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Analysis of the main determinants of away-from-home consumption of fishery and aquaculture products in the EU28

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ABSTRACT

The European Union (EU) is the largest market in nominal terms for fishery and aquaculture products (FAPs), partly due to the away-from-home consumption of these products in restaurants and food outlets. In view of this, it is necessary to identify the main determinants of the away-from-home consumption patterns in order to propose strategies that could increase the consumption of FAPs. Following this, ordered probit models were estimated alongside their marginal effects to identify the most relevant factors determining the frequency of away-from-home consumption of FAPs in the EU28, using a representative sample of 27732 EU residents. We found that those in the highest classes of society are most likely to consume FAPs away-from-home more frequently. Also, the most important reasons for consuming FAPs away-from-home more frequently are that they are less expensive than other foods, taste good, and are healthy and easy to digest. In addition, among the different nationalities, British consumers are more likely to consume FAPs away-from-home. We also found that there is a higher frequency of away-from-home consumption of FAPs for consumers between the ages of 25 and 54, who do not live in rural areas, who prefer wild-caught and local and marine products, and that are very satisfied with their lives. The study contributes to the literature with the analysis of FAPs away-from-home consumption by using a large representative sample of EU28 consumers. The study is also relevant with respect to the extensive list of determinants that include factors related to the attitudes of respondents to FAPs and socio-demographic characteristics.

1. Introduction

Fishery and Aquaculture products (FAPs) consumption is an important component of the human diet, as it accounts for around 17% of the intake of animal protein in the global population (FAO, 2018). Consumption of FAPs offers health benefits, due to the presence of high biological value proteins, unsaturated fatty acids, vitamins and minerals (Sidhu, 2003), while it has also been associated with a low risk of heart disease (Zarrazquin et al., 2014). In addition, Maciel et al. (2016, 2019) found that regular fish consumers had a better perception of the quality of life and were more physically active; suggesting that they were healthier people.

The average consumption of seafood by European residents is 24,33 kg per capita (European Union, 2018b), which is considerably higher than the 20,3 kg per capita of global consumption (FAO, 2018). This is not surprising given that the European Union (EU) is the largest trader in nominal terms of FAPs in the world (FAO, 2018). Part of the consumption is spent away-from-home, in places such as restaurants and food outlets, where 32% of European residents consume FAPs at least once a month and 11% at least once a week (European Union, 2018a).

Considering that consumers who purchase seafood more regularly are more likely to pay higher prices for seafood than those who purchase them less (Quagrainie, 2006), it is important to better understand the patterns of consumption of FAPs in the EU. According to our best knowledge, besides the numerous studies that analyse the preferences of consumers and frequency of consumption of FAPs, only a small part of them focuses on the identification of particular determinants of away-from-home consumption. The limited number of studies (Almeida et al., 2015; Baptista et al., 2020; Herrmann et al., 1994; Hori et al., 2020) usually involves a particular country, region and/or fish species, and the set of determinants is also limited in number and scope. Thus, the obtained results are not easily generalizable and the value for policies that could involve supranational entities such as the EU is also narrow.

The present investigation analyses the main determinants that explain the frequency of away-from-home consumption of FAPs by

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European residents using for the first time a heteroscedastic ordered probit model. Ordered Probit models are a proper analytical framework when the responses of a survey are ordinal (Kumar et al., 2008; Thong & Solgaard, 2017). In addition, the heteroscedastic model does not assume that error variances are constant or homoscedastic across observations, and the issue of biased parameter estimates as well as miss-specified standard errors is consistently handled. Our research extends the previous literature in two important aspects: (1) we use a large representative sample of consumers of the EU28, and (2) the list of determinants is very extensive and includes factors related to the attitudes of respondents to seafood and socio-demographic characteristics. We estimate the marginal effects of the different determinants to obtain the key factors that are likely to increase the likelihood of consuming FAPs away-from-home more frequently. The findings provide very important insights that are especially relevant for restaurant owners and the rest of the stakeholders of the supply chain in order to design and implement commercial strategies that enhance the FAPs logistic value. In addition, the results of the marginal effects may also be useful in drawing policy lessons or in guiding the extent of future investigations for researchers and authorities.

The rest of the paper presents the literature review and hypotheses (section 2), the data and methodology used for the analysis (section 3), the results (section 4), the discussion (section 5), and the conclusions (section 6).

2. Literature review and hypotheses

Higher demand for away-from-home food consumption in recent decades, especially in developed countries, has been attributed to different aspects, such as increased incomes (Binkley, 2006; Gäl et al., 2007; Ham et al., 2004; Ma et al., 2006) and increased pursuit of convenience through time savings (Binkley, 2006; Gäl et al., 2007; Mutlu & Gracia, 2004). Increased participation of women in the labour market has also favoured a tendency to spend more on leisure activities (Binkley, 2006; Gäl et al., 2007; Mutlu & Gracia, 2004). In addition, the growth in urbanization gives families greater access to restaurants that facilitates away-from-home food consumption (Ma et al., 2006; Mutlu & Gracia, 2004). According to Rezende and Avelar (2012), a variety of practices are related to the consumption of food away-from-home, such as the consumption of food products in food-specialized establishments, such as restaurants and snack bars, or in places where food is part of the service offered, such as hotel and in-flight meals, as well as the consumption of non-commercial substitutes, such as family meals.

There is a large number of studies assessing the consumption of fish and seafood. In general, according to Carlucci et al. (2015), the main drivers for fish consumption are the sensory liking (taste, smell and texture) of fish, perceived health benefits and fish-eating habits, while the main barriers are the sensory disliking of fish, health risk concerns, high price perception, lack of convenience, lack of availability of the preferred products, and lack of knowledge in selecting and preparing the product. Moreover, Olsen (2004) argues that the consumption of seafood varies considerably across individuals, families, cultures and countries. In addition, the species consumed may be associated with cultural traditions that are also changing over time (Apostolidis & Stergiou, 2012).

The consumption of FAPs is usually studied in the literature by analysing the choices of consumers or the frequency of consumption. Regarding the determinants of the frequency of consumption of seafood products, different quantitative approaches have been used according to the literature reviewed (see Appendix A). The most common methods used range from basic statistical analysis such as ANOVA or descriptive analysis to multinomial regressions and more sophisticated methods such as Probit and logit models.

The independent variables used for these models are usually related to socioeconomic variables and factors related to consumer attitudes towards seafood. As far as socioeconomic variables are concerned, the studies consulted have shown that there are no absolute trends for this type of attributes, as it depends on the characteristics of the sample within the context of the study or aspects related to the products, such as the species. However, the majority of the investigations indicate that female (Can et al., 2015; Cavaliere et al., 2019; Thong & Solgaard, 2017), elderly people (Herrmann et al., 1994; Murray et al., 2017; Myrland et al., 2000; Thong & Solgaard, 2017), highly educated people (Can et al., 2015; Cavaliere et al., 2019; Islam et al., 2018; Myrland et al., 2000), people with higher incomes (Can et al., 2015; Cavaliere et al., 2019; Herrmann et al., 1994; Lee & Nam, 2019; Thong & Solgaard, 2017; Yousuf et al., 2019) and living with a partner (Cavaliere et al., 2019; Kumar et al., 2008; Thong & Solgaard, 2017), usually have a higher frequency of consumption of different seafood products.

Moreover, other factors are related to the lifestyle of the respondent. It has been found that consumers tend to consume seafood products more frequently when: they are used to eat seafood products (Yousuf et al., 2019); they frequently consumed seafood when they were young (Murray et al., 2017); they engage in regular physical activity (Myrland et al., 2000); and they engage in recreational fishing activities (Herrmann et al., 1994).

As shown in Table 3 (Appendix A), most of the studies analysed the general frequency of consumption, and only a limited number carried out separate analyses for home consumption or away-from-home consumption, or both. This is an important point to consider given that some studies have found that the main determinants of home and away-from-home FAPs consumption differ (Almeida et al., 2015; Herrmann et al., 1994). In addition, Almeida et al. (2015) concluded that the self-reported frequency of consumption of seafood differs from the frequency of consumption calculated as the sum of the frequency of consumption of seafood on different occasions (at-home or away-from-home, at lunch or dinner), being the self-reported frequency of consumption of around 3 times a week, while the estimated consumption from summing up the various occasions is approximately 5 times a week. The difference might be due to the fact that the respondents could be more accurate when their consumption response is based on occasions, as it might be easier for them to take into account

Table 1
Sample features.

Country	Frequency	Percentage (%)
FR - France	1006	3.6
BE - Belgium	1055	3.8
NL - The Netherlands	1006	3.6
DE-W - Germany - West	1011	3.6
IT - Italy	1025	3.7
LU - Luxembourg	506	1.8
DK - Denmark	1020	3.7
IE - Ireland	1011	3.6
GB-UKM - Great Britain	1043	3.8
GR - Greece	1016	3.7
ES -Spain	1035	3.7
PT - Portugal	1082	3.9
DE-E Germany East	539	1.9
FI - Finland	1017	3.7
SE - Sweden	996	3.6
AT - Austria	1044	3.8
CY - Cyprus (Republic)	503	1.8
CZ - Czech Republic	1023	3.7
EE - Estonia	1004	3.6
HU - Hungary	1064	3.8
LV - Latvia	1007	3.6
LT - Lithuania	1015	3.7
MT - Malta	502	1.8
PL - Poland	1033	3.7
SK - Slovakia	1071	3.9
SI - Slovenia	1015	3.7
BG - Bulgaria	1031	3.7
RO - Romania	1021	3.7
HR - Croatia	1031	3.7
Total	27732	100.0

Table 2
Definitions of the independent variables.

Variable	Definition
Attitudes towards characteristics of the product	
6 dummy variables regarding the main reasons for buying or eating FAPs	Healthy Taste good Are products for special occasions Contain little fat Easy to digest Less expensive than other food
1 wild products preference dummy variable	Wild products preference
1 sea products preference dummy variable	Sea products preference
1 locals products preference dummy variable	Preference for local and national products
Psychological factors related to life conditions and life satisfaction	
4 dummy variables regarding life satisfaction	Very satisfied Fairly satisfied Not very satisfied Not at all satisfied (BASE)
4 Dummy variables regarding the expectations of life conditions in 5 years	Better The same/no change Worse (BASE) NA
Sociodemographic factors	
29 country dummy variables	FR - France BE - Belgium NL - The Netherlands DE-W - Germany - West IT - Italy LU - Luxembourg DK - Denmark IE - Ireland GB-UKM - Great Britain GR - Greece ES -Spain PT - Portugal DE-E Germany East FI - Finland SE - Sweden AT - Austria CY - Cyprus (Republic) CZ - Czech Republic EE - Estonia HU – Hungary (BASE) LV - Latvia LT - Lithuania MT - Malta PL - Poland SK - Slovakia SI - Slovenia BG - Bulgaria RO - Romania HR - Croatia
7 age generations dummy variables	15–24 years (BASE) 25–34 years 35–44 years 45–54 years 55–64 years 65–74 years 75 years and older
4 dummy variables according to household size	Household size (1) (BASE) Household size (2) Household size (3) Household size (4 or more)
3 dummy variables related to the place of living	Rural area (BASE) Towns and suburbs/small urban area Cities/large urban area
Economic factors	
3 dummy variables related to difficulties in paying the bills at the end of the month in the last year	Most of the time (BASE) From time to time Almost never/never
6 dummy variables related to the class of society	The working class (BASE) The lower middle class The middle class The upper-middle class The higher class NA

the seafood consumed as a supplement, such as an intake included in a sandwich, rather than just considering the seafood consumed as a main meal dish. The authors, therefore, concluded that it would be better to ask for more detailed information on consumption as the general answer tends to underestimate the frequency of consumption.

Focusing now on the studies that have assessed the frequency of away-from-home consumption separately, Almeida et al. (2015) found that the frequency of at-home consumption was far higher than the frequency of away-from-home consumption. The authors also found that consumers with a higher knowledge of seafood (in terms of the amount of information they know about the characteristics, the preparation and the assessment of the quality of fish and other seafood) had a higher frequency of consumption of seafood and were more interested in information on seafood products. In another study, Hori et al. (2020) found that eco-friendliness was a significant positive reason for the more frequent consumption of seafood away-from-home, while freshness, price, quality and taste and the expiry date were significant reasons for not consuming seafood more frequently away-from-home. The country of origin and food safety were not significantly linked to the frequency of away-from-home consumption.

2.1. Attitudinal factors

Attitudinal factors present a general pattern of preference. Several studies have shown that there is a higher frequency of consumption for consumers who: prefer fresh products over other presentations (Almendarez-Hernández et al., 2017; Can et al., 2015; Kumar et al., 2008; Yousuf et al., 2019); have a positive attitude towards seafood products (Kumar et al., 2008; Lee & Nam, 2019); care about eco-labels and the environment (Almendarez-Hernández et al., 2017); care about health issues of the products (Can et al., 2015; Murray et al., 2017; Thong & Solgaard, 2017); and consider important that the seafood products have low calories and fat (Thong & Solgaard, 2017). On the other hand, certain attitudes that favour a lower frequency of consumption of seafood products are: being uncomfortable cooking or preparing seafood (Murray et al., 2017; Thong & Solgaard, 2017); not purchasing wild seafood (Murray et al., 2017); or finding the products with higher prices (Hall & Amberg, 2013; Lee & Nam, 2019; Thong & Solgaard, 2017). Based on the previous findings, we have proposed the following first hypothesis:

H1. *Attitudinal factors towards the characteristics of FAPs are important determinants of the frequency of away-from-home consumption of FAPs.*

2.2. Psychological factors

Other factors are related to life conditions and life satisfaction. For general fish consumption, Maciel et al. (2016, 2019) found that those who consume fish often had a better perception of the quality of life and were more physically active. They concluded that they were healthier people. As a result, we can establish the following hypothesis:

H2. *Psychological factors are relevant determinants of the frequency of away-from-home consumption of FAPs.*

2.3. Sociodemographic and economic factors

Sociodemographic and economic factors are also important determinants of away-from-home consumption. Baptista et al. (2020) found that consumers who were born between 1961 and 1997, who have

high incomes, postgraduate education and families without children are more likely to eat seafood products in restaurants than to eat them at-home. Herrmann et al. (1994) found that consumers associated with frequent purchases at restaurants are likely to be those with the highest income, white-collar occupations, recreational fishing activities and living in households with children aged 10 or under. They also determined that the attitudinal variables show less correlation with the frequency of purchases at restaurants than with the frequency of at-home consumption. Based on the previous investigations, we have established the following two hypotheses:

H3. *There are differences in the frequency of away-from-home consumption of FAPs depending on sociodemographic factors.*

H4. *There are differences in the frequency of away-from-home consumption of FAPs depending on factors that are related to the economic status of consumers.*

3. Data and methodology

We used the Special Eurobarometer survey 2018 (European Union, 2018a) as the main dataset for our study. This dataset has already been used by the study (Cantillo et al., 2020) as it has a lot of potentials to analyse FAPs consumption issues in the EU due to its representativeness. The survey includes a series of questions that analyse the internal market of FAPs in the EU28 and was conducted at the request of the European Commission between June and July 2018. The surveys were conducted face to face in the 28 countries of the EU, using the native language of the country of residence of the individuals. The final sample consisted of 27734 EU residents and the sample description can be found in Table 1, including information on the number of respondents per country and the frequency of the total sample.

In the present study, the frequency of away-from-home consumption of FAPs is the dependent variable, while the independent variables are associated with attitudes about the consumption of FAPs and sociodemographic characteristics of the individuals. The Eurobarometer survey addressed the frequency of away-from-home consumption of FAPs with the following question: "How frequently do you eat fishery or aquaculture products at restaurants and other food outlets (canteens, bars, market stands etc.)?". Respondents must choose only one of the following options: "at least once a week", "at least once a month but less than once a week", "several times a year but less than once a month", "less than once a year", "never" and "don't know". Those who replied with the "don't know" option were insignificant and as a result, not considered in the present investigation. According to the Eurobarometer survey, in the EU, 11% of the respondents reported consuming FAPs away-from-home at least once a week, 21% at least once a month but less than once a week, 28% several times a year but less than once a month, 14% less than once a year and 26% never (European Union, 2018a).

With regard to the independent variables, the attitudes towards the reasons for buying or eating FAPs were measured in the Eurobarometer survey by displaying a list of possible options that allowed respondents to select up to three of them, while the preferences for certain product attributes such as the method of harvesting (farmed vs wild), local preference and sea-product preference were assessed through multiple choice questions with a unique answer.

A description of the independent explanatory variables is provided in Table 2. Variables that were fixed to 0 for the estimation of the model are accompanied by the word 'base' between brackets. The independent variables were organized according to the following broad categories to facilitate the description and discussion of the results:

- Category 1: Attitudes towards characteristics of the product
- Category 2: Psychological factors related to life conditions and life satisfaction.
- Category 3: Sociodemographic factors.
- Category 4: Economic factors.

3.1. Methodology

The present investigation uses a heteroscedastic ordered probit model to analyse the determinants of away-from-home consumption of FAPs. The ordered probit model approach was selected considering that the responses given by consumers regarding the frequency of away-from-home consumption were ordinal (Kumar et al., 2008; Thong & Solgaard, 2017). Probit models have been previously selected as an approach to assess fish consumption behaviour in the investigations of Almendarez-Hernández et al. (2017), Kumar et al. (2008), Lee and Nam (2019), Myrland et al. (2000), Terin (2019) and Thong and Solgaard (2017). We selected the form of a heteroscedastic model, which allows the standard deviation of the error term to vary, offering more trustable and less unbiased results than homoscedastic models.

The model has a utility function that relies on a latent dependent variable Y_i, which depends on a linear combination of an independent variable vector X_i and a vector parameter θ_i, and an error term $\varepsilon_i$as shown in equation (1). The vector parameter is to be estimated, while the error term allows obtaining unobserved factors of individual *i*.

$$Y_i = \sum_{k=1}^{K} \theta_i X_i^k + \varepsilon_i \quad (1)$$

The dependent variable Y_i on Equation (1) cannot be observed but can be measured by a set of y_i indicators representing the different levels or categories of the frequency of away-from-home consumption, which in our case consist of five different consumption levels (Equation 2). From this equation, the threshold category parameters (μ_1, μ_2, μ_3, μ_4) indicate the points of variation for the level of consumption given a high change in the latent preference and are to be estimated taking into account that $\mu_1 < \mu_2 < \mu_3 < \mu_4$.

- 1st level – Never: $y_i = 1$ *if* $Y_i \leq \mu_1$
- 2nd level: Less than once a year: $y_i = 2$ *if* $\mu_1 < Y_i \leq \mu_2$
- 3rd level: Several times a year but less than once a month: $y_i = 3$ *if* $\mu_2 < Y_i \leq \mu_3$
- 4th level: At least once a month but less than once a week: $y_i = 4$ *if* $\mu_3 < Y_i \leq \mu_4$
- 5th level: At least once a week: $y_i = 5$ *if* $\mu_4 < Y_i$ (2)

Moreover, the model assumes that the independent variables (which explain the behaviour of the dependent variable) are a set of socioeconomic characteristics of individuals as well as particular attitudes towards FAPs. The selection criteria for the independent variables were based on our expertise and the literature review (Table 3). We tried to cover all the factors analysed in other studies, with the limitation that the variables were included in the questions answered in the Eurobarometer survey. The model allows estimating the probabilities for each frequency of consumption level according to a variation in the different attributes incorporated.

The heteroscedastic model allows the standard deviation of the error term to vary according to the following equation: $\sigma_i = \exp(\delta Z_i)$, where Z_i is a vector of variables that explain the level of variance and δ is a vector of parameters to be estimated. The parameters are estimated by maximising the log-likelihood function.

Moreover, we estimated the marginal effects for the different attributes, which indicate the change in the probability of away-from-home consumption of FAPs for each level of consumption when there is a change in the value of an independent variable.

Among the limitations of the use of traditional ordered probit models, it should be clarified that these models do not account for unobserved heterogeneity and therefore assume that the estimated parameters are considered to be fixed. However, the specification of a

simpler model that does not account for unobserved heterogeneity favours the interpretation of the results, which may be more meaningful for policy analysis.

4. Results

Homoscedastic and heteroscedastic ordered probit models were estimated (see Appendix B for full results). We also estimated the marginal effects on different away-from-home consumption patterns of FAPs. In several cases, the results of the heteroscedastic model indicated that the standard deviations of the factors were significant, suggesting that assuming homoscedasticity could lead to biased results for some of the coefficients of the parameters in the homoscedastic model. In addition, the likelihood ratio test showed that the heteroscedastic model was superior to the homoscedastic, thus the results of the investigation will be based on the outcomes of this superior model.

The marginal effects on the away-from-home consumption of FAPs at least once a week are shown in Fig. 1, while those related to the frequency of consumption at least once a month but less than once a week are shown in Fig. 2. In these figures, the green colour elements are significant drivers of the frequency of consumption, the red elements are significant drawbacks, and the white elements are non-significant factors. The description of the results is organized according to the categories presented in the previous section.

4.1. Attitudes towards the main reasons to eat or buy FAPs

We confirmed that attitudes towards the main reasons for eating or buying FAPs are important determinants of the frequency of away-from-home consumption of FAPs. It was found that the attitude associated with the highest probability to consume FAPs away-from-home more frequently is to consider them as less expensive than other foods, while other important attitudes that increase their consumption is to eat or buy them because they are "easy to digest, healthy, taste good" are products for special occasions or because they contain little fat.

Consumers who consider that one of the main reasons for consuming FAPs is because they are less expensive than other foods, have a higher probability of around 10.5% and 7.9% to consume them at least once a week and at least once a month, respectively. For other reasons, the probability ranges from 1.5% (contain little fat) to 3.9% (easy to digest)

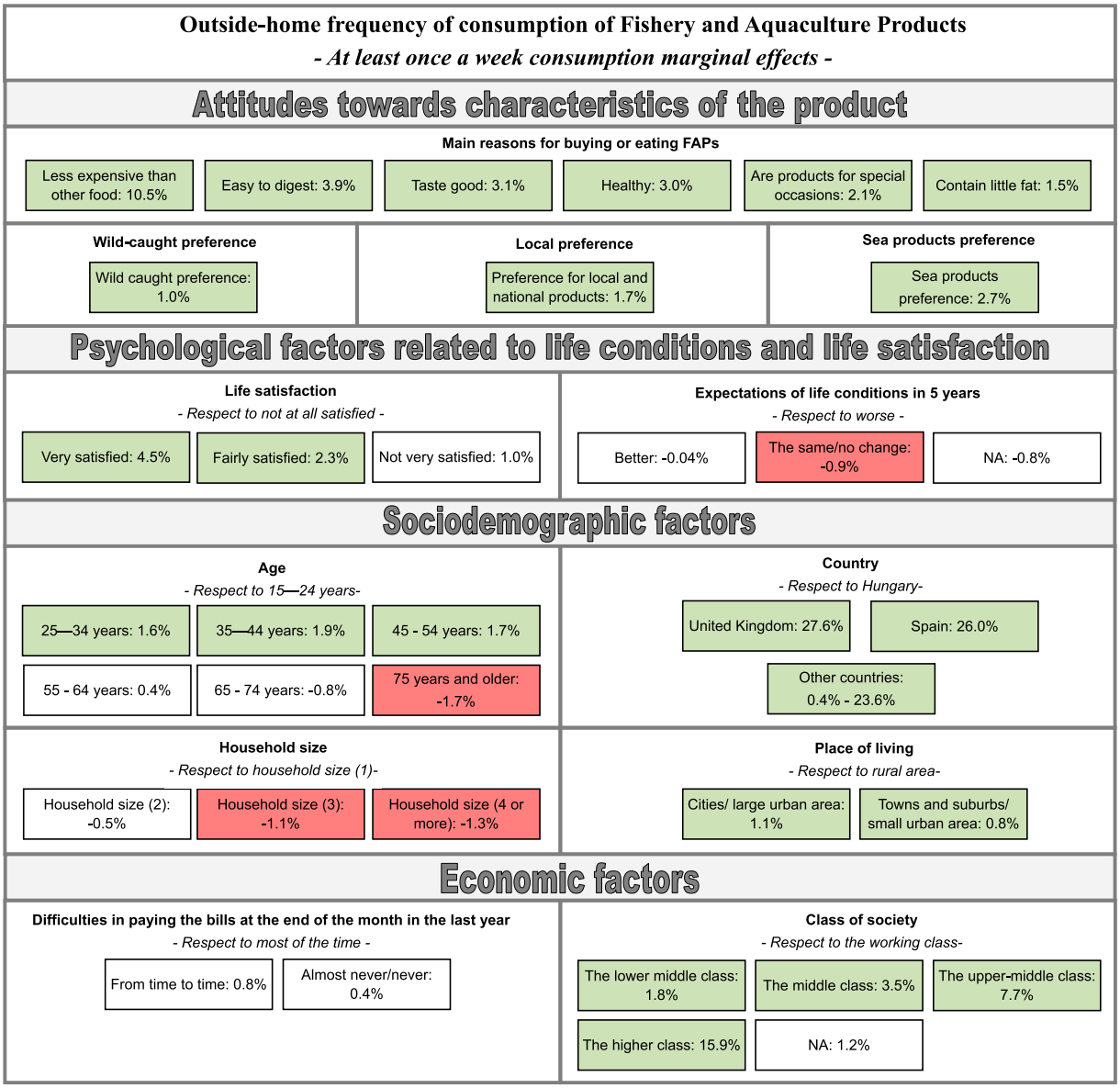

Fig. 1. Marginal effects for the away from home consumption of FAPs. (At least once a week).

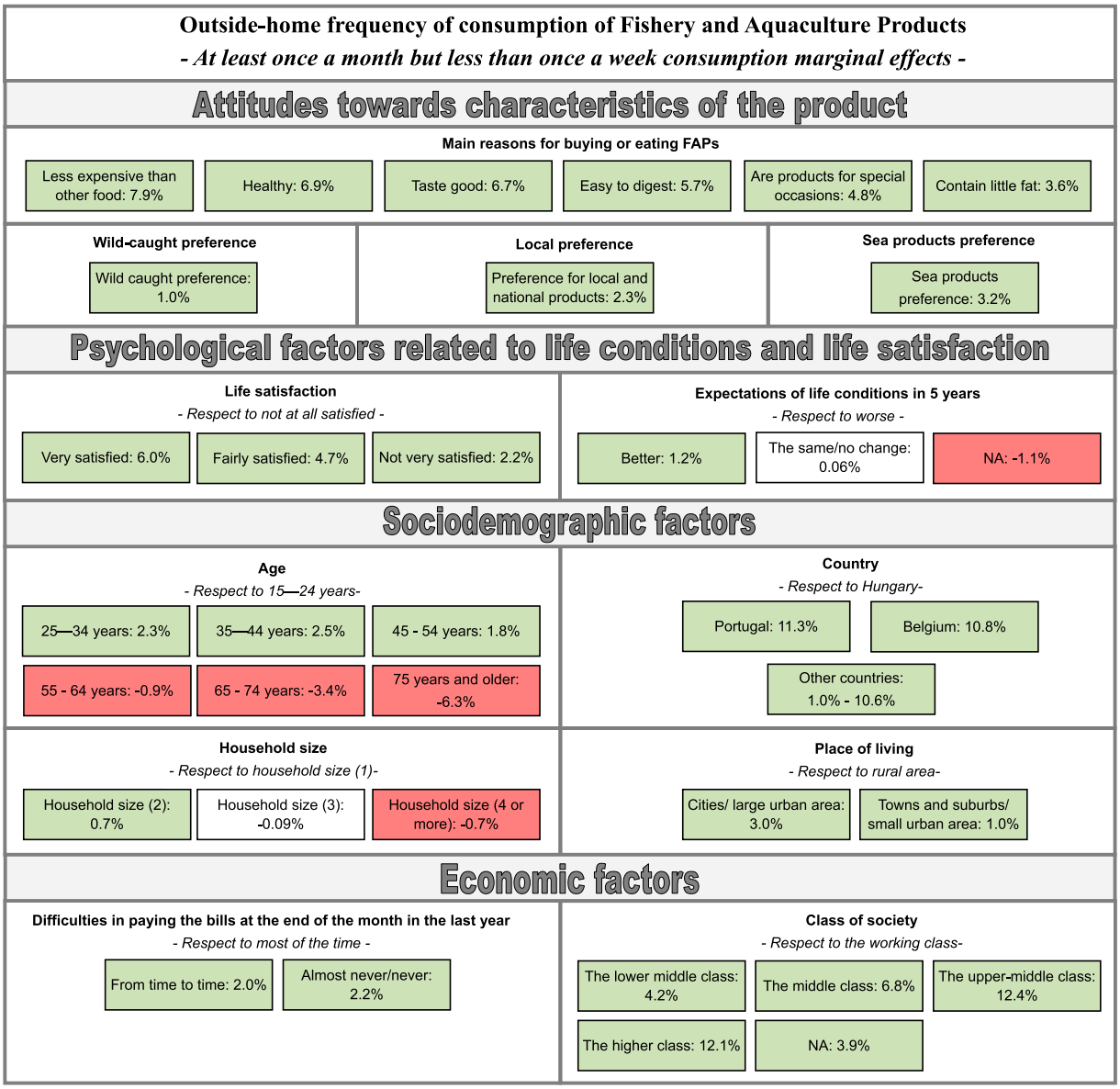

Fig. 2. Marginal effects for the away from home consumption of FAPs. (At least once a month, but not more than once a week).

for the level of consumption of at least once a week, and from 3.6% (contains little fat) to 6.9% (healthy) for the level of consumption of at least once a month but less than once a week.

Moreover, the preference for marine products over freshwater products, local versus foreign products, and wild-caught versus farmed products are significant drivers of higher consumption rates, for both at least once a week and at least once a month levels of consumption. Among these, the preference for marine products was the most important aspect for both levels of consumption, increasing the likelihood of consumption at least once a week by 2.7% and of at least once a month by 3.2%.

4.2. Psychological factors related to life conditions and life satisfaction

Life satisfaction was also a positive driver of higher consumption rates. In fact, those with the highest level of satisfaction had a higher probability of 4.5% of consuming the products at least once a week and of 6.0% of consuming the products at least once a month compared to those individuals who were not at all satisfied with their lives. With regard to life conditions expectations, it was found that those who consider that their life conditions in five years would be the same have a lower probability of around 0.9% of consuming the products at least once a week, compared to those that are in the endpoints (worse or better life conditions); however, those than consider that they will be better, have a higher probability of 1.2% to consume the products at least once a month but less than once a week than those that expect their conditions to be worse.

4.3. Sociodemographic factors

The results show that the frequency of away-from-home consumption of FAPs varies between countries, with British consumers having the highest probability of consumption for the at least once a week level and Portuguese consumers for the at least once a month but less than once a week level. Figs. 3 and 4 show the probabilities of eating FAPs at least once a week and at least once a month away-from-home for the countries, respectively, indicating in general terms, that the residents of the countries located on the western part of the EU28 tend to have a higher probability of consuming FAPs away-from-home more frequently than those located in countries on the eastern part of Europe.

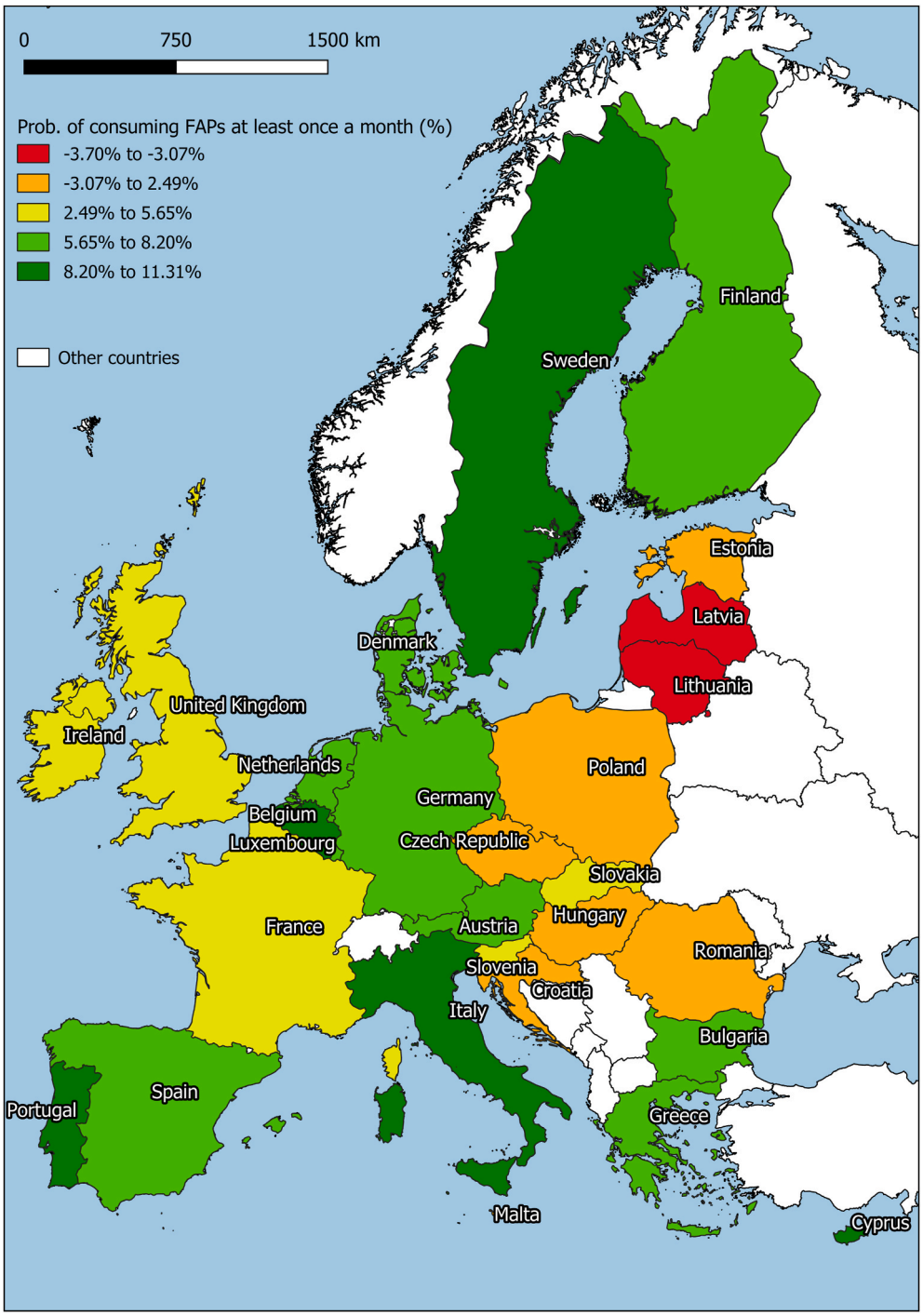

Fig. 3. Probability of eating FAPs away from home for countries at least once a week.

According to the age, the results show that consumers between 25 and 54 years of age are more likely to consume FAPs away-from-home at least once a week of around 1.6%–1.9%, compared to those between 15 and 24 years; while those over 75 years of age were less likely to consume them at least once a week than the youngest group at around 1.7%. Similar results were found for the consumption level of a least once a month but less than once a week, with residents between 25 and 54 years of age having a higher probability of 1.8%–2.5% to consume FAPs away-from-home compared to the youngest generation, while those older than 55 had a lower probability of consuming FAPs at least once a month but less than once a week than the youngest generation ranging from 0.9% to 6.3%.

Furthermore, the results show a tendency of a lower frequency of away-from-home consumption of FAPs for larger household sizes, while there is a higher frequency of consumption for residents living in cities, towns and suburbs compared to those living in rural areas.

4.4. Economic factors

The class of society attribute showed the highest marginal effects and indicated that those in the higher classes have a higher probability to consume FAPS away-from-home more frequently, reaching up to 15.9% for the higher class in the consumption level of at least once a week.

The variable related to the difficulty of paying bills at the end of the

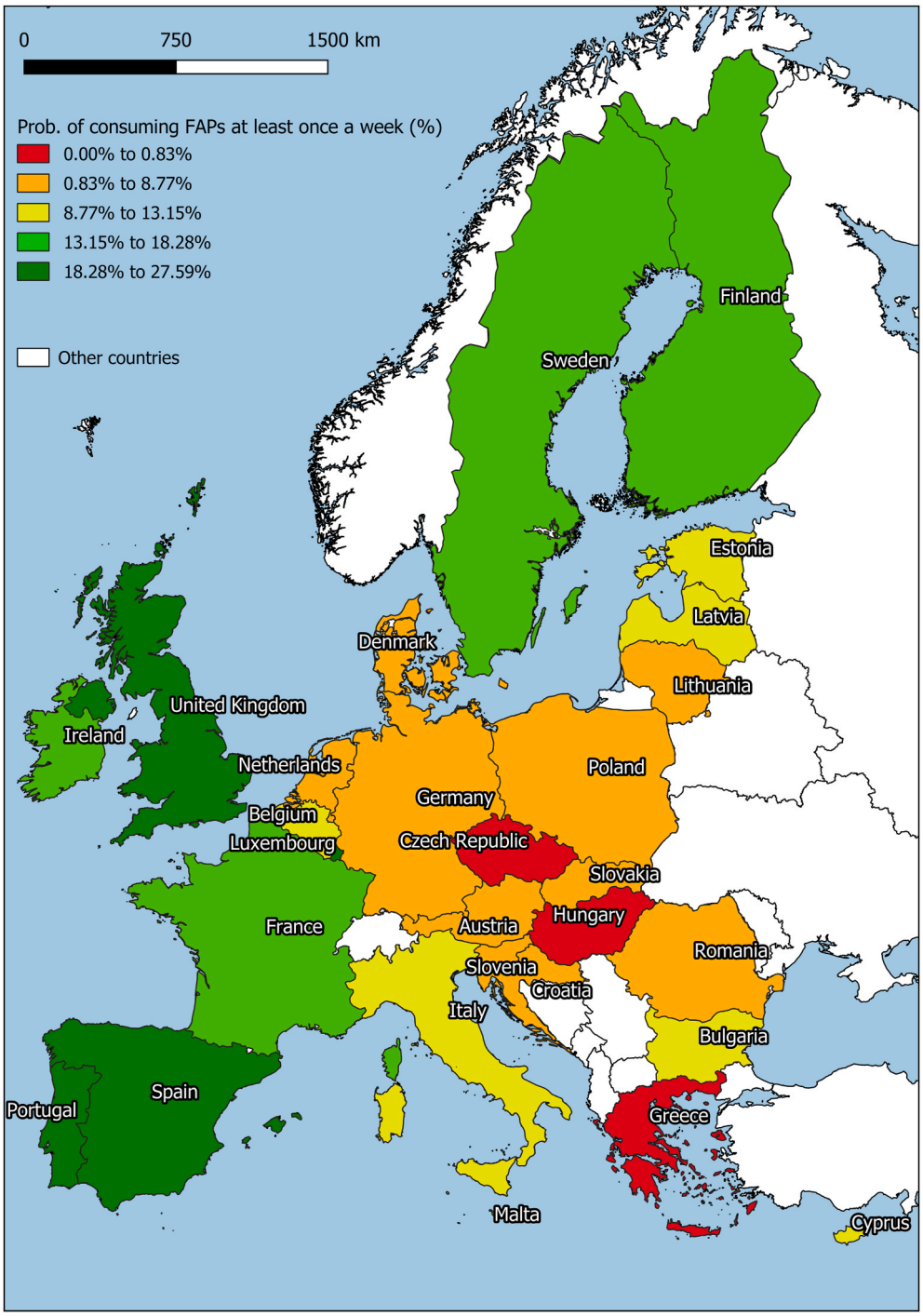

Fig. 4. Probability of eating FAPs away from home for countries at least once a month.

month in the last year was not correlated to the frequency of consumption of at least once a week, while for the frequency of consumption of at least once a month, showed a higher frequency of consumption for those with less or no difficulties, compared to those with difficulties most of the time.

5. Discussion

5.1. The impact of generational differences on away-from-home fish consumption

We found that consumers between 25 and 54 years of age (born between 1964 and 1993) are more likely to consume FAPs away-from-home. Similar results have been found by Baptista et al. (2020) in Brazil, who have determined that consumers born between 1961 and 1997 are more likely to eat seafood products in restaurants than to eat them at-home. This can be explained by the fact that this group is the largest active labour force, which means that they generally have higher incomes, allowing them to spend more money on leisure activities such as eating at restaurants or food outlets. In addition, since this group also tends to have the busiest schedules, it may be more convenient for them to save time by avoiding cooking at home more regularly.

Meanwhile, those over 75 years of age had the lowest probability of consuming FAPs away-from-home more frequently. This may be due to a

number of reasons, such as the preference and availability of more time to cook their own meals, as this group of people usually do not work; and it may also be related to dietary restrictions that make it difficult for them to find suitable products that could be consumed away-from-home. In view of this, the strategy that can be implemented is to highlight the importance of the nutritional and health benefits that FAPs can offer.

5.2. Away-from-home fish consumption: a luxury meal or an affordable food choice?

In our results, the largest marginal effects were related to the social class of the residents, indicating that there is a higher frequency of away-from-home consumption of FAPs for high-class residents. Similar results were found in the investigations of Baptista et al. (2020) and Herrmann et al. (1994). Both studies found a higher frequency of restaurant purchases of seafood products for consumers with higher incomes. This finding and the fact that those who consider that "FAPs are products for special occasions" are more likely to consume these products more frequently, suggest that seafood could probably be perceived as a luxury food to be eaten away-from-home. However, our findings also indicated that the most important attitude that contributes to consuming more frequently away-from-home FAPs was to consider them to be less expensive than other foods.

This apparent contradiction can be explained considering different aspects. First, it is important to point out that those higher-income consumers usually eat more often in restaurants, regardless of the product they consume, so the higher frequency of consumption for this group may be the result of a higher presence in restaurants. For this reason, it is important that future studies compare the actual propensity of people with higher incomes to choose fish instead of other food products at restaurants. Some investigations have already shown that affluent consumers usually consume more frequently fish than meat products (Cavaliere et al., 2019; Islam et al., 2018), but the results cannot be generalized to the away-from-home context.

It is also important to consider that there is a wide range of prices that can be found in the European restaurants and food outlets, depending on the type of fishery and aquaculture product consumed and the type of restaurant. Products can therefore be cheaper than other foods if cheap species (such as hake, cod, pangasius and tilapia) are considered in affordable restaurants compared to other protein sources, but at the same time products can be considered as luxury if species such as lobster, salmon, bluefin tuna or caviar are consumed in places specialized in high-income segments. In addition, given the heterogeneity of the sample, the discrepancies may be due to different cultural and social factors regarding the status of fish in each country.

5.3. The role of health on away-from-home fish consumption

Other important reasons that increase the frequency of away-from-home consumption of FAPs are to eat or buy them because they are easy to digest, healthy or low-fat products. These attitudes evidence that consumers attach great importance to the health and nutritional benefits of FAPs. This is not surprising given the high recognition of seafood products as healthy and nutritious for benefits such as high content of Omega 3 and low-fat content (Birch & Lawley, 2012; Verbeke, Vermeir, & Brunsø, 2007). Other important nutrients found in FAPs include vitamins A and D3, digestible proteins, and minerals such as iodine and selenium (Ramalho Ribeiro et al., 2019).

5.4. The role of products attributes on away-from-home fish consumption

In addition, the findings indicate a higher frequency of away-from-home consumption of FAPs for consumers who prefer wild-caught to farmed products, local to foreign products and sea to freshwater products. Consumers may obtain indirect information on the harvest method and the origin of the FAPs when they eat in restaurants located near a water body (beach or river) and expect that the products are fresh and wild. For example, consumers may choose restaurants located near a beach or a marine, expecting that their products wild, local and recently caught, because of their proximity to that water source. In this sense, a sort of endogeneity issue might be present in a way that these locations could be indirectly favouring these specific fish attributes in consumers' preferences. The fact that there is a higher frequency of consumption for those who prefer wild-caught products is consistent with many investigations in the literature, in which consumers describe farmed products as being of lower quality and less healthy when compared to wild-caught (Claret et al., 2014; Verbeke, Sioen, et al., 2007). Thus, this finding reaffirms that aquaculture producers, authorities and promoters should continue to work on planned programs to change the negative image that aquaculture products currently have (Bronnmann & Hoffmann, 2018). Moreover, the fact that those who prefer local products have a higher frequency of away-from-home consumption was expected, given that many investigations have found similar results, for reasons such as greater trust in local products or the ethnocentrism of consumers (Luomala, 2007; Verlegh & Steenkamp, 1999) or even because of health and food safety issues (Hinkes & Schulze-Ehlers, 2018). Also, the higher frequency of away-from-home consumption of FAPs for those who prefer sea products to freshwater products, indicates that freshwater producers must encourage trust in their products by promoting the quality of their products through marketing campaigns.

5.5. Consumers' psychological factors and their relationship with the away-from-home consumption

According to our results, favourable psychological attitudes such as optimism and positiveness in life satisfaction and future living conditions, contribute to increased away-from-home consumption of FAPs. This can be explained considering that, probably due to their current and future good living conditions, consumers are willing to spend more money on eating food away from home on a more frequent basis. Similar results were found in the investigations of Maciel et al. (2016, 2019) who determined that those who consume fish regularly had a better quality of life perception and were more physically active. However, the literature is very scarce on the relationship between FAPs consumption and quality of life, as only the two studies mentioned assess this issue, and they refer to fish consumption in general, and not particularly to the away-from-home consumption.

5.6. Home vs away-from-home consumption

In a similar study, using the same Eurobarometer survey but focusing on at-home consumption, Cantillo et al. (2021) found similar trends in some of the variables, as well as opposite results in others. With regard to similarities, it was found that consumers who prefer wild-caught products, who are very satisfied with their lives, who are part of the higher classes of society and never or rarely have any difficulty paying bills, have a higher frequency of at-home consumption of FAPs. In addition, there is a similar trend towards higher consumption of FAPs at home and away from home for countries located on the western side of Europe. Similarly, as in the present study, Cantillo et al. (2021) found that selecting as important any of the reasons listed for eating or buying the products would result in a higher probability of consuming FAPs more frequently, except for the reason "are products for special occasions", which suggest that FAPs are usually consumed at special occasions that are celebrated away-from-home, rather than at those celebrated at-home, in which they probably preferred other food options. With respect to the opposite results, Cantillo et al. (2021) found that consumers over 55 years of age tend to eat FAPs more frequently at-home, which implies that the generational effect is a relevant factor in distinguishing between groups consuming more at-home or away-from-home. It seems evident that the generational effect might

depend on the health and cultural reasons. Older consumers usually have more dietary restrictions that restrict them from getting appropriate seafood at restaurants and food outlets, while they can cook the products the way they need at-home. Moreover, the fact that older people were born is a less globalized world, in which at-home consumption was more frequent when they were younger, could also have an impact on their preference to consume more these products at-home. Furthermore, the results of Cantillo et al. (2021) also differed from the current study with respect to the place of living. They found that those living in cities and large urban areas have a lower frequency of at-home consumption of FAPs. This might be in part explained because consumers living in these areas have better access to restaurants and food outlets, and as a result, they consume FAPs more frequently away-from-home. Similarly, the results for those who live in rural areas can be explained analogously. Finally, another interesting difference to highlight is related to the household size, as Cantillo et al. (2021) found that those living in households with 3 or more people tend to consume FAPs at-home more often, suggesting that FAPs are more regarded as a family meal when eating at home, while in restaurants and food outlets, they are more popular with couples and single consumers.

6. Conclusions

The findings of this investigation present very important and useful insights for restaurant owners and the rest of the stakeholders of the supply chain who obviously could benefit from an increase in the frequency of away-from-home consumption of FAPs. The information can be used to enhance the marketing campaigns of the products and to look for better strategies that increase the consumption of the products in the EU. In addition, we highlight that the use of a proper representative sample increases the strength and reliability of the results.

We have proved the four hypotheses formulated. For the first hypothesis, we found that certain attitudes that increase the frequency of consumption of FAPs are to consider important the following reasons to buy or eat them: less expensive than other foods, easy to digest, healthy, tasty, low-fat and for special occasions. Also, we found that consumers who prefer wild, local and marine products consume FAPs away-from-home more frequently, which could be an indirect consequence of choosing a restaurant near a water body, as they expect certain fish characteristics based on the selected location. For the second hypothesis, we found that those who are more satisfied with life and optimistic about future living conditions have a higher probability to consume FAPs more frequently away-from-home. With regard to the third and fourth hypotheses, we determined that consumers between 25 and 54 years of age, who live in smaller households not located in rural areas, belonging to the higher class of society and who have fewer financial difficulties are more likely to consume FAPs away-from-home.

The main limitation of this study is that it is based on a survey that is not specific to the consumption of seafood away-from-home but the consumption of seafood in general. As a result, there may be some lack of precision in the results to represent reality, particularly in the attitudes towards the main reasons for the consumption of seafood, as the valuation and preference for attitudes may vary in the differentiation between home and away-from-home consumption. Additionally, another limitation is that the attitudes assessed in the current study describe only beneficial attributes of fish, and therefore those who eat fish will probably find FAPs in a more positive way. The results of this investigation are therefore limited and restricted to the available data, which is a good starting point but requires improvement for more relevant and accurate results. Future research should consider the design of a specific survey, in which the respondents are advised that all the issues addressed fall within the context of away-from-home consumption.

Future studies should focus on similar analyses for particular species in order to obtain clearer results, especially those species that are important for away-from-home consumption should be further analysed. Also, separate analyses are required for fish species and other categories of seafood. Furthermore, it may be relevant to consider the spatial locations of the respondents, to know whether the low away-from-home consumption of FAPs may be due to a lack of specialized seafood restaurants in the area, rather than to consumer preferences. Moreover, future research should also include the spatial location of the consumer, as one possible important driver is how close the consumer lives from a sea coast or a lake.

Author contributions

All of the authors contributed significantly to the research. The contributions according to the CRediT taxonomy are:

Javier Cantillo: conceptualization, methodology, modelling, analysis, writing—original draft; Juan Carlos Martin: conceptualization, methodology, analysis, writing—review and editing, validation, supervision; Concepción Román: conceptualization, methodology, analysis, writing—review and editing, validation, supervision.

Ethical review

Not applicable.

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Declaration of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Data availability statement

The data can be publicly accessed at https://doi.org/10.4232/1.13212.

Appendix A. Literature review

Table 3 presents a review of the main studies which analyse the frequency of consumption of seafood products using a quantitative approach. The table includes the authors, the year of publication, the species analysed, the country or region of application, the methodology, the size of the sample, the context in which the frequency of consumption is studied (general, at-home or away-from-home), the factors considered and the main results.

Appendix B. Homoscedastic and Heteroscedastic ordered probit models

Table 4 presents the complete results of the homoscedastic and heteroscedastic ordered probit models. The values that are in bold letters have a minimum level of significance of 0.05, while those in italics have a minimum level of significance of 0.1.

Table 5 presents the results of the marginal effects of the heteroscedastic model on the frequency of consumption at least once a month but less than once a week (y = 4) and at least once a week (y = 5).

Table 3
Investigations that analyse the frequency of consumption using a quantitative approach.

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
Almeida et al. (2015)	Seafood products	Portugal	Basic statistics and ANOVA	1240	H&O	Gender, age, education level, work situation, marital status, income, household size, living with children, living environment (rural area, small town, large town), distance from the coast	More knowledgeable consumers had a higher frequency of consumption of seafood and were more interested in information about seafood products. The frequency of at-home consumption was much higher than the frequency of away-from-home consumption.
Almendarez-Hernández et al. (2017)	Tuna	Mexico	Ordered probit model and ordered logit model	364	GC	Income, organic label, free dolphin label, origin, presentation (canned, frozen), price, age, occupation	Higher-income, older and college graduate consumers are more likely to eat fish more frequently. The price of the product was not significant for the frequency of consumption of the product. Consumers who prefer canned tuna have a lower frequency of consumption compared to those who prefer fresh tuna. Consumers who are informed of the "dolphin-safe" eco-label are more eager to consume canned tuna.
Baptista et al. (2020)	Seafood products	Brazil	Multinomial logistic regression	932	H&O	Region of living, gender, generation, marital status, education, family income, children in the family	High-income citizens are more likely to consume seafood products on a weekly basis than those with lower incomes. Consumers who are part of Generation X (born between 1961 and 1980) and Y (born between 1981 and 1997), with high incomes, postgraduate education and families with no children are more likely to eat seafood products in restaurants than to eat them at-home.
Can et al. (2015)	Fish	Turkey	Multiple linear regression (MLR) and statistical analysis	127	GC	Education level, gender, income, primary reasons for fish consumption (economic, health, taste), preferred type of fish (cultivated, caught, frozen), preferred fish marker, fish preparation method, preferred period for fish consumption, number of fish species consumed	Single individuals, students and young people tended to have a higher level of consumption than their counterparts, while females also consumed more fish than males. Health concerns are relevant to fish consumption. The level and frequency of fish consumption were linked to education, total meat

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
							consumption and income, while the total number of fish species consumed by consumers and their age are significant predictors of fish consumption. Fresh fish is preferred over processed fish
Cavaliere et al. (2019)	Different food categories, including one for fish	Italy	Ordinary Least Squares (OLS) regression	36032	GC	Education, income, age, gender, household size, marital status	Both socio-economic and demographic factors have an impact on the frequency of fish consumption. Individuals with higher education, higher incomes, young, female, and living with a partner are more likely to consume fish more often.
Hall and Amberg (2013)	Farmed species grouped in uncommon species, common species, and farmed bivalves	US	Factor analysis	1159	GC	Education, age, income, gender, price, seafood health beliefs, aquaculture problems, aquaculture benefits, wild quality, familiarity, fish concerns, freshness, positive media recall, negative media recall	Price, freshness, and familiarity were the most important factors in the choice of seafood, but they did not predict the consumption of specific classes of farmed species or the overall preference for wild fish rather than farmed products. Beliefs about the benefits of aquaculture were positively linked to increased consumption of aquaculture products, but beliefs about environmental and health-related aquaculture problems did not predict specific choices for consumption. The socio-demographic factors have little or no relation to the consumption of all species. In the case of common fish, education was positively linked to the frequency of consumption of these species.
Hermida and Costa (2020)	Fish and seafood products	Madeira and Porto Santo islands (Portugal)	Generalized linear models (GLM)	465	GC	Age, gender, education level, job, area of residence, job, likes the fish taste, healthy eating, fishing activity	The most important preference and lifestyle factor determining the frequency of consumption of fish and seafood was the taste of fish followed by the activity of fishing. Healthy eating, on the other hand, had no impact on the frequency of consumption. Age had a negative effect on the consumption of seafood (including octopus, shrimp, and limpets additionally from fish)

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
							but not on the consumption of fish. Women were more likely to consume both fish and seafood products more frequently. People employed in basic occupations, professionals and technicians had a high level of consumption of fish and seafood, while people outside the workforce had the lowest levels of consumption.
Herrmann et al. (1994)	Finfish and shellfish	US	Logistic regression model and cluster analysis.	1200	H&O	Age, race of the respondent, presence of young children, residence of the respondent, occupation, annual household income, region, recreation fishing by family members, perception variables for fish (readily available, inexpensive compared to other meat, high quality, attractive appearance and packaging, undesirable fish odour, delicate flavour, nutritional value, easy to prepare at-home, has few bones)	Seafood purchases depend on attitudes towards fish, especially on the frequency of purchases at-home. The main drivers of home purchases were white-collar occupation, older age, urban/ suburban residence, New England location and recreational fishing participation. Consumers associated with frequent restaurant purchases are likely to be those with the highest income, white-collar occupations, recreational fishing activities and living in households with children aged 10 or under. Attitudinal variables show less correlation with the frequency of purchases at a restaurant than with the frequency of eating at-home.
Higuchi et al. (2017)	Fish	Peru	Probit model	159	GC	Price, age, number of children, family members, education, district, gender.	In predicting the frequency of fish consumption, socio-economic factors have little explanatory power.
Hori et al. (2020)	Seafood products	Japan	Multiple regression analysis	6000	H&O	Reasons (quality and taste, freshness, expiration date, country of origin, food safety, price, eco-friendliness)	In terms of the frequency of consumption of seafood at-home, quality and taste, freshness, country of origin, eco-friendliness and food safety were significant positive reasons for more frequent consumption of seafood, while the price was a negative reason. The expiry date was not significantly related to the frequency of at-home consumption. As regards the frequency of consumption of seafood away-from-home, eco-friendliness

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
							has been a significant positive reason for the more frequent consumption of seafood, while freshness, price, quality and taste and the expiry date have been significant reasons for not consuming seafood more frequently. The country of origin and food safety were not significantly linked to the frequency of away-from-home consumption.
Islam et al. (2018)	Different food categories, including one for fish	Bangladesh	Frequency distribution, factor, and cluster analysis	676	GC	Gender, age, marital status, family size, education, occupation, religion social class, place of living, price preferences (low, high, medium), preference parameters (my family involved in cooking and preparing the meal, quality food with the lowest price, organic food, likeness of shopping food for the family, fresh food, food without preservatives, food nutrition is more important than taste, likeness to go to restaurants, preference to keep fish in the meal, fish over meat, likeness to cook new recipes, likeness to buy new food items)	Fish was mostly consumed by groups related to restaurant consumers and those characterized by a high level of awareness of the quality and price ratio and freshness of food and a high level of concern for the food and cuisine of other family members. The average consumption of fish was higher for men, the upper-middle and upper social classes, living in households with fewer family members, and secondary and higher education levels.
Kumar et al. (2008)	Farm-raised catfish	US	Ordered probit model	1194	GC	Form of purchase, method of preparation, method of serving (main, side dish), place of purchase, freshness, expiration date, origin of the product, USDA labelling, price, packaging preferences, opinion of catfish, ethnicity, marital status, age, household size	Fresh catfish buyers, married couples, Caucasians, and African Americans were more likely to buy catfish more frequently. Also, the positive opinions of catfish, origin labels and vacuum-sealed packaging have had a positive and significant impact on the frequency of purchases.
Lee and Nam (2019)	Live fish	South Korea	Ordered probit model	766	GC	Residential area, occupation of the respondents, marital status of the respondent, number of family members, household income, preference for live fish, favourable fish species (black rockfish and red seabream), importance of the price, importance of wild-caught products, satisfaction for the safety of live fish.	Respondents with low-priced demand elasticity are likely to consume live fish more frequently. Although the preference for wild-caught fish is relevant to the consumer's choice, it is insignificant for their frequency of consumption. Consumers with higher consumption frequencies usually consider safety to be more relevant than price.
Murray et al. (2017)	Seafood products	Canada	Mixed methods approach	315	GC	Important factors when buying seafood (taste,	There was a significant but small correlation

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
			(qualitative semi-structured interviews and quantitative survey); Spearman's correlation			smell and appearance, cultural or religious reasons, wild vs farmed, health benefits and nutritional value, uncomfortable cooking or preparing seafood, price, origin of the product, sustainability of the species, health risks)	between childhood and adult consumption frequencies. Age was positively correlated with the frequency of adult purchases, while income and gender were not the same. Adult purchase frequency has been positively affected by consumers who have purchased seafood due to its health benefits and nutritional value. The most important factors affecting the decision to purchase seafood were those related to sensory qualities (taste, smell, and appearance). The second most important factor was the price, while other important factors were the distinction between farmed and wild and the origin of seafood and the health benefits.
Myrland et al. (2000)	Three major seafood categories (fat, lean and processed seafood)	Norway	Maximum likelihood probit models and ordered probit models	4014 (Only Norwegian women from 30 to 44 years involved in a medical study)	GC	Age, education, household size, kids in the household, income, region of location, rating level of physical activity, wine consumption, reasons why not to eat more fish (price, too few choices, supply varies too much, quality varies, shortage on prepared dishes, smell during preparation, difficult to prepare, taste, family do not like fish), consumption of other meats and dishes, preference for seafood.	Product attributes are perceived as more important barriers to consumption than price beliefs. The presence and location of school-aged children are relevant factors for the type of seafood consumed, while overall consumption is increased when people are older, have higher education or have a larger household size. Income does not appear to have a direct role to play in the frequency of consumption of seafood. The relationship between the lifestyle and the consumption of fish was assessed on the basis of the level of physical activity and the consumption of wine, the first being a direct relationship to the consumption of fat and lean seafood dishes, probably because they are perceived as healthy dishes; although it could not be possible to attribute a role to wine consumption.
Terin (2019)	Fish	Turkey	Ordered logit model	260	GC	Income, child number, household head, gender, wife of the house working, other seafood consumption, residence in a rental	Households with higher incomes and a higher number of children, where the householder works and consumes seafood products other

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
						house, fish prices high, public spots, household head working.	than fish, tend to consume fish more frequently. Households who thought that fish prices were not high or that public places had a positive effect on the consumption of fish tend to consume fish more frequently. The highest marginal effect for the highest level of consumption (more than once a week) is on households that consume other types of seafood other than fish, followed by not considering prices for fish as high.
Thong and Solgaard (2017)	Fish, shrimp, and mussels	France	Ordered probit model	996	GC	Food motives (health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, ethical concern), age, income, education, having child under 15, marital status, family size, gender, region of living	Old and high-income consumers were more likely to consume seafood more frequently, especially fish, while the presence of children in households had a significant impact on the consumption of shrimp, but not on fish and mussels. Single and male consumers eat less seafood than their counterparts, while the family size has a negative effect on the consumption of fish and shrimp. Among the nine reasons assessed for the frequency of fish consumption, the most important ones were weight control (low in fat and calories) and convenience (facility to prepare), the first being a positive driver and the second a barrier. The health motive is a significant predictor of fish consumption, while the natural content is significant for both fish and mussel consumption. Price and household income are major barriers to the consumption of fish and shrimp, while people who consider sensory quality to be important eat fish and shrimp more regularly. Familiarity has a negative impact on the consumption of shrimp and mussel.
Vanhonacker et al. (2013)		Sweden, Germany,	Frequency distribution	3213	GC	Country of origin of the respondent	In most of the countries studied, the self-

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Table 3 (*continued*)

Investigation (year)	Fish species analysed	Country or region of application	Methodology	Sample size	Context of the frequency of consumption	Factors considered	Main results about the frequency of consumption
	Fish products and seabass and seabream	United Kingdom, Romania, Czech Republic, Portugal, Greece, and Italy					reported consumption of wild fish was higher than the self-reported consumption of farmed fish, except for Germany, Romania, and the Czech Republic. Seabass self-reported consumption was higher than seabream self-reported consumption in Germany, Sweden, the United Kingdom, Greece, and the Czech Republic, while it was the opposite for Italy, Romania, Portugal.
Yousuf et al. (2019)	Seafood products	Oman	Logit model	906	GC	Nationality, household size job type, education, monthly income, age range of household members, eating preference (home, restaurant, take away, other), form of seafood, expenditure/month, food products preferences (beef, poultry, lamb, vegetables, seafood), seafood, information source, habit, product and physical attributes (quality, taste, protein, convenience, availability, health benefits), selling outlets, price	Nationals, members of smaller households and fresh fish consumers were more likely to consume fish, while consumers with lower incomes and those with persistent habits were more likely to purchase fish more frequently.

H&O: the frequency of consumption is analysed separately by at-home and away-from-home consumption.
GC: the frequency of consumption does not differentiate between the at-home and away-from-home consumption.

Table 4
Homoscedastic and heteroscedastic model.

Value		Homoscedastic model				Heteroscedastic model							
		Parameter (θ)				Parameter (θ)				Standard deviation of the parameter (σ)			
										Parameter (δ)			
		Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.
Attitudes towards characteristics of the product													
Reasons for buying	Healthy	0.3841	0.0151	25.3832	0.0000	0.3417	0.0246	3.8688	0.0000	−0.0990	0.0151	6.5699	0.0000
	Taste good	0.3663	0.0140	26.2365	0.0000	0.3144	0.0224	4.0431	0.0000	−0.0836	0.0131	6.3763	0.0000
	Are products for special occasions	0.2435	0.0272	8.9616	0.0000	0.2032	0.0244	8.3409	0.0000	−0.0668	0.0239	2.7894	0.0053
	Contain little fat	0.2004	0.0154	13.0385	0.0000	0.1600	0.0156	0.2626	0.0000	−0.0559	0.0136	4.1024	0.0000
	Easy to digest	0.3000	0.0174	17.2039	0.0000	0.2554	0.0208	2.2675	0.0000	−0.0251	0.0157	1.6054	0.1084
	Less expensive than other food	0.5200	0.0340	15.3045	0.0000	0.4249	0.0406	0.4728	0.0000	0.0649	0.0304	2.1333	0.0329
Wild	Wild products preference	0.0557	0.0156	3.5698	0.0004	0.0458	0.0131	3.4948	0.0005	0.0139	0.0139	1.0035	0.3156
Sea	Sea products preference	0.2011	0.0159	12.6689	0.0000	0.1468	0.0161	9.1477	0.0000	0.0184	0.0142	1.3001	0.1936
Local	Preference for local and national products	0.1451	0.0146	9.9294	0.0000	0.1029	0.0137	7.4913	0.0000	0.0059	0.0133	0.4448	0.6565
Psychological factors related to life conditions and life satisfaction													
Satisfaction	Very satisfied	0.2900	0.0417	6.9526	0.0000	0.2707	0.0392	6.9003	0.0000	−0.0075	0.0394	0.1896	0.8496
	Fairly satisfied	0.2269	0.0390	5.8236	0.0000	0.2204	0.0363	6.0678	0.0000	−0.0521	0.0370	1.4093	0.1587
	Not very satisfied	0.0862	0.0403	2.1387	0.0325	0.0998	0.0364	2.7416	0.0061	−0.0306	0.0386	0.7920	0.4283
Expectations	Better	0.0774	0.0217	3.5640	0.0004	0.0558	0.0186	3.0006	0.0027	−0.0459	0.0198	2.3178	0.0205

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Table 4 (*continued*)

Value		Homoscedastic model				Heteroscedastic model							
		Parameter (θ)				Parameter (θ)				Standard deviation of the parameter (σ)			
										Parameter (δ)			
		Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.
	The same/no change	0.0178	0.0197	0.9066	0.3646	0.0081	0.0168	0.4814	0.6302	−0.0547	0.0183	2.9975	0.0027
	NA	*−0.0583*	0.0307	−1.8976	0.0577	*−0.0499*	0.0274	1.8255	0.0679	−0.0068	0.0291	0.2337	0.8152
Sociodemographic factors													
Countries	FR - France	0.5577	0.0499	11.1667	0.0000	0.4437	0.0473	9.3900	0.0000	0.2523	0.0475	5.3155	0.0000
	BE - Belgium	0.7219	0.0485	14.8800	0.0000	0.5592	0.0463	2.0676	0.0000	0.0148	0.0442	0.3356	0.7371
	NL - The Netherlands	0.4342	0.0503	8.6320	0.0000	0.3263	0.0396	8.2353	0.0000	0.0106	0.0459	0.2319	0.8166
	DE-W - Germany - West	0.2849	0.0498	5.7190	0.0000	0.2383	0.0371	6.4300	0.0000	−0.0933	0.0460	2.0276	0.0426
	IT - Italy	0.6658	0.0497	13.3859	0.0000	0.5347	0.0461	1.5983	0.0000	0.0106	0.0455	0.2318	0.8167
	LU - Luxembourg	0.9338	0.0601	15.5465	0.0000	0.7369	0.0641	1.4899	0.0000	0.2232	0.0560	3.9829	0.0001
	DK - Denmark	0.4649	0.0508	9.1577	0.0000	0.3564	0.0423	8.4191	0.0000	0.0686	0.0468	1.4669	0.1424
	IE - Ireland	0.6233	0.0501	12.4338	0.0000	0.4891	0.0489	9.9953	0.0000	0.2399	0.0485	4.9480	0.0000
	GB-UKM - Great Britain	0.9763	0.0501	19.4925	0.0000	0.7766	0.0623	2.4726	0.0000	0.4009	0.0497	8.0721	0.0000
	GR - Greece	0.3268	0.0511	6.3953	0.0000	0.2619	0.0378	6.9236	0.0000	−0.1851	0.0458	4.0404	0.0001
	ES -Spain	0.9590	0.0498	19.2624	0.0000	0.7871	0.0595	3.2298	0.0000	0.2821	0.0474	5.9548	0.0000
	PT - Portugal	0.9515	*0.0494*	19.2506	0.0000	0.7705	0.0565	3.6448	0.0000	*0.0890*	0.0458	1.9410	0.0523
	DE-E Germany East	0.4628	0.0584	7.9254	0.0000	0.3555	0.0452	7.8590	0.0000	−0.0480	0.0526	0.9121	0.3617
	FI - Finland	0.6137	0.0497	12.3585	0.0000	0.4828	0.0467	0.3375	0.0000	0.1846	0.0460	4.0086	0.0001
	SE - Sweden	0.8358	*0.0506*	16.5114	0.0000	0.6622	0.0521	2.6994	0.0000	0.0913	0.0463	1.9704	0.0488
	AT - Austria	0.4106	0.0493	8.3329	0.0000	0.3349	0.0399	8.3876	0.0000	0.0247	0.0461	0.5350	0.5926
	CY - Cyprus (Republic)	0.5963	0.0603	9.8952	0.0000	0.4874	0.0515	9.4638	0.0000	0.0326	0.0538	0.6062	0.5444
	CZ - Czech Republic	0.0752	0.0497	1.5129	0.1303	*0.0697*	0.0368	1.8956	0.0580	−0.0345	0.0466	0.7413	0.4585
	EE - Estonia	0.2790	0.0503	5.5523	0.0000	0.1765	0.0460	3.8373	0.0001	0.3348	0.0496	6.7480	0.0000
	LV - Latvia	0.0473	0.0507	0.9327	0.3510	−0.1119	0.0547	2.0461	0.0407	0.5038	0.0521	9.6789	0.0000
	LT - Lithuania	−0.0691	0.0512	−1.3492	0.1773	−0.2205	0.0559	3.9410	0.0001	0.4195	0.0526	7.9752	0.0000
	MT - Malta	0.4993	0.0613	8.1461	0.0000	0.3738	0.0604	6.1844	0.0000	0.3560	0.0603	5.9062	0.0000
	PL - Poland	0.2044	0.0497	4.1161	0.0000	0.1155	0.0416	2.7745	0.0055	0.2187	0.0470	4.6530	0.0000
	SK - Slovakia	0.3080	0.0494	6.2294	0.0000	0.2180	0.0420	5.1888	0.0000	0.1894	0.0478	3.9627	0.0001
	SI - Slovenia	0.3551	0.0499	7.1172	0.0000	0.2745	0.0403	6.8126	0.0000	0.0501	0.0464	1.0793	0.2805
	BG - Bulgaria	0.6022	0.0497	12.1116	0.0000	0.4520	0.0461	9.8009	0.0000	0.1460	0.0463	3.1512	0.0016
	RO - Romania	0.2383	0.0498	4.7835	0.0000	0.1351	0.0429	3.1469	0.0017	0.2378	0.0477	4.9847	0.0000
	HR - Croatia	0.2159	0.0498	4.3384	0.0000	0.1118	0.0428	2.6120	0.0090	0.2657	0.0471	5.6413	0.0000
Age	25–34 years	0.1315	0.0283	4.6523	0.0000	0.1056	0.0230	4.5941	0.0000	−0.0033	0.0253	0.1300	0.8966
	35–44 years	0.1337	0.0272	4.9072	0.0000	0.1145	0.0223	5.1342	0.0000	0.0034	0.0244	0.1397	0.8889
	45–54 years	0.1018	0.0275	3.7071	0.0002	0.0822	0.0221	3.7173	0.0002	0.0195	0.0247	0.7916	0.4286
	55–64 years	−0.0636	0.0285	−2.2337	0.0255	−0.0482	0.0236	2.0442	0.0409	0.0619	0.0260	2.3856	0.0170
	65–74 years	−0.2205	0.0298	−7.3907	0.0000	−0.1792	0.0275	6.5143	0.0000	0.0925	0.0273	3.3836	0.0007
	75 years and older	−0.4229	0.0337	12.5436	0.0000	−0.3737	0.0382	9.7751	0.0000	0.1737	0.0318	5.4530	0.0000
Household size	Household size (2)	0.0418	0.0182	2.2963	0.0217	0.0377	0.0159	2.3702	0.0178	−0.0575	0.0172	3.3507	0.0008
	Household size (3)	0.0042	0.0230	0.1844	0.8537	0.0038	0.0191	0.2006	0.8410	−0.0639	0.0213	3.0001	0.0027
	Household size (4 or more)	−0.0266	0.0218	−1.2179	0.2233	−0.0244	0.0185	1.3189	0.1872	−0.0506	0.0201	2.5140	0.0119
Place of living	Towns and suburbs/ small urban area	0.0705	0.0172	4.0975	0.0000	0.0449	0.0148	3.0272	0.0025	0.0088	0.0160	0.5523	0.5808
	Cities/large urban area	0.1568	0.0169	9.2725	0.0000	0.1383	0.0163	8.4991	0.0000	−0.0520	0.0156	3.3256	0.0009
Economic factors													
Difficulties	From time to time	0.1134	0.0278	4.0798	0.0000	0.0918	0.0245	3.7507	0.0002	−0.0316	0.0257	1.2295	0.2189
	Almost never/never	0.1276	0.0281	4.5370	0.0000	0.1100	0.0250	4.3915	0.0000	−0.0618	0.0260	2.3747	0.0176
Class of society	The lower middle class	0.1994	0.0220	9.0564	0.0000	0.1830	0.0217	8.4500	0.0000	−0.0615	0.0206	2.9846	0.0028
	The middle class	0.3602	0.0175	20.5501	0.0000	0.3159	0.0241	3.0813	0.0000	−0.0729	0.0165	4.4174	0.0000
	The upper middle class	0.5890	0.0302	19.5250	0.0000	0.4970	0.0378	3.1316	0.0000	−0.1279	0.0272	4.6968	0.0000
	The higher class	0.6864	0.0785	8.7423	0.0000	0.6417	0.0777	8.2573	0.0000	−0.0025	0.0719	0.0344	0.9726
	NA	0.1699	0.0346	4.9075	0.0000	0.1667	0.0316	5.2792	0.0000	−0.0786	0.0333	2.3617	0.0182

Threshold parameters								
Thresholds	Estimate	Std. err.	t-stat	p-val.	Estimate	Std. err.	t-stat	p-val.
μ_1	1.1937	0.0620	19.2380	0.0000	1.0077	0.0696	14.4840	0.0000
μ_2	1.6803	0.0624	26.9430	0.0000	1.4302	0.0886	16.1480	0.0000
μ_3	2.5011	0.0629	39.7360	0.0000	2.1135	0.1245	16.9710	0.0000
μ_4	3.3435	0.0637	52.5260	0.0000	2.8160	0.1646	17.1070	0.0000

Model adjustment		
Initial Log-Likelihood	−42574.91	−42574.91
Final Log-Likelihood	−38587.58	−38032.22
McFadden's R2	0.0937	0.1067
AIC	77305.16	76316.45

Likelihood-ratio test - Homoscedastic model vs. Heteroscedastic model	
Degrees of freedom	61
LRT	1110.7
P-value	0.0000
Statistically superior model:	Heteroscedastic model
LRT = chi-square test statistic for the likelihood-ratio test: -2 (LogLmodel1-LogLmodel2)	
Degrees of freedom = degrees of freedom for the χ^2 test statistic defined as the difference	

Table 5
Marginal effects.

Value		Marginal effects of the Heteroscedastic model							
		Frequency of consumption at least once a month but less than once a week (y = 4)				Frequency of consumption at least once a week (y = 5)			
		Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.
Attitudes towards characteristics of the product									
Reasons for buying	Healthy	**0.0692**	0.0028	24.6283	0.0000	**0.0301**	0.0028	0.6919	0.0000
	Taste good	**0.0669**	0.0027	25.0816	0.0000	**0.0315**	0.0028	1.0842	0.0000
	Are products for special occasions	**0.0478**	0.0053	9.0714	0.0000	**0.0213**	0.0064	3.3227	0.0009
	Contain little fat	**0.0358**	0.0029	12.3943	0.0000	**0.0146**	0.0033	4.4099	0.0000
	Easy to digest	**0.0571**	0.0033	17.1885	0.0000	**0.0392**	0.0043	9.2037	0.0000
	Less expensive than other food	**0.0788**	0.0070	11.3326	0.0000	**0.1047**	0.0111	9.4073	0.0000
Wild	Wild products preference	**0.0103**	0.0028	3.6889	0.0002	**0.0098**	0.0032	3.0468	0.0023
Sea	Sea products preference	**0.0323**	0.0029	11.1893	0.0000	**0.0270**	0.0034	8.0333	0.0000
Local	Preference for local and national products	**0.0227**	0.0027	8.5328	0.0000	**0.0170**	0.0030	5.6892	0.0000
Psychological factors related to life conditions and life satisfaction									
Satisfaction	Very satisfied	**0.0595**	0.0087	6.8510	0.0000	**0.0446**	0.0095	4.6727	0.0000
	Fairly satisfied	**0.0467**	0.0074	6.2902	0.0000	**0.0228**	0.0074	3.0680	0.0022
	Not very satisfied	**0.0222**	0.0085	2.6207	0.0088	0.0099	0.0084	1.1691	0.2424
Expectations	Better	**0.0116**	0.0041	2.7963	0.0052	−0.0004	0.0044	0.0860	0.9315
	The same/no change	0.0006	0.0037	0.1649	0.8691	**−0.0094**	0.0040	2.3318	0.0197
	NA	*−0.0112*	0.0059	−1.9064	0.0566	−0.0085	0.0059	1.4374	0.1506
Sociodemographic factors									
Countries	FR - France	**0.0499**	0.0098	5.0964	0.0000	**0.1540**	0.0141	0.9573	0.0000
	BE - Belgium	**0.1084**	0.0117	9.2951	0.0000	**0.1319**	0.0138	9.5866	0.0000
	NL - The Netherlands	**0.0689**	0.0100	6.9168	0.0000	**0.0663**	0.0126	5.2549	0.0000
	DE-W - Germany - West	**0.0581**	0.0102	5.7218	0.0000	**0.0228**	0.0109	2.1032	0.0355
	IT - Italy	**0.1056**	0.0119	8.8813	0.0000	**0.1235**	0.0141	8.7803	0.0000
	LU - Luxembourg	**0.0752**	0.0135	5.5584	0.0000	**0.2360**	0.0187	2.6470	0.0000
	DK - Denmark	**0.0670**	0.0100	6.7061	0.0000	**0.0877**	0.0136	6.4315	0.0000
	IE - Ireland	**0.0565**	0.0103	5.4572	0.0000	**0.1634**	0.0145	1.2863	0.0000
	GB-UKM - Great Britain	**0.0428**	0.0104	4.1261	0.0000	**0.2759**	0.0146	8.8671	0.0000
	GR - Greece	**0.0688**	0.0116	5.9103	0.0000	0.0083	0.0105	0.7909	0.4290
	ES -Spain	**0.0680**	0.0109	6.2145	0.0000	**0.2598**	0.0147	7.6545	0.0000
	PT - Portugal	**0.1131**	0.0124	9.1155	0.0000	**0.2189**	0.0152	4.4072	0.0000
	DE-E Germany East	**0.0820**	0.0124	6.6097	0.0000	**0.0603**	0.0147	4.0977	0.0000
	FI - Finland	**0.0658**	0.0101	6.5167	0.0000	**0.1490**	0.0141	0.5662	0.0000
	SE - Sweden	**0.1035**	0.0120	8.6319	0.0000	**0.1828**	0.0152	1.9999	0.0000
	AT - Austria	**0.0689**	0.0101	6.8200	0.0000	**0.0717**	0.0125	5.7466	0.0000
	CY - Cyprus (Republic)	**0.0933**	0.0134	6.9784	0.0000	**0.1161**	0.0172	6.7405	0.0000
	CZ - Czech Republic	*0.0154*	0.0086	1.7818	0.0748	0.0042	0.0094	0.4429	0.6578
	EE - Estonia	0.0110	0.0082	1.3369	0.1813	**0.1096**	0.0130	8.3961	0.0000
	LV - Latvia	**−0.0307**	0.0066	−4.6707	0.0000	**0.0945**	0.0126	7.5061	0.0000
	LT - Lithuania	**−0.0370**	0.0063	−5.8488	0.0000	**0.0564**	0.0117	4.8167	0.0000
	MT - Malta	**0.0249**	0.0112	2.2228	0.0262	**0.1607**	0.0179	8.9888	0.0000
	PL - Poland	*0.0141*	0.0078	1.8204	0.0687	**0.0690**	0.0119	5.8075	0.0000
	SK - Slovakia	**0.0314**	0.0087	3.5906	0.0003	**0.0837**	0.0125	6.7050	0.0000
	SI - Slovenia	**0.0547**	0.0097	5.6600	0.0000	**0.0634**	0.0123	5.1727	0.0000
	BG - Bulgaria	**0.0690**	0.0105	6.5727	0.0000	**0.1315**	0.0137	9.6146	0.0000
	RO - Romania	*0.0153*	0.0080	1.9175	0.0552	**0.0775**	0.0122	6.3303	0.0000
	HR - Croatia	0.0100	0.0075	1.3232	0.1858	**0.0794**	0.0124	6.4271	0.0000
Age	25–34 years	**0.0233**	0.0050	4.6451	0.0000	**0.0165**	0.0061	2.6858	0.0072
	35–44 years	**0.0252**	0.0048	5.2753	0.0000	**0.0193**	0.0060	3.2281	0.0012
	45–54 years	**0.0180**	0.0047	3.8201	0.0001	**0.0171**	0.0059	2.8832	0.0039
	55–64 years	*−0.0090*	0.0047	−1.9180	0.0551	0.0048	0.0058	0.8423	0.3996
	65–74 years	**−0.0343**	0.0048	−7.1994	0.0000	−0.0080	0.0056	1.4125	0.1578
	75 years and older	**−0.0633**	0.0049	13.0329	0.0000	**−0.0166**	0.0059	2.8181	0.0048
Household size	Household size (2)	**0.0072**	0.0035	2.0322	0.0421	−0.0054	0.0037	1.4491	0.1473
	Household size (3)	−0.0009	0.0045	−0.2034	0.8388	**−0.0115**	0.0044	2.6072	0.0091
	Household size (4 or more)	*−0.0069*	0.0041	−1.6582	0.0973	**−0.0132**	0.0042	3.1680	0.0015
Place of living	Towns and suburbs/small urban area	**0.0100**	0.0032	3.1592	0.0016	**0.0086**	0.0036	2.4032	0.0163
	Cities/large urban area	**0.0300**	0.0032	9.4736	0.0000	**0.0113**	0.0036	3.1798	0.0015

(*continued on next page*)

Table 5 (*continued*)

Value		Marginal effects of the Heteroscedastic model							
		Frequency of consumption at least once a month but less than once a week (y = 4)				Frequency of consumption at least once a week (y = 5)			
		Value	Std. err.	t-stat	p-val.	Value	Std. err.	t-stat	p-val.
Economic factors									
Difficulties	From time to time	**0.0201**	0.0054	3.6902	0.0002	0.0081	0.0057	1.4221	0.1550
	Almost never/never	**0.0223**	0.0051	4.3607	0.0000	0.0044	0.0056	0.8000	0.4237
Class of society	The lower middle class	**0.0420**	0.0047	9.0062	<2.2e-16	**0.0180**	0.0050	3.6048	0.0003
	The middle class	**0.0683**	0.0035	19.7614	<2.2e-16	**0.0347**	0.0037	9.4461	0.0000
	The upper middle class	**0.1243**	0.0074	16.7263	<2.2e-16	**0.0768**	0.0089	8.6326	0.0000
	The higher class	**0.1215**	0.0195	6.2271	0.0000	**0.1588**	0.0295	5.3913	0.0000
	NA	**0.0393**	0.0079	4.9952	0.0000	0.0120	0.0078	1.5465	0.1220

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