, Altintzoglou, Schelvis-Smit, & Luten, 2009) than by consciousness about the production method and its different benefits and risks to human health and the environment (Vanhonacker et al., 2011; Verbeke, Vanhonacker, Sioen, Van Camp, & De Henauw, 2007). Claret, Guerrero, Gartzia, Garcia-Quiroga, and Ginés (2016) showed that, even when farmed fish is perceived of the same sensory quality as wild fish, information about the production method resulted in improved acceptance of the wild fish, but not of the farmed fish. It also seems that European consumers prefer fresh (chilled) fish to other preserving methods, such as canned or smoked, due to the perceived loss of product quality, naturalness, nutritional value and/or healthiness (Cardoso et al., 2013; Claret et al., 2012).

1.1.2 Health and nutrition claims

Several studies that investigated perceptions related to fish consumption in general have found that while many consumers believe that fish is healthy, their knowledge about specific health and nutritional benefits is rather poor (Pieniak, Verbeke, Scholderer, Brunsø, & Olsen, 2007; Verbeke, Sioen, Pieniak, Van Camp, & De Henauw, 2005). Nevertheless, these studies point to the fact that those consumers with higher knowledge actually acknowledge Omega-3 fatty acids and proteins as main nutrients and relate positive health effects to heart and brain disease protection. As many fish products on the market carry the above health and nutrition claims (Mintel, 2016) they merit further

investigation. Specifically, although fish is predominantly perceived as a healthy product linked to several health and nutritional benefits (Verbeke et al., 2005), farmed fish is often seen as less natural, unhealthy, and containing elements such as antibiotics and other components (Claret et al., 2014). Even though a bulk of studies have shown that health and nutrition claims impact consumers' preferences and choice (Lähteenmäki, 2013; Van Wezemael, Caputo, Nayga Jr, Chryssochoidis, & Verbeke, 2014), to our knowledge no studies have explored the effect of nutrition and health claims on consumers' preferences and WTP (Willingness to Pay) for aquaculture products.

1.1.3 Country of origin (COO) label

Many of the previous studies have pointed to COO label as one of the most important attributes of consumers' fish product choice (Jaffry et al., 2004; Mauracher et al., 2013; Santeramo et al., 2018). These studies show a clear preference for domestic *vs.* imported origin of fish products and that consumers are willing to pay more for domestic-origin, perceived as being superior to imported fish in quality, freshness and safety. This can be partially explained by the cognitive information processing theory, according to which consumers view fish as highly perishable product and value freshness more than any other quality attribute; thus, shorter transportation distance (entailing domestic origin) plays important role in consumer choice (Birch, Lawley, & Hamblin, 2012). COO label can also evoke a strong affective and symbolic effect, as highlighted in prior studies; strong ethnocentric attitudes emerge when evaluating products from other countries (i.e., consumer ethnocentrism), using preconceptions originating in the norms and customs of the own culture (Balabanis & Diamantopoulos, 2004; Santeramo et al., 2018). Therefore, exploring the impact of COO label on consumer choice of new aquaculture products in a cross-cultural context seems to be extremely pertinent.

1.1.4 Eco-labelling

Eco-labels, such as the MSC, the "Dolphin Safe" and the organic fish labels, among others, indicate a reduced environmental impact of fisheries and aquaculture and are becoming important drivers of consumer choice (EC, 2018; FAO, 2018). A few studies have explored consumers' preferences and willingness to pay for these eco-labels for the specific case of fish and aquaculture products (Asche, Larsen, Smith, Sogn-Grundvåg, & Young, 2015; Lim, Hu, & Nayga, 2018). These studies have shown that consumers are interested in buying eco-labelled fish products. This interest seems to be positively correlated to consumers' environmental concerns, "green living", and trust in NGOs or public institutions sponsoring specific eco-labels (Brécard, Lucas, Pichot, & Salladarré, 2012; Salladarré et al., 2016). Past research further implies that the MSC label can produce favourable effects for the imported *vs.* domestic products overriding country-specific effects and cause higher marginal WTP for the imported products (Lim et al., 2018). Furthermore, the MSC label seems to be commanding a price premium of about 13-14% in the UK (Asche et al., 2015; Sogn-Grundvåg, Larsen, & Young, 2014). However, in the case of aquaculture, the ASC label is rarely explored. Studies that explore the impact of ASC eco-label show that it can actually override negative associations of farmed fish, and give a similar price for the ASC-labelled farmed fish and MSC-labelled wild fish (Bronnmann & Asche, 2017; Jonell, Crona, Brown, Rönnbäck, & Troell, 2016).

2. Materials and methods

The present study uses discrete choice experiments (DCE) to investigate consumer preferences for health and nutrition claims, COO and ASC eco-label in the context of new, aquaculture products with different preserving methods (i.e., fresh/chilled, smoked, and canned).

134 *2.1 Participants and data collection*

135 Data collection has been undertaken during July 2016 in five selected countries (FR, DE, IT,
136 ESP, and the UK). In each country, approximately one hundred participants were recruited for each
137 of the three products (i.e. fresh (chilled), canned, and smoked) by a professional market agency. In
138 total 1,598 individuals were involved in the study (i.e. ~100 participants x 5 European countries x 3
139 products), or about 500 participants per product. The main recruitment criteria were that
140 participants consume fish and are responsible for food shopping in their households. Age, gender,
141 income and marital status were balanced across countries and products, taking into consideration
142 respective demographic quotas. The purchase and consumption behaviour of farmed and wild fish
143 varied across countries as expected (see Table 1).

144 **--Insert Table 1 about here--**

145 Questionnaires were distributed through three online surveys, one per product, in each of five
146 countries, lasting approximately 20 minutes. Each questionnaire was prepared in English and (back)
147 translated by professional translators in the four domestic languages.

148 **3. Experimental design**

149 This section introduces the chosen products, their attributes and the attribute levels, as well as
150 the experimental design.

151

152 *3.1 Selection of products, attributes, and attribute levels*

153 A selection of choice products has been based on the results of a previous qualitative study
154 (Banovic, Krystallis, Guerrero, & Reinders, 2016), as well as a series of consumer sensory

perception tests (Lazo et al., 2017), both undertaken across the same five European target-countries (i.e. France, Germany, Italy, Spain, and the UK). Consequently, three product concepts with different preservation methods have been chosen for the study: (i) fresh product (chilled) (i.e., fresh fish steak), (ii) canned product (i.e., small fish fillets in olive oil), and (iii) smoked product (i.e. smoked fish fillet). The chosen products are common offerings in supermarkets and fishmongers throughout Europe (Mintel, 2016), while its consumers are generally familiar with these products (Claret et al., 2012; Reinders, Banovic, Guerrero, & Krystallis, 2016). Due to the interest in health and nutrition claims, the above preserving methods are suitable for better understanding how claims on products with different preserving methods could facilitate consumers' choice.

The product images have been taken with a professional camera using physical product prototypes developed earlier (Guerrero, Lazo, Bou, Robles, & Claret, 2016), in proper packaging and without any labelling information, to resemble final, retail-ready products as much as possible. The product images were further processed and labelling information added using GNU Image Manipulation Program (GIMP) (see an example of a product in Figure 1).

The selection of attributes and attribute levels has been based on two criteria. First, it is based on a literature review of the most important labelling elements with regard to fish products (see section 1.1) and on the results of a preceding qualitative and quantitative study (Banovic et al., 2016; Reinders et al., 2016). These studies demonstrate that European consumers acknowledge: (i) the nutritional value of fish particularly related to Omega 3 fatty-acids and proteins, (ii) health benefits in terms of heart and brain disease protection, and (iii) environmentally responsible farming methods reflected through the ASC label. Second, the selection of attributes and their levels is based on a desk research of existing data on newly launched fish products, their label information (i.e., health and nutrition claims, certifications, brands, and price), and for the selected countries (FR, IT, DE, ESP, and the UK) (Mintel, 2016). The above findings have been cross-checked against

179 Eurobarometer 450 on consumer habits in relation to fishery and aquaculture products (EC, 2017).
180 Nutrition and health claims have been phrased following the suggestions and the EU regulation
181 (EC) No 1924/2006 from 1st of July 2007 (see Table 2). No additional explanation has - been
182 provided to the consumers to mimic real-life purchase, as suggested by previous studies (Uchida et
183 al., 2014; Van Wezemael et al., 2014).

184 **--Insert Table 2 about here--**

185 Price levels were adjusted using average prices of existing similar products in the selected
186 countries (Mintel, 2016). As average real prices for the selected products did not vary significantly
187 across selected countries, it was decided to use as a global reference price, the lowest average price
188 per product and two price premiums of +15% and +30% on top of the reference price. The suggested
189 prices were crosschecked with fish industry stakeholders in each country. The average weight of the
190 products was 300gr, as this is the most typical weight of fish products in the selected countries
191 (Mintel, 2016).

192 *3.2 Choice task set-up and choice experiment*

193 The selected attributes and their levels were varied according to a 2^1x3^4 orthogonal design in SAS
194 software (Hensher, 2010; Train, 2009). This design produced 36 experimental sets and was further
195 partitioned into 12 versions of choice-sets, each containing 3 choice options (see example in Figure
196 1), to limit consumer cognitive burden (Train, 2009).

197 **--Insert Figure 1 about here--**

198 The choice experiment started with the introductory part that informed participants about the
199 main objective of the experiment and the way to answer the questions. As standard practice
200 (Hensher, 2010), a cheap-talk script adapted from Van Wezemael et al. (2014) has been introduced
201 to reduce the hypothetical bias of respondents exaggerating stated WTP for a specific product at a

specific price. The choice experiment continued with prompting participants to imagine standing in front of a supermarket shelve, trying to decide which of the products shown on the screen would be the "*most (least) likely to purchase for a dinner on a typical day*". Both the "most likely" and the "least likely" options were added to the choice experiments to make the purchase environment in the experiment more realistic by allowing participants the option that some products would be unlikely to meet their requirements (Hensher, 2010; Louviere, Hensher, & Swait, 2000). The products in a visual simulation were mimicking real products in a realistic purchase situation. Manipulation checks were added to lower the confirmation bias, assure that the estimated utility and WTP were not interpreted based on pre-existing beliefs, and that equal consideration is given to alternative possibilities (Nunes & Boatwright, 2004). First, a price manipulation check was introduced to examine whether participants noticed the price in the experimental sets (Biswas et al., 2013). If answering correctly, participants were further asked if they considered these prices too high (too low), and the price differences between product options too large (too small) on a 1-7 scale respectively. Secondly, participants were asked about their overall liking after having seen the plain product unpacked, and the product's (empty) packaging and labelling (using scale from 1 – dislike it extremely to 9 - like it extremely), to account for and identify possible constraints that may impact actual choices (Hensher, 2010). At the end of the study, questions regarding purchasing and consumption behaviour related to fish and seafood in general were asked, as well as socio-demographic questions.

4. Theory: Econometric models and willingness to pay

Discrete choice (DC) models were used to analyse the collected data (McFadden, 1974; McFadden & Train, 2000). DC models are based on the random utility theory (Lancaster, 1966) that is a standard economic framework for behavioural models of consumer choice. Two estimators are

used to model consumers' choice of fish products (Asioli, Berget, & Næs, 2018): (i) a Conditional Logit (CL) model that denotes consumers' preference heterogeneity parametrically, and (ii) a Latent Class (LC) model that denotes preference heterogeneity by clustering the consumers into distinct latent classes. The CL model is preferred to Multinomial Logit (ML) model that assumes homogeneous preferences across individuals, which in turn can bias the results if preference heterogeneity occurs in a sample (Louviere et al., 2000). The LC model on the other hand corrects for CL model's Independence of Irrelevant Alternatives (IIA) problem of assuming that when some alternative is excluded from the choice set, none of the remaining alternatives can more likely serve as the substitute for the excluded alternative. LC model, thus, assumes that consumers may pertain to different latent class segments that may have different preferences, where IIA holds within each latent class segment (Greene & Hensher, 2003). For both models, the Best-Worst (BW) scaling method was used as a choice-based measurement to account for both best (most likely) and worst (least likely) consumer choices, providing in that way more information about consumer preferences than only account for "one" preferred choice (Louviere, Flynn, & Marley, 2015).

The general assumption behind the basic aggregate or CL model introduced by McFadden (1974) is that consumers make their particular choice of an alternative A_j from a set of alternatives $A = \{A_1, A_2, \dots, A_J\}$, where the alternative selected A_j is one with the highest utility U_j and is thus modelled with the equation $U_j = V_j + e_j$. In the equation V_j denotes systematic utility component and e_j a stochastic error. In a choice situation, the systematic utility component V_j is postulated to satisfy a linear function $V_j = \beta_{0j} + \beta_1 X_{j1} + \beta_2 X_{j2} + \cdots + \beta_K X_{jK}$ of the choice attributes X_1, X_2,…, X_K, where the $\beta_k X_{jk}$represents partworth utility associated with attribute k, and β_{0j} an alternative specific constant. If Z denotes union of all the sets of alternatives, it follows that for any subset of alternatives$A' \subseteq Z$, the probability of choosing $A_j \in A'$ is specified by the multinomial equation

$P_j = \frac{\exp(V_j)}{\sum_{k \in A'} \exp(V_k)}$ for the CL model. However, since the CL model does not assume proportional substitution of alternatives (IIA), the LC model corrects for this assuming that IIA holds within each of $T \geq 1$ segments or latent classes, specified by the equation: $P_{j.t} = \frac{\exp(V_{j.t})}{\sum_{k \in A'} \exp(V_{k.t})}$ with $t = 1,2, \ldots T$ (Vermunt & Magidson, 2014).

WTP estimates were also derived from CL and LC models, for an attribute of a certain alternative as the ratio of the marginal utility of the attribute on the marginal utility of its cost; that is, the ratio between the attribute coefficient b_c and the cost coefficient b_y, giving the simplified equation $WTP = -\left(\frac{b_c}{b_y}\right)$ (Louviere et al., 2000). The attribute parameters and WTP estimates for each attribute level were first estimated across countries on the pooled sample, and then for each individual country accounting for each product. The CL model is estimated using SAS-based programme JMP 13 and the LC model with LatentGOLD 5.1.

5. Results

5.1 Manipulation checks

5.1.1 Prices

The criteria for the exclusion was the same across the countries and involved responding correctly whether the price tag was located on the left-hand side or the right-hand side of the label. Approximately 85 percent of the participants overall across countries, as well as per investigated product, responded correctly to this question (N=1358). Participants were also asked about their perception of the presented prices; that is, if the prices were too high (too low) for the (perceived) product quality, and if the price differences among various products for their quality was too large (too small). Respondents considered that the given prices were to a certain extent on the high side for

269 the perceived quality of the products (mean scores between 3.1 and 3.55 across countries and
270 products, 7-point scale). However, the price difference between the various products was not
271 considered neither too large nor too small than their perceived product quality would justify (mean
272 scores between 3.45 and 4.2 across countries and products, 7-point scale).

273 *5.1.2 Overall liking of the products after visual inspection*

274 In terms of plain packaging and labelling, overall liking did not differ across countries for the
275 three products (all $p_s > 0.05$). However, the overall liking of the physical product image did differ
276 across products and countries, where the fresh product scored always higher (average means range:
277 M_{ESP}=7.29 to M_{FR}=6.68) when compared to the canned (average means range: M_{FR}=6.13 to
278 M_{DE}=5.17) and smoked products (average means range: M_{UK}=6.64 to M_{FR}=5.74) (average means
279 from all $p_s < 0.05$). In fact, participants on average preferred the smoked product to the canned
280 product. The fact that packaging and labelling was perceived similarly across products, while the
281 liking/perception of the physical product image differed depending on the preserving method
282 allowed for further comparison of the products.

283 *5.2. Results of the choice experiments using the CL model*

284 The results of the choice analyses using the CL model are described below per product at two levels:
285 the overall sample and per investigated country.

286 *5.2.1 Preferences for logos and claims*

287 Each of the estimated models for the three products across countries showed good fit (see Tables 3
288 to 5), as indicted by Louviere et al. (2000). The relative attribute importance (based on their part-
289 worth utilities) was similar across the three products on the pooled sample, where the COO label and
290 price were followed by the ASC eco-label and the nutrition and health claims.

291 **--Insert Tables 3-5 about here—**

The separate models per country indicated similar preferences, supporting the adoption of the CL model. In all countries and for all three products, the negative price coefficients confirmed consumer preferences for lower over higher prices. The higher price sensitivity was generally observed for the canned product (especially in Germany, and then in France and the UK) and the lowest for the smoked product (except for Germany). Price sensitivity for fresh/chilled product was high in Spain and the UK. Results further suggest an increasing probability of choosing a fish product that has been produced in own (domestic) country. All the investigated fish product alternatives bearing the ASC eco-label showed increased probability of choice, except in Italy in the case of smoked product (Table 5, p=0.051). The effect of ASC eco-label was particularly pronounced in Germany and for all three products.

Consumer preferences for the nutrition and health claims varied across products and countries. Based on the parameter estimates, the nutrition claims worked much better than the health claims across the three products. Specifically, the nutrition claims had a significant contribution to consumer preferences for the studied products (except for the fresh/chilled product in Spain and the canned product in Germany). The nutrition claim "*rich in Omega 3*" carried the highest utility and was the most attractive across all products and countries. In the UK, the health claim "*improves heart function*" carried more weight for the fresh/chilled and the canned product, while health claim "*improves brain function*" was more important for the smoked product. In Italy, the health claim "*improves heart function*" had significant impact on the canned product choice and the claim "*improves brain function*" on the smoked product choice. In Spain, the health claim "*improves heart function*" increased the choice probability for the fresh/chilled and the smoked products. On the other hand, in France the health claims were significant only for the smoked product; while in Germany the health claims were insignificant for all three products.

315 *5.2.2 WTP using the CL model*

316 The values of WTP estimates (see Table 6) were rather comparable to the reference (average)
317 prices. This fact points to the conclusion that the cheap talk script made participants aware of the
318 possibility of overestimating prices when hypothetical contexts are involved. As seen from the
319 estimated cost coefficients (price part-worth utilities), the target consumers were overall less price
320 sensitive for the smoked product than the fresh/chilled and canned products. This was confirmed by
321 the WTP results, where for all three products and at the overall level, consumers were willing to pay
322 more if a product is "*produced in own (domestic) country*" compared to the alternative "*produced in*
323 *the EU*". The latter typically yielded negative WTP (except for the fresh/chilled product in Spain),
324 which was also the case with having no COO label at all (the lowest negative WTP overall across
325 products and countries). "*Produced in the EU*" was not significant for the smoked product in
326 Germany, Italy and Spain.

327 In terms of nutrition claims, consumers were willing to pay more for the "*rich in Omega 3*" claim
328 compared to the alternatives "*high in protein*" or having no nutrition claim option (typically negative
329 WPT and not significant across products and countries except for the fresh/chilled product in the
330 UK). Moreover, the "*improves heart function*" health claim typically created significantly higher
331 WTP than the "*improves brain function*" and was significant for fresh/chilled and smoked product in
332 Spain, while the "*improves brain function*" was significant for the smoked product in Italy and the
333 UK. The alternative with no health claim produced the lowest (and typically negative) WTP in
334 general. Finally, consumers would pay more for a product that carries the *ASC* eco-label compared
335 to the no label alternative (negative WTP in general) across all countries and products.

336 **--Insert Table 6 about here—**

337 For the fresh/chilled product (see Table 6), French and Italian consumers were willing to pay
338 significantly higher than the reference price for a product carrying the COO label "*produced in own*

country". For the same European countries, as well as for Germany, the nutrition claim "*rich in Omega 3*" created higher WTP than the claim "*high in protein*" (negative WTP, and not significant), while in the UK both claims created almost equally high WTP. Further, UK and Spanish consumers were willing to pay more for products carrying the "*improves heart function*" health claim than the claim "*improves brain function*" (which however created still positive WTP in the UK and Spain as opposed to the remaining three countries, however not significant). Finally, German consumers were willing to pay more for the *ASC* eco-label compared to consumers in the other four countries, followed by the Italians.

For the canned product (see Table 6), WTP of Spanish and Italian consumers was higher than the reference price for a product carrying the COO label "*produced in own country*". For UK and Italian consumers, the nutrition claim "*rich in Omega 3*" created higher WTP than the claim "*high in protein*" (almost zero or negative WTP everywhere, and not significant). Further, these consumers also had higher WTP for products carrying the "*improves heart function*" health claim. German and UK consumers WTP was higher for the *ASC* eco-label compared to consumers in the other three countries.

For the smoked product (see Table 6), Spanish, Italian and French consumers had higher WTP for a product carrying the COO label "*produced in own country*" compared to UK and German consumers. For consumers in Spain and Italy, the nutrition claim "*rich in Omega 3*" created higher WTP than the claim "*high in protein*" (negative WTP for all countries except for the UK, and not significant). Further, Spanish consumers, had higher WTP for "*improves heart function*" health claim. German consumers had again higher WTP for *ASC* eco-label compared to consumers in the other countries.

361 *5.3. Results of the choice experiments using the LC model*

362 Even though the results from the CL model are valuable in determining the impact of the studied
363 "search" attributes on consumer choice of new aquaculture products, they do not reflect the
364 heterogeneity of preferences among the investigated countries and products. The CL model's main
365 assumption that utility is homogenous across countries and products might not be the case in our
366 study. Thus, the LC model was estimated to account for possible preference heterogeneity. Using
367 the country as the known class and products as a covariate, we investigated if any clear differences
368 exist at the country and the product level. The resulting model (LL= -31811; BIC=64020;
369 AIC=63730; Npar=54; $p < 0.001$ R^2=0.19) showed no significant differences for each of the
370 variables and products, as measured by the choice probabilities for each class/country level in the
371 latent class analysis (see Figure 2). Furthermore, the product covariate parameter estimates were not
372 significant (Wald=0.27, p=0.99). These findings suggest that preference similarities exist across the
373 countries on the one hand, and the three products on the other. However, this does not necessarily
374 mean that there are no additional classes/segments within the overall sample.

375 **--Insert Figure 2 about here—**

376 Thus, it has been decided to collapse the data and to estimate a new model where country and
377 product were used as covariates and was assumed that consumers may belong to different latent
378 class segments with heterogeneous preferences. To account for heterogeneity, the LC model was
379 run several times each time with increasing number of classes. To identify the optimal number of
380 classes/segments, an assessment of the higher simulated LL function, respective lower values of
381 BIC and AIC, as well as lower classified errors and higher R^2 were considered when deciding on
382 the optimal number of segments (Magidson, Eagle, & Vermunt, 2003). The information criteria
383 identified the 4-class model as the best to explain most of the preference heterogeneity found in the
384 sample (see Table 7).

385 **--Insert Table 7 about here—**

386 *5.3.1 Segmentation*

387 In the 4-class model, 36.0% of the participants belong to segment 1, 27.8% to segment 2, 18.1% to
388 segment 3, and 18.1% to segment 4 (see Table 8 and Figure 3).

389 For segment 1 named the "nutrition conscious", the relative importance of the attributes shows
390 that consumers in this segment have a preference for nutritional and health claims and the COO
391 label. Utility parameters further show that besides "*produced in own country*", the claims "*rich in*
392 *Omega 3*" and "*improves heart function*" are significant determinants of choice for aquaculture
393 products no matter the product preserving method.

394 For segment 2 named the "ethnocentric", the only attribute that mattered was the COO label, in
395 particular that the product is "*produced in own country*", which increases likelihood of buying the
396 product no matter the product preserving method. For "ethnocentric" consumers, all the other
397 attributes hold very little importance, as described by the utility parameters.

398 For segment 3 named the "price conscious", only price was important, with the lowest price
399 being preferred over the premiums, increasing the probability of choice. Furthermore, "price
400 conscious" consumers pay much less attention to the COO label than the other three segments.

401 Finally, segment 4 was named the "eco-conscious", since consumers in this group were much
402 more conscious about the ASC eco-label when compared to consumers in the other three segments.
403 They were also more ethnocentric than consumers in the "nutrition conscious" and "price
404 conscious" segments. Thus, for the "eco-conscious" consumers the ASC eco-label and the
405 "*produced in own country*" label increased the likelihood of product choice.

406 **--Insert Table 8 and Figure 3 about here—**

407 *5.3.2 WTP using the LC model*

408 The WTP estimates (see Table 9) across segments differed to a large extent. Consumers in the
409 "nutrition conscious" segment had higher WTP than consumers in other segments for the nutrition
410 claim "*rich in Omega 3*", as well as both of the health claims. The "ethnocentric" consumers had
411 higher WTP for the "*produced in own country*" label when compared to the other segments. This
412 segment also valued the ASC eco-label more than the "nutrition conscious" and the "price
413 conscious" segments. For the "price conscious" consumers, price was the only WTP driver. Finally,
414 the "eco-conscious" consumers had higher WTP than other segments for the ASC eco-label.

415 **--Insert Table 9 about here—**

416 **6. Discussion**

417 This study aimed to investigate the impact of health and nutrition claims, country-of-origin and
418 eco-label on consumer choice of new aquaculture products in a cross-cultural context. The results
419 indicate that use of a COO label in general, and "*produced in own (domestic) country*" in particular
420 stimulates European consumers (across all five countries investigated) to think more positively
421 about the product besides increasing the probability of its purchase (Balabanis & Diamantopoulos,
422 2004; Santeramo et al., 2018). The importance of COO label and especially of the "*produced in*
423 *own country*" label could be also related to the fact that consumers make stronger associations
424 between product quality and domestic COO in fresh and perishable products, where there is a
425 higher perceived risk for health and safety issues (Claret et al., 2012; Santeramo et al., 2018;
426 Verbeke et al., 2007). This further points to the role of "freshness" and its importance in European
427 consumers' quality associations, particularly for the fresh/chilled product making it more probable
428 to be selected if its COO is domestic *vs* produced somewhere in the Europe, and even more so for
429 imported food products (Banovic et al., 2016; Reinders et al., 2016).

Moreover, o results show that consumers do notice ASC label and would pay more for products carrying this label. It was previously shown that use of a certification labelling increases the probability of consumers considering and trusting the product (Lim et al., 2018; Pieniak et al., 2007).Besides the fact that the eco-label currently does play an important role in consumers' fish product choices, results show that future use of quality certification labels could depend on the extent to which consumers' general concern about sustainability of fish sources and responsible aquaculture farming can be turned into actual behaviour, having in mind the very low percentage of EU consumers recognizing aquaculture products in general (EC, 2017).

This study further shows that, with some product or country exceptions in case of health claims (i.e., found as important attribute only for fresh/chilled product in Spain and the UK; canned product in Italy; and smoked product in Italy, Spain, and the UK), use of health claims is not considered, as important as COO and eco-label. The reason behind this finding might be that consumers are already aware of the fact that fish is healthy, so they do not pay attention to it, or that health claims are not properly used in the aquaculture sector, even though they could constitute a marketing opportunity if used properly (Pieniak et al., 2007; Verbeke et al., 2007). Nevertheless, this paper shows that use of nutrition claims would actually help consumers make more informed choices, aligned with their preferences (i.e., found as important attribute across three products and all countries, except in Germany for the canned product), stimulating further health-related behaviour (Lähteenmäki, 2013).

Finally, this study also points to heterogeneous consumer segments, which could allow for further opportunities for the investigated products to succeed in the marketplace. This is of great importance to aquaculture sector experts, as it points to the fact that different segments exist in the market in terms of consumer motivations (i.e. nutrition claims, eco-labels, COO label, and price), while reaching these segments will depend on the proper use of labelling. As noted above, some

segments (as in our study, "nutritious conscious" and "eco-conscious") would be more likely to choose products that contain nutrition and health claims, and eco-labelling, respectively. On the other hand, great proportion of consumers are very "ethnocentric" and for them COO label is enough to make a choice. As previously found by Balabanis and Diamantopoulos (2004), consumer ethnocentrism (i.e. belief that one's own culture is superior to other cultures) can be a strong predictor of COO evaluations. Specifically, COO label also works well for "eco-conscious" consumers pointing to the fact that these consumers are not only aware of the importance of aquaculture but that they are willing to pay more to protect the environment. Finally, the "price conscious" consumers' main drive is price and for this segment, labelling of aquaculture products might not work. Thus, aquaculture companies should take into account that a certain degree of customisation is needed to different consumer segments, as results show that these are not product- and country-dependent, but more related to consumer lifestyles.

7. Conclusions

Present results point to several managerial implications. First, the added value of aquaculture products could be communicated through customised combinations of "search" attributes, particularly the ASC eco-label and COO (own country) label to help enhance the often unsustainable image of aquaculture sector and its products, also acknowledged as a derivative of changing consumer preferences (Verbeke et al., 2007).Second, aquaculture companies should continue to rely on eco-labels, i.e. the ASC label, in their marketing differentiation to signal their customers that their products come from a "controlled", certified and responsible aquaculture source. Third, and in addition to above, the fact that nutrition and health claims seems to be less important should be considered seriously in new product development initiatives and implies that the aquaculture industry should properly use these claims, i.e., only for those fish products that

could actually fulfil criteria for the use of these claims. As not all claims are similarly appealing to consumers from different European countries, fish companies should consider tailoring labelling of their products to country-specific needs, improving in that way the effectiveness of label-based marketing communications. Finally, consumer nutrition conscious, ethnocentric, price conscious and eco-conscious segments represent a structured view of the European consumer, suggesting the proportions of people holding similar patterns of preferences around which marketing campaign elements could be designed that would further facilitate message development, and media selection for enhanced targeting to advance aquaculture sector marketing effort. This is especially timely now, in light of the current campaigns towards healthier and sustainable food choices and overwhelming amount of products carrying nutrition and health claims (Banovic et al., 2018).

7.1 Limitations and future research

This study has several limitations that can motivate future research. First, a hypothetical choice-experiment approach is applied to investigate consumer choices that resembles but is not a real-life market context, thus a study on consumer choice behaviour in a real-life intervention (e.g., online supermarkets) could be a valuable addition to the present research. Second, although cheap-talk script was used for calibration and manipulation checks (to determine the efficiency of the attribute employment), another complementary approach as eye-tracking would help supplement these findings to highlight the potential impact of different labels/claims on consumers' decision-making strategies (Banović, Chrysochou, Grunert, Rosa, & Gamito, 2016). Third, only front-of pack labels and no nutrition facts information have been used usually presented at the back of the package, as regulated by EU legislation. As consumers often like to check the claims against the nutrition facts (Pieniak et al., 2013), this could have lowered the impact of health and nutrition claims in our study and merits further investigation. Fourth, even though we have used products with different processing levels (i.e. fresh/chilled, canned, and smoked), generalization of the findings to the other

products beyond these is not suitable, as consumer perceptions and preferences of fish may vary across products (Claret et al., 2012). Nevertheless, our theoretical and experimental approach can be applied to other products in the future.

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638

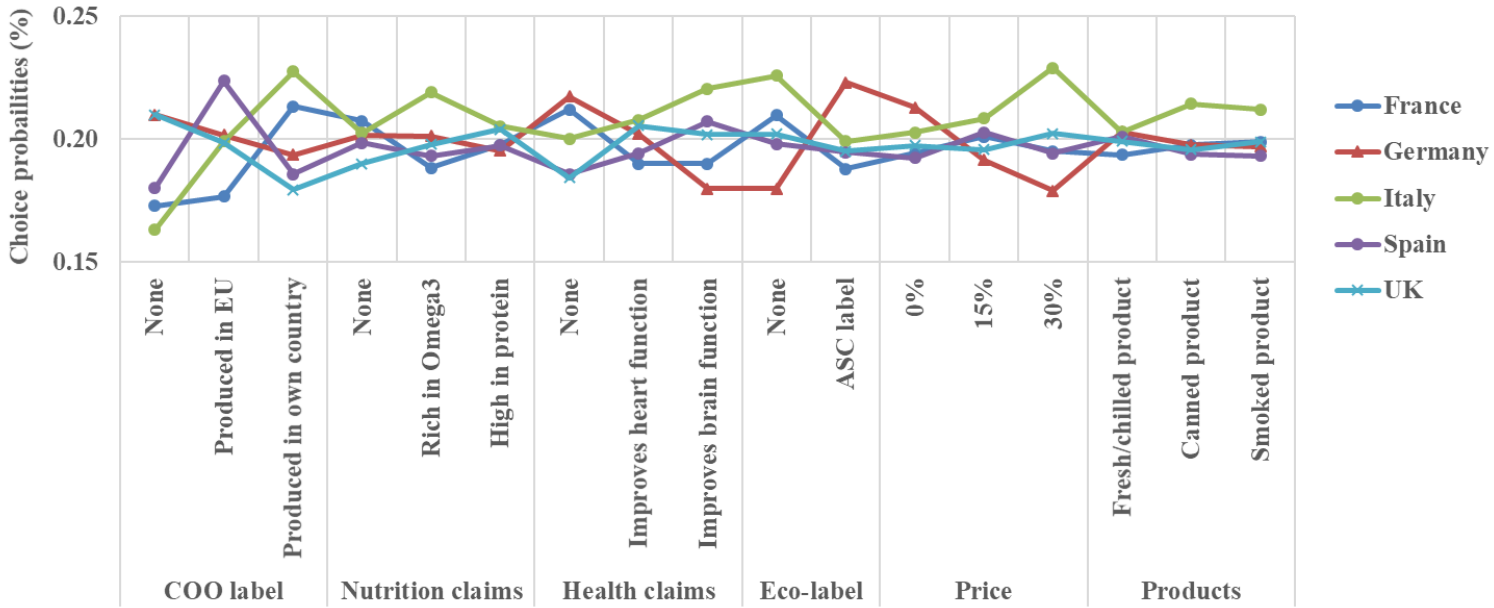
639 **List of Figures**

640 **Figure 1**. Example of the product stimuli used in the choice experiments (UK, example of a choice

641 set).

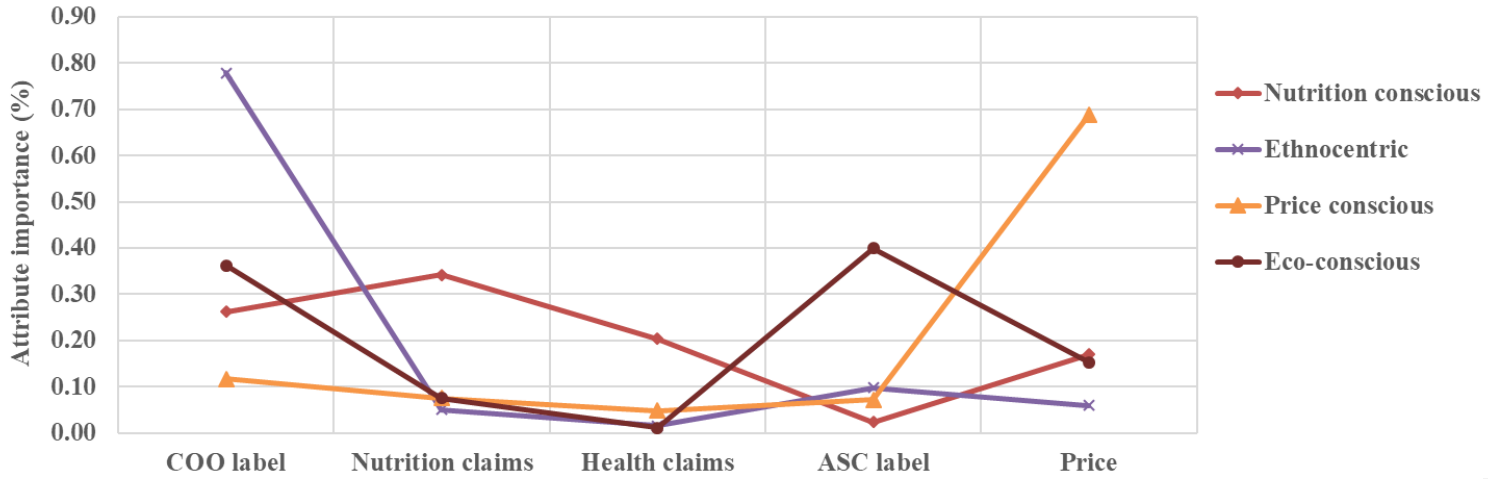
642 

643 **Figure 2.** Choice probabilities per country, where country is the known class and products are treated as covariate.



644

Figure 3. Attribute importance per consumer segment.



List of Tables

Table 1. Socio-demographic profile and fish purchase and consumption behaviour of the participants.

Characteristics (%)	Overall (N=1598)	France (N=314)	Germany (N=318)	Italy (N=337)	Spain (N=313)	UK (N=316)
Age						
(mean in years)	40.8	41.5	41.7	39.9	39.9	41.4
Age group						
20-40	49.7	49.7	49.1	50.1	50.2	49.7
41-60	50.3	50.3	50.9	49.9	49.8	50.3
Gender						
Male	50.4	50.0	49.7	51.9	50.8	49.7
Female	49.6	50.0	50.3	48.1	49.2	50.3
Marital status						
Married/co-habiting	64.7	65.0	56.0	59.3	75.1	68.7
Single/divorced/widowed	35.3	35.0	44.0	40.7	24.9	31.3
Level of education						
Secondary/higher education	52.0	50.6	55.7	57.0	45.0	56.5
University/Post graduate	48.0	49.4	44.3	43.0	55.0	48.4
Income						
More than average	13.9	13.4	14.8	5.6	14.7	21.2
Average	65.3	65.9	61.9	72.1	69.6	57.3
Less than average	20.7	20.7	23.3	22.3	15.7	21.5
Food shopping responsibility						
Main decision maker	77.0	74.8	78.3	74.2	79.9	77.8
Joint decision maker*	23.0	25.2	21.7	25.8	20.1	22.2
Purchase behaviour						
Wild fish						
once a week	16.4	10.8	7.9	15.2	26.8	21.2
2-3 times a week	25.2	26.8	21.1	20.6	30.0	27.5
once a month	21.2	22.6	26.7	18.5	16.6	21.5
less than once a month	37.2	39.8	44.4	45.8	26.6	29.8
Farmed fish						
once a week	21.7	10.5	9.1	28.8	39.0	24.2
2-3 times a week	27.0	27.4	23.0	29.7	27.2	27.5
once a month	18.3	18.5	21.7	16.1	13.7	21.5
less than once a month	33.0	43.6	46.2	25.4	20.1	29.8
Consumption behaviour						
Wild fish						
once a week	16.0	11.5	8.5	15.8	28.8	15.8
2-3 times a week	26.6	25.8	22.6	26.1	33.5	25.0
once a month	23.0	27.4	25.5	21.8	16.9	23.4
less than once a month	34.4	35.3	43.4	36.3	20.8	35.8
Farmed fish						
once a week	23.1	11.5	9.4	27.6	43.1	24.1
2-3 times a week	28.1	28.7	26.1	31.8	25.6	28.2
once a month	17.5	19.1	18.9	17.9	13.1	18.7
less than once a month	31.3	40.7	45.6	22.7	18.2	29.0

*Shares responsibility for food shopping.

672 **Table 2.** Product attributes and attribute levels.

Attribute	Levels
Country of Origin (COO) label	None, produced in the EU, produced in own country (FR, DE, IT, ESP and UK)
Aquaculture Stewardship Council (ASC) eco-label	None, Yes
Nutrition(al) claims	None, rich in Omega 3, high in protein
Health claims	None, improves heart function, improves brain function
Price[1] (all products) per 300gr of weight	0% (reference price), two premiums 15%, 30% of reference price
- Fresh (chilled) product	5.73€, 6.59€, 7.45€
- Canned product	6.69€, 7.69€, 8.70€
- Smoked product	5.31€, 6.11€, 6.90€

673 [1]prices in the UK adjusted in pounds.

Table 3. Parameter estimates for fresh/chilled product.

	Overall		France		Germany		Italy		Spain		UK	
Attribute levels	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*
COO label		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
None	-0.614		-0.633		-0.493		-0.748		-0.723		-0.496	
Produced in the EU	-0.087		-0.199		-0.162		-0.126		0.126		-0.074	
Produced in own country	0.701		0.832		0.655		0.874		0.597		0.570	
Nutrition claims		<0.001		<0.001		<0.001		0.001		0.048		<0.001
None	-0.161		-0.147		-0.162		-0.138		-0.117		-0.238	
Rich in Omega 3	0.150		0.182		0.239		0.166		0.068		0.116	
High in protein	-0.012		-0.035		-0.077		-0.028		0.049		0.122	
Health claims		<0.001		0.543		0.138		0.308		<0.001		0.002
None	-0.092		-0.036		0.010		-0.066		-0.210		-0.160	
Improves heart function	0.086		0.050		0.072		0.057		0.145		0.094	
Improves brain function	-0.006		-0.014		-0.082		0.009		0.065		0.065	
Eco-label		<0.001		0.002		<0.001		<0.001		<0.001		<0.001
None	-0.201		-0.114		-0.351		-0.190		-0.212		-0.144	
ASC label	0.201		0.114		0.351		0.190		0.212		0.144	
Price		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
0%	0.503		0.434		0.499		0.460		0.598		0.539	
15%	-0.162		-0.091		-0.181		-0.107		-0.178		-0.248	
30%	-0.341		-0.344		-0.317		-0.353		-0.419		-0.291	
Summary statistics												
LL	-11256.27		-2143.55		-2297.07		-2198.49		-2274.99		-2380.42	
AIC (LL)	11374.16		2161.71		2313.18		2214.60		2291.11		2396.53	
BIC (LL)	11435.13		2204.23		2354.40		2255.90		2332.25		2437.60	

Table 4. Parameter estimates for canned product.

	Overall		France		Germany		Italy		Spain		UK	
Attribute levels	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*
COO label		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
None	-0.604		-0.715		-0.531		-0.709		-0.693		-0.408	
Produced in the EU	-0.207		-0.259		-0.294		-0.202		-0.135		-0.135	
Produced in own country	0.811		0.974		0.825		0.911		0.828		0.543	
Nutrition claims		<0.001		<0.001		0.223		<0.001		0.007		0.007
None	-0.154		-0.202		-0.046		-0.187		-0.136		-0.216	
Rich in Omega 3	0.137		0.150		0.085		0.175		0.117		0.180	
High in protein	0.017		0.051		-0.039		0.012		0.019		0.036	
Health claims		0.001		0.505		0.308		0.001		0.063		0.050
None	-0.069		-0.001		0.003		-0.136		-0.100		-0.105	
Improves heart function	0.072		0.050		0.056		0.151		0.011		0.085	
Improves brain function	-0.003		-0.049		-0.059		-0.015		0.088		0.020	
Eco-label		<0.001		0.002		<0.001		0.042		0.001		<0.001
None	-0.150		-0.113		-0.268		-0.068		-0.120		-0.190	
ASC label	0.150		0.113		0.268		0.068		0.120		0.190	
Price		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
0%	0.565		0.678		0.710		0.419		0.484		0.570	
15%	-0.135		-0.151		-0.547		-0.365		-0.390		-0.358	
30%	-0.430		-0.527		-0.163		-0.054		-0.095		-0.211	
Summary statistics												
LL	-5512.17		-2028.58		-2100.97		-2310.77		-2150.34		-2335.91	
AIC (LL)	11042.36		2044.70		2117.08		2326.88		2166.46		2352.02	
BIC (LL)	11080.91		2085.77		2158.16		2368.61		2207.38		2393.02	

Table 5. Parameter estimates for smoked product.

	Overall		France		Germany		Italy		Spain		UK	
Attribute levels	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*	*Coef.*	*p*
COO label		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
None	-0.625		-0.665		-0.564		-0.781		-0.612		-0.528	
Produced in the EU	-0.084		-0.204		0.006		-0.043		-0.014		-0.153	
Produced in own country	0.710		0.870		0.558		0.824		0.626		0.681	
Nutrition claims		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
None	-0.201		-0.076		-0.214		-0.250		-0.244		-0.252	
Rich in Omega 3	0.195		0.067		0.240		0.259		0.241		0.194	
High in protein	0.006		0.009		-0.026		-0.009		0.003		0.058	
Health claims		0.001		0.611		0.214		0.002		0.001		0.001
None	-0.088		0.045		0.004		-0.152		-0.178		-0.173	
Improves heart function	0.045		-0.030		0.067		0.027		0.106		0.062	
Improves brain function	0.043		-0.016		-0.071		0.125		0.073		0.110	
Eco-label		<0.001		<0.001		<0.001		0.051		<0.001		<0.001
None	-0.162		-0.110		-0.359		-0.065		-0.120		-0.169	
ASC label	0.162		0.110		0.359		0.065		0.120		0.169	
Price		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
0%	0.432		0.461		0.577		0.416		0.295		0.444	
15%	-0.183		-0.165		-0.244		-0.195		-0.126		-0.184	
30%	-0.249		-0.296		-0.333		-0.221		-0.169		-0.261	
Summary statistics												
LL	-5712.31		-2182.81		-2226.62		-2343.19		-2297.00		-2288.77	
AIC (LL)	11481.02		2198.93		2242.74		2359.29		2313.12		2304.89	
BIC (LL)	11442.60		2239.92		2283.66		2400.81		2353.88		2345.88	

Table 6. Estimated WTP for fresh/chilled, canned, and smoked product.

	Fresh/chilled product						Canned Product						Smoked product					
	Overall	**FR**	**DE**	**IT**	**ESP**	**UK**	**Overall**	**FR**	**DE**	**IT**	**ESP**	**UK**	**Overall**	**FR**	**DE**	**IT**	**ESP**	**UK**
Attribute levels																		
COO label																		
None	-1.33^{d}	-1.56^{d}	-1.10^{d}	-1.75^{d}	-1.29^{d}	-1.02^{d}	-1.13^{d}	-1.11^{d}	-0.78^{d}	-1.76^{d}	-1.52^{d}	-0.76^{d}	-1.67^{d}	-1.64^{d}	-1.08^{d}	-2.22^{d}	-2.46^{d}	-1.34^{d}
Produced in the EU	-0.22^{d}	-0.51^{d}	-0.40^{d}	-0.33^{b}	0.21^{a}	-0.19^{a}	-0.41^{d}	-0.42^{d}	-0.45^{d}	-0.52^{d}	-0.31^{b}	-0.29^{b}	-0.26^{d}	-0.51^{d}	-0.01	-0.17	-0.10	-0.44^{c}
Produced in own country	1.55^{d}	2.07^{d}	1.49^{d}	2.08^{d}	1.08^{d}	1.21^{d}	1.55^{d}	1.53^{d}	1.23^{d}	2.28^{d}	1.82^{d}	1.05^{d}	1.93^{d}	2.16^{d}	1.09^{d}	2.39^{d}	2.57^{d}	1.78^{d}
Nutrition claims																		
None	-0.34^{d}	-0.35^{b}	-0.38^{c}	-0.33^{b}	-0.19^{a}	-0.49^{d}	-0.28^{d}	-0.29^{d}	-0.06	-0.46^{c}	-0.28^{b}	-0.42^{d}	-0.51^{d}	-0.15	-0.44^{d}	-0.65^{d}	-0.97^{c}	-0.64^{d}
Rich in Omega 3	0.34^{d}	0.46^{c}	0.56^{d}	0.46^{c}	0.12	0.26^{b}	0.27^{d}	0.24^{b}	0.13	0.45^{c}	0.26^{a}	0.37^{d}	0.54^{d}	0.16	0.49^{d}	0.75^{d}	1.00^{d}	0.53^{d}
High in protein	0.00	-0.11	-0.19	-0.13	0.07	0.23^{a}	0.01	0.06	-0.07	0.01	0.02	0.05	-0.03	-0.01	-0.05	-0.10	-0.04	0.11
Health claims																		
None	-0.18^{d}	-0.08	0.02	-0.14	-0.35^{d}	-0.31^{b}	-0.12^{b}	0.02	0.01	-0.33^{b}	-0.20	-0.19^{a}	-0.21^{b}	0.14	0.02	-0.40^{b}	-0.71^{b}	-0.44^{b}
Improves heart function	0.20^{d}	0.13	0.20	0.15	0.25^{b}	0.22^{a}	0.14^{c}	0.08	0.09	0.38^{b}	0.02	0.19^{a}	0.15^{a}	-0.07	0.16	0.10	0.46^{a}	0.19
Improves brain function	-0.02	-0.06	-0.22^{b}	-0.01	0.10	0.09	-0.03	-0.10	-0.10	-0.05	0.18	0.00	0.07	-0.07	-0.18	0.30^{a}	0.25	0.24^{a}
Eco-label																		
None	-0.44^{d}	-0.27^{b}	-0.80^{d}	-0.44^{d}	-0.38^{d}	-0.30^{d}	-0.27^{d}	-0.16^{b}	-0.39^{d}	-0.16^{a}	-0.25^{b}	-0.37^{d}	-0.42^{d}	-0.25^{b}	-0.71^{d}	-0.16	-0.48^{b}	-0.43^{d}
ASC label	0.44^{d}	0.27^{b}	0.80^{d}	0.44^{d}	0.38^{d}	0.30^{d}	0.27^{d}	0.16^{b}	0.39^{d}	0.16^{a}	0.25^{b}	0.37^{d}	0.42^{d}	0.25^{b}	0.71^{d}	0.16	0.48^{b}	0.43^{d}

^{a}p <0.05; ^{b}p<0.01; ^{c}p<0.001; ^{d}p<0.0001

Table 7. Criteria for determining the optimal number of classes/segments.

Number of classes	Number of parameters	LL	BIC	AIC	Class Error	R^2	$R^2(0)$
1	10	-29484	59041	58987	0.000	0.18	0.21
2	22	-26512	53186	53068	0.007	0.31	0.34
3	34	-24240	48730	48548	0.021	0.44	0.46
4	46	-23274	46887	46640	0.032	0.49	0.50
5	58	-22647	47721	47409	0.036	0.46	0.48

Table 8. The LC model parameter estimates.

	Segment 1 "Nutrition conscious" (36%)	Segment 2 "Ethnocentric" (28%)	Segment 3 "Price conscious" (18%)	Segment 4 "Eco-conscious" (18%)	Mean	Std. Dev.	Wald	*p*-value
Attributes								
COO label								
None	-0.258	-2.209	-0.586	-1.356	-1.058	0.809	2624.26	<0.001
Produced in EU	0.058	-0.554	0.138	0.405	-0.035	0.344		
Produced in own country	0.201	2.763	0.448	0.950	1.093	1.068		
Nutrition claims								
None	-0.321	-0.201	-0.430	-0.268	-0.298	0.078	656.27	<0.001
Rich in Omega3	0.279	0.083	0.202	0.209	0.198	0.078		
High in protein	0.042	0.118	0.228	0.059	0.100	0.068		
Health claims								
None	-0.221	-0.007	-0.211	0.031	-0.114	0.113	247.27	<0.001
Improves heart function	0.137	0.052	0.216	0.008	0.104	0.071		
Improves brain function	0.084	-0.045	-0.004	-0.038	0.010	0.057		
Eco-label								
None	-0.020	-0.313	-0.318	-1.269	-0.382	0.438	580.87	<0.001
ASC label	0.020	0.313	0.318	1.269	0.382	0.438		
Price								
0%	0.124	0.163	2.919	0.448	0.700	1.051	1333.06	<0.001
15%	0.050	0.051	0.237	0.077	0.089	0.070		
30%	-0.174	-0.213	-3.156	-0.525	-0.789	1.121		
Covariates								
Country	-0.144	-0.060	0.056	0.149			32.33	<0.001
Product	0.064	0.067	-0.048	-0.082			3.77	0.290

Table 9. Estimated WTP for consumer segments.

	Segment 1 "Nutrition conscious" (36%)	Segment 2 "Ethnocentric" (28%)	Segment 3 "Price conscious" (18%)	Segment 4 "Eco-conscious" (18%)
Attributes				
COO label				
None	-1.732[d]	-11.761[d]	-0.193[d]	-2.787[d]
Produced in EU	0.387[c]	-2.952[d]	0.046[c]	0.833[d]
Produced in own country	1.344[d]	14.713[d]	0.147[d]	1.954[d]
Nutrition claims				
None	-2.152[d]	-1.070[d]	-0.142[d]	-0.550[d]
Rich in Omega3	1.873[d]	0.439[a]	0.067[d]	0.430[d]
High in protein	0.279[b]	0.630[b]	0.075[d]	0.121[a]
Health claims				
None	-1.479[d]	-0.037	-0.070[d]	0.063
Improves heart function	0.916[d]	0.278	0.071[d]	0.016
Improves brain function	0.563[d]	-0.241	-0.001	-0.079
Eco-label				
None	-0.136	-1.665[d]	-0.105[d]	-2.608[d]
ASC label	0.136	1.665[d]	0.105[d]	2.608[d]

[a]p <0.05; [b]p<0.01; [c]p<0.001; [d]p<0.0001