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# **Subjective Knowledge and Organic Fish Consumption in Europe**

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## **Abstract**

This study focused on investigating how subjective knowledge regarding organic food can influence organic food consumption in general and organic fish in particular. Data were collected through a consumer survey (n=2007) conducted in UK, France, Italy and Germany. Two distinct consumer groups were created based on their subjective knowledge level regarding organic food, consisting of 631 and 338 participants respectively. These consumer groups differed significantly with respect to: a) consumption behavior towards organic fish, b) motives and barriers for organic fish choice, c) use of information sources regarding organic fish and d) socio-demographic characteristics. A strong relation between subjective knowledge and organic food/fish consumption was identified. Main motives found for organic fish choice were concerns about personal health and environmental benefits while main barriers were high price and limited availability. These comparisons also revealed a consumer profile for future targeted marketing development with the aim to increase organic fish consumption. Recommendations for the targeted information campaigns to specific consumer segments through communication channels like internet and fish mongers were formulated. Several implications for policy makers and market actors were discussed.

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**1. Introduction**

The first time organic products appeared in Europe was in the 1920's. However, the difficult financial situation at that time hampered the development of the organic food market. It was not before the 80's that organic agriculture and relevant international standards started to develop. Since then, consumers' demand and in turn the number of farmers increased considerably in Europe and the United States (Lampkin & Padel 1994). Comparing organic products retail sales of the year 2014 globally, the USA was the leading single market (43% of global retail sales, valued at €27.1 billion), followed by the EU (38%, valued at €24 billion). Within EU (overview of retail sales distribution shown in Figure 1), Germany (€7.9 billion) was the largest organic single market, followed by France (€4.8 billion) which had shown very dynamic growth over the past couple of years. The UK (€2.3 billion) held third place, followed by Italy (€2.1 billion). From 2005 to 2014, the value of European and EU markets had more than doubled while per capita consumer spending on organic food almost doubled. For the year 2014's per capita spending on organic food, EU consumers spent around €47.4 (€35.5 in Europe) with the Swiss on first place with €221 per capita and the United States (€85) on second place.

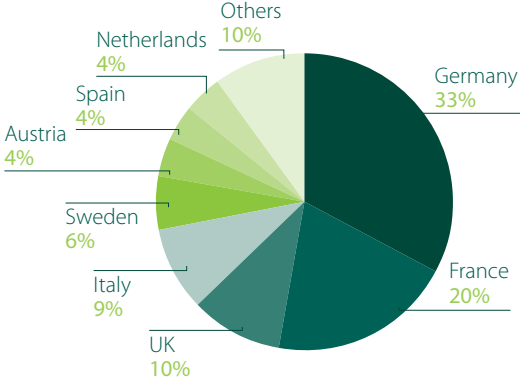


Figure 1: Distribution of organic retail sales in EU-28, 2014 (IFOAM 2016).

Worldwide in 2014, European countries accounted for the highest shares of organic food sales. As percentage of their respect markets for food, Denmark scored the highest share (7.6%). A number of individual organic products gained considerable shares of their respective total markets in terms of sales value in many European countries. Amongst them, organic eggs were one of the winners within the total retail market. For example, the market share in terms of sales value for organic egg in Germany and

France was 16.7% and 22.1% respectively in 2014. The other two highly popular organic products among European organic consumers were organic fruits and vegetables. Organic vegetables had the highest market shares after eggs, representing between 9% and 15% of the sales value of all vegetables sold in Switzerland, Austria, and Germany. On the other hand, products like organic beverages (except wine) and meat (especially poultry) had low market shares in general (IFOAM 2016).

Conversely, compared with the large and fast growth of the organic food market, organic aquaculture was not able to provide large quantities and diverse organic seafood (Tacon & Brister 2004). Worldwide in 2008, the total number of certified organic aquaculture businesses was just over two hundred with half of them situated in Europe (EC 2010). The total global production of organic aquaculture products increased from 5,000 tons in the year 2000 to 53,500 tons in 2009 (Bergleiter 2011). Even though organic aquaculture is taking place in most regions of the world (Lem 2005) and the potential overall growth of the organic seafood market exists, it is highly probable that this market will remain a niche (Toften 2008). However, for Sweden, organic fish and fish products retail sales accounted for 12% of 2014's total organic retail sales (1.4 billion euro). As a comparison, in France, it accounted for 2% of 2014's total retail sales (4.8 billion euro) (IFOAM 2016).

Regarding organically farmed fish species in 2008, Atlantic salmon was the most consumed in the EU, with a share of 80% of the whole European organic production, while species like rainbow trout, sea bass and sea bream were still in low quantities. Countries with largest production were United Kingdom, Ireland, Hungary, Greece and France (EC 2010). However absolute numbers were still low. For example, in the year 2012 less than ten companies were active in Italy and in Greece were three companies producing organic certified sea bass and sea bream in 2014. Norway - the leading world supplier of salmon - had invested in organic salmon production in UK and Ireland (Castellini et al. 2012; Polymeros et al. 2014).

More specifically about salmon, even though 80% of the European organic aquaculture production is salmon, total production in 2012 was just 20,600 tons, which only amounts to 1.4% of the total salmon production in Europe of nearly 1,500,000 tons. Ireland was the biggest organic producer in both volume



and relative production aspect. It produced 9,600 tons organic salmon in 2012 which represented almost 70% of the total production of salmon in Ireland and nearly half (46%) of the organic production in Europe. Norway, as the biggest producer of conventional salmon for the European market (1,240,000 tons or 80%), produced only 0.07% as organic. However, these 8,060 tons organic salmon amounts to 40% of the European production (Zubiaurre 2013).

Organic farming has been regulated on EU level since 1991, and in 2007 a regulation on organic aquaculture was introduced and established on a step-wise basis. As a young industry, the first EU regulation (EC Regulation 710/2009) for organic aquaculture was implemented in 2010.

In this context, the objective of OrAqua project is the aggregation and improvement of scientific knowledge and research to sustain established organic aquaculture and to suggest improvements by providing: i) recommendations for the regulatory framework for organic aquaculture in Europe and ii) increased understanding of organic farm economics as well as consumer perceptions and sentiments to guide farmers, regulators, policy makers and global seafood market actors. Thus, retailers, category managers and buyers will benefit from the clear and targeted communication of organic aquaculture, leading to a higher demand as well as a more stable delivery of aquaculture products. This could result from improved regulation and marketing and scaling up of production of a growing organic aquaculture industry as aimed at in the overall vision of OrAqua.

A lot of scientific attention has been put into organic food consumption behavior in general (Hemmerling et al. 2015). However, very few studies to date have focused on organic fish consumption and consumer behavior, even though consumer preferences are the driving factor behind the growth of organic aquaculture (Polymeros et al. 2014). For our study, we included variables with respect to organic food consumption behavior, subjective knowledge regarding organic food, use of information sources about organic fish and socio-demographic characteristics, to examine how these factors could influence organic fish consumption comprehensively.

To achieve this goal, first we investigated how influential the factor subjective knowledge could be on participants' consumption behavior by dividing them into two groups based on their subjective

knowledge about organic food. Second was an investigation of motives and barriers regarding organic fish, in which we aimed to find out the motivations and obstacles behind food choice towards organic fish. Third, we needed to identify which communication tool/information channel could be effective in order to communicate with consumers and deliver specific information to them to increase their knowledge level. Finally, the depiction of consumers' socio-demographic characteristics facilitated future marketing development towards organic fish. The theoretical framework which inspired the choice of elements we studied is listed below:

## **Theoretical background**

### ***Consumer knowledge***

Product knowledge is an important factor in consumer decision-making. It influences the way consumers gather information and subsequently choose what to purchase (Alba & Hutchinson 1987). Two conceptually different constructs can be identified: subjective knowledge (i.e. people's subjective perceptions of what or how much they know about a product, based on their own subjective interpretation) and objective knowledge (i.e. the accurate information about the product stored in consumer's long-term memory) (Park et al. 1994; Selnes & Gronhaug 1986).

According to previous studies, the correlation between these two measures often falls in the range from 0.3 to 0.6 (Brucks 1985; Carlson et al. 2009; Feick et al. 1992; Klerck & Sweeney 2007). As researchers have sometimes neglected the differences between these two constructs, it was recommended by Selnes and Gronhaug (1986) and Klerck and Sweeney (2007) to pay attention to the differences between both, as each has different impact on information processing and following consumer behavior. Furthermore, Selnes and Gronhaug (1986) proposed that subjective measures should be used for research regarding motivational aspects of product knowledge while objective measures should be preferred for ability differences. Furthermore, Selnes and Gronhaug (1986) and Feick et al. (1992) found that subjective knowledge is a stronger motivator for purchase-related behaviors in comparison to objective knowledge. Similarly, House et al. (2005) observed that higher levels of subjective knowledge were significantly

and positively related to consumers' willingness to eat genetically modified food while this relationship was not found with objective knowledge.

When it comes to knowledge and organic food, Demeritt (2002) reported that a lack of knowledge and low awareness about organic products were important barriers for buying organic food. In line with this, several studies found that a higher awareness and knowledge about organic food had a positive influence on the attitude towards and consumption of organic food (Gracia & de Magistris 2008; McEachern et al. 2005; Stobbelaar et al. 2007). Moreover, a study from Gotschi et al. (2007) found that objective knowledge about organic product labels had no significant relation to attitude and behavior towards organic food products. Similarly, Aertsens et al. (2011) found that objective knowledge had no direct influence on organic food consumption in comparison to subjective knowledge. Also, findings from Pieniak et al. (2010) suggested that subjective knowledge was the more important predictor of organic vegetables consumption when compared to objective knowledge.

### ***Motives and barriers***

Many previous consumer studies regarding organic food have researched motives and barriers that drive or limit organic food consumption. A literature review of organic food consumption conducted by Hemmerling et al. (2015) concluded that health, taste, safety and environmental protection were the main motives for purchasing organic food. According to Shepherd et al. (2005), the most important reason for consumers to buy organic food is health benefits. With regards to purchasing barriers, several studies identified the following barriers for organic consumption, starting with the most important: high price, limited availability, skepticism about the credibility of product claims, poor appearance, non-awareness of organic and contentment with existing products (Beharrell & MacFie 1991; Davies et al. 1995; Klonsky & Tourte 1998; Latacz-Lohmann & Foster 1997; Lockie et al. 2002; Magnusson et al. 2001; Makatouni 2002; Pearson 2001; Pearson 2002). For organic fish consumption, a study from Dagistan et al. (2009) presented the main effective factors that influence purchase were: price, shopping place, health and quality, which explained 65.34% of the variation.

### *Use of information sources*

Use of information sources is associated with consumer behavior and food choice (Alba & Marmorstein 1987) and information could significantly affect consumers' cognitive mechanisms and their perception of product properties (Caporale & Monteleone 2004). To get insights in which information sources consumers use frequently regarding organic fish is important so that the information can be delivered effectively. Consumer differences in the use of information sources depend on the food choice faced, the information communicated and the type of potential health or safety risk (Gutteling & Wiegman 1996; Jungermann et al. 1996). Taking fish for an example, a previous study reported that consumers mostly use personal sources of information like fishmongers, family and friends (Pieniak et al. 2007).

### *Aim*

Overall, the primary objective of this study was to identify differences in consumption behavior regarding organic food generally and organic fish in particular, among consumer groups categorized by different levels of subjective knowledge about organic food. The second objective was to investigate whether these consumer groups differed with respect to motives/barriers for consuming/buying organic fish, and use of information sources regarding organic fish and socio-demographics. By doing so, we aimed at getting a consumer profile for further target marketing purposes to increase organic fish consumption.

## **2. Materials and methods**

### **2.1 OrAqua consumer survey**

OrAqua consumer survey conducted in UK, France, Italy and Germany was designed according to established scientific methodology by the scientists in OrAqua. The purpose of this survey was to get insights about consumer perceptions of organic aquaculture and fish in Europe. Four international survey providing companies were contacted and evaluated by Nofima who was a partner involved in OrAqua project. After a selection based on price and quality regarding performing the survey, IPSOS

was chosen to recruit a representative sample of consumers and collect the data. The results from the survey were delivered in raw data format.

This study was based on data collected from the survey. A final sample of 2007 consumers was obtained with a quota of minimum 25% organic food consumers included. The gender, age, household size, occupation and country distribution of the total sample is presented in Table 1. This online survey measured a wide variety of constructs including consumer motives and barriers, use of information sources, knowledge and consumption behavior with respect to organic fish.

*Table 1: Overview of the whole survey's characteristics (n=2007).*

<b>Gender</b>	
male	42.1 %
female	57.9 %
<b>Age</b>	
18-24	6.7 %
25-34	18.5 %
35-44	26.7 %
45-54	24.1 %
55-65	24.1 %
Mean(SD)	44.56 (12.58)
<b>Household size</b>	
1	37.6 %
2	29.0 %
3	14.7 %
4	11.8 %
5+	6.9 %
<b>Occupation</b>	
Professional/manager/executive	13.0 %
Business owner/self-employed	6.9 %
Other white collar	22.5 %
Blue collar	5.5 %
Government employee	8.9 %
Technical worker	3.6 %
Housewife/Househusband	7.8 %
Retired	14.7 %
Student	5.0 %
Others	12.2 %
<b>Country</b>	
UK (n=503)	25.1%
France (n=501)	25.0%
Italy (n=501)	25.0%
Germany (n=502)	25.0%

**2.2 Measures**

**Subjective knowledge measures regarding organic food**

Three statements were used to assess consumer’s subjective knowledge. These items were “I feel that I know a lot about organic food”, “Compared to my friends, I know a lot about organic food” and “Compared to experts, I know a lot about organic food”. Participants were asked to rate how much they agree or disagree with these statements by using a 7-point Likert scale ranging from “1 strongly disagree” to “7 strongly agree”. This measure is consistent with measures used in previous research (Park et al. 1994). The relevant part of the survey is shown in the appendix (section 7.2).

*Categorization of low and high knowledge consumer groups*

The average knowledge variable regarding organic food was computed by averaging above 3 items and the percentages of consumers is displayed in Figure 2. Then another variable containing two groups which were defined as “low” and “high” knowledge groups was created based on above average subjective knowledge variable. The 1st quartile (1.667) and 3rd quartile (4) were chosen as cut points for low and high knowledge groups respectively. The low knowledge (LK) group consisting of 631 consumers was ranging from 1 to 1.667 while the high knowledge (HK) group made up of 338 consumers was from 4.33 to 7 by excluding 4 as it denotes neither agree or disagree.

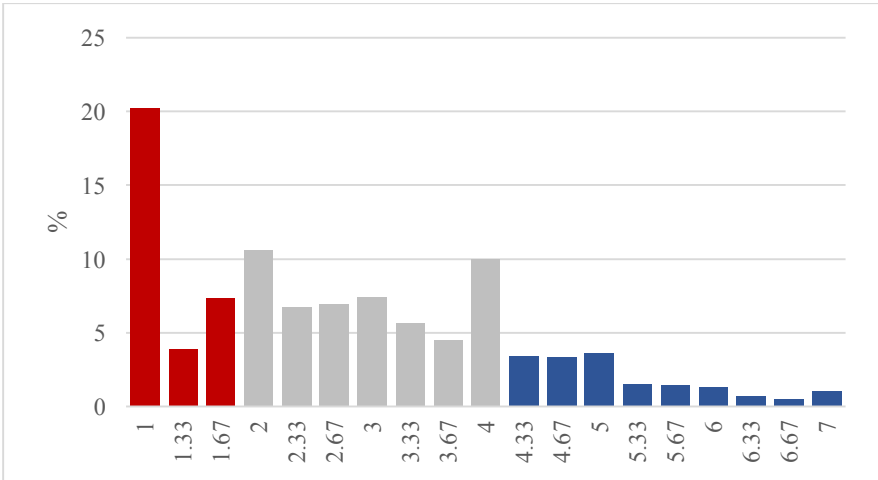


Figure 2: Bar chart of consumers’ average organic food knowledge (as percent of the total sample size n=2007).

Red bars indicate the low knowledge group (LK) and blue bars the high knowledge group (HK).

### **Consumption behavior of organic food**

Consumers were asked to rate how often they consumed organic food during the last year. The organic food items were “Fruit/juice”, “Vegetables”, “Red meat”, “Dairy products”, “Poultry”, “Eggs”, “Fish/seafood”, “Grains”, “Beverages” and “Other”. A 7-point scale ranging from “never” to “more often than once a week” was used.

The monthly consumption frequency variables were computed by recoding the response categories as follows: “never” = 0, “less than once a month” = 0.5, “once a month” = 1, “twice a month” = 2, “three times a month” = 3, “once a week” = 4, and “more often than once a week” = 5.5. These variables are shown in Figure 4 and Figure 5. A similar method was used in Vereecken et al. (Vereecken et al. 2005).

In order to get an in-depth comparison, organic fish consumption behavior between LK and HK groups needed to be put into a bigger context. This was achieved by comparing them with other organic food categories and also with the general consumption frequency across UK, France, Italy and Germany. These countries were chosen to represent main European markets for organic fish. The entire organic food consumption behaviors are displayed in results section 3.1.

### **Motives and barriers for consuming organic fish**

Participants were asked to rate their motives and barriers for organic fish consumption by using a 7-point Likert scale ranging from “1 strongly disagree” to “7 strongly agree”. A total of 14 statements could be divided into two categories: motives and barriers. The motives consisted of 10 items: “Organic fish tastes better than conventional fish”, “I believe that organic is an important issue”, “I always buy organic fish”, “It makes me feel good to buy organic fish”, “I believe that organic fish is good for my health”, “Organic fish has good quality”, “Organic fish is safe to eat”, “Organic fish contains no additives”, “Buying organic fish is good for the environment” and “Organic fish is good value for money”. Barriers were measured with 4 items: “Organic fish is too expensive for my budget”, “I don’t care whether the fish I buy is organic”, “The fish species I like are not available as organic” and “Organic fish is not available where I shop”. Measure used is consistent with DEFRA (2011).

### **Use of information sources regarding organic fish**

Respondents were asked about the frequency of their use of information sources with respect to organic fish. Seventeen items were rated by using a 7-point Likert scale ranging from “never” (1) to “very often” (7). These 17 items were family and friends, fish industry, consumer organization, government, scientists, fishermen/ fish farmers, supermarkets, fish monger, doctor and dietician, newspapers, internet, social media, television, advertising, public health recommendations and radio. The measure was adapted from Pieniak et al. (2007).

### **2.3 Data analysis**

Statistical methods: one-way analysis of variance was used to compare group means and post-hoc analysis (LSD) was used to test for the hypothesis about differences between countries. Cross-tabulation and Pearson Chi-Square tests were used to compare the socio-demographic characteristics of the consumer groups and organic food consumption levels. Differences were considered statistically significant when  $p < 0.05$ . The analysis was performed by using the statistics software SPSS (statistics version 24 for iOS, [www.ibm.com/analytics/us/en/technology/spss/](http://www.ibm.com/analytics/us/en/technology/spss/)).



### **3. Results**

#### **3.1 Consumption behavior**

##### **3.1.1 Consumption behavior regarding LK and HK groups**

Table 2 reports significant differences regarding organic food consumption between LK and HK groups. The top 4 most often consumed items for the HK and LK group were vegetables, dairy products, fruit/juice and eggs. However, in a different order: Eggs were the second most consumed product for the LK group and the fourth most consumed product of the HK group. The 3 least consumed items were grains, red meat and fish/seafood. These items had similar frequencies for the HK group. For the LK group, red meat was consumed 30-35% more often than the other two.

Furthermore, the LK group's consumption frequency of organic food was in general much lower compared with the HK group. Figure 3 visualizes these differences. All means were at least 1.19 lower for the LK group in comparison to the HK group. However, mean differences between LK and HK were similar for all categories (average of mean differences = 1.42, SD=0.13).

In addition, Figure 4 and Figure 5 show that the highest percentage of cases from the LK group belonged to the 0-consumption level for all organic food items. However, consumers from the HK group distributed relatively evenly across all the consumption levels. For organic fish, 50.7% (LK) and 17.2% (HK) of consumers respectively, did not consume any organic fish. The numbers shown in the figures can be found in the appendix Table 9 and Table 10.

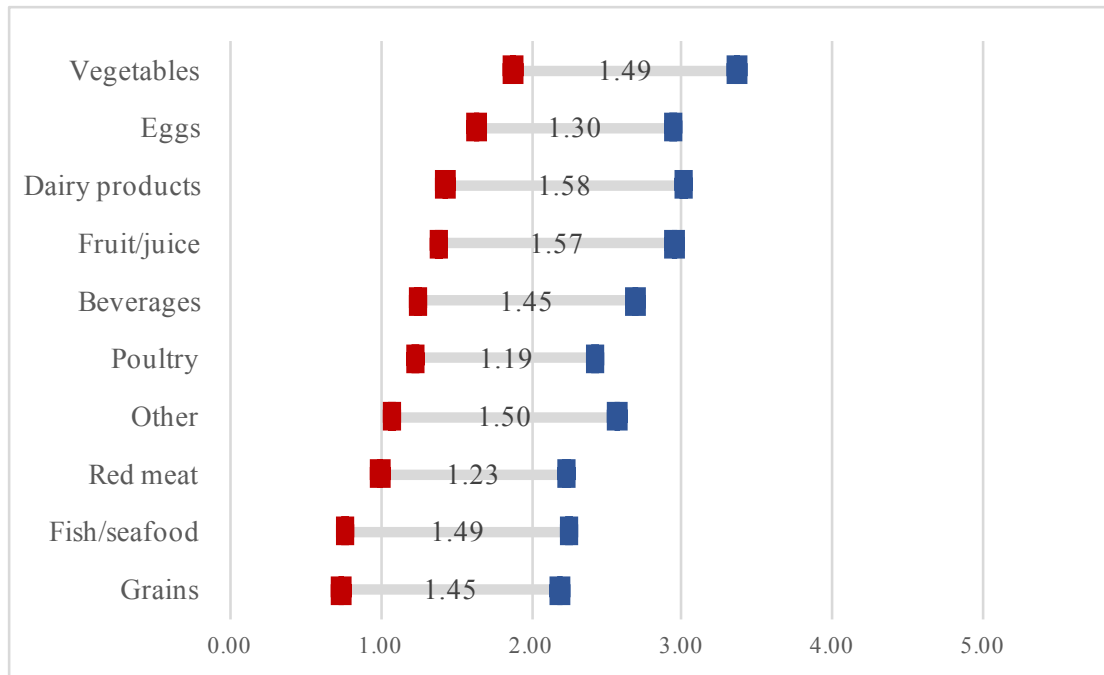


Figure 3: Mean scores for consumption frequency. Red squares indicate means of LK and blue squares of HK (as shown in Table 2). The differences between these two values are indicated by grey bars and the actual differences as numbers. The items were sorted according to LK means.

Table 2: Consumption frequency of organic food categories between LK and HK groups.

	LK Mean	SD	HK Mean	SD	Total mean	Mean diff	p-Value*
Fruit/juice	1.38	1.94	2.95	2.01	1.93	1.57	<0.001
Vegetables	1.87	2.06	3.36	1.99	2.39	1.49	<0.001
Red meat	0.99	1.54	2.23	1.81	1.42	1.23	<0.001
Dairy products	1.42	1.98	3.01	1.96	1.98	1.58	<0.001
Poultry	1.23	1.65	2.43	1.82	1.65	1.19	<0.001
Eggs	1.63	1.84	2.94	1.86	2.09	1.30	<0.001
Fish/seafood	0.76	1.23	2.25	1.77	1.28	1.49	<0.001
Grains	0.73	1.40	2.18	1.91	1.24	1.45	<0.001
Beverages	1.24	2.02	2.69	2.06	1.75	1.45	<0.001
Other	1.07	1.78	2.57	1.92	1.59	1.50	<0.001

\*Significance based on one-way ANOVA.

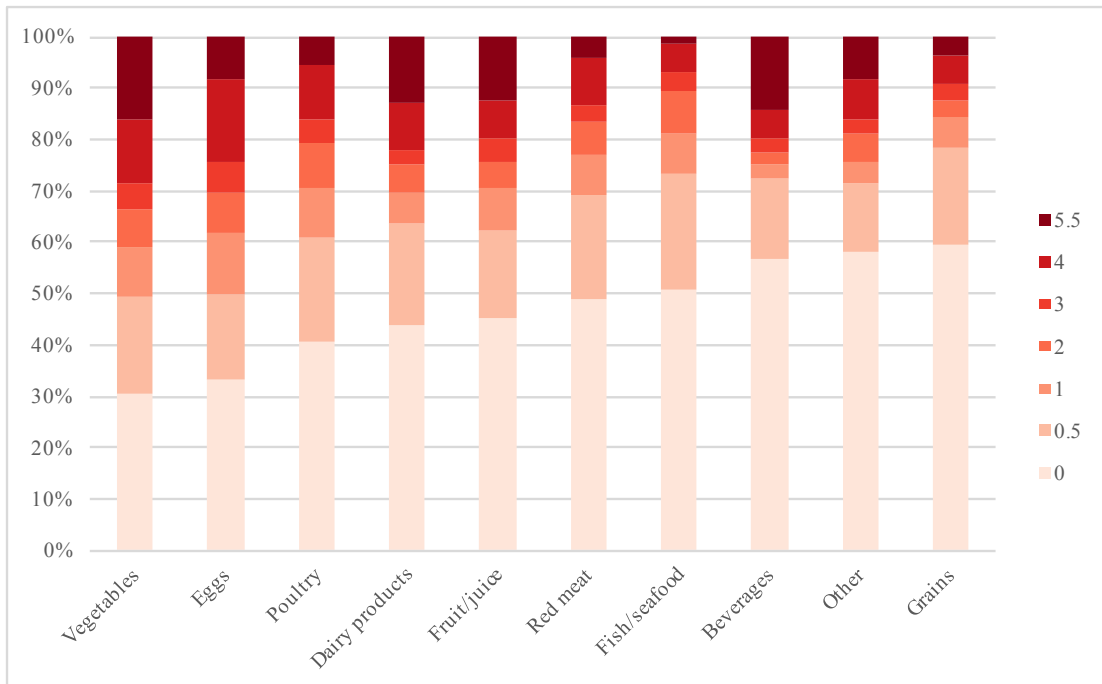


Figure 4: Percentage of all consumption levels of organic food categories for LK group. Numbers indicate consumption frequency per month. Items were sorted according to 0-consumption level.

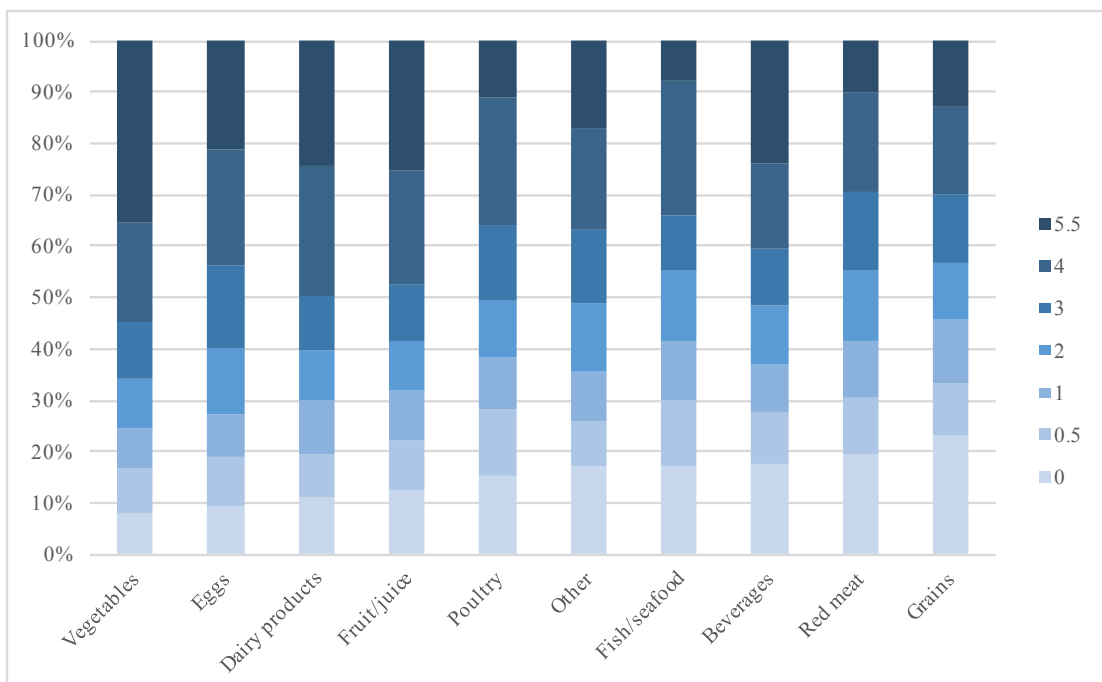


Figure 5: Percentage of all consumption levels of organic food categories for HK group. Numbers indicate consumption frequency per month. Items were sorted according to 0-consumption level.

### 3.1.2 Consumption behavior regarding the whole sample

Table 3 displays differences in organic food consumption frequency across the four countries. All categories were significantly different ( $p < 0.05$ ) except for dairy products and beverages ( $p = 0.874, 0.100$  respectively). Italians had the highest consumption in all significantly different items except for grains, which they shared with France. The top 3 most often consumed items were vegetables, eggs and dairy products, while the least two were grains and fish/seafood. For organic fish, Italians had the highest consumption frequency (1.55 times per month) while Germans had the lowest (1.09 times per month)

*Table 3: Consumption frequency (times per month) of organic food categories across UK, France, Italy and Germany. In case of significant ANOVA results (column “p-Value”), a LSD post-hoc test was performed. Groups which do not share a lower case letter, were significantly different to each other.*

	UK	France	Italy	Germany	Total	p-Value
Vegetables	2.39 <sup>b</sup>	2.37 <sup>b</sup>	2.74 <sup>a</sup>	2.43 <sup>b</sup>	2.48	0.015
Eggs	2.02 <sup>b</sup>	1.97 <sup>b</sup>	2.33 <sup>a</sup>	2.03 <sup>b</sup>	2.09	0.009
Dairy products	2.04	2.01	2.11	2.03	2.05	0.874
Fruit juice	1.77 <sup>b</sup>	1.96 <sup>b</sup>	2.32 <sup>a</sup>	1.85 <sup>b</sup>	1.97	<0.001
Beverages	1.63	1.63	1.91	1.72	1.72	0.100
Poultry	1.63 <sup>b</sup>	1.65 <sup>b</sup>	1.93 <sup>a</sup>	1.40 <sup>c</sup>	1.65	<0.001
Other	1.45 <sup>b</sup>	1.55 <sup>b</sup>	1.94 <sup>a</sup>	1.53 <sup>b</sup>	1.62	<0.001
Red meat	1.30 <sup>cd</sup>	1.52 <sup>b</sup>	1.79 <sup>a</sup>	1.16 <sup>d</sup>	1.44	<0.001
Fish/seafood	1.30 <sup>b</sup>	1.20 <sup>bc</sup>	1.55 <sup>a</sup>	1.09 <sup>c</sup>	1.28	<0.001
Grains	1.45 <sup>a</sup>	0.92 <sup>b</sup>	1.02 <sup>b</sup>	1.48 <sup>a</sup>	1.22	<0.001
n	503	501	501	502	2007	

### 3.2 Motives and barriers for consuming organic fish

Table 4 displays significant differences in motives and barriers towards organic fish consumption between LK and HK groups except the item “Organic fish is not available where I shop”, which differed only marginally between groups ( $p=0.184$ ). In general, HK group reported relatively more agreement with all the statements except two items “Organic fish is too expensive for my budget” and “I don’t care whether the fish I buy is organic”, which can be seen in Figure 6. Furthermore, HK group agreed most with the statement “I believe that organic is an important issue” and least with “I don’t care whether the fish I buy is organic” while LK group scored highest for the item “Organic fish is too expensive for my budget” and lowest for the statement “I always buy organic fish”. Regarding mean differences between these two groups, the biggest difference was found for the motive item “I always buy organic fish”. Moreover, the four items as barriers occupied the smallest four mean differences with “Organic fish is not available where I shop” as the lowest one.

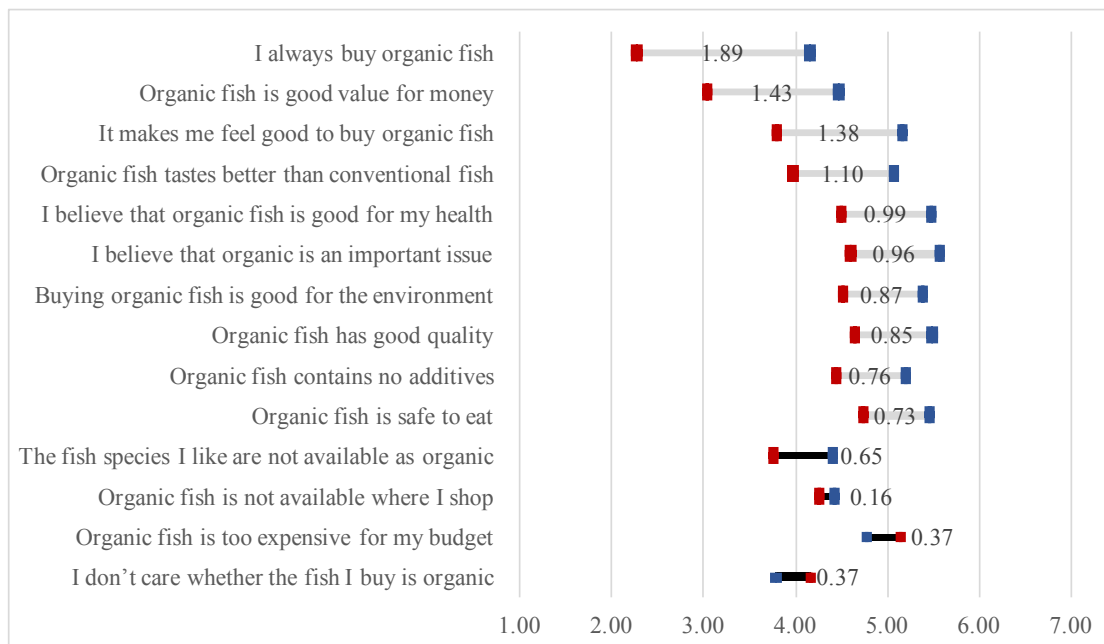


Figure 6: Motives and barriers comparison between LK and HK consumer groups. Red squares indicate means of LK and blue squares of HK (as shown in Table 4). The differences between these two values are indicated by grey bars for motives and black bars for barriers. The items were sorted according to their differences.

Table 4: Mean and SD for motives and barriers comparison between LK and HK consumer groups. The column “Mean diff” indicates the difference HK-LK means. Both motives and barriers were sorted according to the total mean.

	LK		HK		Total mean	Mean diff	p-Value*
	Mean	SD	Mean	SD			
<i>Motives:</i>							
Organic fish is safe to eat	4.73	1.54	5.46	1.41	4.99	0.73	<0.001
Organic fish has good quality	4.64	1.44	5.49	1.34	4.94	0.85	<0.001
I believe that organic is an important issue	4.60	1.75	5.56	1.47	4.93	0.96	<0.001
I believe that organic fish is good for my health	4.49	1.61	5.48	1.47	4.83	0.99	<0.001
Buying organic fish is good for the environment	4.51	1.60	5.38	1.53	4.81	0.87	<0.001
Organic fish contains no additives	4.44	1.61	5.20	1.58	4.70	0.76	<0.001
Organic fish tastes better than conventional fish	3.97	1.53	5.08	1.58	4.36	1.10	<0.001
It makes me feel good to buy organic fish	3.79	1.69	5.17	1.60	4.27	1.38	<0.001
Organic fish is good value for money	3.04	1.50	4.47	1.72	3.54	1.43	<0.001
I always buy organic fish	2.27	1.42	4.15	1.82	2.93	1.89	<0.001
<i>Barriers:</i>							
Organic fish is too expensive for my budget	5.15	1.66	4.78	1.64	5.02	-0.37	0.001
Organic fish is not available where I shop	4.26	1.75	4.41	1.81	4.31	0.16	0.184
I don't care whether the fish I buy is organic	4.16	1.82	3.78	1.98	4.02	-0.37	0.003
The fish species I like are not available as organic	3.76	1.54	4.41	1.70	3.98	0.65	<0.001

\*Significance based on one-way ANOVA.

### 3.3 Use of information sources regarding organic fish

Comparison of the frequency of the use of information sources between the two groups is presented in Table 5. All sources were significantly different between the groups. The top 4 most often used sources for HK group were internet, fish monger, family and friends, and consumer organization. Fish monger, internet, family and friends, television were the top 4 for the LK group. Furthermore, government, doctor, radio and fish industry were least used for HK group while fish industry, social media, doctor and government/dietician (same score) for the LK group. Generally, both groups' scores on the use of information sources were very low as none of the mean scores exceeded the midpoint of the scale, except for the "internet" score of 4.28 in the HK group. In addition, scores from LK group were much lower in comparison with the scores from HK group, especially for information sources like internet and consumer organization. Figure 7 visualizes these differences. All means were at least 1.54 higher for the HK group compared with the LK group.

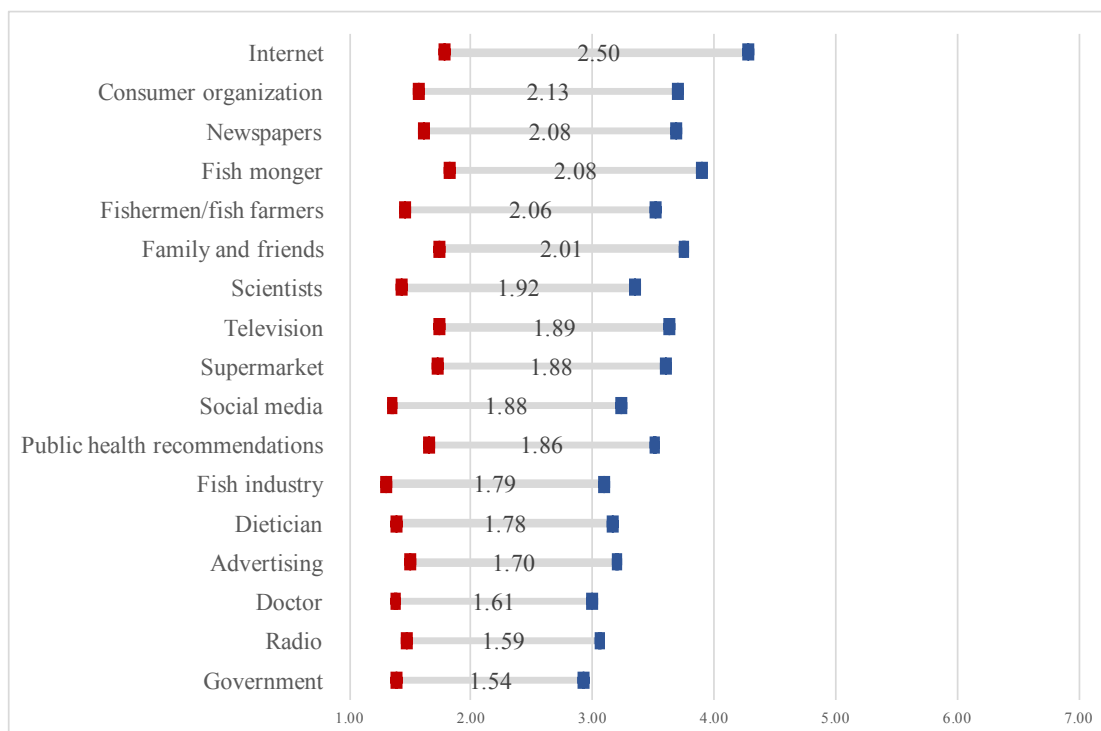


Figure 7: Mean scores for usage of information sources. Red squares indicate means of LK and blue squares of HK (as shown in Table 5). The differences between these two values are indicated by grey bars and the actual differences as numbers. The items were sorted according to their differences.

Table 5: Mean scores and SD for use of information sources. The column “Mean diff” indicates the difference HK-LK means.

	LK Mean	SD	HK Mean	SD	Total mean	Mean diff	p-Value*
Family and friends	1.74	1.38	3.75	1.96	2.44	2.01	<0.001
Fish industry	1.30	0.84	3.09	1.89	1.92	1.80	<0.001
Consumer organization	1.57	1.25	3.70	2.01	2.31	2.13	<0.001
Newspapers	1.61	1.22	3.69	2.03	2.33	2.08	<0.001
Internet	1.78	1.46	4.28	2.11	2.66	2.50	<0.001
Social media	1.35	0.96	3.23	2.06	2.01	1.88	<0.001
Government	1.39	0.99	2.93	1.92	1.93	1.54	<0.001
Scientists	1.43	1.10	3.35	1.99	2.10	1.92	<0.001
Fishermen/fish farmers	1.46	1.17	3.52	2.03	2.18	2.06	<0.001
Television	1.74	1.37	3.63	1.96	2.40	1.89	<0.001
Supermarket	1.72	1.34	3.60	1.95	2.38	1.89	<0.001
Fish monger	1.82	1.50	3.90	2.03	2.54	2.08	<0.001
Doctor	1.38	0.98	2.99	2.00	1.94	1.62	<0.001
Advertising	1.50	1.09	3.20	1.99	2.09	1.71	<0.001
Public health recommendations	1.65	1.30	3.51	1.98	2.30	1.87	<0.001
Dietician	1.39	1.03	3.17	2.02	2.01	1.78	<0.001
Radio	1.47	1.09	3.06	1.96	2.02	1.59	<0.001

\*Significance based on one-way ANOVA.



### **3.4 Socio-demographic characteristics**

Significant differences within socio-demographic composition between two consumer groups is presented in Table 6. Starting from gender, women were significantly over-represented (60.7%) in LK group. Higher proportions of young people (below 35 years), lower proportions of older people (over 45 years) and lower age mean were found in HK group in comparison to the LK group. For both groups, more than one third of the participants were living in single households. However, the LK group had higher proportion in 2-person households while the HK group was higher in 3, 4 and 5+ households. Regarding occupation, more participants in HK group were business owner/self-employed, other white collar, blue collar and student, while more were professional/manager/executive, government employee and retired in the LK group. The remaining 3 categories (technical worker, housewife/househusband and others) were more evenly distributed. Finally, more British and French were found in the LK group and more Italians in the HK group while Germans were relatively evenly distributed in both groups.

Table 6: Social-demographic profile of the consumer groups.

Social-demographic profile	Consumer groups		Total	p-Value	F-Value* / Pearson $\chi^2$
	LK (631)	HK (338)			
<i>Gender</i>				0.003	8.66
male	39.30%	49.10%	42.70%		
female	60.70%	50.90%	57.30%		
<i>Age</i>				0.015	12.28
18-24	5.10%	9.50%	6.60%		
25-34	16.30%	20.70%	17.90%		
35-44	28.10%	27.80%	28.00%		
45-54	25.40%	20.40%	23.60%		
55-65	25.20%	21.60%	23.90%		
Mean	45.65	42.95	44.71	0.001	10.3
SD	12.31	12.87	12.57		
<i>Household size</i>				<0.001	5
1	36.45%	35.21%	36.02%		
2	33.44%	22.49%	29.62%		
3	14.10%	20.41%	16.31%		
4	11.09%	13.02%	11.76%		
5+	4.91%	8.88%	6.30%		
<i>Occupation</i>				<0.001	38.28
Professional/manager/executive	13.30%	9.50%	12.00%		
Business owner/self-employed	4.80%	10.10%	6.60%		
Other white collar	21.20%	25.10%	22.60%		
Blue collar	4.60%	7.10%	5.50%		
Government employee	9.40%	7.40%	8.70%		
Technical worker	4.10%	4.70%	4.30%		
Housewife/Houseman	8.90%	9.20%	9.00%		
Retired	18.20%	8.90%	15.00%		
Student	3.30%	7.40%	4.70%		
Others	12.20%	10.70%	11.70%		
<i>Country</i>				<0.001	110.56
UK (n=256)	30.10%	19.50%	26.40%		
France (n=243)	31.10%	13.90%	25.10%		
Italy (n=228)	13.60%	42.00%	23.50%		
Germany (n=242)	25.20%	24.60%	25.00%		

\*F-value for the age mean, Chi-square for all other tests.

## **4. Discussion**

### **Consumption behavior**

Our results indicated that subjective knowledge about organic food was significantly related to organic food consumption and consumers with higher subjective knowledge about organic food consume organic food more often. These findings confirmed a previous study done by Aertsens et al. (2011) for the specific case of organic vegetables. They found that higher levels of subjective knowledge about organic vegetables were positively correlated with consumption behavior. This can be further explained by studies from Chryssochoidis (2000) and Gracia and de Magistris (2007). They observed that a higher level of product knowledge will positively influence the intention to purchase organic food. Gracia and de Magistris (2007) explained this by knowledge being the only instrument consumers have in order to differentiate the attributes of organic products from conventional products and in turn to form positive attitudes toward them. Also, Chryssochoidis (2000) argued that weak perceived self-competence could keep consumers away from organic food as they would feel incapable of making a good choice. In this respect, Thøgersen (2009) confirmed that uncertainty has a direct negative impact on the intention to buy organic food and on the translation from purchase intention into actual purchase towards organic food.

Furthermore, in order to facilitate understanding of how practically influential this factor could be, Table 7 was added in this section, showing the consumption frequency of each group in comparison with the general consumption frequency of the whole sample. We noticed that in average, HK consumed all organic food categories almost one time per month more than the total sample, while LK consumed 0.5 time less. These findings from our study imply that policy makers and market actors should consider subjective knowledge as one of important factors that influence organic food consumption generally and organic fish consumption in particular. Higher subjective knowledge level about organic food may not only trigger new customers to try organic products, but also it is likely to increase the consumption frequency among existing consumers of organic food. In order to raise consumers' subjective knowledge and in turn increase organic fish consumption, for example, one could employ promotion campaigns

that offer all organic food items temporarily at lower prices to attract consumers to experience them. Also, according to Aertsens et al. (2009), an interesting strategy for retailers is to provide a visible place in a shop for organic food/fish to increase consumers' familiarity with these organic products. Aertsens et al. (2009) and Richter and Hempfling (2003) stressed that those retailers who were successful in the organic products sales often invested a high proportion of their resources in communication related to the organic assortment. Such efforts not only convey objective information regarding organic food among consumers, but also provide consumers a subjective feeling of being informed about organic products and in turn raise their subjective knowledge.

*Table 7: Comparison between total mean organic food consumption frequency (numbers from Table 3) and consumption for LK and HK (Table 2). Numbers are the differences of the respective group means minus total mean.*

	Total mean	Difference to the total mean LK	HK
Vegetables	2.48	-0.61	0.88
Eggs	2.09	-0.46	0.85
Dairy products	2.05	-0.63	0.96
Fruit/juice	1.97	-0.59	0.98
Beverages	1.72	-0.48	0.97
Poultry	1.65	-0.42	0.78
Other	1.62	-0.55	0.95
Red meat	1.44	-0.45	0.79
Fish/seafood	1.28	-0.52	0.97
Grains	1.22	-0.49	0.96
Organic food mean	1.75	-0.52	0.91

Our study also showed that organic fish was among the least often consumed organic items across the whole sample. In contrast, vegetables, eggs, dairy products and fruit/juice were the popular items among consumers, especially for vegetables whose consumption frequency almost doubled compared to organic fish. IFOAM (2016) referred to this aspect by investigating product sales in national organic retail markets in Europe. They found that vegetables and fruits were the most popular group amongst organic consumers in France, Germany and Sweden in 2014. This could be expected as vegetables and

fruits were pioneering organic products in Europe. This market situation may be used as an advantage for organic fish retailing. For example, retailers could advertise more dominant organic food items like organic vegetables together with organic fish in order to help the latter get more attention from organic vegetables buyers. Moreover, a promotion package with price discounts could be offered by retailers if consumers buy both items. However, we need to keep in mind that fish is generally less often consumed than vegetables, fruits and dairy products, which are part of most people's daily diets. Thus, a general increase in fish consumption would likely increase the organic fish consumption simultaneously.

### **Motives and barriers**

Regarding motives and barriers, the four items with the smallest differences were all from barriers category. This finding showed that barriers were more similar for both groups while motives tended to be more different. In other words, both groups faced the same problems even though they had different motives. The common barriers which were limiting the organic fish consumption were first high price and second limited availability. These findings confirmed previous studies (Beharrell & MacFie 1991; Davies et al. 1995; Klonsky & Tourte 1998; Latacz-Lohmann & Foster 1997; Lockie et al. 2002; Magnusson et al. 2001; Makatouni 2002; Pearson 2001; Pearson 2002). These authors investigated barriers for organic consumption, starting with high price as the most important, then limited availability, skepticism about the credibility of product claims, poor appearance, non-awareness of organic and contentment with existing products. In addition to the high price as the most important barrier to organic fish consumption, a study by O'dierno et al. (2006) found that around 25% of the respondents throughout the survey in the USA expressed the belief that organic seafood is not significantly different from conventional seafood and should not have higher prices. This aspect was investigated by Prins et al. (2016). They reported that the cost price of organic aquaculture is 20% to 50% higher compared to conventional aquaculture across species and production region according to the implementation of European Commission Regulation EC no. 2009/703. One of the main reasons for the higher production costs was that only organically produced feedstuff was allowed to use. For example, the price of organic carp feed which mainly consist of cereals is doubled compared with the price of conventional feed. These findings imply that besides the limited possibility of lowering the prices, market actors could

better justify the higher price of organic fish. Zielke (2010) referred to this aspect in more detail and found that perceived value was the most important driver of shopping intentions in organic food stores. He suggested that retailers should communicate actively and justify price differences between organic products and conventional products. In other words, retailers should improve price justification by emphasizing the added value of organic fish. These findings pointed in the same direction as discussed previously in this thesis (“consumption behavior” chapter) and indicated that an information campaign is one of the most promising steps to increase the consumption of organic fish. It may be difficult to lower the retailing price to a similar level as conventional products because of the higher production costs of organic fish. Thus, improving the information/knowledge level of the customers may be easier to achieve.

Our results also indicated that another important barrier to limit organic fish consumption was availability. These findings were confirmed in a review article by Hemmerling et al. (2015). They found that consumers from different countries reported that they were not satisfied with the number of purchase locations for organic products and that they would welcome a wider net of purchase places. They also stated that limited availability discouraged them from purchasing organic food and that they were willing to buy more organic food if the availability increased. This pointed out that all stakeholders regarding organic fish should prioritize the supply side in order to meet consumer demand.

In regard to purchasing motives, our results showed a similar agreement of the HK group with high importance ratings for the importance of organic as an issue, quality, health concern, safety and environmental concern. This showed that these consumers were not only motivated by personal but also environmental benefits. However, in an earlier article by Shepherd et al. (2005), the most important reason for consumers to buy organic food was the individual health benefit, while altruistic concern about the environment was not of great importance. This change in consumer motives could be explained by a change of priorities during the last decade, since topics as climate change and environmental friendly lifestyles moved more into focus.

### **Use of information sources**

With respect to the use of information sources, our results indicated that respondents did not search very actively for information about organic fish in general. Internet was identified as the only information source, which was mentioned with an average score of more than four by the HK group. The second highest for this group was fish mongers. These findings were not entirely in agreement with a study by Pieniak et al. (2013). They found product labels and sellers in retail outlets or supermarkets were most frequently used information sources by consumers when buying fish and aquaculture products, followed by the internet and television. It was pointed out that labelling of retailers and supermarkets were of highest importance. Pieniak et al. (2013) further suggested that a simple and easily recognizable labelling system should be developed to assist the consumers' decision making. Thus, such a labelling system would also make it easier to communicate recommendations through fish mongers and internet add campaigns. However, a recent study by Honkanen et al. (2016) reported that consumers' familiarity of organic labels was low, especially the Euro-leaf (1.9 on a 7-point scale), which was meant to help consumers make informed choices in the jungle of private and national organic labels in the EU area. This could be explained by the short history of the Euro-leaf label which was introduced in 2010. Also, it was a result of the communication strategy or lack of it. It showed that relying on a label alone cannot reach its users effectively, but requires a combined information strategy.

### **Socio-demographics**

In regard to socio-demographics, our results indicated statistically significant linkages between gender, age, household size, occupation, country and subjective knowledge level. To some extent, these results can be explained by previous research from Botonaki et al. (2006) who found that different characteristics regarding consumers' socio-economic and demographic were associated with differences in consumers' attitudes and purchasing behavior towards organically certified food. Also, O'dierno et al. (2006) found a correlation between consumers' educational level and interest in purchasing organic seafood while Polymeros et al. (2014) provided evidence that consumers' socioeconomic and demographic characteristics were key factors to determine consumers' purchasing behavior for organic aquaculture products. Moreover, Dettmann and Dimitri (2009) reported that households with high

education level were more likely to purchase organic vegetables while the probability was lower for older households. However, comparable measures regarding education level and income level were not available in our study which future research could look into.

More specifically, our results showed that LK consisted of relatively more women, people over 45 years in age and living in small households. The occupations with more managers, government employee and retired were likely correlated with the higher age in this group. In contrast, HK consisted of more young people (up to 34 years), living in bigger households. The occupations were likely partly correlated with the lower age in this group, with more self-employed, blue/white collar and students. These findings could be used as a basis to plan more targeted information campaigns for each group. For example, combining insights from the previous chapter regarding communication channels, we could reach the HK group through a blog or some other social network platform. Besides, an interesting finding was that women were over-represented in the LK group which seemed not in agreement with a study done by Ureña et al. (2008). They reported that women had a more favorable attitude towards organic food purchase and consumption than men. This aspect should be addressed in further research. Interesting was also the significantly higher subjective knowledge in Italy. Further research to identify the reasons for a potentially higher knowledge level could help to improve future information campaigns. In addition, the relatively lower knowledge level in Britain and France showed that these countries have a greater need for improvement.

### **Marketing insights towards organic fish consumption**

Overall, linking group socio-demographics differences together with group differences with respect to consumption behavior, motives/barriers, use of information sources, our entire results identified a differentiated consumer profile summarized in Table 8. This classification facilitates future marketing development by depicting the consumers' socio-demographic characteristics together with their motives/barriers towards organic fish consumption, use of information sources regarding organic fish and consumption behavior. The results suggested that HK were high-potential organic fish consumers while LK represented low-potential consumers of organic fish who indicated a significantly lower subjective knowledge towards organic food. Thus, in order to improve knowledge regarding organic



food in general, and organic fish in particular and consequently increase the organic fish consumption, the adoption of a marketing strategy aiming to boost knowledge about organic food generally, organic fish particularly, is a promising strategy. In particular, the results supported the adoption of a market segmentation strategy with a principal focus on high-potential consumers (HK). Our study served to identify the specific characteristics of this target market. However, for the long run, in order to achieve a more robust market development, all stakeholders should not just rely upon the minority of high potential consumers to sustain growth, but must aim to improve knowledge of the larger consumer segment by implementing educational marketing campaigns that reinforce the ethical, environmental and societal benefits of organic fish production and consumption. For example, information and promotion campaigns could focus on promoting organic fish and organic food in general, so that people are provided with information and experiences that stimulate at least their belief of being knowledgeable about organic food in general and organic fish in particular. Greater subjective knowledge about organic food may not only introduce new customers to try organic products (and organic fish), but it may also enhance the consumption level among existing consumers.

*Table 8: Consumer profile for further target marketing purposes. Table shows a brief summary of relative over-representation in the two consumer groups.*

	LK	HK
consumption frequency	low	high
gender distribution	women	even
age	45-65	18-34
household	2	3, 4, 5+
occupation	professional/manager/executive, government employee and retired.	business owner/self-employed, other white collar, blue collar and student
country	British and French	Italians
motives		health, environment, quality, safety
barriers		high price, limited availability
information sources	general low	internet most important

## **Limitations of this study**

Our study faced a number of limitations. It was not possible to compare education level and income level as different measures were used for the four countries. Regarding barriers, a larger set besides of price and availability would have been interesting. Adding barriers like poor appearance, skepticism about the credibility of organic fish, non-awareness of organic fish and satisfaction with existing conventional products, would have added additional valuable information. Furthermore, the survey was conducted solely through an internet survey. This may affect the results by overrepresentation of more frequent internet users.

## **5. Conclusions and Implications**

In our study, a strong relation between subjective knowledge and organic food consumption was identified. Organic fish was the second least frequently consumed organic food item from the survey. Different strategies to increase the consumption of organic fish were discussed. For example, a campaign to increase knowledge about the topic of organic production, improved displays of organic fish in the store and bundles with top-selling organic items (e.g. vegetables).

Motives to buy more organic fish were consistently ranked as more important within the group of people with higher subjective knowledge about organic food (HK), including concerns about personal health and environmental benefits. On the other hand, barriers were mostly similar in the high and low knowledge groups, with high price and limited availability as the main obstacles. These results pointed out that a communication campaign, informing about these benefits would likely have a positive impact on consumption behavior. The internet and fish mongers were the main information sources for the high knowledge group; thus, an internet add campaign and educating fish mongers about organic fish were identified as the most promising strategies to increase organic fish consumption on both HK and LK. Further, socio-demographic differences between HK and LK were identified and may add to the more targeted information campaigns.

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## 7. Appendix

### 7.1 Tables

Table 9: Percentages of consumption levels of organic food categories for LK group.

Consumption level	0	0.5	1	2	3	4	5.5
Vegetables	30.4%	19.2%	9.4%	7.3%	5.1%	12.7%	16.0%
Eggs	33.1%	17.0%	11.9%	7.8%	5.7%	16.5%	8.1%
Poultry	40.9%	20.0%	9.8%	8.6%	4.8%	10.6%	5.4%
Dairy products	43.9%	19.7%	6.3%	5.4%	2.9%	8.9%	13.0%
Fruit/juice	45.2%	17.1%	8.4%	4.9%	4.4%	7.8%	12.2%
Red meat	49.1%	20.0%	7.9%	6.5%	3.3%	9.2%	4.0%
Fish/seafood	50.7%	22.5%	8.1%	8.1%	3.6%	5.7%	1.3%
Beverages	56.7%	15.7%	2.5%	2.7%	2.5%	5.4%	14.4%
Other	58.0%	13.3%	4.4%	5.5%	2.5%	7.8%	8.4%
Grains	59.7%	18.5%	6.0%	3.5%	2.9%	5.9%	3.5%

Table 10: Percentages of consumption levels of organic food categories for HK group.

Consumption level	0	0.5	1	2	3	4	5.5
Vegetables	8.0%	8.6%	8.0%	9.8%	10.9%	19.5%	35.2%
Eggs	9.5%	9.5%	8.3%	13.0%	16.0%	22.8%	21.0%
Dairy products	11.2%	8.3%	10.7%	9.5%	10.7%	25.4%	24.3%
Fruit/juice	12.4%	9.8%	9.8%	9.5%	11.2%	21.9%	25.4%
Poultry	15.4%	12.7%	10.4%	10.9%	14.8%	24.9%	10.9%
Other	17.2%	8.6%	9.8%	13.6%	13.9%	19.8%	17.2%
Fish/seafood	17.2%	13.0%	11.2%	13.9%	10.7%	26.3%	7.7%
Beverages	17.5%	10.1%	9.2%	11.8%	10.9%	16.6%	24.0%
Red meat	19.5%	11.2%	10.7%	13.9%	15.1%	19.5%	10.1%
Grains	23.1%	10.4%	12.4%	10.9%	13.3%	16.9%	13.0%

## 7.2 OrAqua survey contents

Survey performed in Germany, Italy, France and UK, in respective language. Delivered in SPSS format.

Within question (e.g. 1, 2, 3) please program randomization of the items (e.g. a, b, c) for each participant. If this is not feasible while programming the survey, please randomize the items at least once.

Welcome to the survey related to fish consumption and elements related to fish production. We are grateful for your participation and we are looking forward to your personal opinions about this topic. We aim at an in depth analysis of this information that will provide important feedback in this field of research and policy.

This survey is based on questions which you need to either rate on a scale, pick yes or no, or pick one or more items from a list of alternatives. Please keep in mind to answer all questions based on your honest first opinions as there are no right or wrong answers. Finally, we would like to remind you that the data will be treated based on full anonymity.

3. Moving on, we would like to focus on organic fish. Please indicate whether you agree or disagree with the following statements (7-point scale from 1 Strongly disagree to 7 Strongly agree) (DEFRA report; modified Steptoe FCQ scale)
  - a. Organic fish is too expensive for my budget
  - b. I don't care whether the fish I buy is organic
  - c. Organic fish tastes better than conventional fish
  - d. The fish species I like are not available as organic
  - e. Organic fish is not available where I shop
  - f. I believe that organic is an important issue
  - g. I always buy organic fish
  - h. It makes me feel good to buy organic fish
  - i. I believe that organic fish is good for my health
  - j. Organic fish has good quality
  - k. Organic fish is safe to eat
  - l. Organic fish contains no additives
  - m. Buying organic fish is good for the environment
  - n. Organic fish is good value for money



14. How often do you use the following sources to get information about organic fish? (7-point scale from 1 never to 7 very often; SEAFOODplus)

- a. Family and friends
- b. Fish industry
- c. Consumer organization
- d. Newspapers
- e. Internet
- f. Social media
- g. Government
- h. Scientists
- i. Fishermen/fish farmers
- j. Television
- k. Supermarket
- l. Fish monger
- m. Doctor
- n. Advertising
- o. Public health recommendations
- p. Dietician
- q. Radio

16. Please rate how often you consumed organic food of the categories below during the last year?

(seven points: never, <1/m, 1/m, 2/m, 3/m, 1/w, >1/w)

- a. Fruit/juice
- b. Vegetables
- c. Red meat
- d. Dairy products
- e. Poultry
- f. Eggs
- g. Fish/seafood
- h. Grains (Cereals/bread/pasta)
- i. Beverages (coffee/tea/etc.)
- j. Other (specify) .....

18. Socio-demographics (standard socio-demographic items used by the survey company)

- a. Age
- b. Gender
- c. Education
- d. Income
- e. Occupation
- f. Household situation
- g. ...



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