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The Greek olive oil market and the factors affecting it

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Abstract

The objective of the research was to highlight the role that socio-economic and spatial attributes of consumers – households exert on their choices regarding not only the supply modes but also the price they are willing to pay for different categories of olive oil, especially the packaged one. Three aspects are successively examined as regards alternative characteristics of olive oil that are proposed: (a) the label, (b) the quality certification protocol and finally (c) the respect of environmental criteria in the production process. It verifies that significant market shares belong to informal networks, which are analyzed to self-consumption, and purchase from either relatives or friends who produce it. The most influential factors purchasing olive oil, amongst others being examined, are the age, the educational level, and the placement of residents in olive oil producing zones. Regarding the WTP for different olive oil labels, consumers are willing to pay premiums only for olive oils being processed by either private companies or cooperatives, with the latter to gain 34% of them in the case they would decide to change the olive oil they usually purchase. The most important consumer profiles are that young educated consumers turn to buy olive oil from SM, do not want to pay less for SM own label olive oil, and they perceive olive oil being packaged by cooperatives as a distinct product they want to use, and pay a premium for it. On the contrary, elderly people are willing to pay less for own label olive oil.

Key words: *Multinomial logistic regression, Consumer behavior, Olive oil.*

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Introduction

Olive oil, as an integral part of Greek and Mediterranean diet, has strong and long life relations with Greek consumers, as it is continuously used not only to cover nutritional needs, but also for cultural and religious purposes. For the period 2000-2008, Greece is the first olive oil per capita consumption country worldwide, followed by Spain, Italy and others (FAO, 2012). Olive oil sector is one of the most important components of the Greek primary production activities: olive groves are being cultivated in 50 out of 54 prefectures of the country while Greece, with an average production about 360,000 tons per year (IOOC, 2009), is the third olive oil producing country, after Spain and Italy. In total, 1.1 million hectares are being covered with 140 million olive trees, with the vast majority of them producing olives for olive oil (more than 85%), while the rest of them represent edible olive varieties (Ministry of Agriculture, 2009). Only 22% of olive groves are being irrigated, with the island of Crete to have the majority of irrigated olive groves.

Another important characteristic of this sector is the relatively large number of olive oil labels of Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI)[1]: Greece, to date, has 26 olive oils granted as PDO and PGI, while the main competitors, Italy and Spain, have respectively 39 and 25. Considering this evolution, different studies have recently attempt to evaluate the level of consumers' awareness regarding quality labeling for several foodstuffs and olive oil in particular and to measure the Willingness To Pay for purchasing such products (Fotopoulos and Krystallis, 2001; Skuras and Vakrou, 2002; Fotopoulos and Krystallis, 2003; Philippidis and Sanjuan, 2003; Menapace et al., 2011). Sandalidou et al. (2002) maintain that organic olive oil is a quite promising product, but there is considerable lack of information and uncertainty about the organic origin of the product. As regards, Fotopoulos and Krystallis (2002) concluded that there is a straight forward tendency from consumers to pay higher prices for organic olive oil while there is a lot to be done on the consumers' satisfaction issue as well as the promotion and food safety fields in order organic food consumption to be increased. Krystallis et al. (2006), Tsakiridou et al. (2006) and Krystallis and Chryssohoidis (2005) show off that high pricing of organic foods in addition with low awareness of the term *Organic* create a quite adverse trading environment for further expansion and evolution of the organic market in Greece.

If we accept that PDO and PGI labels are *de facto* a guaranty of quality and can be perceived as such by consumers, we also assume that other characteristics of the product, especially environmental aspects, have an important role on the achievement

[1] According to the EU agricultural product quality policy, PDO covers agricultural products and foodstuffs which are produced, processed and prepared in a given geographical area, using recognized know-how. PGI covers agricultural products and foodstuffs closely linked to the geographical area (EU, 2012)

of the final quality of olive oil. Among them, we can mention the type of olive mills and the technology adopted especially in terms of proper sewage treatment of residuals.

Until now, most of the studies related to consumers' behavior for olive oil are not considering these specific attributes of quality while they are focused on organic olive oil market only. For this reason, through a country wide sample, the present study attempts to evaluate the Greek consumers' preferences and behavior for different olive oil brands and various specific olive oil's attributes. This research focused not only to the recognized quality certification but also to environmental components of the production process. Finally, the objective of the study was to highlight the role that socio-economic and spatial attributes of consumers – households exert on their choices (behavior) regarding not only the supply modes but also the price they are willing to pay for different categories of olive oil.

1. The framework of analysis

Consumers' preferences and willingness to pay more for specific foods' attributes is a complex decision-making process that has been widely conceptualized via the Theory of Reasoned Action (TRA; Ajzen and Fishbein 1980). This theory suggests that attitudes toward a behavior and subjective norms predict an individual's intention which, in turn, predicts the behavior itself. Even if this theory has been used to predict a wide range of human behaviours, it was criticized for neglecting the role of social factors and the environment surrounding the individual behaviour (Werner, 2004). Consequently, Ajzen (1991), with the Theory of Planned Behavior (TPB) proposed an extension of the model incorporating the idea of Perceived Behavioral Control as both a predictor of intention and a direct predictor of behavior.

Fishbein and Ajzen (2010) cite defining a behavior of interest as a critical step in predicting and understanding human behavior. Since behaviors are observable events taking place under specific conditions, they should be defined clearly. There are four major components of behaviour to consider: the action that is being performed, the target at which the action is directed, the context in which the action is performed, and the time at which the action is performed. For example, consuming behavior may be defined as purchasing (action) foodstuff (target) at the supermarket or directly from the producer (context) within a month (time). The same degree of specificity used to define the behavior should be applied to all constructs in the TPB (i.e., attitude, perceived social pressure, and perceived behavioral control must all be measured with respect to completing the action towards the target within the specified context and time). Defining all constructs at the same level of specificity satisfies the "principle of compatibility," and moreover the idea that all measures in the model must be compatible with the defined behavior to facilitate predictive validity (Ajzen and Fishbein, 1980).

During the last years, the theory in itself has been largely improved (Ajzen 1991; Fishbein and Ajzen, 2010). The behavior – the dependent variable of the model – refers to the action that the researcher is attempting to predict and depends mainly on four groups of variables: intention, attitude, perceived social pressure and perceived behavioral control. Intention refers to the extent to which it is an individual's objective or purpose to perform the behavior (i.e., the extent to which the individual plans to engage in the behavior). Attitude refers to the valence of the individual's evaluation of performing a behavior (i.e., how favorably or unfavorably an individual evaluates performing the behavior). The TRA and TPB both include a "subjective norm" constructed as a gauge of social pressure (Ajzen 1991; Ajzen and Fishbein 1980). This norm only captures what an individual believes important others want him/her to do. More recent theoretical frameworks combined two categories of norms, the injunctive[2] and the descriptive[3] ones (Fishbein and Ajzen, 2010) in order to produce an overall measure of perceived social pressure. Finally, perceived behavioral control refers to the extent to which the individual believes s/he has control over the factors that facilitate or inhibit the performance of the behavior (i.e., how much the individual feels s/he has control over whether the behavior is performed).

The potential of the TPB to explain WTP for different goods (both public and private) has provided mixed results (Ajzen and Driver, 1992; Luzar and Cosse, 1998; Pouta and Rekola, 2001; Werner et al., 2002). Both Pouta and Rekola (2001) and Werner et al. (2002) found perceived behavioral control to be an important predictor of WTP while others suggest that psychosocial variables are better predictors than attitudinal variables alone (Sparks and Shepard, 1992). These mixed results tend to prove that there is no consensus as regards the predominant explanatory variables, especially for food consuming behavior. This is not so surprising because a wide range of factors as well as the nature of the product are likely to interfere.

In the present research, the dependent variable (behavior) refers firstly to the purchasing choices for olive oil (supply modes) and secondly to the price they are willing to pay for different categories of olive oil, especially the packaged one. Three aspects are successively examined as regards alternative characteristics of purchased olive oil: (a) the type of labels, (b) the quality certification protocol and finally (c) the respect of environmental criteria in the production process.

Our research is specifically focused and consequently limited to the role that socio-economic (including the cultural dimension) and spatial attributes of consumers – households exert on their choices (as for example, the place of residence). In other words the objective is to highlight and evaluate the importance of the environment surrounding the household's behavior. It is well known that a great diversity of attributes

[2] The injunctive norms refer to the frequency with which the individual believes the behavior is performed by important others (i.e., how often important others perform the behavior)

[3] The descriptive norms are related to the frequency with which the individual believes the behavior is performed by important others (i.e., how often important others perform the behavior)

has a direct impact on consumer perceptions on quality as well as price levels. Among them, the most obvious – as it appears in the relative literature review – concern the demographic and socio-economic characteristics of households while spatial considerations have been most recently recognized as a determinant factor (Rieutort & Duquenne, 2010). The spatial dimension can be analyzed according to different perspectives. The following ones are not in contradiction, they include complementary spatial dimensions:

- The first one refers to the localization of the grocery stores, highlighting the impact of distances, transportation, central or peripheral place as well as the dimension and/or category of the store etc.
- The second one takes into account the household's localization and more precisely the geographical attributes of its residential area (as for example, urban or rural place).
- The third one considers that household localization is not only reflecting geographical attributes but also, socio-cultural ones that may be predominant in the case of ethnic products as it is the case in Greece, for olive oil or Greek cheese feta. Moreover, the consumers' preference for local/regional products and direct food purchases seem to take an increasing place. In this case, the consumers' motivations are various (Thilmany et al., 2008; Charton-Vachet, 2009). Among them, we can mention especially the regional belonging (van Ittersum, 2001).

The second and third dimensions are the perspectives adopted in this research because the purchase of branded olive oil through grocery stores (1st dimension) is only a segment of the national market (ICAP, 2005; Dagkalidis, 2011). Moreover, a recent research (Vlontzos and Duquenne, 2010) has shown that consumers' behavior as regards olive oil presents deep specificities. Firstly, due to its importance in the Mediterranean diet, the demand is quite inelastic as regards economic attributes. The per capita household's income doesn't seem to exert serious effects on demand. Secondly, there is still an important "informal" sector: households living in zones nearby production regions are directly been supplied with olive oil from their family or their near social environment (ICAP, 2005). It is first of all a question of confidence but also reflects a strong cultural bond with the territory of origin. In this context, the residential area and the proximity to production zones take on a different dimension. Indirectly it allows us to take into account the affective association with the product's region of origin (Skuras and Vakrou, 2002). Following Verlegh and van Ittersum (2001, p. 269), we can consider that this affective association "refers to the feelings or emotions that are evoked by the place of origin".

2. Methodological approach

For this empirical analysis a field research was conducted on a national level by administering 2,000 questionnaires in 23 municipalities of the country[4]. The municipalities have been selected through a stratified random sampling where strata are related to urban/rural areas, traditional production/non production zones of olive oil and population size of the municipalities. Consequently, the research covers both urban and rural areas in addition to producing and non-producing olive oil zones. As above mentioned, we introduce a double spatial distinction because urban lifestyle affects the nature of the foods consumed as well as the dietary patterns (Delisle, 1990) while the proximity to traditional producing zones seems to reinforce the direct olive oil purchases. A recent study concerning a single region of Greece (Thessaly) confirmed that there is a significant difference among consumers on the preferred ways of purchasing olive oil, according to their proximity to production zones (Rieutort and Duquenne, 2010). Taking into account that a large part of the national consumption (45%) concerns unbranded olive oil directly purchased from small producers (ICAP, 2005; Dagkalidis, 2011), we thought necessary to introduce this second spatial dimension.

Concerning the households' residential areas, it was finally possible to define three urban centre categories: (a) Athens and Thessalonika (800 households), (b) large regional cities (843 households) and (c) small medium cities (349 households). As regards the second criteria, 1322 households are living in non-production zones against 670 in olive oil production zones. The methodological approach can be summarized as follows:

First step: after a short presentation of the consumers and households profile, the analysis is focused on the determinants of preference for packaged or in bulk olive oil. The objective is to assess and confirm the relative importance of economic and socio-spatial attributes as regards the consumers' decisions. This analysis is based on the following assumptions:

Assumption 1: In Greece, olive oil can be regarded as an integral part of inhabitants' diet. It is the first worldwide country in terms of annual per capita consumption (more than 15kg). Under this assumption, the demand is being considered as almost inelastic to the household expenditure and hence the preference for packaged olive oil (being purchased in retail chain stores) is not influenced considerably by the standard of living of the household's members (Vlontzos and Duquenne, 2010).

[4] This sample of around 2,000 households comforts a 99% level of confidence (a=1%), as well as a restricted confidence interval (d=3%), which is generally considered as an appropriate margin of error for such kind of market survey. Consumers were chosen by the interviewers randomly in every definite ageing group following the principles of stratified random sampling.

Assumption 2: Abutting to olive oil production areas increases the ability for providing to the household olive oil from relatives or friends as well as it increases the likelihood of self-consumption. It is known that during the last decades quite many households have settled to large urban areas, without abandoning or selling their premises and their olive groves, continuing to cultivate them, mainly to cover their needs for olive oil and edible olives. This process of "distant farming" (Goussios, Duquenne, 2003) was first detected in areas with extensive agriculture, as the case of olive groves is.

Assumption 3: Maintaining close relationship with the place of origin will affect the consuming behavior of the household when in such a place there is traditional olive groves cultivation. This phenomenon explains why urban consumers continue to purchase olive oil from informal networks (ICAP, 2005). The tendency of this behavior though is higher in the case of elderly households, which means that, age might be a deciding factor regarding olive oil supply way. This could reflect that the "affective association" tends to be less strong among the younger generations.

For testing the three above assumptions, we used a discrete choice modeling, due to the fact that the dependent variable is expressed as a categorical variable, reflecting the three alternative supply modes: (i) Super-markets, (ii) friends – small producers and (iii) family – self consumption. This kind of model is effectively the most usual model used in order to explain consumers' behavior, considering a series of exogenous variables. Discrete choice models, based on maximum likelihood method (Ben-Akiva and Lerman, 1985), combined individual – level perceptions with individuals and/or households objective attributes. These models permit to estimate the probability for a consumer to choose each predefined supply modes (categories of the variables) considering the selected exogenous variables.

When the dependent variable is a dichotomous one (dummy variable), the family of logit/probit models or binomial logistic regression are alternatively used, depending to the nature of the examined problem. Generally, the **logistic regression** is considered as the most appropriate when it is supposed that consumer's behavior reflects a utility maximizing decision process (Bishop, 2006). In the present research, the **multinomial logistic regression** is used. It is a similar model as the logistic one but more general as the dependent variable contains more than two events.

The fundamental assumption of this model is that the dependent variable Y (with k categories) follows multinomial distribution with probabilities pj, (j = 1, ..., k) . Basically, the multinomial regression compares different groups of people through a combination of separate logistic regressions (Hosmer and Lemeshow, 1989).

By logistic regression (Tarling, 2008), it can be estimated the impact of selected determinants on the probability consumers to select alternative supply methods of olive oil. As mentioned above, we have three choices for the dependent variable (j = 1 to 3), so the likelihood of each mode of supply is expressed as follows:

[1] $$p_{i,j} = \frac{e^{z_{i,j}}}{e^{z_{i,1}} + e^{z_{i,2}} + e^{z_{i,3}}}$$

$p_{i,j}$ = Probability for individual i to choose the class j

The variable Zi,j is expressing the satisfaction of individual consumer i, when he is choosing supply way j, is a linear function of T determinants Xm where m = 1 ... M

[2] $$Z_{i,j} = a_{i,0} + a_{i,1}X_1 + a_{i,2}X_2 + ... + a_{i,M}X_M$$

The rates a_k are estimated by the method of Maximum log-likelihood function, so that it can be identified which are the significant factors that maximize the likelihood of each option (j = 1..3) to occur. Choosing one of three options as the reference category, we have:

[3] $$\log\left(\frac{p_{j/X_1,\ldots,X_M}}{1 - p_{j/X_1,\ldots,X_M}}\right) = a_0 + \sum_{m=1}^{M} a_m X_m$$

According to the equation [3] when the rate αm> 0, the probability of category j with respect to the chosen reference category, increases and vice versa when αm <0.

It is important to underline that, one of the central questions in discrete choice modeling is to select the appropriate attributes: the number of them (as the number of categories) cannot be unlimited; it is in a large part conditioned by the sample size in order to avoid an eventual too large number of empty cells, which can alter the goodness-of-fit of the model. For this reason, we suggest to carry out a series of dependency tests between the dependent variable and the explanatory variables initially selected that is:

- demographic individuals attributes : sex, age and education level of the interviewer, family size
- household's socio-economic attributes: family size, average income per capita, average food expenses per capita,
- geographical-cultural attributes: category of residential area (type of urban centre), proximity to olive oil production zone, category of store where the household is generally shopping at (local – traditional store, super-regional super market, discount markets).

Second step: in order to estimate how consumers and households' attributes would impact their propensity to opt for a given price, when they are suggested to acquire a specific category (label) of olive oil, a similar approach was carried out, implementing once again multinomial logistic regression, with different price levels as dependent variable. The objective is to detect under which conditions, consumers are willing to pay more or less than the current price, in order to purchase different brands of olive oil or to prefer an olive oil with specific characteristics as for example olive oil with quality certifications.

Finally, it is necessary to mention that, for all the multinomial logistic regressions implemented:

(a) The backward elimination method (successive removal of non-statistically significant determinants[5]) has been used in order to eliminate step by step, the factors with no significant contribution to the models. At the last stepwise, the model includes only factors that contribute to explain at least one of the two alternative household's behaviors (to pay less or to pay more). It is necessary to underline that the forward method has also been used and gave finally the same results (not significant differences).

(b) The overall performance of each model was mainly evaluated through:

- The log likelihood value (-2LL) which allows to test the existence of a relationship between the dependent variables and the independent factors, the -2LL following a chi-squared distribution. For the eight examined models, the null hypothesis that there is no difference between the model without independent factors and the model with independent factors is effectively rejected. Two additional statistics measures of goodness-of-fit (Pearson and Deviance) are also produced. When the significance level is greater than 5%, we can admit that the data are consistent with our hypotheses.
- The overall predictive accuracy of the model is based on the percent of correct predictions comparatively to the rate of accuracy achievable by chance alone. It is generally accepted that a 25% improvement over the by chance accuracy rate allows us to characterized the multinomial regression as useful.

[5] The backward elimination method starts with the full model including all explanatory variables. Then variables are deleted one by one until the stopping condition, based on F statistic, is satisfied. At each step, the variable corresponding to the smallest contribution to the model is dropped provided that this variable presents a non-significant F statistics. The process continues until all independent variables remaining in the model have an F statistics significant at the selected significance level (usually 5%).

3. Consumers and households profile.

Having chosen the exits of the retailer stores as places for approaching the interviewees, it was expected that the majority would be women. In fact women are the 60% of the sample. The consumers' age is between 18 and 89 years old with median the 45 years old age, while 50% of the sample is up to 44 years old.

The household's size (number of members per household) is 2.9 on average, which is quite satisfactory, because previous studies have estimated that Greek household size is 2.8 on average (Kaklamani and Duquenne, 2009). This estimation is very important, because the household's size has a direct impact on food consumption and expenditure in general, influencing by this way the final purchasing choice of consumers.

4. Consuming peculiarities of olive oil in the internal market

The findings of this research confirm too that the market shares being covered through relative – self consumption and informal distribution networks[6] are quite high nationally (32% and 17% respectively) and that there is a significant variance of them between non-producing and producing olive oil zones. For the last ones, like Crete, the formal market shares are not above 25%, by far smaller compared with the national average (51%).

The impact of the main factors being examined in this research as regards the final purchasing choice for olive oil is summarized in the following table.

Table 1: Purchasing olive oil's impact factors

	Chi square Statistic	**Degrees of Freedom**	**Significance level**
Age	36.3	6	0.000**
Education Level	28.4	8	0.000**
Household's size	10.9	5	0.139
Income	5.9	4	0.206
Urbanity	2.4	4	0.665
Producing – non-producing area	76.7	1	0.000**

*** p-value ≤ 1%, * p-value ≤ 5%*

Source: Our own field research on 2000 households, (1st semester of 2011)

[6] By the term Informal distribution networks we mean the distribution of olive oil among relatives or friends without the involvement of merchants or retailers

It is obvious that, ceteris paribus, the most important factors are the age of the consumer, the educational level and the case of living or not nearby to an olive oil producing area. The finding that the income factor is not significant is acceptable because olive oil, as it has already been mentioned, is an integral part of the Greek diet, adopting attributes of inelastic products.

Table 2: The impact of age on the final purchasing choice for olive oil: (% of households for each age group)

Age	Super Market	Friend-Relative	Self-consumption	Total
< 25	58.8%	10.9%	30.3%	100%
26-34	56.5%	13.4%	30.1%	100%
35-44	52.3%	14.6%	33.1%	100%
45-54	50.3%	21.0%	28.7%	100%
55-64	43.8%	21.7%	34.6%	100%
Above 65	37.9%	22.6%	39.5%	100%
Overall	50.6%	17.4%	32.0%	100%

Source: Our own field research on 2000 households, (1st semester of 2011)

The above table analyses in more detail the distinct and the contradictory role of age on the formation of market shares. The younger the consumer, the greater preference is expressed in purchasing olive oil from S.M. rather from friends. Quite interesting is the finding regarding the impact of age on the self-consumption trend, proving that younger consumers are not willing to cultivate olive groves they pertain, in order to cover their olive oil needs, like previous generations used to.

Table 3: The impact of education level on the final purchasing choice for olive oil (% of households for each education level)

Education level	Super Market	Friend-Relative	Self-consumption	Sum
Primary school	44.4%	19.0%	36.5%	100%
High school	45.5%	24.4%	30.0%	100%
Lycee	50.6%	14.4%	35.0%	100%
University graduate	53.6%	17.3%	29.1%	100%
Overall	50.6%	17.4%	32.0%	100%

Source: Our own field research on 2000 households, (1st semester of 2011)

A further analysis of the education level factor, show off that more educated consumers prefer to purchase olive oil from S.M., with the other alternatives though to maintain their impact to noteworthy levels (Table 3). The dynamic of both factors already mentioned is positive for S.M. and create ambitions for radical changes in market structure in the near future. The reasoning for this optimism lies upon the fact that younger generations will be the future consumers, the education level is improving rapidly and there is no other

factor justifying that the dynamic of the informal distribution networks will be stable or increased in the near future.

Table 4: Olive oil market shares in producing and non-producing zones (% of households)

	Non-producing zones	Producing zones	All zones together
Super Market	57.6%	36.7%	50.6%
Friends – Relatives	17.3%	17.7%	17.4%
Self – consumption	25.1%	45.7%	32.0%
Overall	100.0%	100.0%	100.0%

Source: Our own field research on 2000 households, (1st semester of 2011)

Households abutting on olive oil producing or non-producing zones diversify considerably the distribution of market shares at local markets, with the S.M. to prevail against the informal channels in non-producing zones and vice versa (Table 4). The fact that the two larger urban areas, Athens and Thessalonica, are placed nearby to producing and non-producing zone respectively, perhaps requires the implementation of different marketing strategies from packaging firms and retailers, in order to strengthen further their position into the market. It is worth mentioning though that both the self-consumption and the supply from relatives'/friends percentage in large urban areas like Athens or Patras is quite considerable and it is being explained because of the abutting of these cities with olive oil producing zones. On the contrary, the same percentages for cities being placed at northern Greece, where there are no producing zones, are quite small, result which was fully expected to occur.

5. Determinants of preference for packaged olive oil

Based on the above results, we can suggest that the preference for packaged or in bulk olive oil is more related to social-spatial characteristics of households as well as the place of origin, rather than purely economic factors. The following analysis aims to assess and confirm the importance of these specific characteristics.

For the analysis of the preferences of households regarding the type of olive oil they consume, the reference category chosen concerns the purchase from retail chain stores (packaged olive oil), allowing us to determine what factors directly affect the supply of the two alternative forms of informal networks which are either the family/relatives or friends, compared each time with the purchase from Super Markets. The application of

multinomial regression, using the backward elimination method reached to the following conclusions:

• The income variable does not affect consumers' choice. From all the socio-economic and spatial variables being tested, this is the only one that does not contribute to the interpretation of preferences, confirming the first hypothesis being made.

• The results of the final model without the above variable are very satisfactory: all the criteria for overall evaluation of the model are statistically significant. By controlling the likelihood ratio (Table 5), is being checked the satisfactory adaptability of the model, by comparing the final model with the original one, including only the fixed term. The statistic follows the Chi-square distribution with k = 8 degrees of freedom (number of deterministic variables * number of models being compared), confirming the good adaptability of the final model. It is also important to control the assessed rating of households in the 3 groups of purchase. The overall evaluation of correct assessment is 58%, reaching 80% for households purchasing bottled olive oil. It is considered that the model is useful when the rate is valued by at least 25% (chance accuracy rate), as it happens in this case.

Table 5: Overall model evaluation

2LL (log-likelihood):	
First model	1010.275
Final model	858.446
Likelihood Ratio Tests (Chi-square)	151.290
Degrees of freedom	8
Significance level	≈ 0.000
Chance accuracy rate	
Super Market	80.8%
Friends	38.3%
Family/self-consumption	38.1%
Overall	58.2%

Source: Our own field research on 2000 households, (1st semester of 2011)

It is obvious that the chance accuracy rate concerning the purchase of olive oil from formal networks (SM) is particularly high (81%), compared to the other two categories (38%). This result indicates that the model could be improved by incorporating other determinants, in particular, like factors referring to the place of origin of consumers, or the migration era to urban areas (1st, 2nd, or 3rd immigration era). Regarding the determinants, Table 6 summarizes the results of the model for the two groups, taking as "reference" the group of consumers purchasing olive oil at SM.

• The households' residence taking into consideration the proximity to olive oil production area is significant. Table 6, shows off that is more likely for a household to be provided with olive oil from friends (instead of SM) when this residence is nearby

production zone (log-odds = +0.566). Similar but stronger effect (log-odds = +1.339) observed for the supply from family environment (including self-consumption) compared to purchasing at SM. In the first case, the relative risk ratio is expected to increase by 1.76 points when the household is placed at production area while for the second case, the increase reaches 3.81 units. Therefore, households being placed nearby production areas, increase their relative probabilities for purchasing olive oil from relatives/friends by 76% (from 1.761-1) and 282% (from 3.815-1) for being supplied with olive oil from family or by producing it by cultivating their own olive groves.

Table 6: Determinants regarding alternative of olive oil consumption

(a) Purchasing from Friends compared with purchasing from Super Market

Determinants	Coefficients	Standard Error	Wald	Significance level	Exp(a)	95% C.I.
Constant	-2.604	0.308	44.941	0.000		
Production zone	0.566	0.154	13.441	0.000	1.761	[1.301;2.383]
Urbanity	0.107	0.098	1.199	0.274	1.113	[0.919;1.350]
Age	0.257	0.051	24.984	0.000	1.293	[1.169;1.430]
Education	0.015	0.061	0.059	0.807	1.015	[0.900;1.145]

(b) Purchasing from family/self-consumption compared with purchasing from Super Market

Determinants	Coefficients	Standard Error	Wald	Significance level	Exp(a)	95% C.I.
Constant	-1.294	0.258	25.067	0.000		
Production zone	1.339	0.130	105.763	0.000	3.814	[2.955;4.923]
Urbanity	0.371	0.088	17.622	0.000	1.449	[1.219;1.724]
Age	0.105	0.042	6.203	0.013	1.111	[1.023;1.206]
Education	-0.112	0.052	4.735	0.030	0.894	[0.808;0.989]

Source: Our own field research on 2000 households, (1st semester of 2011)

• The urban center type (large, medium or small) is not a determinant for purchasing olive oil from friends (level of significance, a = 0.274). On the contrary, it has an impact on self-consumption or being supplied from the family environment in the way that living in large urban centers (rather than medium or small centers) increases the likelihood of this type of supply compared with purchasing from SM. The relative risk ratio is expected to be increased by 1.45 points when the household is placed at very large urban center, instead of being placed at middle size ones. Thus, staying in large urban centers increases the relative likelihood of being supplied from family environment compared with buying from SM by 45%. This positive influence can be partly seen as an unexpected result. The raison behind this finding could be that a significant proportion of consumers living in large cities are abutting to production areas (Heraklion, Patras, Volos, etc.) as well as it can be assumed that several households in Athens have their origin from Peloponnese, one of the biggest olive oil producing zones in the country, and

therefore up till nowadays still have the option of being supplied from the family environment. This assumption can be a new field for research to evaluate the real impact of the place of origin of households on consumers' behavior.

• Age is also an important factor in both cases being checked for the supply alternatives of olive oil. It appears that the preference to use "informal networks" (instead of purchasing at SM) is positively correlated with age (log-odds = +0.257 and 0.105). Therefore, the older the consumers the more is likely the olive oil supply to be done through friends or relatives. This trend though can be quite useful for SM, because leads to the conclusion that younger consumers prefer purchasing olive oil from retail stores, providing hints for SM that it is feasible a restructuring of market shares in the near future in favor of them. The question therefore arises is this: to what extent this differentiation (between young and elderly consumers) can be interpreted as a tendency to decrease both self-consumption (and therefore the continuousness of cultivation of the family's olive groves) and the bonds with the place of origin, as well as the relative importance of informal networks?

• Finally, the education level is a determining factor only in the case of self-consumption. On the contrary its meaning is not statistically significant for the option of purchasing from friends (a = 0.857). It should be noted that as far as the educational level improves, the possibility of self-consumption or being supplied from relatives is being negatively affected, as it should be expected (log-odds = -0,112). The transition from one educational level to the upper one directly leads ceteris paribus to decrease by 10.6% the likelihood of the potential supply from the family environment, compared with purchasing from SM. Assuming that it is more likely that the average level of education of young consumers is higher than that of the elderly ones, this finding is absolutely consistent with the previous one.

6. Willingness to pay for olive oil under alternative attributes regarding price, quality and environmental protection

Eight (8) variables are examined concerning their willingness to pay for different brands or specific olive oil's attributes. As regards brands, three alternative label groups of olive oil are considered: (b1) supermarket own label, (b2) private company and (b3) cooperative label. As regards the specific attributes, two main aspects are examined: the recognized quality and more especially (c1) the organic label and (c2) the quality certification, while as regards environmental aspects three criteria have been selected:

(e1) appropriate sewage treatment of the residuals of the milling process, (e2) olive oil being produced in non-irrigated olive groves and (e3) use of recycled packaging.

6.1. Group of labels

In terms of group of labels, the consumers' behavior is quite obvious (Table 7). The propensity to pay at the very most, the same price for supermarket own labels is quite general (more than 93% of households) while around 20% of the consumers would accept to pay more for a different private label than the one they usually buy. As regards cooperative labels, it seems that its "image" is quite better, with a propensity to pay more concerning around 34% of the households.

Table 7: Willingness to pay for alternative labels

Price levels	**S.M. own label**		**Private label(*)**		**Cooperative label**	
	Frequency	%	Frequency	%	Frequency	%
-20%	343	34.2	93	9.3	87	8.7
-10%	344	34.3	244	24.3	190	18.9
0%	252	25.1	471	47.0	385	38.4
10%	53	5.3	139	13.9	247	24.6
20%	11	1.1	56	5.6	94	9.4
	1003	100.0	1003	100.0	1003	100.0

(*) The Super Market brand for olive oil in Greece corresponds mainly to a low-cost generic brand. The private label concerns a product for which we know precisely its origin (as the name of the producer, the production region)

Source: Our own field research on 2000 households, (1st semester of 2011)

6.2.: Quality labels

The consumers' behavior as regards the quality certified by a specific label, highlight clearly that, generally, Greek households recognized certification as a guaranty of quality. A few numbers of households (especially in the case of organic certification) are not ready to pay more than what they usually do (Table 8). Moreover we can admit that the perception of quality is more evident in the case of organic certification: more than 56% of the consumers are disposed to pay a price at least more than 10% higher against 31% for any other quality label. The fact that half of them consider that the price of olive oil with any other quality certification has to be the same with the non-certified olive oil reflect that there is serious skepticism regarding these validity of these certification procedures and protocols.

Table 8: Willingness to pay for certified quality

Price levels	Organic certification		Other quality certification	
	Frequency	%	Frequency	%
-20%	45	2.3	158	8.0
-10%	85	4.3	199	10.1
0%	535	27.1	1009	51.0
10%	867	43.9	493	24.9
20%	445	22.5	118	6.0
	1977	100.0	1977	100.0

Source: Our own field research on 2000 households, (1st semester of 2011)

6.3. Environmental aspects

For each one of the three environmental criteria, the propensity to pay more than the usual price concern about 50% of the consumers, reflecting a relative awareness about the main environmental aspects of olive oil production process. More precisely, as it appears in the table 9, consumers that are systematically disposed to pay more (for each one of the three criteria considered) represent 23% of the sample while another 25% accepts to pay more for two of the three aspects (generally appropriate sewage treatment and recycling).

Table 9: Willingness to pay for guaranteed environmentally friendly production process

	Sewage treatment		Non irrigated olive groves		Recycled packaging	
Price levels	Frequency	%	Frequency	%	Frequency	%
-20%	56	2.9	81	4.1	91	4.7
-10%	134	6.9	178	9.1	168	8.6
0%	707	36.2	808	41.4	704	36.1
10%	759	38.8	630	32.2	706	36.2
20%	298	15.3	257	13.2	283	14.5
	1954	100.0	1954	100.0	1952	100.0

Source: Our own field research on 2000 households, (1st semester of 2011)

Conclusions

This paper examines various aspects of olive oil consumption in the Greek market. It verifies that still significant market shares belong to informal networks, which are analyzed to self-consumption, and purchase from either relatives or friends who produce it. This consumer behavior, although it appears to be stable, it is proved that it is not

being adopted by younger consumers, providing considerable hints that this market structure comes to its end.

The most influential factors purchasing olive oil, amongst others being examined, are the age, the educational level, and the placement of residents in olive oil producing zones. On the contrary, non-significant factors proved to be the household's size, the family income, and the size of the urban centre, substantiating the fact that olive oil consumption is being characterized as inelastic.

Regarding the WTP for different olive oil labels, consumers are willing to pay premiums only for olive oils being processed by either private companies or cooperatives, with the latter to gain 34% of them in the case they would decide to change the olive oil they usually purchase. Amongst the various certification protocols being implemented up to now, consumers accept to pay premiums for organic olive oil up to 66.4%, while probably due to lack of information, the percentage for the other certification protocols shrinks to 30.9%. Olive oil consumers appear to be quite environmentally friendly, because in all environmental aspects they were asked, they replied they are willing to pay more for olive oil from non-irrigated olive groves and for olive oil being produced in mills which have proper sewage treatment infrastructure as well as being packaged in recycled packaging, with 45.4%, 54.1% and 50.7% respectively.

The lack of information leads to not very secure results, regarding consumers' behavior being affected by environmental issues. It was a positive outcome though that the issue being explained by the model up to a statistically acceptable level is the sewage treatment one, with young, educated consumers, spending significant amount of money for foodstuffs, to be ready to pay premiums for olive oil being produced in mills with proper sewage treatment infrastructure. All the above findings verify that perceived behavioral control explain on a satisfactory level consuming practices for olive oil, regarding their willingness to pay premiums for specific types of the product. All this information can be very helpful for researchers, retailers, policy makers, farmers, and processors, in order to meet the consumers' demands, as they presented through this field research.

Finally, the ongoing financial crisis being experienced by the Greek population since the year 2010 creates a totally new economic environment for all the participating parties of the olive oil market. These dramatic changes on households' incomes appear to change drastically their consumption trends, motivating this research to be repeated, in order to be reshaped the Greek olive oil consumer profile.

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