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## FOOD QUALITY, CONSUMER PERCEPTION AND PREFERENCES: AN ANALYSIS ON OLIVE OIL

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**Abstract:** *With high competition pressure and a saturated market, food quality has become an increasingly important means of competition on the market. Quality concept focuses on customer needs and expectations. A powerful and indispensable tool to understand the intrinsic quality of foods and to translate customer needs into product is sensory analysis. In this study we have chosen to focus the analysis on olive oil, given its importance in the present competitive scenario and also for the renewed and growing interest that this product has in nutrition. The aims of this work were twofold: firstly, to see whether the consumers have an adequate knowledge of the specific qualities of olive oil and also the perceived quality in regard to origin; and secondly, to analyze consumer preferences in order to identify sensory characteristics most important to the acceptability of five olive oil products.*

**Keywords:** *Food quality, olive oil, region of origin, sensory evaluation, preference mapping.*

### 1. Introduction

The processes of globalization and trade liberalization that have characterized the last decade have determined a new global scenario of targets and opportunities for agribusiness. On the supply side these processes involve an increasing possibility for new products and for products originating from different geographical areas to enter markets, that were previously difficult to access, provided they satisfy certain requirements for quality [2]. On the other hand, the demand

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for food in advanced societies, in recent decades, is experiencing profound changes due to various economic, demographic and socio-cultural causes. Consumers are increasingly demanding more quality in the product rather than a variety of attributes such as nutritional balance, health, image, presentation and, in general, convenience. Traders in this scenario, must implement manufacturing and business strategies in an economic contest which is increasingly more globalized and strongly determined by demand. Otherwise, large shares of the market will be lost to those competitors who are more aware of the importance of quality.

The definition of food quality is a very subjective matter, differing from person to person and should be discussed in regard to changes in consumer expectations, legislative needs and new developments in instrumental analysis. The concept of food quality should be analyzed as a system of product requirements both material and immaterial, related to the product in itself, the production context, the product-packaging system, and the product-market system. Also, the dynamics of the quality system is shown as a relationship between processing conditions, product characteristics, product performance, and consumer requirements [11]. Over the years the concept of quality has changed, due to the consumers themselves, who have defined the parameters that characterize quality, demanding products which are healthy, safe, nutritious and produced in environmentally friendly production processes and by animal welfare. The consumers do not buy a product only for its functional characteristics, but also for the utility that the product is able to pass through its attributes.

It is widely accepted that quality has two dimensions: objective and subjective. The objective quality concerns physical characteristics incorporated into the product which are usually determined by engineers and food technologists, whilst the subjective quality is the quality as perceived by consumers. The quality required by industry is an “objective quality”, that is well defined, measurable and verifiable, with certain standard parameters and which is closely linked to the concept of “food security”. However, what is demanded by the consumer is a “perceived quality”, determined by subjective and objective factors and dependent on the time and/or situation and food industries try to estimate in different ways the quality demanded by consumers. The relationship between objective and subjective quality is the most significant part of the economic importance of quality [5]. Quality will be a competitive parameter for food producers only when they are able to transform the consumer requests into physical product characteristics, and when the consumers can deduce required qualities from the way the product has been produced. There are two schools of thought on subjective quality: the holistic approach and the excellence approach. According to the former approach quality holds all the desirable properties a product is perceived to have, according to the latter the products can have desirable properties that consumers, in their own language, may not view as part of quality.

The three main lines of research regarding food quality and safety are: consumer demand for quality and safety, provision of quality and safety, and consumer perception of quality and safety [5]. The first line examines how much consumers are willing to pay for extra qualities and/or safety. The second line concerns the supply side, because to improve safety and/or quality, changes may be necessary in the organisation of agricultural and food production, mainly with regard to governance structures of value chains. Whereas the first two lines of research represent the traditional economic approach to dealing with quality and safety matters, recently a third line has been added that treats the way in which quality and safety is perceived by consumers, and how these perceptions influence consumer decision-making. Therefore this new line can be seen as mediating between supply and demand, because it is the perception of the supply of goods that leads to the demand for these goods. So the knowledge of consumer preferences is therefore the

starting point for defining marketing strategies and related policy choices regarding product, price, communication and distribution. This paper gets into the stream of the empirical contributions about the evaluation of quality food.

## **2. The perceived quality of olive oil and region of origin**

In this study we have chosen to focus the analysis on a specific product: olive oil. This choice is based on the importance of olive oil in the present competitive scenario in light of the commitments made by the European Union (EU) and Southern Mediterranean countries for the creation of a free trade area in the Mediterranean, starting in 2010, within the rules set out by the World Trade Organization (WTO). Trade in agricultural products has been included in this process and a liberalization process in stages is foreseen. In the Mediterranean area, the olive oil sector has a strategic importance that emerges when considering production, consumption and trade. Almost all of the entire world production of olive oil is concentrated in this area with Spain, Italy and Greece, which hold over 80.0% of total output, followed by four non-EU countries, Syria, Turkey, Tunisia and Morocco (13.0% of total production). Furthermore, the consumption is concentrated in the countries which are also the main producers: 70.0% is consumed by the EU, of which Italy and France account for nearly 50.0% of total demand. Finally, 98.0% of world exports of olive oil and 54.0% of imports, belong to the Euro-Mediterranean area, in an increasingly integrated market, the exports, especially after 1997, have grown at a faster rate than production. Studies on the world market of olive consider the increase in demand to be the key factor in the development of the sector. Furthermore, it is expected that the quantitative expansion of the market will go hand in hand with an increase in their segmentation and differentiation of consumer habits. As a result an increasing number of consumers will request olive oils with different quality attributes of product and process, like those related to the origin or by obtaining olive oil from biological production practices.

Given the importance of this product in the Euro Mediterranean competition, and also in the renewed and growing interest that this product has in nutrition, we wanted to see firstly, whether consumers have an adequate knowledge of its specific nutritional, health benefits and organoleptic qualities and secondly, which are their preferences. To this end, it was decided to divide the analysis into two phases. In the first a pre-test was conducted in order to detect the degree of attention of the consumer in the consumption of olive oil that has particular attributes of quality. In the second phase we are looking for relevant descriptors to explain consumer preference on the olive oil, that will ensure its appreciation.

To understand the importance that the consumers give to the quality and to the origin of olive oil which they purchase, the questionnaire for the pre-test was proposed to a very large sample of 403 consumers selected voluntarily and recruited among people who buy olive oil regularly. The 75.6% of the consumers were females and the 24.4% were males; the 52.0% aging between 31 and 50 years, the 31.5% aging between 20 and 30 years and the 16.6% aging more than 50 years. The 67.2% has the secondary education level, and the 32.8% has the university education level. The 38.7% of the consumers consists of housewives, the 27.8% are employees, the 11.9% of professionals, the 6.0% students, the 15.6 has other professional status.

First we tried to figure out if the consumer interviewed is, in general, a consumer who gives particular attention to the food consumed. The survey analysis showed that 62.3% of the sample

declares attentiveness to what they eat, 19.1% is not always careful and 18.6% claimed not to be attentive. Moreover, only 27.0% of people interviewed use organic products. After tracing the profile of the consumer, which emphasises however, that overall, about 80.0% of the sample recognize the importance of the quality of food consumed, we moved on to the specific questions on the consumption of olive oil. The percentage of consumers claiming to be careful of the oil used was 59.8%, 8.4% was not always and 26.1% of the sample stated not to be attentive to the quality of olive oil and 5.7% do not answer. Comparing the importance that the sample attaches to the quality of food consumed with the specific focus on the quality of olive oil consumed, the first element that emerges is that if the percentage of the sample who pay attention to quality only decreases from 62.3% to 59.8%, there is, however, a significant growth in the percentage of respondents who do not pay attention to quality from 18.6% to 26.1%. In other words, a part of the sample who even declared attentiveness to the quality of food, in general, does not pay attention to the quality of oil. A further element of investigation was the verification of the importance attached by consumers to oil used in restaurants. By restricting the analysis only to those who declared they often go to the restaurant, it shows that 57.7% reported being careful of oil used. A additional step in this preliminary investigation was concentrated on the regions of origin of the oil consumed. The literature on region of origin demonstrates that the name of the region of origin evokes general regional characteristics (traditions, inhabitants, culture) capable of triggering the feelings connected with a regional product [3]. All these feelings influence preference for a regional product [10] [16] [17].

That part of the questionnaire showed that, firstly, 100% Italian olive oil is purchased by 78.2% of consumers interviewed, 10.0% do not always buy it and 11.8% does not buy it. However, in the next question, that asks if they are able to recognize an oil that is actually 100% Italian, 80.3% answered no. This, clearly demonstrating the strong information asymmetry that characterizes the sector, highlights the problem that, although there is a significant proportion of consumers who would buy an oil that is characterized as being 100% Italian (78.2%). In fact, considering that 80.3% said they were not able to recognize Italian oil, we can say that the actual purchasing behaviour is different from those presumed by the consumer. To correct the existing information asymmetries the use of an appropriate labelling system becomes crucial. A major contribution to solving this important information asymmetry was given by the recent Regulation (EC) 182 of 6 March 2009 amending Regulation (EC) 1019/2002, whereby it will no longer be possible to pass off as Made in Italy the extra virgin olive oil made from a mixture of pressed, Spanish, Greek and Tunisian olives, without any clear and transparent information. The extension of the obligation to indicate on the label the origin of the olives used to produce extra virgin olive oil in all European countries is a consistent response to the need to ensure transparency to the purchasing decisions of the European union consumers and to fight fraud<sup>1</sup>. The innovation provided by Regulation imposes changes on the labels of bottles of Italian olive oil marketed throughout Europe. In particular, the information on the label of the 100% Italian oil should be reported as e.g. “*obtained from Italian olives*” or “*obtained from olives grown in Italy*” or “*100% from Italian olives*”, while for mixtures from different origins it should be indicated whether they are “*European Community mixtures of olive oil*”, “*non-European Community mixtures of olive oil*”, “*European Community and non-European Community*

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<sup>1</sup> According to Coldiretti, in 2008, Italy imported 185 million kilos of olive oil which, in the absence of labelling, are mixed with the National production which was a little more than 600 million kilos. In other words almost one bottle out of two produced in Italy contains oil coming from foreign olives.

*mixtures of olive oil*". However, it is necessary to emphasize that the investigations were made after the entry into force of this Regulation, but the consumer is still not aware of the possibility of reading on the label all the information about the origin of the olives used to produce the oil they buy. This highlights the problem of communication that apparently still persists. A similar problem is noted by the consumer knowledge of stringent sanitary and hygiene regulations that can differentiate products, as for example, compared to productions from Third Mediterranean countries. In fact, 90.3% of the sample is not aware.

Additional elements of investigation have been aimed at verifying the existence of a particular link of the consumer with the territory in the choice of consumption of olive oil. The result showed a very weak link as only 16.3% of respondents said they prefer an oil produced on their territory. Moreover, it must be said that only 12.6% of respondents prefer an oil that has a quality certification.

In the final analysis specific inquiries were made to discover whether the consumer had tried the oils from the Campania region that are recognized by the European Protected Designation of Origin (PDO) certification<sup>2</sup>. As for the "*olio extravergine di oliva del Cilento*" only 5.8% of the sample has tried it. In addition, the remainder of the sample that has not tested the product is so divided between the three possible reasons proposed: 53.4% did not know the product, 3.9% felt that the price was too high and 36.8 % did not buy it because it was not available in stores frequented. As for the "*olio extravergine di oliva Colline Salernitane*" only 9.2% of the sample has tried it. In addition, the remainder of the sample that has not tested the product is so divided between the three possible reasons proposed: 45.5% did not know the product, 2.6% felt that the price was too high and 42.6 % did not buy it because it was not available in stores frequented. As for the "*olio extravergine di oliva Penisola sorrentina*" only 9.5% of the sample has tried it. In addition, the remainder of the sample that has not tested the product is so divided between the three possible reasons proposed: 48.2% did not know the product, 2.9% felt that the price was too high and 39.5 % did not buy it because it was not available in stores frequented.

What emerges from the last part of the questionnaire, then, is that compared to a relatively low percentage of consumers who have tried the Campania Certificate products, the consumer either does not know of its existence or cannot find it in stores frequented. Only a small percentage does not buy it because they believe that the price is high. Once again it should be noted that consumer information about olive oil is extremely lacking and this, in a context of ever increasing opening of market competition, such as that with the Third Mediterranean countries, requires the adoption of appropriate policy measures to encourage, also in the consumer the "*culture of Italian olive oil*". Considering that oil producing countries of the European Union can compete with the productions of Third Mediterranean countries especially on no-price elements, and in particular, focusing on quality, the lack of consumer information, as noted above, can be a significant limiting factor for the system's competitiveness in a sector that already has a complex crisis situation in terms of supply of production.

### **3. Consumers preferences: an analysis of five brands of olive oils**

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<sup>2</sup> However is necessary to emphasise that the production of labels for oil Protected Designation of Origin in Italy only corresponds to 2% of total production, according to what emerges from the first estimates of Unaprol - Federdop, elaborate by Ismea.

### 3.1 *Materials and methods*

The second aim of this work was to analyze consumer preferences in order to identify and quantify the characteristics most important to the quality of foods. The analysis of consumers preferences has assumed nowadays an extreme importance in business in order to improve quality of products and to obtain a competitive advantage. For describing and quantifying perception and preference and for understanding the intrinsic quality of the foods in order to translate customer needs into product a powerful and indispensable tool the sensory analysis [9] [15].

Sensory analysis is an integral part of the control olive oil quality: the chemical-physical and microbiological characteristics are important, but if the product does not hold appropriate characteristics perceptible to the senses, these have only a relative value. Sensory analysis is the examination of a product through the evaluation of the attributes perceptible by the five sense organs, such as colour, odour, taste, touch, texture and noise. The use of senses in judging food quality is part of our daily actions of the consumption. Sensory science is used to understand consumer preferences, and to predict eating quality with instrumental measurements. Sensory evaluation defined as the “systematic study of human response to physico-chemical properties” of products can be used in very different contexts from the production line to the research laboratory and for a wide range of applications. Obviously, perception plays a major role in the science of sensory analysis. Sensory analysis comprises a variety of powerful and sensitive tools to measure human responses to foods and other products. Sensory methods have been used to determine sensory attributes using descriptive analysis and consumer evaluation methods. It is well known that the investigation of existing relationship among sensory instrumental and preference data is fundamental to develop new products and quality evaluations.

In order to determine meaningful drivers of liking in terms of sensory attribute, defined and measured by consumer perceptions, and physicochemical characteristics, the relationship between homogeneous groups consumers' overall preference and liking of specific sensory and physical inputs was analyzed by the preference mapping [12]. Generally, there are two approaches: internal and external preference mapping. Internal preference mapping is a principal component analysis (PCA) of the matrix of hedonic scores across the products (the observations) and the consumer (the variables), which is carried out on a covariance matrix to allow for differences in the strength of the consumer preferences to be expressed [6]. Internal preference mapping [1] refers to the analysis of preference data only, and provides a summary of the main preference directions and the associated consumer segments [4]. External preference mapping aims to understand the descriptive sensory attributes that influence consumer preferences [14] [8] [7] in order to identify the particular attributes that move their acceptance. It relates consumer preferences onto a multidimensional representation of products obtained from descriptive sensory data [13]. In external preference mapping, the dimensions of the descriptive analysis space are the predictor variables, whereas consumer acceptability is the response variable [14]. Using a number of regression models, external preference mapping regresses the preferences of each consumer onto the first two principal components of a principal component analysis of the products' sensory characteristics. As a result, a graphical representation was derived, showing consumers with opposite preference judgements for the oil allocated onto vectors in opposite directions through the map.

The empirical study on the olive oil was carried in order to look for relevant descriptors to explain consumer preference on the olive oil, that will ensure an its appreciation. The research conducted in this study is not intended to establish superiority of one method over another, but

the work may be useful to product developers for the optimization of product formulations. Product attributes included physical aspects, chemical composition, sensory attributes as evaluated by sample of judges. Based on the findings of the pretest, we have not taken into account the three typical local olive oils, given their lack of knowledge. So we have decided to analyze the most widespread commercial products and fairly comparable regarding their sensory profiles. Due to the fact that it was very difficult to submit to the judge a too high number of products, five olive oil prototypes were selected.

A questionnaire was administered through CAPI to the sample of 500 respondents selected voluntarily and recruited among people who buy olive oil regularly. Each consumers were asking to fill the questionnaire concerning information considered relevant for consumer description and for the explanation of their choices. The 75% of the consumers were females and the 25% were males; the 53% aging between 31 and 50 years, the 30% aging between 20 and 30 years and the 17% aging more than 50 years. The 48% of the consumers consists of housewives, the 32% are employees, the 11% of professionals, the 5% students; 73% love to cook, mostly the first course; the 71% make purchases at the supermarket. The olive oils were firstly analyzed in terms of chemical composition parameter and secondly they were assessed by the consumer sample in terms of overall liking. The physicochemical composition parameter and sensory attributes recognized as significant factors of olive oil acceptance and quality are presented in Table 1.

**Table 1. Products, physicochemical composition parameter and sensory attributes.**

Products	Physicochemical parameter	Sensory attributes
Bertolli	Energy value	Flavour
Carapelli	Saturated fats	Aftertaste
De Cecco	Monounsaturated fats	Digestibility
Monini	Polyunsaturated fats	Aroma
Sapio		

All sensory attribute were measured using a five-point scale (where 1 means not important and 5 means very important). The mean results of sensory descriptors are seen in Table 2.

**Table 2. Measured judges mean sensorial descriptors values of 5 olive oil samples.**

Products	Flavour	Aftertaste	Digestibility	Aroma
Bertolli	2.44	2.66	3.27	2.22
Carapelli	2.96	2.52	2.71	2.41
De Cecco	3.02	2.71	2.38	2.50
Monini	2.21	2.90	3.07	2.42
Sapio	2.16	2.49	2.97	2.71

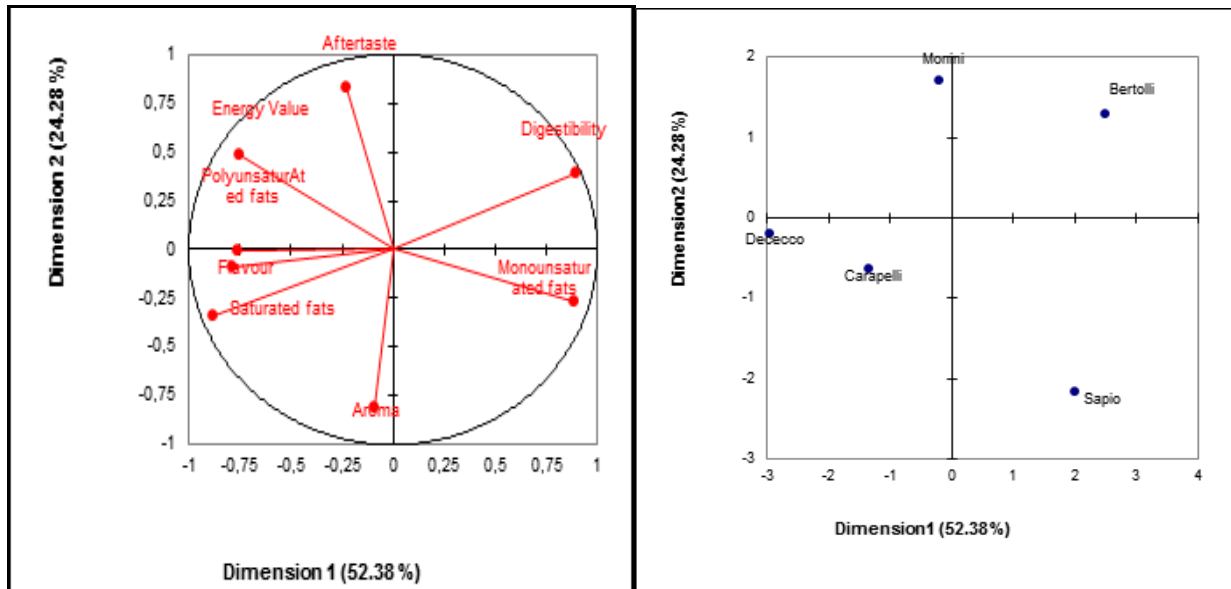
The flavour of the five samples was between 2.16 (sample Sapio) and 3.02 (sample De Cecco); the aftertaste is between 2.49 (Sapio) and 2.90 (Monini); the digestibility is between 2.38 (De Cecco) and 3.27 (Bertolli), and the aroma is between 2.22 (Bertolli) and 2.71 (Sapio).

On each product, consumers expressed an overall liking a five-point scale (where 1 means no preference and 5 means high preference).

### 3.2 Results

In order to identify and understand product attributes that influence consumers' preference we have used External Preference Mapping.

So, firstly we have created two maps by running a PCA on the matrix of standardized mean ratings for the 8 attributes across the 5 olive oils: the map of the sensory and physicochemical characteristics and the map of the products (Figure 1). The variance explained by the first two component was 76.66%: the first dimension explained 52.38% and the second dimension explained 24.28% of the total variability.



**Figure 1.** Map of the sensory and physicochemical characteristics (on the left) and Map of five olive oil products (on the right).

The first dimension of the map of the sensory and physicochemical characteristics opposed flavour to digestibility, and energy value, polyunsaturated fats and saturated fats to monounsaturated fats. This last contrast reflects the difference between monounsaturated fats, which are characterized by having one double bond and saturated fats, which have only single bond and polyunsaturated fats, which instead have many double bonds. The second dimension setted aroma against aftertaste.

The horizontal dimension of the map of five olive oil products was discriminate between the De Cecco and Carapelli oils on the left and the Bertolli and Sapio oils on the right. This contrast can be explained by the fact that the judges had perceived more flavour for the De Cecco and Carapelli products than for the Bertolli and Sapio oils. The judges associate these products with a more digestibility. As well, De Cecco and Carapelli oils have an increased amount of polyunsaturated fats, while Bertolli and Sapio have a larger amount of monounsaturated fat, also the top two brands have an energy value higher than the second. On the vertical dimension Monini and Bertolli oils was clearly separated from the Sapio oil. The contrast depended on two sensory attributes: aftertaste and aroma. The consumers who valued the aftertaste of an oil chosen Monini, while the consumers who given importance to the aroma chosen Sapio.

As one of the aims of the research was linking sensory profiles to consumer appreciation, in order to identify sensory descriptors driving consumer liking, we chose the external preference mapping. Since the number of consumers is significant, we have decided to group them into homogeneous classes according to their liking in order to make the preferences' analysis results easier to interpret. The five clusters are identified applying, firstly, an agglomerative hierarchical



clustering to select the number of clusters, and secondly, the k-means cluster. Clusters 1, 2, 3, 4 and 5 represented, respectively, 29, 22, 16, 17 and 16 per cent of the judges. The consumer clusters differed only in preference scores ( $p < .05$ ); in contrast, the socio-demographic characteristics were not different ( $p > .05$ ) by analysis of variance.

The second step of the external preference mapping was to regress preference data for each cluster (centroid of each cluster) on to the principal components descriptive space derived from PCA. The models considered in this study are the vector and the circular models. Here, the first two principal component ( $x_1$  and  $x_2$ ) were retained in the process of relating sensory and consumer data. So, the vector model was expressed as:

$$Y = b_0 + b_1x_1 + b_2x_2$$

And the circular model as:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3(x_1 + x_2)^2$$

Were  $Y$  is the liking,  $b_0$  is the intercept and  $b_1, b_2$  and  $b_3$  are the regression coefficients. The results we have obtained (table 3) show that the vector model is the best model for the groups 1, 2, 3 and 5. However, it is significant only for the groups 1 and 3.

For group 4 the circular model is significant.

**Table 3. Model validation.**

<b>Y</b>	<b>Model</b>	<b>R<sup>2</sup></b>	<b>F</b>
GROUP1	Vector	0,906	9,684**
GROUP2	Vector	0,456	0,839ns
GROUP3	Vector	0,974	37,370**
GROUP4	Circular	0,995	73,394**
GROUP5	Vector	0,039	0,041ns

The analysis of five consumers' cluster preference on the eight characteristics (sensory and physicochemical variables) and five products leads to the map showed in Figure 2.

The overall preferred oils for consumers in group one in the top right portion of the plot were the Bertolli and Monini, characterized primarily by digestibility and aftertaste. The consumers in groups two and three preferred the aroma of oil and they liked Sapio oil. The groups four and five preferred De Cecco and Carapelli oils, which were characterized by flavour. Some olive oil have a similar pattern of preference, most notably Carapelli and De Cecco, as were Bertolli and Monini. So producers of these products may want to try to distinguish their oil from the competition and to sell oils with specific characteristics to specific target market segments. From the preference analysis, interestingly, it is observed that sensory and physicochemical characteristics can be discriminating factors. However, more research with larger numbers of olive oil samples is needed to confirm the ability of sensory and physicochemical characteristics by themselves for olive oil discrimination.

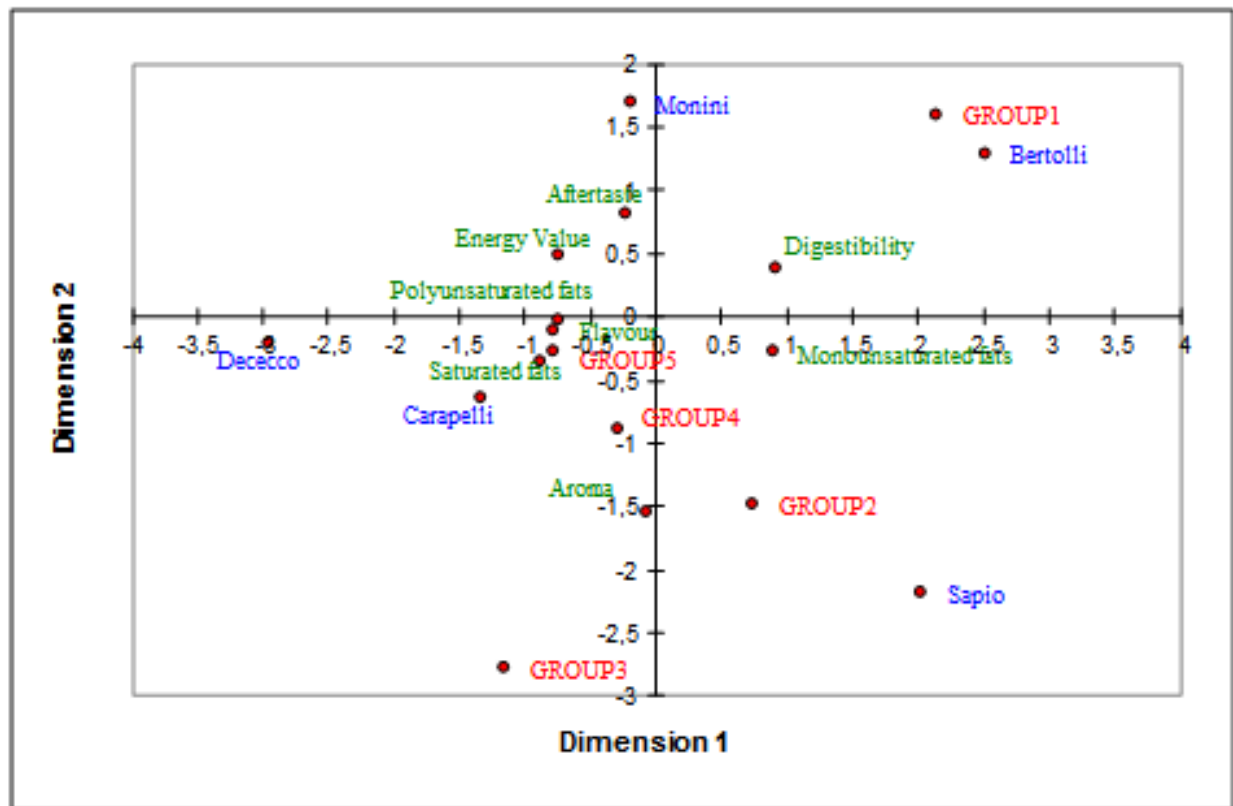


Figure 2. External preference map.

#### 4. Conclusions and perspectives

In the first part of our research, we have tried to analyze whether consumers have an adequate knowledge of the specific qualities of olive oil and also the perceived quality linked to its origin. To this end, a pre-test was conducted and the results of this preliminary investigation revealed that a relevant part of the sample who even declared attentiveness to the quality of food, in general, does not pay attention to the quality of oil. As regards the regions of origin of the oil consumed the investigation showed firstly, that a significant proportion of consumers who would buy an oil that is characterized as being 100% Italian, is not able to recognize it. This highlights the strong information asymmetry that characterizes the industry. A further step of this investigation showed a very weak link of the consumer with the territory in the choice of consumption of olive oil. In particular, only a low percentage of consumers have tried the oils from the Campania region that are recognized by the European Protected Designation of Origin PDO, because the consumer does not know of its existence or can not find it in stores frequented. Only a small percentage does not buy it because they believe that the price is high. This shows, once again, that consumer information about olive oil is particularly lacking. In the second part of our research, five olive oil prototypes were selected from the most widespread commercial products in order to identify and quantify sensory characteristics most important to the quality of the olive oils and to understand its consumer acceptance. The sensory attributes which driven the overall preferred oils were digestibility and aftertaste for consumers who liked the Bertolli and

Monini, aroma of oil for the consumers liked Sapio oil and flavour for the consumers who preferred De Cecco and Carapelli oils.

Preference mapping provides valuable information about consumers' acceptance in a visual format. If the same information were presented in tables, understanding the key features of the products and their relationship to acceptance would be more difficult. A visual format of the product set aids in interpreting how product characteristics affect consumer acceptance.

Preference mapping techniques can contribute to optimize products by combining the use of consumer and sensory data to identify attributes driving liking. Based on the results of this analysis it may explore the motives behind choice or consumers' perceptions of the products, including new and/or quality products. The sensory analysis helps the marketers to identify determinant product attributes that influence customer choice within the product class and to select quality in a company brand. These determinant attributes must be important to customers and must also exhibit differences across brands. Regardless of the importance of a product attribute, if the products are not perceived to differ in that attribute, then the attribute will not be influential in customers decisions. Nonetheless, the choice for a specific research design and approach, with its corresponding selection of specific research methods, implies some limitations on this study. A first limitation pertains to the nature of data collection, i.e. the selection procedure, as well as people selected. A last limitation concerns the sensory evaluations which were performed outside controlled testing environment and without using standardised and uniform sample preparation and presentation procedures. However that has permitted to recruit a more heterogeneous consumers. As a continuation of this study, the comparison current customers and expert panel could be improved.

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