



Research article

Impact of information and Food Technology Neophobia in consumers' acceptance of shelf-life extension in packaged fresh fish fillets

Eugenio Demartini^{a,*}, Anna Gaviglio^a, Piermichele La Sala^b, Mariantonietta Fiore^b^a Department of Health, Animal Science and Food Safety "Carlo Cantoni" (VESPA), University of Milan, Via Celoria, 2, 20133, Italy^b Department of Economics, University of Foggia, Via Romolo Caggese, 1, 71121 Foggia FG, Italy

ARTICLE INFO

Article history:

Received 18 May 2018

Received in revised form 26 July 2018

Accepted 27 September 2018

Available online 3 October 2018

1. Introduction

Consumers are increasingly searching for sustainable, safe and healthy products (Fiore et al., 2017; Cafarelli et al., 2017; Demartini et al., 2018b). In this sense, consumers should consider as a positive attribute of foods the use of new packaging technologies assuring shelf-life extension (SLE) that increases the sustainability of food products with no loss in terms of sensory characteristics and nutritional value. On the other hand, due to natural aversion to novelties, consumers may oppose novel foods (Costa-Font et al., 2008; Dovey et al., 2008; Siro et al., 2008; Barrera and Sánchez, 2013) and new food technologies (Cardello et al., 2007; Siegrist et al., 2007; Chen et al., 2013; Lusk et al., 2014). Thus, as inventing and promoting new products are expensive activities (Esbjerg et al., 2016) food firms often avoid innovation. The Eurostat Report on Innovation statistics (Release March 2017) confirms this interpretation. Indeed, during the period 2012–2014, less than a quarter of the surveyed European firms introduced a new product on the market. The vast majority of non-innovators stated that they were not motivated to innovate and, when asked, the most frequent deterring factor was the low level of market demand. These data suggest that consumers' attitudes towards novel products is one of the leading preventing factors for industry to invest on R&D activities.

The aversion to novel foods derives from a partly unjustified sense of risk of buying something that is perceived as dangerous or might not satisfy consumers' quality and safety expectations (Pliner et al., 1993). This inappropriate phobia towards novel foods has been called "food neophobia" or "new food technology neophobia" to specifically designate consumers' averseness towards

food produced by using new processes (Sjöberg, 2000; Cox and Evans, 2008; Faraji-Rad et al., 2017; Damsbo-Svendsen et al., 2017). The public and private interest for innovation, related to expected increase of food safety and security, taste and convenience at lower price and improvement of nutritional properties (Lusk et al., 2014) encouraged researchers to search efficient strategies to increase consumers' acceptance of new products.

The present paper contributes to the literature by testing the impact of two different informative messages on acceptance of a shelf-life extension on a traditional fresh fish product. Despite the improvement offered by shelf-life extension technologies, fish consumers may not appreciate the innovation in fresh packaged fish, because of very traditional food purchasing habits (Honkanen et al., 2005), and the high heterogeneity of fish products in the market (Gaviglio et al., 2013). Thus, an on-line survey on shelf life extension (SLE) technology by 10 days on fresh fish has been conducted. Participants valued a portion of 400gr of fresh sea bream fillets (*Sparus aurata*) presented as packaged by using a new package. Two information treatments randomized between subjects have been introduced in order to evaluate the best message to increase consumers' acceptance of the product.

The remainder of the text is organized into four paragraphs. Paragraph 2 presents the review of the literature review on consumer attitudes towards fish and novel food and the role of information in changing consumers' attitudes. Paragraph 3 discusses the materials and methods and the statistical approach used in the analysis. Finally, paragraphs 4 and 5 are devoted to the results and their discussion respectively.

2. Theoretical background

The present paper discusses the results of an experiment that aims to increase the attitudes towards a novel fresh fish product using different informative messages and to explore the role of neophobia on product acceptance. Thus, the literature review

* Corresponding author.

E-mail addresses: eugenio.demartini@unimi.it (E. Demartini), anna.gaviglio@unimi.it (A. Gaviglio), piermichele.lasala@unifg.it (P. La Sala), mariantonietta.fiore@unifg.it (M. Fiore).

takes into consideration three main aspects: (1) the consumers attitudes towards fresh fish products, and their relationships with other individual characteristics and fish consumption; (2) the relationship between neophobia, with specific reference to new food technology neophobia, and novel food acceptance; and, (3) the role of informative messages in changing consumers attitudes towards foods.

2.1. Consumers attitudes toward fresh fish products

According to (FAO/WHO, 2011), eating fresh fish products guarantees health benefits such as protecting against depression and cardiovascular diseases, and in controlling the cholesterol levels in blood. Despite several WHO promotion strategies, fish consumption continues to be low and relevant differences in consumption levels are measured across countries (Zhou et al., 2015; Altintzoglou and Heide, 2016). Due to the role of fresh fish products in a balanced, healthy and high quality diet, the growing variety in consumer's dietary needs and their low consumption levels, the study of consumers' perception and attitudes towards fresh fish products reached more and more attention over the last decades. The latest studies show that perception of quality attributes plays a relevant part in buying behavior and consumers' attitudes toward fresh fish products (Wang et al., 2009; Altintzoglou and Heide, 2016; Maciel et al., 2016). An Italian study (De Devitiis et al., 2018) investigates consumers' acceptance of a new fish burger that seems to overcome consumption barriers, thank to both convenience and health benefits (deriving from the functional enrichment with omega-3 fatty acids) and nutritional claims. Another study (Nicolosi et al., 2019), focusing on Italy and Spain, highlights that the perception and attitudes towards fish products varies depending on local cultures and consumption habits. A Norwegian survey demonstrates that perception of quality of fish products certainly affects buying-behavior of fresh fish fillets. Furthermore, the perception of quality depends on subjective and objective knowledge about fish quality and social and individual characteristics (Altintzoglou and Heide, 2016). A study made in China (Zhou et al., 2015) offers evidences that economic and socio-demographics factors act as determinants of fish consumption. Through the estimation of a Marshallian demand function, authors found that consumption relates positively to household income and knowledge of health issues. A mixed research investigated the fish consumption habits of consumers from Brazil and Portugal (Maciel et al., 2016) and proved that it is firstly linked to the quality attributes such as country of origin, the certification of sustainable production methods. As a secondary determinant of consumption, the same research reports the preparation and preservation methods and the marketing strategies adopted for the fish products. In line with this research, some authors investigated consumers residents in the city of Corumbá, Mato Grosso do Sul State, Brazil (Maciel et al., 2015) and demonstrate that the sensory and quality characteristics of products are the key drivers in shaping fish consumption habits.

2.2. Consumer aversion to novel food and new food technology neophobia

The global food context is characterized by the increasing demand for functional, convenience and healthy foods. Albeit new food technologies help to respond to the recent market needs, some consumers oppose these novelties, mostly due to unmotivated perception of risky outcomes. For example, despite food irradiation is a useful, cheap and safe technology with many application in food conservation, European consumers seem not appreciate it (Diehl, 2002). Consumers are also generally averse to genetically modified food and do not differentiate between cisgenically vs transgenically modified products (Delwaide et al., 2015) even if

heterogeneity in preferences has been found, being the younger consumers the less averse towards GMOs (Hu et al., 2004). On the other hands, in a very recent study focused on the acceptance of shelf-life extension among Italian students by Cavaliere and Ventura (2018) shows that the willingness to try an innovative foods differs among young consumers depending on the knowledge and interest on sustainability. Somehow counter-intuitively, the results of this surveys demonstrate that the higher is the involvement in sustainability, the less the sustainable innovation is accepted.

Consumers show their reluctance also against functional foods produced using new technologies and unfamiliar ingredients, being the European normally more averse than American towards these wide category of food (Siro et al., 2008).

According to Pliner et al. (1993) consumers' opposition towards novel products may relate to the perception of the novel food as harmful or the perceived risk that new foods will dislike their expectations. The researchers traditionally refer to the aversion to novel food as "neophobia" (Pliner and Hobden, 1992; Damsbo-Svendensen et al., 2017) and, more recently, started using the term "new food technology neophobia" (Cox and Evans, 2008) to indicate consumers' reluctance towards food produced using new processes. The "new food technology neophobia" has several facets either relate to consumers' aversion to try novel food products either to accept new production and processing technologies (Cox and Evans, 2008; DeSteur et al., 2016).

2.3. Changing consumers' attitudes using information

Consumers might oppose novel foods because they are not aware of the method used for their production (Cardello et al., 2007). Thus, providing consumers with information about innovative technologies should reduce their information gap (Contò et al., 2016; Barsics et al., 2017). Some researches confirm that this approach can be effective in the creation of positive attitudes towards foods and foods technologies. A study conducted in New Zealand (Lee et al., 2016) offers evidences that information positively influenced consumers' attitudes towards apple juices that was untreated and processed using high hydrostatic pressure, while it had no effect on pulsed-electric field treated juice. A research conducted in Europe and USA involving experimental auctions (Lusk et al., 2004) proved that providing information about potential benefits of GMOs decrease the money that consumers accepted to buy the GM food. Researchers focused also on the quantity of information provided. Also in this case, there evidences that information shape consumers evaluation of targeted products. For instance, the study of Pohlman et al. (1994) proved that the participation to an educational program improved the attitudes towards food irradiation technologies, while McCullough and Ostrom (1974) proved that mere exposure to similar short messages persuaded involved positive evaluation of daily-use products. However, the information does not always provide positive changes in attitudes. For instance, Jaeger et al. (2015) conducted a qualitative research and measured that providing description changed positively and negatively the evaluation of new food technologies in different group of consumers.

3. Materials and methods

In order to increase the attitudes towards a novel fresh fish product using information and explore the role of neophobia on product acceptance, we firstly analysed the negative values attached to the product and created two informative messages targeting these specific adverse attributes. Secondly, we identified a set of dependent variables represented by the attitudes towards



Fig. 1. Picture of the fish product used in the study. Note: the claim in the green label says “New Package – Fresh fish for 10 days more”; the claim in the light-blue label says: “Tender and delicate – Sea bream fillets”. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

the technology and the product that might be influenced by information. Finally, we determined the set of covariates that may play a role in consumers attitudes toward the novel fresh fish product. These are represented by neophobia, socio-demographic characteristics and fish consumption habits.

3.1. Experimental design

The investigation was conducted in Italy from January to June 2017 by using the Qualtrics® platform. This is based on two consecutive steps. The first step was a pilot study aimed to select the items for the product evaluation in the main questionnaire. During this study, 34 experts of fish products from academy (researchers on fish breeding and fish product safety) and private companies (producers, transformers and traders) and 52 lay people responded to a short qualitative questionnaire describing the perceived gains and losses of the proposed food technology.¹ At this step emerged that the most probable negative consequence of the SLE technology applied to fresh fish products was the perception of less freshness and the decreasing of the quality of the product compared to the traditionally packaged products. On the other hand, the most valuable benefits of the new package for both experts and lay people were the ease of use and reduction in food waste. According to these results, we designed the second step, which represents the main study described in the present paper. This research involved an on-line survey distributed in the Lombardy and Apulia Regions, representative for North and South of Italy. At the end of the survey, out of 530 participants engaged, 418 (78.9%) completed the questionnaire. Thus, the questionnaire that were not finished were excluded from the analysis.

Participants to the survey valued a fictional portion of 400gr of fresh sea bream fillets (*Sparus aurata*) that was presented as packaged using a new technology assuring SLE.² A specifically created picture of the product was presented during the survey with a claim indicating the “10 extra-days” of shelf-life guaranteed by the new technology (Fig. 1).

Furthermore, each respondent was randomly assigned to an experimental group characterized by a specific message aimed at persuading consumers of the goodness of the technology. In accordance to the objective of the research and building on the

¹ For sake of brevity, only the main results of the pilot study are described here, for those interested, all information are available upon request.

² This new technology consists of 2 steps: in the first step, the edible coating was optimized through the use of 5% sodium alginate solution and 7.5% calcium chloride solution in order to increase the shelf life of the sea bream fillet. After that, the edible coating is combined with Modified Atmosphere Packaging – MAP – (5% of O₂ and 95% of CO₂) and the effect on shelf life is evaluated. It results in a SLE of 10 days.

information gained from the pilot study, specific information treatment has been introduced in order to test the effect of different messages on consumers’ acceptance of SLE. As described in Table 1, people who has been randomly assigned to the first treatment represent the *Control* group, in fact they received no additional information a part of the description of the product. The second treatment informed consumers that SLE guarantees 10 extra-days of shelf life with no change in terms of product overall quality; this group of consumer has been coded as *Info_Q*. The content of this information treatment aims to prevent the possible adverse effect of the use of packaging technology on the perception of the overall quality of the product. The third treatment informed readers that SLE helps in decreasing food waste, which involves gains in term of economic and environmental impact. People assigned to this treatment composed *Info_W* group. Finally, the fourth treatment contains both the information provided by the second and third treatment, thus, these participants are coded as *Info_Q+Info_W* group. It is worth noting that this experimental design allows to estimate the effect of informative message in term of type of information provided (*Info_Q* vs *Info_W*) and in term of quantity of information provided (*Control* vs *Info_Q*; *Control* vs *Info_W*; and, *Control* vs *Info_Q+Info_W*).

The measure of consumers’ acceptance of fresh sea bream fillets packaged using SLE followed the information treatment. Consumers stated their perception of the product on three dimensions that have been estimated as follows:

- *Overall liking of the technology.* This dimension is measured by a 10-point semantic differential scale, that describes the perception of convenience of the SLE (disadvantage vs. advantage);
- *Overall linking of the product.* This dimension is measured by the mean of the stated agreement with 7-point Likert scales on four statements referring to the fresh sea bream fillets. Specifically, the items used are: ‘The product is attractive’, ‘I would recommend it to my friends and relatives’, ‘I would buy it’ and ‘It looks good’;
- *Perception of specific characteristics of the product.* Seven semantic differential scales that captures the perception of different attributes of the product measure this dimension. These scales refer to ‘taste and smell’, ‘environmental friendliness’, ‘healthiness’, ‘easy of cooking’, ‘easy of storing’, ‘naturalness’ and ‘freshness’. These seven items are used separately in the analysis to accounts for the perception of the different characteristics that make up the product.

The questionnaire contains three more sections. The first one is devoted to the analysis of the acceptance of new food technologies, estimated via the Food Technology Neophobia Scale (FTNS - Cox and Evans, 2008), the measure of food technology knowledge and the attitudinal antecedents of food choice, estimated by using the Food Values (Lusk and Briggeman, 2009). Furthermore, two final sections are devoted to socio-demographics and fish consumption habits information of each respondent completing the survey.

3.2. Research hypothesis and data processing

The research starts from the formulation of the hypothesis that a positive message would increase consumer’s attitudes towards the product. According to this reasoning, Table 2 presents a first group of hypothesis that can be generalized as follows:

Table 1
Informative message and number of subjects per experimental group.

	Experimental group	Information treatment	Collected		Valid	
			n.	%	n.	%
1	Control	No info	133	25.1	103	24.6
2	Info_Q	The interest in this technology is that it enables to lengthen the product's conservation with no loss in term of qualitative properties	139	26.2	111	26.6
3	Info_W	The interest in this technology is that it reduces product waste with a good impact in economic, environmental and social terms	128	24.2	97	23.2
4	Info_Q+Info_W	The interest in this technology is that it enables to lengthen the product's conservation with no loss in term of qualitative properties and reduce product waste with a good impact in economic, environmental and social terms	130	24.5	107	25.6
Total			530	100.0	418	100.0

[H1] *The information increase consumers' positive attitudes towards the product, and the magnitude of the impact increase with the increase of information provided.*

A second hypothesis has been proposed on the moderating role of individuals' food technology neophobia on the effect of information on consumers' attitudes. This hypothesis is:

[H2] *The individual's FTNS index moderates the effect of the informative message in changing consumers' attitudes towards the product.*

No hypothesis is formulated *a priori* on the different impact between different types of information provided in the case of H1, nor on the sign of the moderation effect of the FTNS scale on the effect of informative message in H2. According to the focus of the present study, authors did not articulate any hypothesis on other consumers' demographics; rather, they are used as control variables in the estimation.

All data processing has been performed by using IBM SPSS software. In order to test H1, a generalized linear model (GLM) has been run for each attitude measurement considered. In addition to the information treatments, the individual's FTNS index, the demographics and the Food Values are used in the models. As described in the following paragraphs, the Food Values enter the estimation as individual factor scores of the two factors obtained by a principal component analysis (PCA) run on the scale. A part of testing H1, this step of the estimation explores the determinants of consumers' attitudes towards the innovative products. An analysis of the individual's FTNS moderating effect on the impact of information on consumers' attitudes follows the GLM estimation in order to test H2. In this step, the Model 1 of the PROCESS package (Hayes, 2012) has been used to calculate the significance and sign of the interaction of treatments and FTNS on attitudes.

4. Results

4.1. Characteristics of the sample

The final characteristics of the sample are shown in Table 3. It consists in 418 respondents aged between 18 and 81 years (Mean= 37.22; SD=12.91), 221 of whom are female, representing the 52.9% of the total. The family counts primarily 3–4 members (224; 53.6% of the total) with mainly with children between 13–18 years (48.3%). Approximately half of the respondents are resident in North of Italy, in Lombardy Region (208; 49.8%), the other half in South of Italy, in Apulia Region (210, 50.2%). The vast majority of the sample has a monthly household's income of 4000€ at maximum (336; 87.6%) and, finally, 216 respondents possess a Bachelor degree or higher (51.7% of the total). Compared to the Italian population, as for the majority of internet surveys, the education level does not reflect the distribution of the variable.

Possibly due to self-selection and non-response bias, this characteristic of the sample causes a decrease in term of expected generalization to the whole population (Hudson et al., 2004; Schonlau et al., 2009) and reproducibility of the results (Aarts et al., 2015). On the other hand, as suggested in a study on fish perception (Gaviglio et al., 2014), the use of control variables in the models helps in isolating the effect of the information treatment excluding accounting separately for the education characteristics of respondents. The descriptive statistics for all experimental groups and all the variables considered are gathered in Appendix A.

4.2. Impact of information on consumers' attitudes towards the innovative product

The results of the estimation of the role of different informative messages on consumers' attitudes towards the innovative fish product are reported in Table 4. Each item used for the evaluation of the SLE technology, the overall liking of the product and its characteristics enters one generalized linear model as dependent variable. According to the questionnaire's sections, the independent variables are presented in four blocks. The information treatments compose the first block of variables and are the fixed factors of the models. A second block of covariates gathers the individual FTNS score, the stated previous knowledge of the technology and the factor scores of the two components extracted by PCA analysis on the Food Values. The third and fourth groups of variables gather the socio-demographics characteristics or the respondents and their fish consumption and purchase habits respectively.

The results show that only a small fraction of hypothesis formulated in H1 can be accepted. In fact, all control variables considered, the information possesses an impact only on the measure of perceived 'taste and smell' and 'naturalness'. Specifically, looking at the parameter estimates, the message provided increased the evaluation of "taste and smell" in the *Info_Q* and *Info_Q+Info_W* groups, while *Info_W* group's evaluation was the same of Control's one. With regard to the evaluation of naturalness, the only group that shows a significant increase was the *Info_Q+Info_W*. Obviously, the rest H1s must be rejected. In fact, the informative messages did not affect the evaluation of the technology, the overall liking of the product and the perception of its 'environmental friendliness', 'healthiness', 'easy of cooking', 'easy of storing', nor 'freshness'. These results indicate that the informative messages tested are just mildly effective in changing consumers' attitudes. Furthermore, the fact that two of three significant effects are measured in the *Info_Q+Info_W* condition suggests that the effect may depend on quantity of information, rather than type of information provided.

Interesting results are highlighted by the analysis of the other determinants of consumers' attitudes considered in the model. Firstly, FTNS scale is always significantly and negatively linked to measures of attitudes. On the contrary, previous knowledge

Table 2
Hypothesis on the effect of the informative message on the evaluation of the product on the different dimensions considered.

	Control		Info_Q		Info_W		Info_Q+InfoW
Overall liking	Technology	<	Technology	=	Technology	<	Technology
	Product	<	Product	=	Product	<	Product
Attributes evaluation	Taste and smell	<	Taste and smell	=	Taste and smell	<	Taste and smell
	Environment	<	Environment	=	Environment	<	Environment
	Health	<	Health	=	Health	<	Health
	Easy cooking	<	Easy cooking	=	Easy cooking	<	Easy cooking
	Easy storing	<	Easy storing	=	Easy storing	<	Easy storing
	Naturalness	<	Naturalness	=	Naturalness	<	Naturalness
	Freshness	<	Freshness	=	Freshness	<	Freshness

Table 3
Characteristics of the sample.

	n.	%		n.	%
Age			Household income (€ per month)		
18–25 years	95	0,23	<1.000	60	0,14
26–35 years	117	0,28	1.000–2.000	143	0,34
36–45 years	87	0,21	2.001–4.000	163	0,39
46–55 years	79	0,19	4.001–6.000	29	0,07
over 56 years	40	0,10	>6.000	23	0,06
Gender			Household size (number)		
Male	197	0,47	1	46	0,11
Female	221	0,53	2	90	0,22
Education			3	95	0,23
First and secondary school	20	0,05	4	129	0,31
High school	182	0,44	5+	58	0,14
Bachelor degree	46	0,11	Children in the household 0–12 years		
Master Degree or higher	170	0,41	No	309	0,74
Residence Region			Yes	109	0,26
North of Italy – Lombardy	208	0,50	Children in the household 13–18 years		
South of Italy – Puglia	210	0,50	No	216	0,52
			Yes	202	0,48

Number of subjects in the survey = 418

contributes negatively to the explanation of the perception of 'environmental friendliness' of the product. With regard to the role of antecedents of consumption on perception of the new product, we run a PCA analysis on the Food Values. According to the results of the analysis (see [Appendix B](#) for the extended description), the eleven items of this scale can be reduced to two components. The first extracted component represents the importance that consumers attach to the *Quality Cues* of products when they make their daily food purchase and is significantly and positively related to the perception of the advantages offered by the new technology, the overall liking of the product, the perception of taste and smell and healthiness of the fresh fillets. The same pattern is showed by the second components that represents the importance that consumers attach to the *Convenience Cues* of foods. Furthermore, this score is positively and significantly related to the perception of the environmental friendliness and the naturalness of the product.

A second remarkable trend is shown by the role of socio-demographic characteristics of respondents. Looking at [Table 4](#), they show no relationships with any of the attitudinal measures studied, with the exception of the Area of residence, which is significantly related to the overall liking of the technology showing differences between Northern Italian and Southern Italian consumers, being the first more positively disposed to the technology. Consumption habits show a similar fashion. They do not correlate clearly to consumers' attitudes towards the fresh fillets. The majority of the significant relationships are found in the evaluation of the environmental friendliness of the products, which is positively related to the purchase at traditional fish shops and consumption of frozen whole fish and negatively to the consumption of frozen fillets. Instead, the easy of cooking is negatively correlated to the consumption of frozen whole fish and positively correlated with

the consumption of anchovies. The consumption of fresh whole fish negatively relates to the overall liking of the technology, while the consumption of fresh fillets positively relates to the expectations in terms of taste and smell and perception of naturalness of the products. Finally, the consumption of anchovies is positively related to the perception of healthiness of the product.

4.3. Moderating role of food technology neophobia scale on the impact of information on consumers' attitudes

Considering the relevance of neophobia in food choices, a second hypothesis was formulated on its moderating role on information treatment. Building on the previous evidences, the moderation analysis has been performed exclusively on those attitudinal measures that was explicated by information treatment and FTNS scale, i.e. the perception of 'taste and smell' and 'naturalness'. The results of the test of $H2$ are expressed in [Table 5](#). The hypothesis must be rejected, because the interaction between the two independent variables is not significant. According to the statistical analysis, informative messages increase the attitudes and individual neophobia decrease the acceptance of the fresh fillets packaged with SLE technology, but there is no additive or subtractive action of FTNS on information treatments. This trend is evident in [Figs. 2](#) and [3](#); here the average measures of perception of 'taste and smell' and 'naturalness' in the four experimental groups are presented considering a median-split of the sample based on FTNS individual score. The growing shapes of the figures demonstrate that attitudes increase with messages, while the differences between 'not neophobic' and 'neophobic' respondents represent graphically the relevance of FTNS with regard to consumers' attitudes towards innovative products, at least in the present case study. The fact that

Table 4
Explanatory variables for evaluation of the product in generalized linear models.

	Overall liking				Attributes evaluation													
	Technology		Product		Taste and smell		Environment		Health		Easy cooking		Easy storing		Naturalness		Freshness	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
<i>Information treatment</i>																		
Info_Q+Info_W	0.177	0.440	0.126	0.469	0.581	0.002	0.343	0.106	0.368	0.070	0.339	0.100	0.356	0.115	0.474	0.039	0.450	0.077
Info_W	−0.295	0.210	−0.093	0.604	0.377	0.046	0.261	0.232	0.066	0.750	0.075	0.723	−0.007	0.976	0.401	0.089	0.046	0.859
Info_Q	0.006	0.978	−0.081	0.642	0.391	0.033	−0.099	0.638	0.318	0.115	0.125	0.544	0.162	0.472	0.251	0.271	0.193	0.446
Control	0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a	
FTNS	−0.437	0.000	−0.538	0.000	−0.334	0.000	−0.406	0.000	−0.539	0.000	−0.294	0.001	−0.283	0.004	−0.538	0.000	−0.491	0.000
Knowledge of techs	−0.055	0.296	−0.009	0.830	−0.043	0.312	−0.116	0.017	−0.078	0.095	−0.063	0.185	−0.061	0.240	−0.043	0.412	−0.026	0.651
FV 1 – Quality Cues	0.186	0.027	0.267	0.000	0.157	0.020	−0.004	0.961	0.201	0.007	0.118	0.121	0.139	0.095	0.007	0.937	0.096	0.303
FV 2 – Convenience Cues	0.263	0.003	0.468	0.000	0.288	0.000	0.300	0.000	0.220	0.005	0.052	0.513	0.126	0.151	0.186	0.036	0.038	0.705
<i>Children max 12 yrs old</i>																		
No	−0.008	0.966	−0.046	0.751	0.001	0.996	0.148	0.401	0.060	0.723	0.174	0.309	0.228	0.223	−0.041	0.831	−0.148	0.482
Yes	0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a	
<i>Children max 13–18 yrs</i>																		
No	−0.138	0.428	0.022	0.870	−0.127	0.366	−0.156	0.336	−0.058	0.707	−0.330	0.036	−0.259	0.133	−0.080	0.648	−0.077	0.690
Yes	0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a	
<i>Area of Residence</i>																		
North Italy – Lombardy	2.508	0.000	−0.087	0.558	0.021	0.894	0.254	0.157	0.101	0.556	0.040	0.818	0.084	0.662	−0.100	0.604	−0.340	0.114
South Italy – Puglia	0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a	
<i>Gender</i>																		
Male	0.156	0.359	−0.019	0.883	−0.191	0.162	−0.155	0.328	−0.017	0.911	−0.134	0.383	0.082	0.625	0.062	0.717	−0.270	0.153
Female	0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a		0 ^a	
Education	−0.003	0.973	−0.024	0.677	−0.069	0.267	−0.008	0.911	−0.037	0.587	−0.021	0.767	−0.037	0.626	−0.035	0.645	−0.046	0.589
Monthly income	−0.004	0.965	−0.042	0.526	−0.042	0.545	−0.096	0.228	−0.037	0.632	0.004	0.958	−0.008	0.923	−0.074	0.391	−0.015	0.874
<i>Place of purchase for fish</i>																		
Fish Shop	−0.091	0.325	−0.002	0.978	0.084	0.256	0.181	0.035	−0.060	0.467	−0.044	0.599	−0.040	0.663	0.050	0.590	−0.013	0.902
Open air market	0.005	0.958	0.005	0.947	−0.048	0.531	−0.167	0.062	0.034	0.689	−0.003	0.972	0.109	0.251	−0.116	0.230	−0.180	0.093
Supermarket	0.145	0.107	0.085	0.216	0.003	0.968	0.067	0.420	0.001	0.987	0.063	0.437	−0.020	0.826	0.005	0.958	−0.128	0.201
<i>Consumption of fish</i>																		
Fresh Whole Fish	−0.214	0.020	−0.074	0.295	−0.069	0.351	−0.062	0.469	−0.092	0.262	−0.040	0.629	−0.081	0.375	−0.096	0.298	−0.168	0.102
Fresh Fish Fillets	0.164	0.065	−0.019	0.781	0.181	0.011	0.091	0.271	0.097	0.220	0.056	0.489	0.171	0.052	0.241	0.007	0.134	0.176
Fresh Fish Recipes	−0.134	0.142	−0.011	0.869	−0.107	0.146	0.079	0.350	0.050	0.541	0.081	0.325	0.089	0.324	0.019	0.837	0.037	0.714
Frozen Whole Fish	−0.072	0.461	0.015	0.839	0.120	0.127	−0.193	0.033	0.077	0.371	−0.173	0.050	−0.165	0.088	0.115	0.240	0.116	0.284
Frozen Fish Fillets	0.011	0.914	0.002	0.973	−0.027	0.734	−0.207	0.022	−0.039	0.650	0.148	0.094	0.131	0.176	0.009	0.923	−0.098	0.366
Frozen Fish Recipes	0.004	0.969	0.141	0.053	0.076	0.324	0.056	0.530	0.063	0.457	0.081	0.351	−0.028	0.771	−0.012	0.902	0.115	0.279
<i>Appreciation offish</i>																		
Sea bream, sea bass	0.041	0.448	0.054	0.197	0.052	0.235	0.009	0.862	0.030	0.536	−0.035	0.475	0.031	0.569	−0.002	0.976	0.068	0.265
Anchovy, sardine, mackerel	0.067	0.112	0.043	0.180	0.030	0.371	0.032	0.408	0.080	0.033	0.088	0.021	0.047	0.259	0.033	0.430	0.091	0.053
Codfish	−0.069	0.202	−0.051	0.211	−0.007	0.867	−0.044	0.380	0.024	0.608	0.054	0.261	0.057	0.287	−0.022	0.689	−0.019	0.749
Salmon	0.074	0.158	0.096	0.017	0.019	0.657	0.073	0.133	0.028	0.550	−0.012	0.808	−0.067	0.196	0.054	0.307	0.109	0.063
Trout	0.010	0.818	−0.006	0.849	0.023	0.521	0.033	0.422	−0.028	0.486	−0.013	0.756	−0.001	0.973	0.061	0.174	−0.018	0.718
Intercept	6.817	0.000	5.909	0.000	4.995	0.000	5.701	0.000	6.202	0.000	5.984	0.000	6.051	0.000	5.679	0.000	5.493	0.000

Note: Bold format emphasizes the significant variables at 0.050.

^aThis parameter is set to zero because it is redundant.

in both graphs the 'not neophobic' and 'neophobic' lines growth approximately in parallel showing that the interaction between the two terms is not to be considered significant.

5. Discussion and conclusions

The present research advances the knowledge on the impact of informative messages on acceptance of new food technology by conducting an on-line survey in North and South of Italy. As a case study, the research used a shelf-life extension technology applied to a 400gr package of fresh seabream fillets. The paper discusses the test of two information treatments aimed at increasing consumers' attitudes towards the product. The first treatment informs consumers that the shelf life extension does not affect the overall quality of the fish fillets, while the second informs that the new packaging technology helps in reducing food waste. As a second goal, the paper explores the moderating role of FTNS on the effect of information and the sociodemographic determinants of consumers liking of the examined product.

By the authors' interpretation, three main conclusions can be derived from the empirical results. First, an adequate quantity of information may positively shape consumers attitudes towards fish products packaged using new shelf-life extension technologies. On the other hand, this implies that the content of information is not clearly relevant in influencing consumers. At least in the examined case, these findings suggest that a promoting campaign should provide many and varied information, rather than focusing on specific positive characteristics of the product. Second, the individual food technology neophobia has been found the most important barrier to novel product acceptance. However, FTNS does not interact with information messages. Thus, despite FTNS is a strong negative determinant of acceptance of innovative and sustainable packaging, this result suggests that, even if "informed" neophobic consumers might not like the product as not neophobic consumers, they are still receptive to information. Third, attitudinal antecedents of food choice, i.e. the Food Values (Lusk and Briggeman, 2009) and partly socio-demographic and consumption habits, are determinants of acceptance of the innovative products. This evidence confirms that heterogeneity of consumers must be considered in order to design effective interventions and target relevant and/or sensible clusters.

These results are in line with the recent literature. Indeed, the majority of the studies demonstrates that information positively influences consumers' perception of some technologies and characteristics of foods, but could be ineffective on other proposed innovations and products (Cardello et al., 2007; Altintzoglou et al., 2014; Lee et al., 2016; Barsics et al., 2017; Demartini et al., 2018a). Furthermore, the comparison with the literature on Italian consumption of fish (Cosmina et al., 2012) suggested that the attitudes towards fish species and types of preparation are strictly related to personal values and habits that generally have a tendency to be transmitted between generations and also to depend on sociodemographic factors (LaBarbera et al., 2018; Kraus et al., 2017). These trends are also showed by most of the studies on food preferences (Fiore et al., 2017; Stranieri et al., 2017). When consumer select a food product chooses the product as a mix of tangible and intangible attributes also relying on personal background thus being influenced by many interacting factors (Antonazzo et al., 2014; Verneau et al., 2014). Finally, it is worth being noticed that food technology neophobia can also depend on personality trait of people and context. Indeed, some authors highlight the relationship among food technology neophobia, satisfaction with life, food-related life because technologies may be rejected outright, without regard to the product in which they are embodied (Schnettler et al., 2017). Building on these reasoning, marketing intervention and public campaign to sustain the introduction of new technologies,

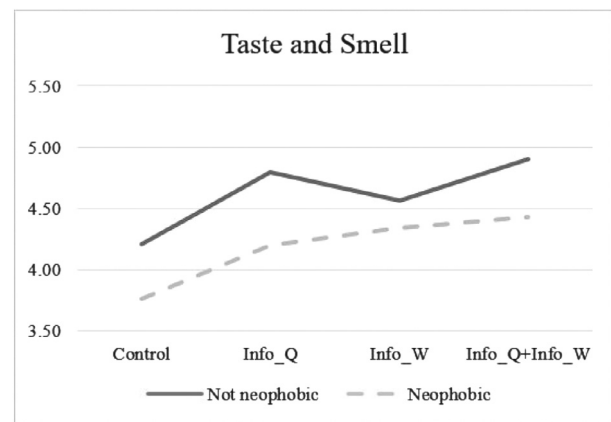


Fig. 2. Mean of the evaluation of taste and smell depending on informative treatment and neophobia.

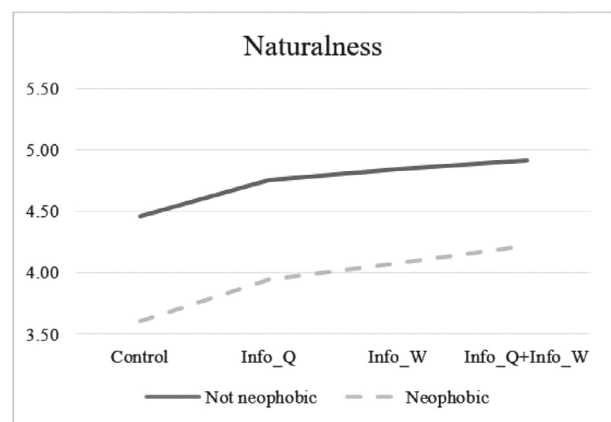


Fig. 3. Mean of the evaluation of naturalness depending on informative treatment and neophobia.

and increase the acceptance of novel foods must possess the following characteristics: (a) being tailored on targeted customers; and, (b) being tailored on targeted characteristics of the products. In this sense, private companies and public bodies are encouraged to use a specific protocol to analyze the context, and design, test and revise their intervention before the launch. This might be an expensive procedure, nonetheless, it is known that the inclusion of the consumers in the innovations development process becomes crucial in order to minimize failure probabilities (Guiné et al., 2016), thus an intensive pre-test of information on a representative sample of consumers would increase the probabilities of success of intervention on the targeted population.

Acknowledgments

This research was supported by Ministero dell'Istruzione, dell'Università e della Ricerca (Prot. 957/ric, 28/12/2012), through the Project 2012ZN3KJL "Long Life, High Sustainability". We also thank the anonymous reviewers for their effort and valuable comments.

Appendix A. Descriptive statistics of the four experimental groups

See Table A.1.

Table 5

Results of the moderation analysis of the role of food technology neophobia scale on the impact of the information treatment on consumers' attitudes.

	Info treatment		Food technologies neophobia scale (FTN)		Info*FTN	
	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.
Taste and smell	3.134	0.002	−4.939	0.000	0.110	0.913
Naturalness	2.154	0.032	−6.433	0.000	−0.286	0.775

Table A.1

Characteristics of each experimental group.

Variables	Experimental Groups				Total sample
	Control	Info_Q	Info_W	Info_Q+Info_W	
Overall liking - <i>Average</i>					
Technology	6.52	6.61	6.26	6.66	6.51
Product	4.45	4.51	4.45	4.70	4.53
Attributes evaluation - <i>Average</i>					
Taste and smell	3.99	4.52	4.44	4.70	4.41
Environment	4.48	4.50	4.80	4.92	4.67
Health	4.48	4.90	4.61	4.91	4.72
Easy cooking	5.22	5.32	5.33	5.55	5.36
Easy storing	5.30	5.46	5.33	5.64	5.43
Naturalness	4.04	4.38	4.42	4.62	4.36
Freshness	3.50	3.83	3.53	4.07	3.73
New food technologies neophobia scale - <i>Average</i>	3.58	3.52	3.24	3.64	3.50
Previous knowledge of packaging techs - <i>Average</i>	3.96	3.84	3.97	3.83	3.90
FV 1 – Quality Cues - <i>Average</i>	0.01	−0.07	0.08	−0.02	0.00
FV 2 – Convenience Cues - <i>Average</i>	−0.08	0.07	−0.01	0.02	0.00
Children max 12 yrs old in household - <i>Count</i>					
No	77	77	76	79	309
Yes	25	34	20	27	106
Children max 13–18 yrs old in household - <i>Count</i>					
No	77	77	76	79	309
Yes	25	34	20	27	106
Area of Residence - <i>Count</i>					
North Italy – Lombardy	53	56	49	50	208
South Italy – Puglia	50	55	48	57	210
Gender - <i>Count</i>					
Male	54	49	45	49	197
Female	49	62	52	58	221
Education - <i>Average</i>	3.99	3.94	3.94	3.94	3.95
Monthly income per household - <i>Average</i>	2.53	2.59	2.39	2.66	2.55
Typical place of purchase for fish product - <i>Average</i>					
Fish Shop	2.03	2.06	2.05	2.12	2.07
Open air market	1.58	1.61	1.71	1.48	1.60
Supermarket	2.73	2.73	2.97	2.73	2.79
Level of consumption different fish products - <i>Average</i>					
Fresh Whole Fish	2.34	2.40	2.56	2.40	2.42
Fresh Fish Fillets	2.31	2.41	2.26	2.43	2.35
Fresh Fish Recipes such as Sushi. Breaded. Spiced	1.93	1.71	1.81	1.74	1.80
Frozen Whole Fish	1.73	1.71	1.73	1.80	1.74
Frozen Fish Fillets	2.14	1.92	2.09	2.13	2.07
Frozen Fish Recipes such as Sushi. Breaded. Spiced	1.87	1.86	1.84	1.83	1.85
Appreciation of different species of fish - <i>Average</i>					
Sea bream and sea bass	5.42	5.78	5.94	5.57	5.68
Anchovy, sardine and mackerel	4.43	4.59	4.52	4.14	4.42
Codfish	4.91	5.02	5.12	4.91	4.99
Salmon	5.45	5.51	5.56	5.61	5.53
Trout	4.19	4.06	4.11	3.83	4.05

Appendix B. Results of principal components analysis on food values items

To estimate the antecedents of food consumption we used the factor scores of a Principal Component Analysis performed on the Food Values (Lusk and Briggeman, 2009) per each respondent. The suitability of the data for the PCA was evaluated using the Kaiser–Meyer–Olkin measure and the Bartlett's test of sphericity. The Table B.1 shows the results of these tests. The KMO results equal to 0.910, proving the sampling adequacy of the variables (Cerny and Kaiser, 1977) and the Bartlett's test of sphericity is significant at <0.000 demonstrating that the variables considered are highly correlated (Dziuban and Shirkey, 1974) and appropriate for the analysis. Given these results, we thus performed the PCA using a

varimax rotation algorithm. The analysis shows that two eigenvalues of the eleven components extracted exceed one, suggesting the presence of two factors that explain the 59.63% of the variance Table B.2. Finally, the rotated matrix of factor loadings can be used to characterize these two components. As showed in Table B.3, the rotated solution shows that the first component is characterized by five variables (FV01–FV06–FV07–FV08–FV09) that relates to the intrinsic quality of the product, while the second component is characterized by three variables (FV03–FV05–FV10) that relates to the convenience attributes of the product. We thus called the two factors *Quality Cues* and *Convenience Cues* respectively indicating that the higher is the factor score the higher is the importance attached by the respondents to the *Quality* or *Convenience* cues perceived in the food product.

Table B.1
KMO and Bartlett's Test.

Kaiser–Meyer–Olkin Measure of Sampling Adequacy		0.910
Bartlett's Test of Sphericity	Approx. Chi-Square df Sig.	2,023.72 55 0.000

Table B.2
Total variance explained by principal components analysis.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.19	47.21	47.21	5.19	47.21	47.21
2	1.37	12.41	59.63	1.37	12.41	59.63
3	0.87	7.87	67.49			
4	0.61	5.51	73.00			
5	0.58	5.28	78.28			
6	0.57	5.19	83.47			
7	0.43	3.93	87.40			
8	0.41	3.71	91.11			
9	0.36	3.30	94.41			
10	0.34	3.05	97.45			
11	0.28	2.55	100.00			

Table B.3
Rotated component matrix.

	Component	
	1 - Quality Cues	2 - Convenience Cues
FV01 – Naturalness	0.781	0.304
FV02 – Taste	0.570	0.540
FV03 – Price	0.172	0.723
FV04 – Safety	0.628	0.530
FV05 – Convenience	0.040	0.733
FV06 – Nutrition	0.690	0.271
FV07 – Tradition	0.720	0.137
FV08 – Origin	0.777	0.252
FV09 – Fairness	0.661	–0.084
FV10 – Appearance	0.198	0.775
FV11 – Environment	0.773	0.191

Note: Based on responses on 7-point Likert scale to the answer “How important are to the following characteristics of a food when making your diet choices?” – from 1: Not important at all, to 7: Absolutely Essential.

References

- Aarts, A., et al., 2015. Estimating the reproducibility of psychological science. *Science* 349 (6251), 1–8.
- Altintzoglou, T., Heide, M., 2016. Fish quality and consumers: How do consumers' knowledge about and involvement in fish quality define factors that influence fish buying behavior? *J. Aquat. Food Prod. Technol.* 25 (6), 885–894.
- Altintzoglou, T., Heide, M., Carlehög, M., 2014. French consumer profiles reactions to information on cod fillet products. *Br. Food J.* 116 (3), 374–389.
- Antonazzo, A.P., Fiore, M., La Sala, P., Contò, F., 2014. Assessing perceptions of wine tourists on organic wine. *Riv. Econ. AgroAlimentare* 17 (2), 57–76.
- Barrena, R., Sánchez, M., 2013. Neophobia, personal consumer values and novel food acceptance. *Food Quality Preference* 27 (1), 72–84.
- Barsics, F., Caparros Megido, R., Brostaux, Y., Barsics, C., Blecker, C., Haubruge, E., Francis, F., 2017. Could new information influence attitudes to foods supplemented with edible insects? *Br. Food J.* 119 (9), 2027–2039.
- Cafarelli, B., La Sala, P.L., Pellegrini, G., Fiore, M., 2017. Consumers' preferences investigation for extra virgin olive oil basing on conjoint analysis. *Riv. Stud. Sulla Sostenibilita* (1), 203–218.
- Cardello, A.V., Schutz, H.G., Leshner, L.L., 2007. Consumer perceptions of foods processed by innovative and emerging technologies: A conjoint analytic study. *Innov. Food Sci. Emerg. Technol.* 8 (1), 73–83.
- Cavaliere, A., Ventura, V., 2018. Mismatch between food sustainability and consumer acceptance toward innovation technologies among Millennial students: The case of shelf life extension. *J. Cleaner Prod.* 175, 641–650.
- Cerny, B.A., Kaiser, H.F., 1977. A study of a measure of sampling adequacy for factor-analytic correlation matrices. *Multivariate Behav. Res.* 12 (1), 43–47.
- Chen, Q., Anders, S., An, H., 2013. Measuring consumer resistance to a new food technology: A choice experiment in meat packaging. *Food Qual. Preference* 28 (2), 419–428.
- Contò, F., Santini, C., La Sala, P., Fiore, M., 2016. Reducing information gap and increasing market orientation in the agribusiness sector: Some evidences from Apulia region. *Recent Patents Food, Nutrit. Agric.* 8 (1), 48–54.
- Cosmina, M., Demartini, E., Gaviglio, A., Mauracher, C., Prestamburgo, S., Trevisan, G., 2012. Italian consumers' attitudes towards small pelagic fish. *New Medit* 11 (1), 52–57.
- Costa-Font, M., Gil, J.M., Traill, W.B., 2008. Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy. *Food policy* 33 (2), 99–111.
- Cox, D.N., Evans, G., 2008. Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale. *Food Qual. Preference* 19 (8), 704–710.
- Damsbo-Svendsen, M., Frøst, M.B., Olsen, A., 2017. Development of novel tools to measure food neophobia in children. *Appetite* 113, 255–263.
- De Devitiis, B., Carlucci, D., Nocella, G., Viscecchia, R., Bimbo, F., Nardone, G., 2018. Insights for the development of a functional fish product: Drivers and barriers, acceptance, and communication of health benefits. *J. Aquat. Food Prod. Technol.* 27 (4), 430–445.
- Delwaide, A.C., Nalley, L.L., Dixon, B.L., Danforth, D.M., Nayga, Jr., R.M., Van Loo, E.J., Verbeke, W., 2015. Revisiting GMOs: are there differences in European consumers' acceptance and valuation for cisgenically vs transgenically bred rice? *PLoS One* 10 (5), e012606.
- Demartini, E., De Marchi, E., Cavaliere, A., Mattavelli, S., Gaviglio, A., Banterle, A., et al., 2018a. Changing attitudes towards healthy food via self-association or nutritional information: what works best? *Appetite*.
- Demartini, E., Vecchiato, D., Tempesta, T., Gaviglio, A., Viganò, R., 2018b. Consumer preferences for red deer meat: A discrete choice analysis considering attitudes towards wild game meat and hunting. *Meat Sci.* 146, 168–179.
- DeSteuer, H., Odongo, W., Gellynck, X., 2016. Applying the food technology neophobia scale in developing country context. A case - study on processed matooke (cooking banana) flour in Central Uganda. *Appetite* 96, 391–398.
- Diehl, J.F., 2002. Food irradiation—past, present and future. *Radiat. Phys. Chem.* 63 (3–6), 211–215.
- Dovey, T.M., Staples, P.A., Gibson, E.L., Halford, J.C., 2008. Food neophobia and 'picky - fussy' eating in children: a review. *Appetite* 50 (2), 181–193.
- Dziuban, C.D., Shirkey, E.C., 1974. When is a correlation matrix appropriate for factor analysis? Some decision rules. *Psychol. Bull.* 81 (6), 358.
- Esbjerg, L., Burt, S., Pearce, H., Glanz-Chanos, V., 2016. Retailers and technology-driven innovation in the food sector: caretakers of consumer interests or barriers to innovation? *Br. Food J.* 118 (6), 1370–1383.
- FAO/WHO, 2011. Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption, Food and Agriculture Organization of the United Nations. World Health Organization, Rome, Geneva.
- Faraji-Rad, A., Melumad, S., Johar, G.V., 2017. Consumer desire for control as a barrier to new product adoption. *J. Consumer Psychol.* 27 (3), 347–354.
- Fiore, M., Gallo, C., Tsoukatos, E., La Sala, P., 2017. Predicting consumer healthy choices regarding type 1 wheat flour. *Br. Food J.* 119 (11), 2388–2405.
- Gaviglio, A., Demartini, E., Mauracher, C., Pirani, A., 2014. Consumer perception of different species and presentation forms of fish: An empirical analysis in Italy. *Food Qual. Preference* 36, 33–49.
- Gaviglio, A., Pirani, A., Demartini, E., 2013. Il quadro normativo sulle denominazioni commerciali dei prodotti ittici nella gestione delle frodi: strumento utile o problema irrisolto? *Econ. Agro-Alimentare* 1, 183–202.

- Guiné, R.P.F., Ramalhosa, E.C.D., Valente, L.P., 2016. New foods, new consumers: Innovation in food product development. *Curr. Nutr. Food Sci.* 12 (3), 175–189.
- Hayes, A.F., 2012. PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://www.afhayes.com/>.
- Honkanen, P., Olsen, S.O., Verplanken, B., 2005. Intention to consume seafood - the importance of habit. *Appetite* 45 (2), 161–168.
- Hu, W., Hünneimyer, A., Veeman, M., Adamowicz, W., Srivastava, L., 2004. Trading off health, environmental and genetic modification attributes in food. *Eur. Rev. Agric. Econ.* 31 (3), 389–408.
- Hudson, D., Seah, L.H., Hite, D., Haab, T., 2004. Telephone presurveys, self-selection, and non response bias to mail and internet surveys in economic research. *Appl. Econ. Lett.* 11 (4), 237–240.
- Eurostat, 2017. Innovation statistics, (Accessed 4th 2017).
- Jaeger, H., Knorr, D., Szabó, E., Hámori, J., Bánáti, D., 2015. Impact of terminology on consumer acceptance of emerging technologies through the example of PEF technology. *Innov. Sci. Emerg. Technol.* 29, 87–93.
- Kraus, A., Annunziata, A., Vecchio, R., 2017. Sociodemographic factors differentiating the consumer and the motivations for functional food consumption. *J. Am. Coll. Nutr.* 36 (2), 116–126.
- LaBarbera, F., Verneau, F., Amato, M., Grunert, K., 2018. Understanding westerners' disgust for the eating of insects: The role of food neophobia and implicit associations. *Food Qual. Preference* 64, 120–125.
- Lee, P.Y., Lusk, K., Miroso, M., Oey, I., 2016. Effect of information on Chinese consumers' acceptance of thermal and non-thermal treated apple juices: A study of young Chinese immigrants in New Zealand. *Food Qual. Preference* 48, 118–129.
- Lusk, J.L., Briggeman, B.C., 2009. Food values. *Am. J. Agric. Econ.* 91 (1), 184–196.
- Lusk, J.L., House, L.O., Valli, C., Jaeger, S.R., Moore, M., Morrow, J.L., Traill, W.B., 2004. Effect of information about benefits of biotechnology on consumer acceptance of genetically modified food: evidence from experimental auctions in the United States, England, and France. *Eur. Rev. Agric. Econ.* 31 (2), 179–204.
- Lusk, J.L., Roosen, J., Bieberstein, A., 2014. Consumer acceptance of new food technologies: causes and roots of controversies. *Annu. Rev. Resour. Econ.* 6 (1), 381–405.
- Maciel, E.S., Savay-Da-Silva, L.K., Galvão, J.A., Oetterer, M., 2015. Quality attributes related to the consumption of fish in the city of corumbá, MS. [Atributos de qualidade do pescado relacionados ao consumo na cidade de Corumbá, MS] *Bol. Inst. Pesca* 41 (1), 199–206.
- Maciel, E.S., Sonati, J.G., Lima, L.K.F., Savay-da Silva, L.K., Galvão, J.A., Oetterer, M., 2016. Similarities and distinctions of fish consumption in Brazil and Portugal measured through electronic survey. *Int. Food Res. J.* 23 (1), 395–402.
- McCullough, J.L., Ostrom, T.M., 1974. Repetition of highly similar messages and attitude change. *J. Appl. Psychol.* 59 (3), 395.
- Nicolosi, A., Fava, N., Marciandò, C., 2019. Consumers' preferences for local fish products in Catalonia. Calabria Sicily http://dx.doi.org/10.1007/978-3-319-92102-0_12.
- Pliner, P., Hobden, K., 1992. Development of a scale to measure the trait of food neophobia in humans. *Appetite* 19 (2), 105–120.
- Pliner, P., Pelchat, M., Grabski, M., 1993. Reduction of neophobia in humans by exposure to novel foods. *Appetite*.
- Pohlman, A.J., Wood, O.B., Mason, A.C., 1994. Influence of audiovisuals and food samples on consumer acceptance of food irradiation. *Food Technol.* 48 (12), 46–48.
- Schnettler, B., et al., 2017. Testing the abbreviated food technology neophobia scale and its relation to satisfaction with food-related life in university students. *Food Res. Int.* 96, 198–205.
- Schonlau, M., VanSoest, A., Kapteyn, A., Couper, M., 2009. Selection bias in web surveys and the use of propensity scores. *Sociol. Methods Res.* 37 (3), 291–318.
- Siegrist, M., Cousin, M.E., Kastenholz, H., Wiek, A., 2007. Public acceptance of nanotechnology foods and food packaging: The influence of affect and trust. *Appetite* 49 (2), 459–466.
- Siro, I., Kápolna, E., Kápolna, B., Lugasi, A., 2008. Functional food. Product development, marketing and consumer acceptance – A review. *Appetite* 51 (3), 456–467.
- Sjöberg, L., 2000. Factors in risk perception. *Risk Anal.* 20, 1–12.
- Stranieri, S., Ricci, E.C., Banterle, A., 2017. Convenience food with environmentally-sustainable attributes: A consumer perspective. *Appetite* 116, 11–20.
- Verneau, F., Caracciolo, F., Coppola, A., Lombardi, P., 2014. Consumer fears and familiarity of processed food. The value of information provided by the FTNS. *Appetite* 73, 140–146.
- Wang, F., Zhang, J., Mu, W., Fu, Z., Zhang, X., 2009. Consumers' perception toward quality and safety of fishery products. Beijing, China. *Food Control* 20, 918–922.
- Zhou, L., Jin, B., Cheng, G., Zhang, Z., Zeng, Q., Wang, D., 2015. Determinants of fish consumption by household type in China. *Br. Food J.* 117 (4), 1273–1288.