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Evaluation of preferences of consumers towards extra-virgin olive oil

A multiperspective approach

Phd thesis

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INDICE

1. Introduction

Olive oil represents one of the pivotal products for Southern Europe economy. Its importance is recognized all over the world (International Olive Oil Council 2015) as well as its importance for healthy diets (Willett and others 1995). Its production is mainly limited to the Mediterranean area, while the consumption is involving most parts of the world (International Olive Oil Council 2015). This trend made olive oil production to switch from low yields and low-input to a capital-intensive farming system involving innovations in both agricultural practices and processing techniques (Dios-Palomares and Martínez-Paz 2011). As a result, the nutritional characteristics of the product had a significant improvement with a profound change in sensory profile, during last years (Caporaso and others 2015). At the end, the Extra Virgin Olive Oil (EVOO) presents itself as a highly differentiated product (Cabrera and others 2015) that is not homogeneously valued by consumers (Caporale and others 2006; Yangui and Gil 2014). At this point is important to highlight what is valued by consumers in order to focus the development of the product toward what the consumer appreciates.

As defined in Commission Regulation (EC) No. 1989/2003, we can identify several categories for olive oil. The most important ones are defined in Table 1.1: Extra-Virgin Olive Oil (EVOO), Virgin Olive Oil and Olive-Pomace Oil. The focus of the present work is on the most important one of these categories: the EVOO. It is supposed to be the most important category and the one that is capable of bringing the highest quality to consumers and the highest revenues to producers.

Table 1.1 - *Olive oil categories as defined by European Regulation No. 1989/2003.*

Definitions	Acidity (%)	Notes
Extra-Virgin Olive Oil	≤ 0.8	Superior category olive oil obtained directly from olives and solely by mechanical means
Virgin Olive Oil	≤ 2.0	Olive oil obtained directly from olives and solely by mechanical means
Olive Oil	<1.0	Olive oil obtained from olives consisting of a blend of refined olive oil and virgin olive oils
Olive-Pomace Oil	< 1.0	Olive oil obtained from olives comprising the blend of refined olive pomace oil and virgin olive oils

1.1 Perceived Quality and Preferences

It is possible to enhance the value of this product only focusing on the elements that are important for consumers and this is the main goal of the entire work. The consumer is the character that decides what to buy so it is the final judge of product quality (Morgan 1985). Identifying consumers' preferences appears to be a complex task as the evolution and differentiation of the product can have heterogeneous responses (Sillani and others 2014).
While *objective quality* is defined as a technical superiority of a product (Monroe and Krishnan 1985), the focus of the present work is on perceived quality, because quality judgments are made by the consumers according to perceptions, needs, and goals (Steenkamp 1990; Grunert 2005). When the consumer is faced with a choice in the purchasing context, what drives his decisions is the judgement of value (V), this can be defined as the perceived quality (Q) divided by the price (P): V=Q/P (Zeithaml 1988; Grunert and others 2004).
The Perceived Quality Model is the framework used by Steenkamp (1990) to explain the process in which the consumer forms its beliefs about the quality of a product. The cues in the environment are elaborated by the individual when making a choice or just searching for information on a certain product. Those cues can be intrinsic (embedded in the product) or extrinsic (attributes that can be changed without changing the product itself). The consumer uses the available cues to infer the attributes of the product, this inferences leads to the quality attribute beliefs. In turn they can be experience (i.e.: they can be ascertained after the trial of the product) or credence (i.e.: the consumer can never ascertain the existence of the feature) attributes (Darby and Karni 1973; Caswell and Mojduszka 1996). The ensemble of the beliefs forms the perceived quality judgement of the consumer. Perceived quality embeds the concept of preferences, that are evaluative judgements of a product such as liking or affect (Steenkamp 1990).

1.1.2 Origin attribute

Literature highlighted what is the importance attached to each attribute of extra-virgin olive oil as a product. Olive oil attributes have been extensively studied using several methods (Nielsen and others 1998; Van der Lans and others 2001; Menapace and others 2011). Among others, what is supposed to be of major importance for consumers while choosing Olive Oil is the origin

(Cicia and others 2005; Tsakiridou and others 2006; Menapace and others 2008; Gázquez-Abad and Sánchez-Pérez 2009; Leonetti and others 2009; Chan-Halbrendt and others 2010; Mane-Kapaj and others 2010; Deselnicu and others 2013; Di Vita and others 2013; Gámbaro and others 2013; Carlucci and others 2014).

The origin is highly valued by consumers as a cue as it is common to consider the final quality of the product as determined by the area, the *terroir*. This term communicates that the environment and the production methods of a certain area are fundamental to determine the quality of the product. Besides, the origin is also linked to concepts as authenticity (Barham 2003), typicality (Bertozzi 1995; Caporale and others 2006) and ethnocentrism (Van der Lans and others 2001). The influence of the origin is such that it is often used as a decision shortcut for consumers that are seeking for quality products (Ahmed and others 2002). Preferences can be more affected by expectations from origin information than from sensory characteristics (Lange and others 2002; Stefani and others 2006).

1.1.2.1 Geographical indications

The Regulation (EC) No. 1151/2002 modifying previous regulations of 1992 and 2006, defined quality schemes to identify products according to their origin. These certifications provide detailed schemes in which typical products can be categorized. For each typical product there are precise guidelines about the area and the production methods, so that traditional products can be easily recognized by the consumers and valued by the market. They also compensate the information asymmetry so that the characteristics that link the product to the *terroir* are completely disclosed to the consumer (Menapace and others 2011). Since the consumer is correctly informed about the methods of production, its willingness to pay for that product is raised (Fotopoulos and Krystallis 2003), due to higher expectations for quality (Fandos and Flavián 2006).

Geographical indications, they also have another role: they create a collective brand for all the typical production from small firms, that, at this point, are able to compete with well-established brands (Costanigro and others 2010), this also benefits the competitiveness of producers from rural areas, that incur in higher costs to follow the guidelines of these productions (Tregear and others 2007). Besides they also allow to build a collective reputation that is what drives the consumer to expect more quality compared to other non-certified products (Tirole 1996; Landon and Smith 1997).

1.1.3 Healthiness

The importance of credence attributes, such as naturalness and healthfulness, depends much on the values of the individual consumer. In fact, what are the main drives for a person while shopping are strictly personal and heterogeneous, so there is high variance in how people evaluate and make trade-offs when credence goods are involved (Oude Ophuis and Van Trijp 1995; Verbeke and Viaene 1999).

If we consider healthiness, there is also a temporal factor in this choice: the choice that is made now on a healthy product will have long-term benefits, while the consumer is focused on a short-term cost/benefits evaluation, furthermore there is also the belief that healthy products are less tasty. These reasons can drive the choice far from healthy products or, at least, make this feature less salient in the mind of the customer in the choice moment. Another opposite trend is the one that sees consumers more and more concerned about credence factors as health (Bernués and others 2003).

1.1.4 Other attributes

Besides origin, there are other attributes that are usually used by consumers for their decisions. The "organic" attribute it is a multifaceted concept embracing several aspects linked to naturalness and respect of the environment (Cicia and others 2009). Organic certification has been shown to be positively perceived by consumers (Van der Lans and others 2001; Cicia and others 2002; Fotopoulos and Krystallis 2002; Sandalidou and others 2002; Soler and others 2002; Zanoli and Naspetti 2002; Cicia and others 2016).

Brand is another valued attribute, it is used as a decision shortcut for quality (Del Giudice and D'Elia 2001; Baourakis and Baltas 2003; Bower and others 2003; Cicia and others 2005; Bracco and others 2009; Dekhili and d'Hauteville 2009; Gázquez-Abad and Sánchez-Pérez 2009; Jiménez-Guerrero and others 2012). The role of brand is essentially of reducing risk and communicating the positioning of the product (Erdem and Swait 1998)(Erdem and Swait, 1998), then they can create a halo effect of favorable associations (Keller 1993; Krishnan 1996; Grunert 2005).

Price is usually considered as the sacrifice traded off with the benefits stemming from the products, it has been extensively studied in the case of olive oil (McEwan 1994; Baourakis and

Apostolakis 1999; Baourakis and Baltas 2003; Lazaridis 2004; Gázquez-Abad and Sánchez-Pérez 2009; Carlucci and others 2014). In some cases the price appears to be a quality indicator for EVOO (Cicia and Perla 2000; Cicia and others 2002; Martínez and others 2002; Scarpa and Del Giudice 2004).

In this work a particular attention will be also directed toward the sensory aspects of the EVOO. The preferences in terms of flavor of the product are strongly heterogeneous and influenced by the habits and familiarity of the consumers with EVOO products (Caporale and others 2006; Mtimet and others 2008; Leonetti and others 2009; Santosa and others 2010; Delgado and Guinard 2011; Mtimet and others 2011; Bevilacqua and others 2012; Recchia and others 2012; Delgado and others 2013; Mtimet and others 2013; Cicia and others 2016). The trend for consumers' preferences in terms of taste is toward plain and neutral flavors, and this is opposed to the production trend that evolves toward products that are increasingly characterized by pungent, bitter and fruity features as supported by European Regulations. In detail, European Regulations are pushing quality productions toward products that are highly characterized on a sensory point of view, this is also due to healthy features linked to the presence of bitter and pungent notes (Caporaso and others 2015).

1.2 Decision Making

When a consumer decides to make a purchase, there are some steps to go through in order to make it: (1) problem recognition (Bruner and Pomazal 1988); (2) information search (Schmidt and Spreng 1996) (3) evaluation of alternatives; (4) product choice; (5) evaluation of outcome (Bi and others 2015).

There are several ways in which the process of decision making can take place, depending upon the need the consumers have to fulfill and the product in question. Furthermore, sometimes the decision can also be totally spontaneous and occur within the store. For food products that are not so much expensive and that are frequently purchased, the decision is taken in a quick way so little time is devoted to the search for information before purchase. What happens most of the times is that common food product purchases are partially planned, so the consumers know what to buy, but within the store they decide in detail according to the alternatives available on the

shelf. Some elements in the store environment, such as attractive packaging, promotions, or other Point-Of-Purchase stimuli that can drive the consumer to make some unplanned purchases or drive the choice of a partially planned buy toward some particular brand (Dittmar, 2001).

1.2.1 The role of the environment

These elements in the environment have the purpose to drive the attention of the consumers toward some salient cues (Burke and Leykin 2014). Attention can then follow two ways: top-down and bottom-up if it is central controlled or triggered by the available cues. We will concentrate our focus on the bottom-up fashion through the role of the packaging that can be designed in a way that conveys detailed information both for consumers that are involved in an extended search, and to give quick information to the more intuitive buyers.

Quality perception, already discussed above, depends upon cues that are available in the environment, from which a personal idea of quality is built, using personal rules of thumb and comparing information with previous knowledge and experience. Cues are different from attributes, as attributes can be ascertained only after consumption (Steenkamp 1990). The assessment of quality from the consumers depends on the product and on the situation: some important product can lead to a piecemeal evaluation of features, other can lead to a quicker evaluation. According to Petty & Cacioppo (1986), the Elaboration Likelihood Model (ELM) can explain how the information about products or advertisement are elaborated: through the central route or through the peripheral route (Maheswaran and others 1992).

According to Steenkamp (1990), quality attribute beliefs formation can occur in three ways: descriptive, informational and inferential. All the available elements will be used to make inferences, even though they are not strictly linked to the actual quality of the product. This phenomenon is known as halo effect, in which, in order to have a consistency among ratings, the final judgment of quality of a product is affected by all the ratings of all attributes even if they do not have a strong correlation with quality (Rahman and others 2013). This is much more important when the decision is made heuristically, so inferences of quality are made on attributes of the product that the consumers decide on rules of thumb, as not all the information is available.

The Total Food Quality Model (Grunert 2002) explains how consumers form expectations about the product in the case of food, then this expectations are used to build an idea of quality

(Parasuraman and others 1988). The role of expectations is much more important in the domain of food as these products can be potentially poisonous for who ingest them (Koza and others 2005; Piqueras-Fiszman and Spence 2015).

Since taste features cannot be ascertained before buying the product, inferences upon the available cues build a certain expectation about the taste experience. When the product has been bought and tried, the experience can be evaluated, and then a repeated purchase can occur or not, according to the final satisfaction. The satisfaction comes from a comparison between expectations and actual performance of the product. According to the value of the comparison we can have different outcomes (Schifferstein and others 1999; Piqueras-Fiszman and Spence 2015): assimilation, contrast, generalized negativity, assimilation/contrast, curiosity hypothesis, prospect theory.

Purchase and consumption is not explained only by low-level attributes, such as flavor or a food's liking, but, sometimes consumers purchase and use goods in order to express a sort of meaning or to achieve higher goals in their life. Every individual has a personal set of core values that represent what is personally important in life and they guide the behavior (Lee and others 2014).

We can identify a hierarchy of values in order to understand how values are linked to consumer behavior: cultural, consumption and product-specific values. Through the use of means-end chain method we can see how everyday consumption is linked to higher goals in life. Consumers, through the choice of products with certain attributes, express their personal values (Reynolds and Gutman 1988). Underlying values explain the whole meaning of products for the consumers, that is beyond a mere functional sense.

1.2.2 The role of the consumer

Besides external factors affecting the choice, there can be also internal ones that can have an influence in the final decision of the consumer. We will analyze how other factors can influence the way quality is perceived and how the product attributes are evaluated according to different consumers.

1.2.2.1 Familiarity

The first element to be considered is the familiarity with the product, as it can lead to different perception of uncertainty. As a result, the expectations of unfamiliar consumers will be more likely to show an assimilation effect of expectations (Deliza and MacFie 1996). The consumers, that are not familiar with a product, tend to build a concept about it relying on available information that can also have an effect in shaping the real experience with the product. Furthermore the risk perception is lowered in the case of familiar products (Verneau and others 2014).

One important personality trait that can have a major impact in food consumption is neophobia that is the reluctance of individuals to try novel food (Pliner and Hobden 1992; Ritchey and others 2003). Although it is a natural impulse in children (Cooke and others 2004; Laureati and others 2014), also in later stages of life can induce people to like what is already familiar and not trust in new products. The neophobia can be extended also in the reluctance toward new methods of production (Cox and Evans 2008; Frewer and others 2011; Rollin and others 2011).

1.2.2.2 Involvement

A trait that also received some attention has been food involvement, as the importance attached to food in an individual's life, considered as a stable individual's characteristic (Bell and Marshall 2003). This trait identifies people that are more knowledgeable about food, so they are more able to evaluate characteristics of food. This group also seems to be more acceptant toward novel food (van Trijp and others 1996). The motives that drive this trait can be mostly referred to sensory appeal of food (Bell and Marshall 2003). This trait can be an important mediator in determining: brand loyalty, information search processing, diffusion of innovations and purchase decisions (Laurent and Kapferer 1985; Zaichkowsky 1987; Mittal 1989). The involvement can be directed toward the product, the purchase decision (Mittal and Lee 1989), or product advertising (Petty and Cacioppo 1986).

1.2.2.3 Nutritional knowledge

Nutritional information are important in food products, as they provide precious information about the product that cannot be assessed in any other way, they allow credence attributes to become search (Caswell and Mojduszka 1996). The problem is that most of the times, due to time pressure, the consumer does not consider this information (Zeithaml 1988). In other cases, familiarity can lead consumers to be knowledgeable about food products before purchase,

without the help of any label. This factor is important in shaping consumer behavior, in fact people with a higher nutritional knowledge are more likely to have a better diet and to try food with health claims (Ares and others 2008).

Nutritional knowledge can affect healthiness perception of food (Wansink and others 2005). Consumers are more willing to try foods with health claims when they are familiar with them, that is why there is a need to inform consumers through nutritional claims that should be reliable, and then trusted (Ares and others 2008). Nutritional knowledge has a direct effect on the attitude toward the product (Crites and Aikman 2005), but it cannot have a direct effect on the actual consumption (Ares and others 2008).

When the consumer is more knowledgeable about food, is less likely to be influenced by the external environment, while less knowledge makes external environment influences have more effect on the evaluations of consumers (Cheung and others 2014). Also the way labels are considered by consumers can change according to their degree of familiarity with food characteristics, in fact knowledgeable consumers are more able to extract information from labels and, thus, they are more willing to give them their attention.

1.3 The framework

A product can be considered successful on the market when it gains a considerable market share, earns profits (Griffin and Page 1993), has a high degree of differentiation, has a good product quality (Hoch and Banerij 1993), customers are satisfied and when it has a considerable loyal customer base. To reach these goals multiple factors can be used to transmit value to consumers.

In this work what we are going to underline is the importance of quality in the different dimensions determined by the role of the consumer. The work is organic and every single part contributes to have a broader view on the topic as a whole. The work proceeds with the following papers:

- What attributes of extra virgin olive oil are really important for consumers: a meta-analysis of consumers' stated preferences. This is the first step to have a complete view about the state of the art identified by the literature. Furthermore the complete view is achieved with a further elaboration of the existent data in the literature with the meta-analysis.
- European Policy for Extra-Virgin Olive oil: are consumers provided with the sensory quality they want? This work is about an hedonic price model applied to extra-virgin olive oil

considering also sensory attributes as determined by a trained panel to allow for some policy considerations.

- "O Premium, Where Art Thou? PDOs Price Premium Disparities in the Italian Olive Oil Market". This work presents an hedonic price model applied to a big dataset of retail scanner data to analyzed the implicit price of attributes of products weighted by the sales of the products. The analysis is deeper compared to the previous work, thanks to the bigger size of data that allow to apply the methodology already acknowledged on a broader sample.
- Visual elements of packaging shaping evaluations of consumers: the case of olive oil. This work analyzes how visual elements of the packaging can influence healthiness perception in the case of two products: olive oil and butter combined with olive oil. The elements that have been tested are: the color of packaging, logos about organic production, Country Of Origin (COO), and cold processing and sensory quality claims. In this case the focus has been shifted more on the subjective perspective of the consumer, considering more deeply the influence of the environment and the personal traits in the evaluation of products.

2. What attributes of extra virgin olive oil are really important for consumers: a meta-analysis of consumers' stated preferences

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2.1 Abstract

The literature on food economics has extensively analyzed consumer preferences for extra-virgin olive oil attributes. In order to summarize and systematize the information gained in recent years, it seems appropriate to make a critique of the existing literature. First, we carry out a narrative systematic review of the literature on the topic. Subsequently, using only the empirical contributions which provide estimates of consumer willingness to pay for quality attributes including a measure of the goodness of the estimation (20 papers with 78 estimates), a meta-analysis was conducted to synthesize the empirical results obtained.

JEL classification: D12; C25; Q18
Keywords: Meta-analysis; Consumers preferences; Extra-virgin olive oil

2.2 Background

Extra-virgin olive oil (EVO) is an important element in the Mediterranean diet and a major agricultural crop for Southern European countries in terms of both farm income and cultivated area (De Graaff and Eppink 1999; Owen and others 2000; Pupo D'Andrea 2007; Marchini and others 2010). Moreover, given the increased popularity of the Mediterranean diet among consumers in the US, Canada, Australia and large parts of Asia, EVO consumption has grown almost worldwide (Santosa and Guinard 2011; International Olive Oil Council 2012). Contextually, olive-oil production has switched from low yields and low-input cultivation to a capital-intensive farming system involving innovations in both agricultural practices and processing techniques. This has led to a considerable improvement in EVO nutritional characteristics accompanied by a profound change in sensory profile, turning a traditional food, with well known organoleptic features, into a brand new kind of dressing.

All the described processes have made it necessary for traders, researchers and policy makers to gain insights into consumer preferences for intrinsic and extrinsic characteristics of EVO, which have become increasingly complex and structured (Sillani and others 2014). In recent years, this has led to a wide range of scientific contributions aiming to identify the chief EVO attributes for the postmodern consumer (Cicia and others 2012). This research field has made extensive use of discrete choice methods based on random utility models, which help identify product characteristics most relevant to consumers, also valuing the willingness to pay for a product with such characteristics. Since the surveys were carried out in different countries, with different sample sizes, different statistical designs and often considering different choice experiment attributes as well, the results emerging from the literature are somewhat heterogeneous, although there are some well defined trends.

In order to summarize and systematize the information gained in recent years on consumer preferences related to extra-virgin olive oil, it thus seems appropriate to offer a critique of the existing literature. Our analysis can be divided into two distinct but complementary parts. The first is dedicated to a narrative systematic review of the literature on the topic. Subsequently, using 20 empirical contributions which provide estimates of consumers' willingness to pay for quality attributes including a measure of the goodness of the estimation, a meta-analysis was conducted to synthesize the empirical results obtained.

In this paper we refer to the definitions of systematic review and meta-analysis provided by the Cochrane Collaboration (2009) and by the PRISMA Statement (Moher and others 2009): "A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the re- view. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies. Meta-analysis refers to the use of statistical techniques in a systematic review to integrate the results of included studies". In as much as is allowed by the subject of our analysis, in our study we followed the instructions provided by the PRISMA Statement (Moher and others 2009) in order to carry out an appropriate review. The paper is organized as follows. In second section the narrative systematic review is described, summarizing the main results of the literature dealing with EVO attributes. The statistical model used in the meta-analysis and the empirical results are discussed in third section. Fourth section comprises the discussion, study limitations and some concluding remarks.

2.3 Narrative systematic review

The Narrative Systematic Review was carried out to summarize the literature about consumer preferences relating to EVO characteristics. The chosen period covered the years between 1994, when the first work, to our knowledge, about the subject emerged, and June 2014. The research was carried out using the main scientific/economic research databases: 1. Thomson Reuters (ISI) Web of Knowledge 2. SciVerse Scopus, 3. EconLit 4. Wiley Online Library 5. Emerald Insight 6. Google Scholar 7. AgEcon Search, 8. CiteSeerXβ 9. Microsoft Academic Search; 10. Google, Bing, Abacho, etc.

The survey identified around 78 major works which studied consumer preferences for EVO features. The scientific production related to this line of research has not appeared to decline at all. As for the countries investigated, about 73 % of the contributions focus on Mediterranean countries, which are traditionally major producers and consumers of olive oil, with Italy being the most commonly analyzed, accounting for 40 % of all contributions. The remaining 27 % of works are distributed between Northern European countries (17 %) and the rest of the world (10 %).

As regards publication type, 70 % of the articles analyzed were published in peer-reviewed journals, 20 % of contributions were presented at international conferences, and 10 % are termed final research reports. Regarding the specific contents of the various works, we can categorize the large number of articles according to two different elements. The first relates to investigation methodology, while the second concerns research questions to be solved.

Methodological approaches followed by the selected works to analyze consumer preferences show a large share of discrete choice models, applied with many variations. In particular, Conjoint Analysis and Random Utility Models (RUM) are the most widely used. As regards Conjoint Analysis, several studies have used this approach to assess the relative importance to consumers of different attributes and to define a hypothetical most preferred product (Cicia and Perla 2000; Van der Lans and others 2001; Martínez and others 2002; Soler and others 2002; Krystallis and Ness 2005; Mtimet and others 2008; Bracco and others 2009; Mtimet and others 2011; Jiménez-Guerrero and others 2012; Di Vita and others 2013; Mtimet and others 2013; Sillani and others 2014).

By contrast, widely adopted Random Utility Models (RUM) provide the impact of product attributes on choices and estimation of the willingness to pay (WTP) (Cicia and others 2002; Ward and others 2003; Scarpa and Del Giudice 2004; Cicia and others 2005; Dekhili and d'Hauteville 2009; Finardi and others 2009; Chan-Halbrendt and others 2010; Finardi 2010; Menapace and others 2011; Aprile and others 2012; Delgado and others 2013; Mtimet and others 2013; Yangui and others 2013; Yangui and others 2014; Yangui and Gil 2014).

For instance, Cicia et al. (2005) valued at one euro per bottle the attribute of Italian product origin (COOL attribute) ascribed by Italian consumers. Amongst the methodologies for analyzing consumer preferences, some studies asked interviewees to rank attributes according to their perceived importance (Del Giudice and D'Elia 2001).

Other empirical approaches adopt the hedonic price method (Ribeiro and Santos 2004; Karipidis and others 2005; Carlucci and others 2014) or multi-criteria analysis (Sandalidou and others 2002; Bevilacqua and others 2012), while others follow mainly qualitative approaches, such as means-end chains, laddering interviews or focus groups. Some interdisciplinary studies comprise features of econometric analysis and sensory analysis (McEwan 1994; Pagliarini and others 1994; Monteleone and others 1997; Morales and others 1997; Caporale and Monteleone 2004; Caporale and others 2006; Finotti and others 2007; Delgado and Guinard 2011; Favati and

others 2013; Fregapane and others 2013; Nakano and others 2013). Finally, other modeling and theoretical frameworks comprise both qualitative analysis techniques such as laddering (Nielsen and others 1998) and supply chain and sector analysis (Belletti and Marescotti 1998; Baourakis and Apostolakis 1999; Mili and Zúñiga 2001; Fucito and Vizzarri 2004; Mili 2006; Del Giudice and others 2012).

As regards the aims of the selected papers, most investigated consumer preferences for specific extra-virgin olive oil attributes: they analyzed intrinsic (taste, appearance, color) and extrinsic (packaging, certifications, label, brand, etc.) product attributes. Thus, in the sections below, we highlight the main conclusions made by the literature sorted by the most commonly investigated attributes.

2.3.1 Olive geographical origin certification

Early studies on this topic indicated geographical origin of the olives as the main focus (McEwan 1994; Bech-Larsen and others 1996; Monteleone and others 1997; Belletti and Marescotti 1998; Nielsen and others 1998; Tsakiridou and others 2006). Geographical origin has received ever-increasing attention over the years. It has been extensively shown that, when making purchasing decisions, consumers, albeit from different geographical and socio-economic realities, attach a priority value to information about the country of origin of the olives concerned (Nielsen and others 1998; Del Giudice and D'Elia 2001; Van der Lans and others 2001; Fotopoulos and Krystallis 2002; Ward and others 2003; Krystallis and Ness 2005; Scarpa and others 2005; Gázquez-Abad and Sánchez-Pérez 2009; Dekhili and others 2011; Aprile and others 2012; Piccolo and others 2013).

The Geographical Origin attribute was also analyzed through the study of influences exerted by Community certification of origin (PDO and PGI, EC Regulation 509/06 and 510/06) on individual preferences. Several studies agree on two common conclusions (Van der Lans and others 2001; Fucito and Vizzarri 2004; Scarpa and Del Giudice 2004; Menapace and others 2008; Bracco and others 2009; Finco and others 2010).

The first conclusion concerns the considerable importance of olive origin as a key element in individual choices. In many markets, origin indication is synonymous with a local product. Consumers seem to prefer, regardless of other items, the typical product of the area of consumption. Since the sensory characteristics of olive oil and extra- virgin olive oil are greatly affected by cultivars and agronomic techniques, knowledge of origin gives the consumer assurances concerning product taste characteristics.

The second conclusion is that EC designations of origin (PDO and PGI) have never fully expressed their potential as differentiation and protection tools. Indeed, they are still little known to consumers, who continue to use other quality signals and origin certification, such as trademarks evocative of particular production areas, trademarks traditionally associated with specific origins, certification of private standards focused on olives origin or label information about bottling location, which often, before the recent legislation came into force (EU Reg. 182/09 and EU Reg. 1169/2011), was unrelated to the source of olives.

2.3.2 Product food safety

A second group of attributes, which has received wide attention from papers discussing EVO health aspects, consists in food safety and traceability. This line of research also includes attention toward organic certification. This attribute has a twofold value for the consumer: first it indicates attention toward health and preservation of the natural environment (Cicia and others 2009). Organic certification has been shown to be positively perceived by consumers, although more than twenty years after EU regulation on organic produce and its definition came into force, consumer information levels were still unsatisfactory (Van der Lans and others 2001; Cicia and others 2002; Fotopoulos and Krystallis 2002; Sandalidou and others 2002; Soler and others 2002; Zanoli and Naspetti 2002; Del Giudice and others 2012).

In more recent works, the relation between origin and traceability emerges quite strongly (Cicia and others 2005; Menapace and others 2008; Gázquez-Abad and Sánchez-Pérez 2009; Leonetti and others 2009; Chan-Halbrendt and others 2010; Mane-Kapaj and others 2010; Deselnicu and others 2013; Gámbaro and others 2013). Traceability and related labeling information have become increasingly analyzed elements. Traceability means the ability to track food through all

stages of production, processing and distribution. Traceability was introduced by the EU's General Food Law (EC Reg. 178/2002). It has been generally shown that information on traceability influences consumer choices, which are ever more geared to food safety (Soler and others 2002; Krystallis and Ness 2005). However, the studies in question indicate that consumers consider information about the origin of the olives the most important element for traceability of the product. Knowledge of all stages of production, processing and distribution does not seem to affect consumer choice, the information about the origin of the raw material seems more important (Cicia and others 2005; Di Vita and others 2013).

2.3.3 Brand

Another relevant attribute within consumer preferences is represented by brand (Del Giudice and D'Elia 2001; Baourakis and Baltas 2003; Bower and others 2003; Cicia and others 2005; Bracco and others 2009; Dekhili and d'Hauteville 2009; Gázquez-Abad and Sánchez-Pérez 2009; Jiménez-Guerrero and others 2012). In particular, the literature highlights the preference of consumers for traditionally known brands and private labels, both with an increasing information value and reassuring features for the consumer.

2.3.4 Price

Price clearly emerges as a "particular" attribute as stated by the literature, with regard to the influence upon purchase choices and on perception of extra-virgin olive oil quality. Indeed, several studies have shown the considerable attention paid to price on the part of consumers (McEwan 1994; Baourakis and Apostolakis 1999; Baourakis and Baltas 2003; Lazaridis 2004; Gázquez-Abad and Sánchez-Pérez 2009; Carlucci and others 2014). Other studies (Cicia and others 2002; Martínez and others 2002; Scarpa and Del Giudice 2004) highlight the role played by the price factor as a quality indicator for extra-virgin olive oil. Indeed, very often the preference toward this attribute seems to follow a triangular path typical of quality products (Cicia and Perla 2000).

2.3.5 Sensory attributes

The last group of attributes analyzed comprises all product sensory and taste aspects. This kind of analysis showed significant changes over the period. In general, in the past, olive oil taste and color were considered two of the attributes that most influenced consumer perception and purchase choice, without, however, identifying them individually as being present (McEwan 1994; Monteleone and others 1997; Cicia and others 2002; Finotti and others 2007).

Further developments in the way EVO sensory and taste aspects are described and researched both at production and processing level have led to in-depth analysis of consumer preferences. On the production side there has been a trend toward oils which, thanks to innovations in production techniques introduced over the past two decades, result in a product with enhanced sensory characteristics (pungent, bitter, fruity, etc.). On the consumption side, because of the strong link with traditional preferences and thanks to the educational role played by branded products and GDO private labels toward tasting, there is now a generation of EVO users who seem to prefer a product with a quite plain, neutral taste, generating a serious split in the market (Caporale and others 2006; Mtimet and others 2008; Leonetti and others 2009; Santosa and others 2010; Delgado and Guinard 2011; Mtimet and others 2011; Bevilacqua and others 2012; Del Giudice and others 2012; Delgado and Guinard 2012; Recchia and others 2012; Delgado and others 2013; Mtimet and others 2013).

2.4 Econometric meta-analysis

Meta-analysis is increasingly proving that it could play a valuable role in objectively and effectively exploring topics which are extensively debated in the scientific literature. Meta-analysis as a tool for scientific investigation was first used in the early 20th century (Simpson and Pearson 1904), although the term itself was first coined only in 1976 (Glass).

This approach has also benefited in recent years from the process that has led to massive web indexing and sharing of the results of scientific research. Although its main application is in the

medical sciences, studies focusing on meta-analysis are be- coming more widespread and accepted in other disciplines, including economics and social sciences (Nelson and Kennedy 2009).

It is undeniable that having a comprehensive and objective view of what research has produced on the subject of interest over the years represents the first stage for any re- searcher interested in providing a new contribution to knowledge, taking advantage of the spillover offered by previous scientific production[1]. With regard to the analysis of consumer EVO preferences, both quality and quantity of scientific output allow the main results to be synthesized and systematized. Within this scope, a meta-analysis study, thanks to the characteristics of the regression models in terms of inference on reality, seems an efficient choice. Therefore, the aim of the meta-analysis proposed herein is to provide a statistically rigorous synopsis of the findings in the literature on consumer preferences for extra virgin olive oil attributes.

Our approach analyzes the WTP of consumers for several EVO attributes. As previously stated, many studies on this subject adopt the discrete choice method based on random utility theory [2]. If the price is included among the attributes, it is thus possible to obtain the preference for the various attributes considered, measured in monetary terms, as WTP. However, direct comparison among studies of WTPs for the various attributes is not strictly feasible in these terms as the results of each estimation are in local currency and they refer to specific space-time situations.

In light of the above considerations, the variable of interest, or the dependent variable of our model, WTP, was transformed into the relative change with respect to the base price of EVO as reported in each specific study. Meta-analysis may thus summarize the general indications on willingness to pay for different attributes by using results from studies from different sites, surveys, methodologies, and sample characteristics.

From an empirical point of view, not all the analyzed studies provided information directly usable for our purpose: only 20 studies explicitly provided the estimated WTP including a measure of the variance of the estimation, information necessary for implementation of random

[1]"If I have seen far, it is by standing on the shoulders of giants" (Isaac Newton, 1676).

[2] An anonymous referee suggested including in the analysis estimates of "implicit prices" provided by hedonic price modeling as done by Deselnicu et al. (2013). Following the arguments provided by Brander and Koetse (2011) we included in our analyses only WTPs provided by stated preference techniques. This decision is also supported by the scarcity of available estimates using hedonic pricing (Carlucci et al. 2014).

or fixed-effect models. Since each study usually considers jointly the preferences for different attributes, thus providing several estimates of WTP, our meta-analysis collected 78 WTPs overall from 20 studies written during the decade 2004–2014 (see Table 3). In order to avoid publication bias, also "non peer-reviewed articles" were included in the meta-analysis (Duval and Tweedie 2000; Rothstein and others 2006). The explanatory variables used in the meta-analysis are shown in Table 1 with some descriptive statistics.

Table 2.1 Explanatory variables used in the meta-analysis

Variable	Mean value	Min	Max
WTP (relative variation)	0.46	-0.92	0.98
Olive Origin certification	0.30	0	1
Brand	0.10	0	1
Neutral taste	0.15	0	1
Traceability	0.07	0	1
Organic Certification	0.12	0	1
Peer-reviewed article	0.60	0	1
Italy-based survey	0.30	0	1

There are three parametric methods most widely used within meta-analysis: 1. *Linear regression analysis model (or meta-regression);* 2. *Fixed-effect meta-regression analysis;* 3. *Random-effect meta-regression analysis*.

The Linear regression analysis model (or meta-regression) follows the ordinary least squares approach. Specifically, we assume that each i-study of n total studies provided an estimate of the relative willingness to pay equal to WTP_i:

$$WTP_i = x_i\beta + u_i \quad \text{with} \quad u_i \sim N\ (0,\sigma^2) \tag{1}$$

where x_i is a $1 \times k$ vector of covariates (including intercept) that characterizes the study i and β is a $k \times 1$ coefficient vector. Standard error estimates are provided through a bootstrap procedure to prevent possible estimation bias due to heteroskedasticity.

Meta-regression assumes that all the estimates of WTP included in the meta-analysis have the same precision or variability. When the confidence interval or the variance of WTP is available, it may be taken into account by adopting a variance weighted OLS. The literature on meta-analysis refers to this specification as *Fixed-effect meta-regression analysis*. In this case Eq. 1 becomes:

$$WTP_i = \mathbf{x}_i\beta + e_i \quad \text{with} \quad e_i \sim N(0,\sigma_i^2) \tag{2}$$

Equation 2 can be estimated by weighted least squares, with the weights $1/\sigma^2_i$ where σ^2_i is the estimated variance of the parameter provided by the *i*-th study.

However, by construction, *fixed effect meta-regression* analysis assumes that between- study variability of the estimates are equal to zero. In order to overcome this limitation *random effect meta-regression* analysis estimates a new parameter (τ^2) for taking between-study variability into account:

$$WTP_i = \mathbf{x}_i\beta + e_i + u_i \quad \text{with} \quad u_i \sim N(0,\tau^2) \quad \text{and} \quad e_i \sim N(0,\sigma_i^2) \tag{3}$$

The estimation procedure of Eq. (3) consists of a first estimate of τ^2 (variance between studies) and then in an estimate of the coefficients β through the least squares method weighted by using $1/(\sigma^2_i+\tau^2)$ as weights. The algorithm is iterative and follows the procedure suggested by Thompson and Sharp (1999).

In particular, having set an initial value for τ^2, the estimate of τ^2 is based on the following log-likelihood function maximization:

$$L_R(\tau^2) = -\frac{1}{2}\sum_i \left\{ \log(\sigma_i^2+\tau^2) + \frac{(y_i-\mathbf{x}_i\hat{\beta})^2}{\sigma^2+\tau^2} \right\} - \frac{1}{2}\log|\mathbf{X}'\mathbf{V}^{-1}\mathbf{X}|$$

where $\mathbf{V}=diag(\sigma^2+r^2,\sigma_2^2+r^2,\ldots,\sigma_n^2+r^2)$ and $\hat{\beta}=(\mathbf{X}'\mathbf{V}^{-1}\mathbf{X})^{-1}\mathbf{X}'\mathbf{V}^{-1}\mathbf{y}$ (Harville 1977).

From the sum of the squares of the weighted errors,

$$Q_E = \sum_i \left(\frac{y_i - \mathbf{x}_i \hat{\beta}}{\sigma_i} \right)^2$$

(Lipsey and Wilson 2001) it is possible to calculate the measure of the percentage of the residual variation that is attributable to between-study heterogeneity:

$$I^2 = \max\left\{ \frac{Q_E - (n-k)}{Q_E}, 0 \right\}.$$

The last two models are particularly useful when the purpose of studies is to estimate the "size effect" (effectiveness of a medicinal product, willingness to pay for a food attribute, etc.), exploiting the information from the confidence intervals of the measure.

In this specific study we apply all three models. For the estimation of the last two models we also use a measure of the variance of the WTP as estimated in the individual studies, in order to weight the effect size of each case study with an index of the goodness of the estimate.

Table 2 reports the results of the three estimates. All the exogenous variables considered show the same direction in the three different specifications. Of the three specifications, the *fixed-effect meta-regression* model seems to perform best, showing overall a higher significance level of the coefficients. This result is formally confirmed by the Cochran (Q_E) test and by the Higgins heterogeneity measure (I^2) (Higgins and Green 2008). This specific result supports the outcomes of the "fixed effects model", implying the existence of a "true effect size" similar for all the studies, and the WTP differences reported in several studies are not statistically significant. In other words, the variation in the WTP for the attributes would appear the same for all studies, albeit conducted in different countries and at different times.

This result might arise from the specific design of the dependent variable as a percentage change with respect to a base price. By using this procedure the differences between the estimates based on study-specific characteristics might be minimized.

Table 2.2 Assessment of implemented econometric models

Variable	*Meta-regression*		*Fixed effect meta-regression*		*Random effect meta-regression*	
	Coeff	std-dev	Coeff	std-dev	Coeff	std-dev
Olive origin certification	0.474***	0.144	0.489***	0.151	0.496***	0.107
Brand	0.521**	0.243	0.608***	0.207	0.531***	0.193
Neutral taste	0.251	0.173	0.197***	0.056	0.194	0.210
Traceability	0.033	0.041	0.145	0.105	0.120	0.080
Organic certification	0.393*	0.215	0.577	0.139	0.403	0.320
Peer-reviewed article	-0.276	0.192	-0.355***	0.124	-0.324***	0.096
Italy-based survey	-0.416***	0.112	-0.646	0.238	-0.459***	0.143
Constant	0.579	0.439	0.120	0.215	0.245	0.201
R^2	0.308		0.319			
τ^2					0.029	
I^2					15.20%	
Adj R^2					81.28%	
Q_E					64.37($\chi^2$89.39; df69; p<0.005	
F(8,69)	3.84		4.05		8.05	
Prob>F	0.0009		0.0005		<0.0001	
#obs:78 || *p<0.1; **p<0.05; ***p<0.01.						

Table 2.3 List of studies included in the meta-regression analysis

Authors	**Year**	**Title**	**Source title**	**Publication type**	**Study Area**
G. Cicia e C. Perla	2000	La percezione della qualità nei consumatori di prodotti biologici: uno studio sull'olio extra-vergine di oliva tramite conjoint analisys	Qualità e valorizzazione nel mercato dei prodotti agroalimentari tipici	Book chapter	Italy

I. van der Lans, K. van Ittersum, A. De Cicco, M. Loseby	2001	The role of the region of origin and EU certificates of origin in consumer evaluation of food products	European Review of Agricultural Economics	Peer-review article	Italy
G. Cicia, T. Del Giudice, R. Scarpa	2002	Consumers' perception of quality in organic food A random utility model under preference heterogeneity and choice correlation from rank-orderings	British Food Journal	Peer-review article	Italy
R. W. Ward, J. Briz, I. de Felipe	2003	Competing Supplies of Olive Oil in the German Market: An Application of Multinomial Logit Models	Agribusiness	Peer-review article	Germany
R. Scarpa, T. Del Giudice	2004	Market Segmentation via Mixed Logit: Extra-Virgin Olive Oil in Urban Italy	Journal of Agricultural & Food Industrial Organization	Peer-review article	Italy
G. Cicia, T. Del Giudice, R. Scarpa	2005	Welfare Loss due to Lack of Traceability in Extra-virgin Olive Oil: a Case Study	Cahiers Options Méditerranéennes	Peer-review article	Italy
S. Dekhili, F. D'Hauteville	2009	Effect of the region of origin on the perceived quality of olive oil: An experimental approach using a control group	Food Quality and Preference	Peer-review article	Tunisia-France
C. Finardi, C. Giacomini, D. Menozzi, C. Mora	2009	Consumer preferences for country-of-origin and health claim labelling of extra-virgin olive-oil	113th EAAE Seminar "A resilient European food industry and food chain in a challenging world"	Conference paper	Italy
C. Chan-Halbrendt E. Zhllima, G. Sisior, D. Imami, L. Leonetti	2010	Consumer Preferences for Olive Oil in Tirana, Albania	International Food and Agribusiness Management Review	Peer-review article	Albania
C. Finardi	2010	Preferenze dei consumatori per attributi di qualità dell'olio extravergine di oliva. Una indagine empirica	AgriRegioniEuropa	Peer-review article	Italy
L. Menapace, G. Colson, C. Grebitus, M. Facendola	2011	2011 Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market	European Review of Agricultural Economics	Peer-review article	Canada

N. Mtimet, K. Ujiie, K. Kashiwaghi, L. Zaibet, M. Nagaki	2011	The effects of Information and Country of Origin on Japanese Olive Oil Consumer Selection	EAAE 2011 Congress "Change and Uncertainty Challenges for Agriculture, Food and Natural Resources"	Conference paper	Japan
M.C. Aprile, V. Caputo, R.M. Jr. Nayga	2012	Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels	International journal of consumer studies	Peer-review article	Italy
C. Delgado, A. Gomez-Rico, J.X. Guinard	2013	Evaluating bottles and labels versus tasting the oils blind: Effects of packaging and labeling on consumer preferences, purchase intentions and expectations for extra virgin olive oil	Food Research International	Peer-review article	USA
G. Di Vita, M. D'Amico, G. La Via, E. Caniglia	2013	Quality Perception of PDO extra-virgin Olive Oil: Which attributes most influence. Italian consumers?	Agricultural Economics Review	Peer-review article	Italy
A. Yangui, M. Costa-Font, J.M. Gil	2013	The effect of food related personality traits and lifestyle orientation on consumer's behavior related to extra virgin olive oil: estimation of an extended hybrid choice model	4th ICAAAE	Conference paper	Spain
N. Mtimet, L. Zaibet, C. Zairi, H. Hzami	2013	Marketing Olive Oil Products in the Tunisian Local Market: The Importance of Quality Attributes and Consumers' Behavior	Journal of International Food & Agribusiness Marketing	Peer-review article	Tunisia
G. Vlontzos, M.N. Duquenne	2014	Assess the impact of subjective norms of consumers' behaviour in the Greek olive oil market	Journal of Retailing and Consumer Services	Peer-review article	Greece
A. Yangui, M. Costa-Font, J.M. Gil	2014	Revealing additional preference heterogeneity with an extended random parameter logit model: the case of extra virgin olive oil	Spanish Journal of Agricultural Research	Peer-review article	Spain

A. Yangui, F. Akaichi, M. Costa-Font, J.M. Gil	2014	Are ranking preferences information methods comparable with the choice experiment information in predicting actual behavior?	EAAE 2014 Congress	Conference paper	Spain

The results of our meta-analysis indicate that known brand, organic certification, olive origin certification (including European PDO, PGI and private certifications of country of origin) and neutral taste have a positive influence on consumers' WTP. The opposite consideration can be made for articles published in peer-reviewed journals, and those referring to Italian consumers. Thus Italian consumers show overall less importance to quality attributes compared to consumers from other countries[3], while articles not published in peer-reviewed journals seem to overestimate the real WTP for the attributes. A possible explanation could be related to the difficulty being published in a peer review journal since higher WTP estimates are considered less reliable. Finally, traceability does not seem to influence WTP. This result is related to the greater influence that information on the area of origin has on consumer choices. Information on the origin of the olives seems the most important aspect of traceability for EVO consumers. Coefficients measure the relative variation of the final price of EVO in terms of WTP, and therefore can be interpreted also as measure of importance for the consumers of the attributes. This means that brand, organic certification and origin certification can be considered the product attributes showing the greatest influence on consumer willingness to pay. Finally, the neutral taste attribute shows the lowest WTP.

2.5 Conclusions

Analysis of the literature on EVO consumer preferences and the meta-analysis implemented on the information attained allow some interesting considerations to be made. The first concerns the importance of the research strand which continues to interest not only traditional producer and

[3] One possible interpretation on the less importance to quality attributes given by Italian consumers could be associated to the fact that being Italy a producer country the oil olive price is on average lower than other non producing countries, and therefore also the WTP for the single attribute. However as highlighted by an anonymous referee, the same is not observed in other producer countries. Further investigations would be necessary on this specific point.

consumer countries but also new geographical areas, such as China and Japan, which have only recently discovered the product's nutritional and gustatory value. The second concerns the evolution of factors/characteristics which have, over the years, been the subject of the literature. Constant value across the period in question is to be attributed to origin certification, in all its various specifications (PDO, PGI, and private certifications of country of origin) and, to a lesser extent, to the known brand. Such attributes represented the cardinal points of our analysis. In all the studies, as also shown by meta-analysis, origin and brand decidedly affect consumer preferences. In particular, all the studies carried out have shown unequivocally the strategic role played by knowledge, on the part of the end purchaser, of the oil's origin. This situation appeared so evident that the European Union issued EC Regulation 182/09 in 2009 with the aim of making information on product origin clear and mandatory on the label. This new regulatory scenario combined with what was already written on the known origin of the extra-virgin olive oil excludes this characteristic from the possible focuses of further innovative research. Investigating how product origin may affect purchases of extra-virgin oil becomes a question of valid research especially if the study is carried out in countries such as China, India or other economies considered potential wealthy markets for the product in question.

Brand is another important attribute: in recent years the role of private labels has acquired major strategic value. Indeed, national and international brands of the large retailers, thanks to the reputation that they have built up, manage to supply the consumer with a guarantee not only of organoleptic quality and food safety but also of environmental (integrated production with the use of low input) and social sustainability (ethical certifications like SA8000). Organic certification represents an element of product differentiation, related to safety and the environment, which the consumer clearly appreciates.

The third reflection concerns aspects of taste in the literature. Indeed, while in older contributions intrinsic attributes were explored without particular focus on the various specifications which they might assume, recent analyses have begun to define the various dimensions of the sensory profile of EVOs. This evolution is due to developments which have occurred in the sensory analysis of olive oil and in the use of panel tests as a monitor- ing tool and guide in quality oil production. To date, agronomic and sensory research has managed not only to identify what aspects of taste and smell are indicators of oil quality but also how the latter correlate with production techniques The situation which currently emerges is that a quality EVO has a sensory profile which is quite marked and well differentiated. By contrast, on the

consumption side, the consumer prefers standard oils with little or no personality. This is amply highlighted by the results of the econometric model where neutral taste is ranked fourth in importance, after brand, organic certification and origin certification. This probably represents the question of the most topical interest. This aspect deserves a central position in future research since consumption preferences as described undermine all efforts to improve product quality made on the production side. Indeed, at present on the EVO market there is a serious discrepancy: producers who invested heavily in the past in improving product quality have had to overhaul their traditional production techniques, rewarded by the "experts" and "punished" by the market.

Finally, mention should be made of the limitations to the analysis. The first concerns the large number of studies, included in the econometric model, implemented in the countries where EVO is traditionally consumed. By contrast, consumer preferences for EVO in new markets, such as Asia, the US and Japan, have so far undergone little analysis.

The second is related to the number of papers included in the econometric analysis. Moreover, the sample size, although adequate for the objectives and the econometric approach of the analysis, did not allow the introduction of additional attributes in the econometric model considered.

A possible development of the analysis may involve the inclusion of papers belonging to a longer time period. This would allow the implementation of analytical models that can provide information on the evolution and changes in consumer preferences.

3. European Policy for Extra-Virgin Olive oil: are consumers provided with the sensory quality they want?

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Short version of title: EU Quality Policy: experts vs consumers

3.1 Abstract

Over the years, European Union (EU) Regulations have pushed quality standards of extra-virgin olive oil towards a product that has a sensory profile consisting of fruity, bitter and pungent notes, as such oils have excellent healthy features. However, whether consumers are ready for a richer and more complex sensory profile than the neutral one historically found on the market is still unclear. This potential discrepancy is investigated herein in order to ascertain in policy terms whether current demand is able to appreciate this path of quality enhancement steered by EU Regulations. Implicit prices for each and every attribute of extra-virgin olive oil with a focus on sensory characteristics were investigated by means of a hedonic price model. While confirming the importance of origin and *terroir* for extra-virgin olive oil, our results strongly confirm the discrepancy between what is currently valued on the market and what European regulations are trying to achieve in terms of sensory properties of such products. Increasing consumer awareness about the direct link between the health quality of oils and their sensory profile seems to be necessary to make quality enhancement programmes more successful on the market and hence more effective for companies.

Practical Application The main objective of this study was to identify how quality is developing into two streams, one determined by experts and another one by consumers. This information can be used by policymakers to develop regulations that meet experts' point of view with what the consumers ask in terms of Extra-Virgin Olive Oil quality.

Keywords: extra-virgin olive oil, sensory profile, hedonic price model, quality policy, European regulation

3.2 Introduction

Extra-virgin Olive Oil (EVOO) is one of leading industries for Southern Europe and, moreover, it is becoming increasingly important for consumers due to its healthy features (De Graaff and Eppink 1999). Moreover, EVOO consumption has grown almost worldwide (Madau 2009; Santosa and Guinard 2011). At the same time, in traditional producing and consuming countries, such as Italy, there has been an evolution of production due to innovations in both agricultural practices and processing, leading to a profound change in the taste, switching from neutral to a new complex sensory profile, with fruity, bitter and pungent notes playing an increasing role in defining EVOO quality (Panico and others 2014). This is only partly due to a change in consumer preferences: developments in olive oil technology research and the new European policy for the olive oil sector have played a crucial role (Anania and Pupo D'Andrea 2008). Most of this evolution can be traced back to the outcomes provided by scientific research: bitter and pungent flavours are linked to the presence of antioxidants (Solinas and others 1978; Caporaso and others 2015)), furthermore olive oil loses its antioxidant properties without bitter or pungent flavours (Gutierrez Gonzales-Quijano and others 1977).

Antioxidants are known to play an important role in protecting human cells from free radicals (Stark and Madar 2002; Servili and others 2009). This implies that the more pungent and bitter is EVOO, the better its health properties: "bitterness is considered as a positive sensorial attribute of this precious product that enhances overall flavour with notes related to unripe olive fruit" (Inarejos-Garcia and others 2009). Moreover, antioxidants play a positive role in shelf-life prolongation (García and others 2001).

The above research has greatly influenced EU policy in the olive oil sector. In 1991, with Regulation No. 2568/91, in the context of a far-reaching reform of the sector, the EU pushed for higher EVOO quality standards, assigning an important role to sensory profile. Sensory profile based on a panel test system became a discriminating tool for classifying an olive oil as "extra-virgin": it can be defined as such only a product that exceeds a set of defined evaluations. In the EU wine sector policy, trained panels for quality assessment had already been used. However, in the case of EVOO, the role of the panel becomes much more important.

With respect to this effort to improve the health properties and sensory profile of extra-virgin olive oil, a serious doubt arises: does a product with a complex sensory profile characterized by fruity and bitter flavor increases consumer satisfaction compared to one with a traditional neutral taste? To this end, several research papers have already assessed consumer preferences for EVOO sensory characteristics (Del Giudice and others 2015). The first investigations date back to the early 2000s, when Garcia and others (2001) submitted EVOOs with different levels of bitterness to a trained panel: although higher bitterness meant higher levels of nutritional components, it lowered consumers' acceptability. According to Garcia and others (2001), bitterness plays a key role in the acceptability of an olive oil. The interest in sensory aspects of EVOO, however, grew at the end of the first decade of the 2000s when several authors investigated, in different countries, consumer preferences for bitterness and pungency in EVOO compared to a neutral sensory profile.

Mtimet and others (2009) concluded that Japanese consumers showed a strong preference for extra-virgin olive oil with a neutral taste, while there was a negative preference for a strong taste. The opposite results were found in Tunisia (Mtimet and others 2013). Delgado and Guinard (2011) concluded that bitterness and pungency were evaluated negatively by a sample of 110 untrained U.S. consumers, while fruitiness was positively evaluated. The same oils were also submitted to a trained panel receiving a positive judgment in relation to bitterness and pungency. The same authors suggested that this negative association may be due to the fact that American consumers are new EVOO consumers, not used to such flavours in a vegetable oil. Similar results were also obtained by Recchia and others (2012) who submitted to a sample of 74 untrained Finnish consumers four Italian EVOOs, two of which were definable as "excellent quality" and two as "regular quality". When submitted to a trained panel, the two "excellent quality" oils showed a high value of bitterness and pungency, while non-trained consumers showed a clear preference for the oils in which bitterness and pungency were moderate. If Japanese, American and Finnish consumers are relatively new to olive oil consumption, not

dissimilar results come from studies on consumers living in countries where EVOO is part of the traditional diet. Chan-Halbrendt and others (2010)) in a survey on a sample of 204 olive oil consumers in Albania, a country where oil consumption is part of the traditional diet, concluded that only 7% of the sample appreciated the pungent characteristic, a percentage that drops to just over 5% due to the bitter characteristic. Also in Italy, Di Vita and others (2013) and Panico and others (2014) found that pungency in olive oil is not preferred by Italian consumers.

To summarise, studies based on comparing judgments of trained panellists vs non-trained consumers have emphasised that consumers, on average, do not seem to appreciate a complex sensory profile of extra-virgin olive oil, unlike expert panellists.

In modern markets, the need for developing standards and regulations can be driven by different motivations, amongst which consumer demand plays a crucial role (Fotopoulos and others 2011). Our research hypothesis is that, in the case of olive oil, the quality standards developed through regulations do not match the quality dimensions as perceived by consumers. This discrepancy between sensorial and chemical evaluations made by experts and the evaluation made by consumers (Poonnakasem and others 2016). Although the problem has been identified in the existing literature as stated above, there is no clear evidence of simultaneous analysis on a broad range of olive oils comparing the two quality definitions, expert quality and consumer quality. To this end, we jointly analysed the tastes within a single framework, valuing the market performance of the sensory profile, as defined by panellists. This allowed us to explicitly test whether scientists and policy makers are pushing producers towards the production of EVOO with characteristics currently not appreciated on the market using a hedonic price model.

A Hedonic Price Model (HPM) will be used to have quantitative data that express this discrepancy. Moreover, among the attributes that characterize the products database, there will be sensory variables derived from a sensory evaluation by a professional sensory analysts jury. The aim was to determine to what extent all these features contribute in the market price formation in the case of EVOO. This allowed us to deal with two interesting issues: a) what are the most important attributes (including sensory ones) in determining EVOO price? b) Do EVOOs with a high-scoring sensory profile enhance consumer acceptance, thereby benefiting higher prices?

The paper is structured as follows: in the next section the European policy background regarding the olive oil sector is discussed, while section three illustrates the data used for the

hedonic price model and the empirical model used for the estimates. Results of the model and their policy implications are presented in section four. Some final remarks conclude the paper.

3.3 Policy background

European policy for the olive oil sector has a long history that begins with the establishment of the common organisation of the market in oils and fats in 1966. EEC Regulation 136/66 provided a specific policy of aid to the income of oil producers and gave a clear definition of the different types of olive oil. Focusing our attention only on the extra-virgin type, it was defined as "oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions, particularly thermal conditions, that do not lead to alterations in the oil, which have not undergone any treatment other than washing, decantation, centrifugation and filtration, to the exclusion of oils obtained using solvents or re-esterification processes and any mixture with oils of other kinds". Moreover "having a maximum free acidity, in terms of oleic acid, of 1 g for 100 g" (Ramirez-Tortosa and others 2006). No reference was made to the sensory profile. The introduction of sensory parameters was to come much later. In 1998, with Regulation 1638/98, there began a new stage in Europe's olive oil policy. Accession to the European Union of Greece, Spain and Portugal in the 1980s transformed the Union from a net importer to a net exporter, thus making it necessary to rethink the subsidy policy. Regulation 1638/98 introduced a transition regime that would lead to a far-reaching reform in 2001 with Regulation 1513/2001. This reform focused upon increasing the quality of olive oil produced in the European Union, encouraging olive growers to deliver consumer satisfaction and increase demand. Olive oils were re-defined and, in particular, a pivotal role was assigned to sensory profile. In the wake of studies that had highlighted the relationship between antioxidants, health properties of olive oil and sensory profile, the European Union, so as to boost the quality, introduced a sensory parameter to define EVO. Regulation No. 2568/91, giving guidance about classification of various olive oil types, considers some organoleptic aspects as necessary to define oil as "extra-virgin". It specifies that extra-virgin olive oil is derived solely from olives using mechanical or other physical means, has an acidity lower than 1, and a global assessment from a panel test higher than or equal to 6.5. EU regulation No. 2568/91 also strictly defines the role of the panel: "The panel organizer shall be a suitably trained, knowledgeably person who is an expert on the kinds of oils which he will come across in the course of his work. (...) The work of the panel supervisor calls for sensory

skill, meticulousness in the preparation of the tests and their rigorous arrangement, as well as for skill and patience in the planning and execution of the tests. (...) He shall ensure that his opinion is not known and shall prevent possible leaders from asserting their criteria over the other tasters. He shall also be responsible for training, selecting and monitoring the tasters in order to ascertain whether they are keeping up to an adequate level of aptitude." (Annex XII, ch. 8). Moreover "Eight to twelve tasters are required for the test" (Annex XII, ch. 9).

In 1992, with Regulation No. 1683/1992 a specific vocabulary for sensory analysis was defined, while Regulation No. 796/2002 introduced a new sensory profile sheet to make the expression of the panel's judgment strictly codified. The parameter of global panel test evaluation equal to or greater than 6.5 was replaced by two different parameters: the median of the defects equal to zero and the median of the fruity attribute greater than zero. The median of the defects is defined as "the median of the negative attribute perceived with greatest intensity" (Regulation No. 796/2002, Annex XII, ch. 5) while the fruity attribute refers to "the range of smells (dependent on variety) characteristic of oil from healthy fresh fruit, green or white, perceived directly or retronasally" (Regulation No. 796/2002, Annex XII, ch. 3). Under Regulation No. 1989/2003, the maximum acidity level of extra-virgin was lowered to 0.8%.

Regulation No. 640/2008 updated definitions of oil sensory evaluation terms and gave further information about sensory features and related optional references on the label: producers can put the sensory profile of the oil on the label only if they are certified by an official panel. In the same regulation there are also further recommendations about the panel: "The testers must be selected and trained on account of their skill in distinguishing between similar samples. The International Olive Council's (IOC) manual on the selection, training and monitoring of qualified virgin olive oil tasters must be followed". (Regulation no. 640/2008, Annex XII, ch. 4).

Panel capabilities are constantly monitored through appropriate tests managed by IOC or, in Italy, by the Ministry of Agriculture and Forestry. This makes judgments from different panels highly standardised. Finally, regulations for PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) provided by the EU seem to "exasperate" the tendency to raise the standards for sensory quality requirements in EVOO. Local products are not only viewed as those that have developed their peculiarity according to their area of origin, but are also products of excellence that are seen as superior to their conventional counterparts. The result is that the guidelines about the sensory profile indicate that the oils should tend to have stronger, more fruity, bitter and sweet notes in each and every certified product. Panel test scores are also specified in each case: these products must have a score equal to or greater than 6.5. The

EU seems assuming that consumer demand for quality is achieved by quality schemes that impose a more marked taste upon PDO and PGI products compared to conventional ones that are supposed to have a lower level of quality.

This body of laws makes olive oil a unique product in the agri-food system as regards EU regulations. Not even in the case of wine, where sensory profile is also particularly relevant, is such strictness observed. However, since the supply of EVOOs with complex sensory profiles was mainly fostered by policies rather than an effective demand it has hitherto remained unresolved whether there is a 'gap' between the preferences of consumers and experts when it comes to sensory profiles: the next section aims to resolve the question definitively.

3.4 Data and Methods

3.4.1 Data collection

3.4.1.1 Brand

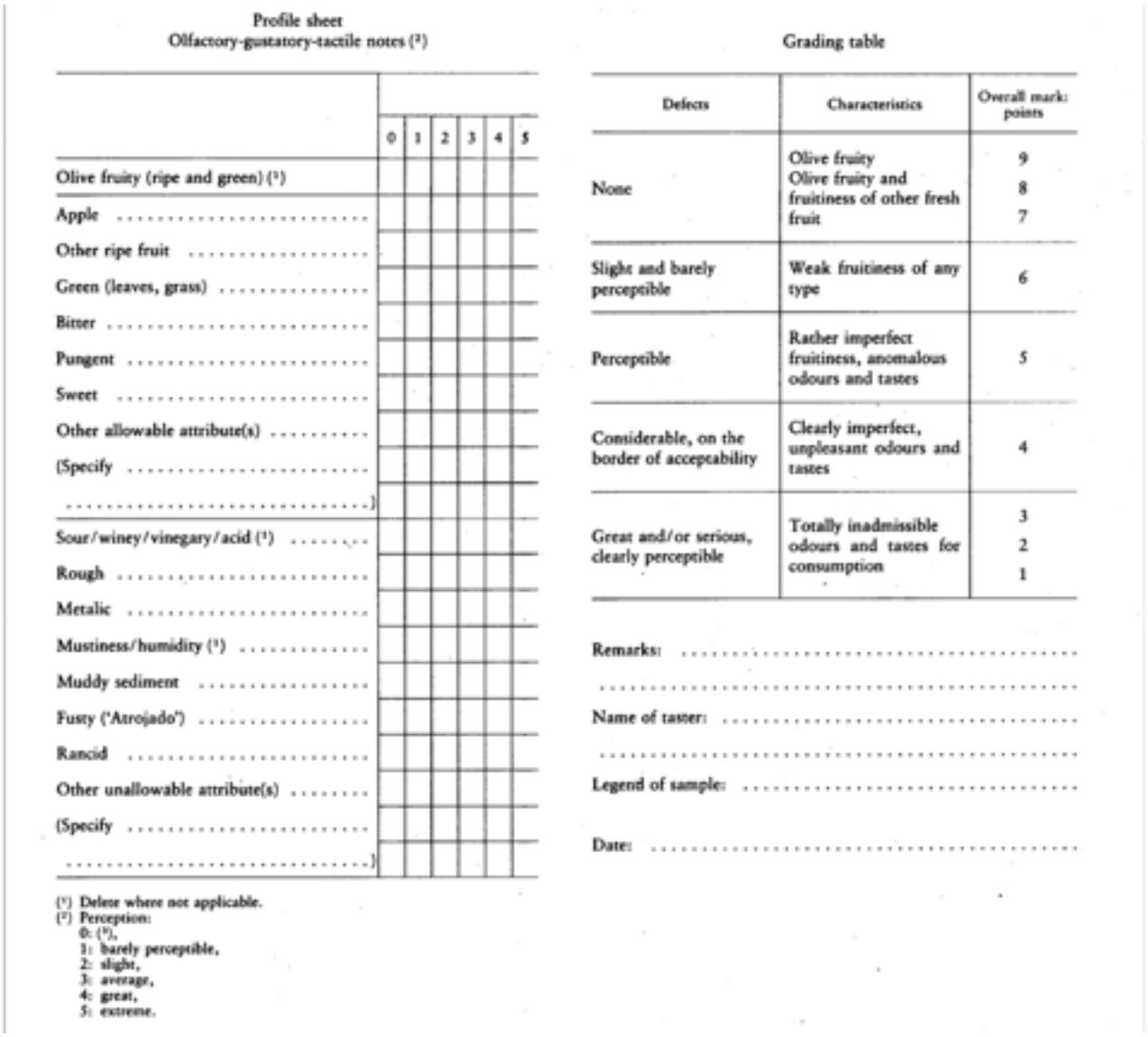
The dataset is made out of the whole assortment of an Auchan hypermarket in Naples. This sampling design was motivated by several considerations: 75% of the whole olive oil consumed in Italy is sold in supermarkets and hypermarkets; Auchan is one of the most important players in Italian food distribution; the EVOO shelf in Auchan contains one of the largest ranges available on the Italian market; according to IRI Infoscan data, the 68 different bottles on the shelf in question account for about 40% of the market; Auchan product prices, albeit with slight variations due to temporary and localized promotions, are essentially fixed throughout the country; all the products involved in the analysis were collected under the same logistical and storage conditions (temperature and light). The latter aspect is particularly relevant to sensory analysis

3.4.1.2 Sensory Analysis

In order to have sensory data related to each product in the dataset, for the sensory analysis has been recruited a private sensory evaluation consulting firm. The recruited company proceeded to

evaluate the sensory profile of the 68 different EVOOs. The samples of oils from the dataset have been evaluated by one jury of eight expert tasters in blind taste sessions. The blind taste sessions were coordinated by a supervisor. The panel classified the samples using the protocol described in "Procedure for the organoleptic assessment of virgin olive oil" - Annex XII of European Regulation (EEC) No. 2568/91, ch. 10. This document introduces a method for the organoleptic evaluation of olive oils with a specific profile sheet.

Fig. 3.1 – Sensory profile evaluation card



Profile sheet
Olfactory-gustatory-tactile notes (2)

	0	1	2	3	4	5
Olive fruity (ripe and green) (1)						
Apple						
Other ripe fruit						
Green (leaves, grass)						
Bitter						
Pungent						
Sweet						
Other allowable attribute(s)						
(Specify						
.....)						
Sour/winey/vinegary/acid (1)						
Rough						
Metalic						
Mustiness/humidity (1)						
Muddy sediment						
Fusty ('Atrojado')						
Rancid						
Other unallowable attribute(s)						
(Specify						
.....)						

(1) Delete where not applicable.
(2) Perception:
0: (3),
1: barely perceptible,
2: slight,
3: average,
4: great,
5: extreme.

Grading table

Defects	Characteristics	Overall mark: points
None	Olive fruity Olive fruity and fruitiness of other fresh fruit	9 8 7
Slight and barely perceptible	Weak fruitiness of any type	6
Perceptible	Rather imperfect fruitiness, anomalous odours and tastes	5
Considerable, on the border of acceptability	Clearly imperfect, unpleasant odours and tastes	4
Great and/or serious, clearly perceptible	Totally inadmissible odours and tastes for consumption	3 2 1

Remarks: .....
.....
Name of taster: .....
.....
Legend of sample: .....
Date: .....

The profile sheet suggested by Regulation No. 2568/91 (Fig. 3.1) allowed to have judgments about the several features of olive oils rated according to a likert scale from 0 to 5. While overall mark is evaluated with a scale from 1 to 9. The evaluation elements included in the dataset are related only to the salient features among the ones comprehended in the profile sheet: Fruity, Bitter, Pungent, Sweet, Defects, and Global Evaluation. Defects are set to the highest value assigned to one of the unallowable attributes reported in the profile sheet (sour, rough, metalic, etc). The overall mark sums up all the elements in one final score, as indicated in the Grading Table (Fig. 3.1).

3.4.1.3 Other attributes

The database has been built according to all the variables that characterize the oils. First of all, the price per liter has been registered according to the price of the selected retailer. Then, the sensory variables are made by the score assigned by the jury as explained above, while the other attributes in the database have been determined by the search attributes detectable by observing the product on the shelf were also collected (Table 1). Three attributes were country-of-origin related: 56% of the oils were made from olives grown exclusively in Italy; 22% had the Protected Designation of Origin (PDO) certification; 69% reported Central Italy as the bottling location. Two features were related to certified production techniques: 10% of the oils analysed were obtained through the organic method; 21% had other ISO certifications. Three features were related to oil intrinsic properties expressed through: very general information about product taste (such as "strong" or "gentle" taste); nutritional facts (calories, saturated fat, etc.); awards received in national or international competitions. On some labels it was also possible to detect a web address that allowed the consumer to obtain broader information on the product. The possible brand impact was evaluated through two different variables. The first took into account EVOO bottled by private label, while a second variable identified the producers with a national market share greater than or equal to 10%. Finally, the following search attributes were also used: plastic (30% of the bottles in our sample were made of plastic); traditional packaging (10% of the bottles had an "old-fashioned" design with several recalling tradition, i.e.: ceramic cap); bottle size (1 litre vs 0.75 litre); non-filtered oil (10% of oils had a deeper colour due to absence of filtering).

Tab. 3.1: Descriptive statistics of the EVO sample

Variables	**Descriptive statistics**			
	Modalities	**Range**	**Average**	**Standard deviation**
Price/liter	Continuous		7.66	3.66
Sensory attributes (Jury grade)				
Defects	Ordinal	0 - 5	0.38	0.75
Fruity	Ordinal	0 - 5	1.97	1.29
Bitter	Ordinal	0 - 5	1.81	1.27
Pungent	Ordinal	0 - 5	2.03	1.16
Sweet	Ordinal	0 - 5	1.75	0.7
Global evaluation	Ordinal	1 - 9	6.77	1.13
Attributes on label				
PDO	Dichotomous	Yes:1 No:0	0.22	0.42
100% Italian	Dichotomous	Yes:1 No:0	0.56	0.5
Central Italy bottling	Dichotomous	Yes:1 No:0	0.69	0.46
Organic	Dichotomous	Yes:1 No:0	0.1	0.31
Other certifications	Dichotomous	Yes:1 No:0	0.21	0.41
Private label	Dichotomous	Yes:1 No:0	0.18	0.38
Taste information	Dichotomous	Yes:1 No:0	0.56	0.5
Brand	Dichotomous	Yes:1 No:0	0.28	0.47
Web address	Dichotomous	Yes:1 No:0	0.76	0.43
Awards	Dichotomous	Yes:1 No:0	0.09	0.29
Nutritional facts	Dichotomous	Yes:1 No:0	0.65	0.48
Attributes bottle related				
750 ml	Dichotomous	Yes:1 No:0	0.26	0.44
Not filtered	Dichotomous	Yes:1 No:0	0.1	0.31
Plastic	Dichotomous	Yes:1 No:0	0.3	0.17
Traditional design	Dichotomous	Yes:1 No:0	0.09	0.29

3.4.1.4 Methodology

Our empirical approach is based on the hedonic price model (HPM). It assumes that each good consists of a bundle of characteristics and is valued by its utility-generating attributes (Lancaster 1966). In other words, the market price reflects the good composition of the attributes which, on the contrary, have no explicit price. To this extent, it is possible to value the attributes that make up the final good by analysing the systematic variation in the price (Rosen 1974).). In this study, the HPM on EVOO was implemented mainly to value the sensory profile detected by a trained panel.

As a relevant proxy of the EVO sensory profile, the jury global score (g_o) can be included as a regressor of the hedonic equation, where the dependent variable (P_o) consists of the observed price in the market; $\mathbf{X}_o$ is a 1 × m vector of all collected observable attributes that characterise the olive oil o and $\boldsymbol{\beta}$ is an m × 1 parameter vector, measuring the effects of these attributes on the market price (hedonic equation).

[1] *hedonic equation* $P_o = \mathbf{X}_o \boldsymbol{\beta} + g_o \delta + e_o$, with $o = 1,...,O$;

The hypothesis being tested in equation [1] is that the EVOO sensory profile could affect the oil olive market price through the estimation of parameter δ.

However, by exploiting the process that leads to define the EVOO sensory profile, since the jury global valuation was determined by the jury on the basis of the single scores associated to each sensory attribute, a second equation can be used to infer properly on the judgment process of the jury (grade equation):

[2] *grade equation* $g_o = \mathbf{Z}_o \boldsymbol{\gamma} + u_o$ with $o = 1,...,O$;

The equation [2] measures, through the estimation of the s × 1 parameter vector $\boldsymbol{\gamma}$, the relationships between the *jury global score* g_o and the 1 × s vector of the sensory attributes $\mathbf{Z}_o$.

The two equations can be estimated a) separately, if the unobserved characteristics of the price formation process (hedonic equation) u_o are uncorrelated with the sensory profile assessment

(grade equation); b) in an equation system, assuming that, conditional on the explanatory variables, the two equations are interdependent. Since diagnostic tests, and especially the Durbin–Wu–Hausman test for endogeneity (p-value = 0.038), provide empirical evidence that the two processes are interdependent, the grade and the hedonic equations constitute a system of equations to be estimated simultaneously in which the jury grade is allowed to be measured with error:

[3] $$\begin{cases} P_o = X_o\beta + g_o\delta + e_o \\ g_o = Z_o\gamma + u_o \end{cases}$$ with $o = 1,\ldots,O$.

3.5 Results

3.5.1 Sensory attributes

The generalized method of moments (GMM) estimates of the HPM are shown in Table 2: the hedonic equation is semi-logarithmic including, as independent variable, the sensory jury judgment expressed as a linear function of oil sensory features. By using this specification, it is possible to value the implicit price of the EVOO sensory profile, given by the jury global valuation, as well as understand how the various aspects of the sensory characteristics affect the overall sensory profile.

In the hedonic equation we find jury global valuation as statistically significant and with a negative coefficient. In terms of marginal effects, every extra point awarded by the jury to the sensory profile corresponds to a price reduction of 8.6%. This result seems to confirm what has already emerged in the literature about the discrepancy between experts and consumers (Delgado and Guinard 2011; Recchia and others 2012).

The second equation relates the expert's global judgment with the score for EVOO sensory descriptors. The most important ones are, respectively: the absence of defects, fruity and pungent; while the descriptors bitter and sweet have a positive sign but are not statistically significant. This result is in part expected because EC Regulation 2569/91 requires that an oil can be defined as extra-virgin if the global score is above 6.5, but also the median of the defects values must be equal to zero and the fruity median has to be above zero.

It should be noted, that the "defects" variable is in both equations. In the HPM it has a negative sign and is statistically significant (- 8.7 %). This could be explained by pricing policies for

perishable food adopted by the large retailers that lead to discount pricing practices as the expiring date approaches, as the quality declines (Wang and Li 2012).

3.5.2 Attributes on the labels

Table 2 shows quite clearly that attributes with a higher positive implicit values are those origin-linked followed by organic certification. EVOOs characterized by geographical origin were the ones with attributes such as: PDO; "100% Italian" and Central Italy bottling. The results show a premium price of + 41.8% for "100% Italian" products. This seems consistent with the findings provided by Del Giudice and others (2015) in which the increase in the estimated WTP compared to the baseline price was, for the origin attribute, + 48.9%.

The attribute "bottled in Central Italy" shows a lower premium price (+ 27.9%). This result is due to a structural lack of transparency in EVOO labelling (Cicia and others 2005), that can erroneously suggest that bottling place corresponds to an origin cue (Cicia and others 2002). Only by EU Regulation No. 1019/2002, the legal framework dealt with this problem, requiring firms to report on the label the country of origin of the olives. However, results suggest that Central Italy, as a bottling place, maintains a good reputation. Finally, the premium price for PDO (+ 23%) is the least contributing to the price structure among geographical attributes. PDO not only refers to voluntary public quality standards (EU Reg. 509/06), but it is also, the most stringent geographical attribute. As a result, PDO oils, are obliged to have a higher sensory profile thanks to procedural guidelines strongly focusing on the organoleptic quality of the product, used as a strategy to differentiate consumer markets (Panico and others 2014).

According to the importance order, the attribute "organic" is in second place, with a + 38% premium over the base product price. Literature already highlighted is importance in in shaping consumers' perception of quality for EVOO (Sandalidou and others 2002; Caporale and Monteleone 2004), and also the premium price was not far from what existent in literature (Del Giudice and others 2015).

A negative and statistically significant coefficient was estimated for the "nutritional information" attribute. It is difficult for consumers to understand and it is less preferred compared to health claims (Van Wezemael and others 2014). Moreover, consumers consider olive oil a healthy product tied to deeper values such as "*good health and long life*" and could therefore be negatively affected by an excess of complex information about calories (Nielsen and others 1998).

The model contains three attributes related to packaging: traditional design; PET bottle; 0.75 litre vs 1.0 litre bottle. Negative coefficients are found for "traditional design" (21.26%) and 750 ml bottle (–11. 57%). PET package does not seem to affect the price, the relative coefficient being not statistically significant. These results should be read in light of the highly innovative process that is affecting oil packaging, transforming it from a traditional format to different solutions in materials, design and in size (Martínez and others 2002; Del Nobile and others 2003).

The negative coefficient (-17.8%) estimated for the private label attribute fully reflects the traditional strategy of brand positioning from large retailers. Private labels compete both in the high quality segment with well known brands, and in low quality segment with weaker brands; they always have a price slightly lower compared to the competitors (Choi and Coughlan 2006). Brand does not seem to affect the price for EVOO. The effect in literature is not constant. Cuellar and Claps (2013), state that brand can have either a large and significant effect on WTP or no effect at all. Piccolo and others (Piccolo and others 2013) show, although positively rated, brand has a relatively weak role in the consumer's decision-making. The first reason why is that brand is a multidimensional attribute composed by different dimensions like uniqueness, social image and country of origin (Anselmsson and others 2014), in this case the effect of origin has been decomposed from the one of the brand. The second issue concerns the price positioning of the major brands in the Italian EVOO market that follow the strategy of a middle price point (Delgado and others 2013).

Regarding the absence of an effect by the indication of a website, this depends by the product category as all the on-line information. In fact, Pan and Chiou (2011)) showed that this effect on consumer choice is weaker in the case of credence goods compared to experience goods. EVOO belongs to the first category thanks to its credence features (PDO, 100% Italian, organic, etc.).

Finally, sensory information on the label, which expresses a very general judgment on the oil's taste, such as gentle, delicate, strong or fragrant, does not statistically significantly affect the price. The same applies to awards reported on the label, that are often assigned in competitions where the jury consists of expert panelists.

Tab. 3.2- Estimates of the structural simultaneous system of equations (hedonic and jury grade)

	Hedonic equation			Jury grade equation				
	β Coef.		Std. Err.	Marginal effect (% change)		γ Coef.		Std. Err.
Sensory attributes								
Jury global score	-0.09	**	47	-8.61				
Defects	-91	*	54	-8.70		-661	***	104
Fruity						453	***	62
Bitter						1		58
Pungent						144	**	64
Sweet						71		111
Attributes on label								
PDO	207	**	108	23.00				
100% Italian	349	***	73	41.76				
Central Italy bottling	246	***	85	27.89				
Organic	322	***	115	37.99				
Other Certifications	35		78					
Private label	-196	**	86	-17.80				
Brand	-48		81					
Sensory information	89		73					
Website number	-152		0.1					
Nutritional info	-243	***	75	-21.57				
Awards	0.03		106					
Attributes bottle related								
Not filtered	204		134					

Packaging								
750 ml	-123	***	168	-11.57				
Plastic	331		96					
Traditional design	-239	*	145	-21.26				
Constant	2.2	***	0.29			5.411	***	302
# observations	68					68		
R^2	0.75					0.77		

3.6 Policy implications and concluding remarks

This work focused on the olive oil regulatory framework and on the importance to lay down a road map to be followed by companies wishing to implement development strategies. European legislation relating to olive oil quality comprises public certification, chemical indicators and sensory analyses conducted by experts. Our research hypothesis was that, in the case of olive oil, the quality standards developed through public regulations do not match the quality dimensions as perceived by consumers.

While confirming the importance of origin and *terroir* for EVOO, our findings strongly confirm the discrepancy between what is currently valued on the market and what European regulations are trying to achieve in terms of sensory properties of such products. The results have major implications both for private firms and policy makers, due to the modern approach to policy as not only based on scientific aspects (Millstone and others 2000).

With regard to firms, the Italian market seems to reward products linked to traditional areas of production and obtained with environment-friendly techniques.

As regards production area, the HPM results show that all the geographical characteristics (PDO, 100% Italian, bottled in central Italy) generate a significant premium price which, in the case of 100% Italian olives, soars to about + 42%. Confirming what stated by the literature, certified origin receives a premium price (Nielsen and others 1998; Chan-Halbrendt and others 2010; Delgado and Guinard 2011; Recchia and others 2012).

Besides, for packaging, the study revealed a strongly negative effect from the traditional bottle design on price as well as PET bottle, showing that the consumer has a preference for a basic packaging and is not appealed by different packaging solutions.

Finally, nutritional facts, focusing on chemical characteristics, have a negative influence on the market price. It would be desirable for firms to focus on health claims which are easier for the average consumer to understand (Ares and others 2008) As already stated under Regulation No. 1924/2006, such claims may be linked to typical healthy aspects of oils with a high-level sensory profile.

With regard to policy making, the results of our study allow us to verify whether there is a match between the dimensions of quality that are important according to consumers and those regulated through norms. According to our results, it seems that, 17 years after the introduction by the EU of the sensory evaluation of oils (Regulation 1638/1998), the market does not seem to reward products with a complex sensory profile and rich in antioxidants, but still rewards oils with a flat taste. This may be a failure for public regulations which have steered the development of products according to a quality concept that is not shared by consumers, who do not have necessary background knowledge to appreciate some attributes (Bech-Larsen and Scholderer 2007). When quality improvement matches consumer preferences, the result is an increased WTP (Grunert 2005), this compensates increased costs for firms and turns in increased profits (Caswell and Mojduszka 1996; Tregear and others 2007), which is what does not happen in the olive oil sector. The situation we described leads to reflections on the need for public intervention to improve consumer knowledge about the actual quality characteristics of EVOO and the correlation they have with health features in order to reduce this discrepancy.

In the case of olive oil, the regulatory system has become a tool to legitimate quality attributes embedded in products. EVOO has always been subject to great attention by the EU in relation to two aspects. The first concerns the improvement in the quality of raw materials so as to obtain oils with increasingly healthy attributes and higher sensory profiles. The second is the safeguard of consumers in terms of origin information, starting from PDO and PGI certifications (EC Regulation No. 2081/92) up to complete traceability required by EC Regulation No. 178/2002 and EC Regulation No. 852/2004).

Both areas of intervention aim to protect local products with a wide sensory characterization, and to push olive oil production towards higher health standards. The focus on production techniques and on quality protection lacks an information strategy that allows consumers to

become better acquainted with all dimensions of quality in order to improve awareness behind choice. Furthermore, few information campaigns have been set up to provide consumers with objective parameters that can be used to make fully informed choices about health. Tying sensory attributes to health aspects would allow, in the medium term, progressive education of the consumer in terms of olive oil taste, avoiding the discrepancy highlighted in this study. To sum up, it seems that olive oil public policy lacks specific interventions on consumer information and education to create a concept of quality that is supported by the whole supply chain.

The effect of different forms of private and public communication on the link between sensory profile and health qualities of EVOO is an aspect that should be properly investigated in future research.

4. "O Premium, Where Art Thou? PDOs Price Premium Disparities in the Italian Olive Oil Market" §

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4.1 Abstract

The aim of the study is to explain how each attribute contributes to the final price of Extra-Virgin Olive Oil (EVOO) in the case of Italian market. Then, we aim to understand, in the case of PDO and PGI extra-virgin olive oils, if origin receives a premium price and how it is distributed across Italian regions. Furthermore, we aim to stress what is the geographical level at which the biggest price premium can be caught by each regional production. In this paper we measured the contribution of different attributes to extra-virgin olive oil prices in Italy, with a focus on price premia for PDOs sold either inside and outside the region of production, using a hedonic price model and a large scanner database of sales (IRI Infoscan) in Italian regions. The results of this study suggest that among the EVOO attributes, the most important are: size, place of bottling, "100% Italian", organic, no filtered. Cold processing and single cultivar do not affect price significantly. Then, sensory claims have a positive markup, except for intense taste. The aggregated premium price for PDO/PGI attribute is +60.7%. This value has been decomposed in regional and national price premia. Results are comprised within two extremes: products from Campania with the lowest premium price and the largest importance of regional vs national sales; and the opposite cases of Apulia, Trentino and Tuscany, that have a significant markup supported nationally and a low one within their region.

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4.2 Introduction

Olive oil is one of the traditionally leading industries of Southern Europe economy. Data from International Olive Oil Council help to understand its importance within the global economy scenario. Olive oil production is concentrated in Mediterranean area: Europe is responsible for 69.9% of worldwide production, the major producing countries, in fact, are: Spain (1781000 tonnes in harvest year 2013/2014) followed by Italy and Greece; they also are the main exporting countries, always in the same importance order. In this area it is also concentrated most of the demand: in fact the most consuming countries are the traditional ones as Italy (641000 tonnes in 2013/2014) followed by Spain and Greece. There are reasons to suppose an increase e of demand for olive oil as the consumption of this product shows a positive trend at a worldwide level, mostly due to emerging markets such as: US, Brazil and Japan, that are increasing constantly their requests in terms of imported volumes (International Olive Oil Council 2015).

In this framework it is important to understand how the value of this product can be improved according to what is important for consumers. In fact, there are different dimensions that contribute to the concept of quality: subjective or objective. Physical and chemical properties determine the objective part of quality, while what determines the subjective part of quality is consumer's perception (Steenkamp 1990; Grunert 2005). Olive oil appears as a quite differentiated product (Cabrera and others 2015), and consumers' preferences seem to be quite heterogeneous about them, especially the sensory ones (Caporale and others 2006; Yangui and Gil 2014). Quality attributes of olive oil have been extensively studied using several methods (Nielsen and others 1998; Van der Lans and others 2001; Menapace and others 2011); what they outlined is that, among others, what is supposed to be of major importance for consumers while choosing extra-virgin olive oil is origin (Tsakiridou and others 2006; Menapace and others 2008; Carlucci and others 2014), that, in turn, is a bundle of other extrinsic and intrinsic attributes (Menapace and others 2011) and it is a decision shortcut for consumers that are seeking for quality products (Ahmed and others 2002). One of the possibilities to communicate this attribute on the label is through PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) certifications. These certifications are normed through proper rules that regulate strictly food production. The effectiveness of these quality schemes can be verified analyzing sales and prices that occur on real markets.

In this context, our work gives an empirical perspective on what are the important attributes according to the consumers of this product. We firstly analyzed, using an hedonic price model,

the different dimensions of quality for extra-virgin olive oil computing price premia attached to them, with a special focus on the ones related to PDOs and PGIs that have been investigated with a regional detail. Specifically what we did is, at first, running an hedonic price model considering the attributes of extra virgin olive oil in order to have an implicit price for each good attribute. Then, we went deeper in our analysis, running an hedonic price model, to calculate the implicit price of each regional PDO, discriminating the products sold in their origin region from the ones sold in the whole country. In this way it is possible to compare the price premia across different PDOs, across Italian regions and across sale regions. The analysis has been carried on using scanner retail data, as they give extensive information about actual sales and prices of extra-virgin olive oil on a regional level.

Hedonic price has already been used to explain the price of olive oil, it is the case of a study based in Greece (Karipidis and others 2005) and one based on Italian e-commerce (Carlucci and others 2014) that helped to understand what contributes to achieve the highest markup; while in the case of olive oil sold in an emerging country, Chile (Romo Muñoz and others 2015) the structure of price helped to explain the differences between domestic and imported olive oils. What our work adds to existing knowledge is the analysis of price premia of extra-virgin olive oils sold in Italian traditional channels (Ipermarkets, supermarkets and superettes), that represent the biggest share of retail sales (ISMEA 2010), and also it adds a deeper understanding of how price premia are achieved for different types of PDOs and PGIs, comparing the performance at a local level (in their origin region) with what is achieved at a national level. This helps to discriminate what are the most successful attributes on the market and at what level (local or national) each PDO achieves the highest markup.

The article proceeds as follows. The next section provides a brief background on olive oil consumers' preferences and on quality schemes including PGI and PDO. This is followed by a description of the model and data used, and a discussion of the estimation procedure used to measure the price premia. Results and policy implications from the model are discussed next, followed by the concluding remarks.

4.3 Background

Extra-virgin olive oil is a differentiated product (Carlucci and others 2014; Cabrera and others 2015), its production evolved with the use of multiple methods that result in products with

different final characteristics, so it has several attributes that help the consumer to distinguish one product from another. Differentiation works best for the most knowledgeable consumers (Delgado and others 2013), as the one living in traditional producing countries (Caporale and others 2006; Fandos Herrera and Flavián Blanco 2011). Italian consumers have a privileged position in familiarity and experience with the product.

Among all the attributes, other Authors point the origin as one of the most important drivers for choice (Van der Lans and others 2001; Dekhili and others 2011). Origin is a multi-fold attribute that can be considered a sum of other safety and traceability attributes (Menapace and others 2011) but it is also linked to concepts such as typicality and ethnocentrism (Van der Lans and others 2001; Caporale and others 2006). Other attributes that are usually valued by consumers about extra-virgin olive oil are the ones concerning production, such as "organic", that it is also a concept embracing multiple aspects linked to naturalness and respect of the environment. Regarding intrinsic attributes such as sensory ones, there is mainly a discrepancy between what is objectively considered desirable for a product with superior healthiness features and what consumers prefer (Caporaso and others 2015; Del Giudice and others 2015), even if this difference is heterogeneous according to the experience of the consumer with the product (Caporale and others 2006; Delgado and others 2013).

4.3.1 Certifications of origin

The origin of products can be conveyed in different ways, besides generic geographical origin indications defined as Country Of Origin Labelling (COOL), there are PDOs and PGIs, which represent a special case in which the indication of origin is usually referred to a limited area. Following the Regulation (EC) No. 1151/2002 modifying previous regulations from 1992 and 2006, which created a regime for identifying and protecting products with geographic identification. In detail the regimes identified were of three types: PDO (Protected Designation of Origin), PGI (Protected Geographical Indication) and STG (Traditional Specialties Guaranteed). In the case of olive oil there are only representatives of the first two groups, the difference between the two relies in the amount of limitations in terms of area, production and processing methods needed to be aligned with other products carrying the same indication.

The premise for the institution of these geographical indications is that the final quality of the product is linked to the area and the production methods that, in turn, are linked to the concept

of *terroir*. The word *terroir* is borrowed from French wine dictionary and it is used to define a strict link between characteristics of the land and the area of production and the product characteristics; it can be broadly understood as a halo of authenticity of products originated in rural areas and this comprehends physical and cultural characteristics, too (Barham 2003). The objective of these indications is to disclose to consumers information about typicality (Bertozzi 1995).

The goal of geographical certifications is to compensate information asymmetry providing the consumer with a bundle of quality characteristics linked to the territory of origin (Menapace and others 2011). As a consequence, the expectations for quality from the consumer's side are higher (Fandos and Flavián 2006) and so it is the willingness to pay for the product (Fotopoulos and Krystallis 2003). In fact, the consumer is not always able to assess objectively the quality level of products he is buying, especially for experience and credence attributes (Caswell and Mojduszka 1996), so he relies on cues available in the environment as the information on the label (Underwood and others 2001). The weight of expectations in liking scores can be proved by the fact that origin information seems to be effective in shaping consumers' preferences independently from sensory characteristics (Lange and others 2002; Stefani and others 2006). Indeed, these elements do have a premium price, included indications regarding origin (Costanigro and others 2010). The reason why is found in the effect that these certifications have in create a collective name for some products that are produced by different small firms from rural areas that otherwise could not compete with well-known brands (Costanigro and others 2010), besides they also allow to build a collective reputation that is what drives the consumer to expect more quality compared to other non-certified products (Tirole 1996; Landon and Smith 1997).

Another feature of the role of PDOs and PGIs regards the support to rural areas. The collective reputation enhances competitiveness of small firms and the above-mentioned premium price allows to increase their revenues. Furthermore, regional products can contribute to build a strong supply chain that involves other actors in the same territory and this can magnify the effects at a local level (Tregear and others 2007).

Why do we consider price premia to evaluate the importance of attributes? They can be interpreted as consumers' willingness to pay for a good reputation, minus the search cost, so they represent a measure of reputation of that collective name (Costanigro 2007; Costanigro and others 2010). They also represent the incentive for producers to invest in quality, incurring in higher production costs (Klein and Leffler 1981). A measure for reputation of PDOs can be

particularly valuable in a scenario where there is a proliferation of indications and the consumer is not always able to understand the differentiation between different certified products (Annunziata and Vecchio 2011; Fandos Herrera and Flavián Blanco 2011). So the value of premium price allows to discriminate the well-established PDO productions from the ones that appear to be redundant according to the judgement of consumers.

4.4 Model Specification and estimation

The hedonic pricing method is based on the assumption that each product can be seen as a bundle of attributes; consumers attach utility to each attribute so that the total utility derived from a good can be seen as a total sum of the single attribute utilities (Lancaster 1966), furthermore, the demand for a good is influenced by its characteristics (Ladd and Martin 1976). Since consumers show a demand for attributes, there is also an offer made by producers: this implies a market for each good attribute, at the market clearing conditions there is the implicit price that is a part of the final price of the whole good (Rosen 1974). This method is what allows to estimate these implicit prices (Rosen 1974; Ladd and Martin 1976; Ladd and Suvannunt 1976; Wilson 1984). In other words, the hedonic price equation is determined by the intersection of demand curves of different consumers with heterogeneous preferences and the supply of different firms with different technology (Palmquist 1989; Feenstra 1995; Huang and Lin 2007). The price of product *j* in market *m* at time *t*, P_{jmt}, can be described by:

(1) $$P_{jmt} = f(X_{jmt})$$

Where X is the vector of product attributes. Price is function of marginal monetary values of the attributes (Ladd and Suvannunt 1976) whose marginal value can be obtained differentiating price with respect to each attribute.

In our case, X is partitioned into vectors: $X^{PA}, X^{PR}, X^{SE}, X^{OR}$.

X^{PA} represents a vector of package characteristics capturing characteristics of the bottle indexed by b ($b=1,...,H$), indicating the different sizes, packaging materials and color of the bottle; X^{PR}, indexed by a ($a=1,...,A$), is a vector that captures the production attributes of the oil, such as:

organic production, cold squeeze, etc.. X^{SE} indicates sensory properties, indexed by s ($s=1,...,S$). The vector X^{OR} includes origin characteristics, indexed by l ($l=1,\dots,L$), such as PDO productions sold in the whole country or in their origin region. Since the aim of our study is to test the performance of price premia of different regional certified products, we will consider separately the prices of PDO products depending upon if the product is sold outside the origin area or within the same region. The parameters of equation (1) will be estimated through a single equation approach (Rosen 1974; Costanigro 2007; Panzone 2011; Carlucci and others 2014).

To choose the proper functional form for the dependent variable we used the Box-Cox transformation, whose output is shown in Table 4.1 (Loureiro and McCluskey 2000; Huang and Lin 2007; Szathvary and Trestini 2014) to compare different functional forms: linear (= 1; where the relationship between the dependent variable and an independent variable is graphically represented by a straight line.), log-linear (= 0; the logarithm of the function is a linear combination of parameters), and inverse (= -1; the relationship between dependent and independent variable is as in linear combination but with an inverted slope).

Table 4.1 – Box Cox transformation for both models

Test		**Restricted**	**LR statistic**	**P-value**
H0:		**log likelihood**	**chi2**	**Prob > chi2**
theta =	*-1*	-210833.87	93963.94	0
theta =	*0*	-164073.69	443.58	0
theta =	*1*	-211842.63	95981.47	0
Test		**Restricted**	**LR statistic**	**P-value**
H0:		**log likelihood**	**chi2**	**Prob > chi2**
theta =	*-1*	-212713.92	92867.84	0
theta =	*0*	-166617.13	674.25	0
theta =	*1*	-212207.55	91855.09	0

The "best" model specifications were selected using a combination of different metrics adapting what already done by other authors (Bimbo and others 2016): 1) goodness of fit, assessed by means of both an *F* statistic for a test of the joint significance of the parameters in the model, and the adjusted R^2; 2) heteroskedasticity, using the Breusch-Pagan test (Breusch and Pagan 1979); and 3) normality of the residuals, using tests for Skewness and Kurtosis of the error terms (D'agostino and others 1990).

The functional form of the model which appear to be fit best the data was the log-linear one, so the estimated equation takes the form :

$$\ln(P) = \beta_0 + \Sigma \beta_i z_i + \varepsilon \quad (2)$$

where: $\ln(P)$ is the natural logarithm of price; β_i represents the coefficient of the variable z that represents the characteristics of the products, they are in a sum as we assumed that the price for the entire good is made by the sum of the implicit prices of each attribute of the good; ε and is the random error.

The different model specifications are estimated via WLS (Weighted Least Squares), where the weights are represented by the sales volume. Usually the hedonic regression gives the same importance to each observation present in the database (Ioannidis and Silver 1999), while the importance given to an observation should be modulated according to its market share (Gordon 2007). In this way it has been possible for us to integrate the information given by the prices of the products with the information about the sales actually occurred on the market. The difference between WLS and OLS (Ordinary Least Squares) that are traditionally used for the hedonic regression, is that, in WLS, each observation is replicated by the number of times indicated by the weight, so it is actually treated as a transaction (Silver 1999). Furthermore, in this case, estimation made through WLS had significant differences in terms of quality of estimation assessed trough heteroskedasticity of the error term.

4.4.1 Data

The data used in our study are Information Resources Inc. (IRI) InfoScan retail sales data. They record the extra-virgin olive oil products sold all across the country through hypermarkets, supermarkets and superettes. Each product is identified univocally by a EAN code, for each and every product there are weekly values of sales in unit, sales in volume and promotion information. These data were purchased for the Italian area, for extra virgin olive oil products. This type of data allows to have precise information about the characteristics of the products and

the volumes sold through the main distribution channels. Several analyses have used scanner data to assess the effect of other types of labels: evaluation of demand for cage free, organic and conventional eggs (Lusk 2010), evaluation of premium price of fresh tomatoes (Huang and Lin 2007) and of ecolabelled products (Roheim and others 2011).

The Infoscan database provides volume and value sales by EAN for over 2000 extra virgin olive oils aggregated across all the retailers in the database in Italy, on a weekly basis for 104 weeks, from November 2012 to November 2014 and they cover 17 IRI regions[4]. Unit prices for each product are averages derived from total sales and volumes. Each product is described through its main attributes. The Infoscan data-base does not specifically identify single private labels products with a unique EAN code, so the values are aggregated across all the different private labels brands.

The database that we used has been reduced (eliminating null values) to 814 extra-virgin olive oil products by 225 producers, 689 brands of which 10 big brands (the ones that own the biggest market shares), then private labels and other producers, for a total of 121,399 observations. The region of production mostly represented is Apulia, followed by Tuscany, Umbria, Sicily and Liguria. There are in total 418 "100% Italian" products, 87 "certified organic products" and 153 "certified PDOs and PGIs" products. Out of a total of 42 PDOs and one PGI for the whole Italian territory, in our database we can identify 23 PDOs and one PGI. The most represented are the "Toscana" PGI, followed by "Terra di Bari" PDO and "Garda" PDO. The region with most PDO products is Tuscany, followed by Apulia and Lombardia. Packaging size varied between 0.25*l* and 5*l*. As the database contained products with unreasonable prices, we eliminate outliers by removing from the analysis all products with prices larger than 50€/*l*, or a total of 3352 observations (about 2.8% of the sample), for a final sample size of a total of 118047 observations. Summary statistics of the attributes considered to build variables are reported in Table 4.2.

[4] The 17 IRI Regions are: Piedmont - Aosta Valley, Lombardia, Liguria, Trentino Alto Adige, Friuli Venezia Giulia, Veneto, Emilia Romagna, Tuscany, Lazio, Umbria, Sardinia, Marche, Apulia, Campania, Sicily, Abruzzo - Molise, Basilicata - Calabria

Table 4.2 – Descriptive statistics of variables included in the model

Variable	Mean	Std. Dev.	Min	Max
Price_liter	5.698	5.744	0.29	50
Dark_bottle	509	500	0	1
Size_025	33	179	0	1
Size_050	114	318	0	1
Size_100	415	493	0	1
Size_150	1	38	0	1
Size_200	5	70	0	1
Size_300	24	154	0	1
Size_500	0	15	0	1
Italian	469	499	0	1
Organic	108	311	0	1
Cold_processing	185	388	0	1
Nofiltered	103	304	0	1
Monocultivar	50	217	0	1
Fruity_taste	365	481	0	1
Sweet_taste	127	342	0	2
Intense_taste	255	436	0	1
Bottling_North	109	312	0	1
Bottling_Center	468	499	0	1
PDO	199	400	0	1
PDO_reg	16	127	0	1
PDO_AbruMol	4	66	0	1
PDO_BasCal	4	65	0	1
PDO_Campania	3	59	0	1
PDO_EmiliaR	2	41	0	1
PDO_FriuliVG	0	0	0	0
PDO_Lazio	5	72	0	1
PDO_Liguria	12	108	0	1
PDO_Lombardia	4	62	0	1

PDO_Marche	0	21	0	1
PDO_PiemonteVDA	0	0	0	0
PDO_Puglia	27	163	0	1
PDO_Sardegna	8	90	0	1
PDO_Sicilia	16	127	0	1
PDO_Toscana	30	172	0	1
PDO_Trentino	0	19	0	1
PDO_Umbria	22	147	0	1
PDO_Veneto	11	104	0	1
PDO_AbruMol_reg	0	20	0	1
PDO_BasCal_reg	0	10	0	1
PDO_Campania_reg	0	15	0	1
PDO_EmiliaR_reg	0	15	0	1
PDO_FriuliVG_reg	0	0	0	0
PDO_Lazio_reg	1	33	0	1
PDO_Liguria_reg	2	41	0	1
PDO_Lombardia_reg	2	41	0	1
PDO_Marche_reg	0	15	0	1
PDO_Piemonte VA_reg	0	0	0	0
PDO_Puglia_reg	2	45	0	1
PDO_Sardegna_reg	1	35	0	1
PDO_Sicilia_reg	1	32	0	1
PDO_Toscana_reg	3	58	0	1
PDO_Trentino_reg	0	15	0	1
PDO_Umbria_reg	1	37	0	1
PDO_Veneto_reg	2	41	0	1

4.4.2 Variables and estimation

The variables identified in our model have been built according to the attributes of products. They have been selected according to what indicated, for each product: in the IRI Infoscan

Database, on the label, and by the regulations that norm the PDO and PGI productions. These attributes are: 100% Italian product, organic, attributes regarding material and color of packaging, the PDO, sensory characteristics, acidity level and other processing attributes, such as cold processing. The goods under investigation are firstly described through *n* attributes, that are the characteristics that describe the products and that the consumer is aware of. According to attributes we built the independent variables.

The variables identified in our model, according to the attributes of the products are, divided in meaning categories:

- Packaging Variables:

- *Dark_bottle*: This variable identifies all the products that have a glass bottle that is not transparent, so there are dark glass bottles and wrapped bottles;
- *Size025*: 0.25 *l* packaging;
- *Size050*: 0.5 *l* packaging;
- *Size100*: 1 *l* packaging;
- *Size150*: 1.5 *l* packaging;
- *Size200*: 2 *l* packaging;
- *Size300*: 3 *l* packaging;
- *Size500*: 5 *l* packaging;
- *Bottling_North*: Products bottled in Northern Italy;
- *Bottling_Center*: Products bottled in Central Italy;

- Production characteristics:

- *Italian*: Products labelled as "100% Italian";
- *Organic*: Products labelled as organically produced;
- *Cold_processing*: Products obtained through cold processing of olives;
- *Nofiltered*: Products that have not been filtered, with a "veiled" aspect;
- *Monocultivar*: Products obtained with a single variety of olives;

- Sensory characteristics:

- *Fruity_taste*: Products that have been labelled with an indication of "Fruity" taste;
- *Sweet _taste*: Products that have been labelled with an indication of "Sweet" taste;
- *Intense_taste*: Products that have been labelled with an indication of "intense" or "bitter" taste;

- Origin characteristics:

- *PDO*: Products that have either a PDO or a PGI certification

- *PDOreg*: Products that have either a PDO or a PGI certification and are sold in their origin region
- *PDO_(reg):* Products from the region *(reg)* sold in the whole country
- *PDO_(reg)_reg:* Products from the region *(reg)* sold in the single origin region.

Two different model specifications are estimated. In the first "national" model we estimated a hedonic price model using WLS and considering, as origin characteristics two variables, *PDO* and *PDO reg*. The first variable allows to have the implicit price of PDO characteristic for all the products in the database at an aggregated level; the second one allows to have the implicit price of the PDO characteristic only for PDO and PGI products that are sold in the same region of origin. In the second "regional" model, we considered PDO and PGI products for each and every region, so we have a set of variables that identify the products of each region *PDO_(reg)* and in the first, we allow the marginal price of the PDO attribute to change if the product is sold outside the origin region (identified by means of the coefficients of the variables *pdod* and *pdoregok*). In the second specification we allow these effects to vary by regions, interacting the two PDO indicator variables with the IRI-region specific dummy variables. We excluded from our evaluations products from Piedmont, Aosta Valley and Friuli Venezia Giulia as there is no PDO product from these regions in our database. The PDO markups for PDO attributes sold in their origin regions are obtained by means of linear combination of parameters. Kennedy's formula (1981) was used to recover correct estimated marginal effects for the indicator variables as:

$$(3) \quad g* = exp\left(\widehat{c} - \tfrac{1}{2}\widehat{V}\left(\widehat{c}\right)\right) - 1$$

Equation (3) allows to compute the percentage premium price relative to the attribute, in case of logarithmic relations it is not possible to interpret straightforward the meaning of the coefficients, but we need it to have an unbiased estimator of the percentage change of the dependent variable. This is possible as we have dummy variables, otherwise, for continuous variables we should have calculated elasticities at the means.

4.5 Results

According to the Box-Cox transformation results (Table 4.1), the functional form chosen for the dependent variable was the log-linear one. Results from the Hedonic Price models are shown in Tables 4.3 and 4.4. The baseline product has 0.75*l* transparent glass packaging (the most popular packaging in our database), the label indicates no production attribute (such as: organic, cold processing, etc.) and no sensory attribute (such as fruity, sweet or intense), it is not a PDO product and it is bottled in Southern Italy, for a price of 4.2 €/*l*.

Table 4.3 - Model 1: Aggregated values for PDO and PGI products

Variable		Coefficient	Std. Err.	Significance	% price premium
Packaging Variables					
Dark_bottle		11	3	**	1.1
Size025		364	8	***	44.0
Size050		184	4	***	20.2
Size100		-153	3	***	-14.2
Size150		15	34		1.5
Size200		-210	16	***	-18.9
Size300		-309	8	***	-26.6
Size500		-331	80	***	-28.4
Bottling_North		297	17	***	34.6
Bottling_Center		95	11	***	10.0
Production characteristics					
Italian		159	3	***	17.3
Organic		249	5	***	28.3
Cold_Processing		8	4	**	0.8
Nofiltered		157	5	***	17.0

Monocultivar	13	7	*	1.3
Sensory characteristics				
Fruity_taste	125	3	***	13.3
Sweet_taste	107	4	***	11.3
Intense_taste	-23	4	***	-2.2
Origin characteristics				
PDO	475	4	***	60.7
PDOreg	8	9		0.8
constant	1.453	20	***	
Total PDO reg	482	9	***	61.9

*Note: *, ** and *** are, respectively 10, 5 and 1% significance levels*

Estimated coefficients or regional and, producer fixed-effects, and monthly dummies omitted for brevity

Table 4.4 – Empirical results: Model 2: Disaggregated values for each and every region

Variable	Coefficient	Std. Err.	Significance	%premium
Packaging Variables				
Dark_bottle	12	3	***	1.2
Size025	341	9	***	40.6
Size0500	194	5	***	21.4
Size100	-181	3	***	-16.6
Size150	-273	35	***	-23.9
Size200	-245	16	***	-21.8
Size300	-337	8	***	-28.6

Size500	-384	81	***	-32.1
Bottling_North	275	18	***	31.6
Bottling_Center	102	11	***	10.7
Production characteristics				
Italian	156	3	***	16.9
Organic	222	5	***	24.9
Cold_processing	8	4	*	0.8
Nofiltered	150	5	***	16.2
Monocultivar	173	9	***	18.8
Sensory characteristics				
Fruity_taste	124	4	***	13.2
sweet _taste	92	5	***	9.6
Intense_taste	-42	4	***	-4.1
Origin characteristics				
PDO_AbruMol	161	24	***	17.4
PDO_BasCal	387	36	***	47.2
PDO_Campania	147	35	***	15.7
PDO_EmiliaR	537	39	***	70.9
PDO_FriuliVG	0	(omitted)		
PDO_Lazio	142	70	**	14.9
PDO_Liguria	153	15	***	16.5
PDO_Lombardia	700	27	***	101.4
PDO_Marche	0	(omitted)		
PDO_PiemonteVDA	0	(omitted)		
PDO_Puglia	363	9	***	43.7
PDO_Sardegna	299	16	***	34.8
PDO_Sicilia	259	15	***	29.6
PDO_Toscana	490	9	***	63.2
PDO_Trentino	829	85	***	128.2
PDO_Umbria	563	9	***	75.6
PDO_Veneto	542	13	***	71.8

PDO_AbruMol_reg	88	56		9.1
PDO_BasCal_reg	24	105		1.9
PDO_Campania_reg	159	74	**	16.9
PDO_EmiliaR_reg	-16	76		-1.9
PDO_FriuliVG_reg	0	(omitted)		
PDO_Lazio_reg	54	46		5.4
PDO_Liguria_reg	52	29	*	5.3
PDO_Lombardia_reg	17	34		1.7
PDO_Marche_reg	57	100		5.3
PDO_PiemonteVDA_reg	0	(omitted)		
PDO_Puglia_reg	-133	26	***	-12.5
PDO_Sardegna_reg	40	34		4.0
PDO_Sicilia_reg	117	35	***	12.3
PDO_Toscana_reg	-40	21	*	-3.9
PDO_Trentino_reg	-61	110		-6.5
PDO_Umbria_reg	0	30		0.0
PDO_Veneto_reg	22	28		2.2
constant	1.431	21	***	

*Note: *, ** and *** are, respectively 10, 5 and 1% significance levels*

Estimated coefficients or regional and, producer fixed-effects, and monthly dummies omitted for brevity

The key goal of this analysis was, at a first stage, to assess the relative importance of attributes characterizing love oil, then decomposing the value of PDOs according to region of production and sale area. In detail, we compared local sales (within the origin region) with national sales of the same PDO and PGI products.

We first started considering origin attribute in a broad sense, we used, among all the information available on the label, the bottling place as a proxy for origin (Table 4.4). The bottling place with the highest premium price compared to the baseline product (bottled in Southern Italy) is Northern Italy (+31.6%), then there is Central Italy (10.7%). This seems to suggest that this origin cue has an effect in communicating origin to consumers as shown by the premium price. Although European law is quite clear about the rules for indicate the origin of the olives and of

the oil (Regulation UE n.1151/2002), the place of bottling can still confuse the consumer and distort the quality perception of the product (Cicia and others 2005).

The results of packaging size variables show that the smaller the package, the higher the price per liter. 0.25*l* (*size 025*) is responsible for a premium price of + 40.6% compared to the baseline product. For bigger size packaging the premium price reduces progressively: +21.4% for 0.5*l*; -16.6% for 1*l*; -23.9% for 1.5*l*; -21.8% for 2*l*; -28.6% for 3*l* and -32.1% for 5*l* (see Table 4.3). Peculiar is the case of 1.5l and 2l packages: only in this case the smaller one (1.5*l*) seems to be cheaper compared to the bigger one (2*l*). Considering other elements of the packaging, the dark glass bottle is valued slightly more than other types of package with a premium price of +1.2% compared to the baseline product. This category comprises dark glass bottles and wrapped bottles. This type of packaging contributes to a better storage of the oil and of the substances that make a product healthy (Rastrelli and others 2002), but due to the very small premium price, we can conclude that the importance of a packaging that shields the oil from light is not appreciated enough by consumers.

The organic attribute accounts for a +25% premium compared to the baseline product. As organic attribute can embody a series of trust attributes the existence of a premium price is in line with expectations (Maguire and others 2004; Krystallis and others 2006). The second, most important production attribute, is "single-cultivar" which results in a premium price of +18.8% compared to the baseline product. This attribute is related to the production of oil with only one variety of olives, this entails that the olives used for production are exclusively from Italy and from a limited area, too. Since they are not made out of blends, they reflect completely the physical and chemical characteristics of the variety of olives used, this is valid also for sensory features, so they tend to have a more distinct flavor. Italian origin of the olives accounts for +16.9% of the premium price which is expected as olives origin is very important in the perception of consumers, as this attribute is seen as a proxy for quality (Ranalli and others 1999; Caporale and others 2006).

Another important element in the price formation is "non-filtered" attribute, that has a +16.2% premium attached. This characteristic entails that olive oil is not filtered and the aspect is "veiled", this implies a lower level of acidity and a slower degradation of healthy substances (Lozano-Sanchez and others 2010), that, on the other hand, are less stable (Tsimidou and others 2005). Cold extraction has the smallest markup (+0.8%), which is surprising as this extraction method leads to health properties and better product taste (Morales and Aparicio 1999; Gimeno and others 2002; Tripoli and others 2005).

Among sensory information on the label, fruity has +13.2% of premium price, sweet +9.6%, while intense flavor shows a markdown (-4.1%) compared to the baseline product. These results are in line with consumers' preferences, which show negative preferences toward bitter and pungent notes of olive oil taste, while fruity and sweet products seem to be more "popular" (Delgado and Guinard 2011; Recchia and others 2012; Cicia and others 2016).

The aggregated premium price for PDO attribute is +60.7% compared to the baseline product (Table 4.3). This suggests that the PDO and PGI certifications, as a whole, have an effectiveness, as it is confirmed by the markup that they actually receive on the market. We tested what is the implicit price of PDO and PGI products when they are sold in the same region of origin, in this case the coefficient is not significant, this means that we have no national trend corresponding to these products. We have more information when comparing the scores of the single regions.

So we computed the implicit price for PDOs from each region: this value has subsequently been decomposed for each regional PDO, either sold in its origin region, either nationally (Table 4.4). In this way it is possible to have a national score corresponding to each regional certification and to compare it with the one related to sales within the origin region. The difference between these two scores indicates, for each region, where the product has the most relevant reputation: if only locally or at a national level. This allows to suppose that sales with higher price premia entail higher revenues for producers.

At first we considered the price performance of the regional PDO products as sold in the whole country (Table 4.4 and Table 4.5). The regional PDO products that have highest values in the whole country are the ones from: Trentino Alto Adige (+128.2%), followed by: Lombardia (+101.4%), Umbria (+75.6%), Veneto (+71.8%) Emilia Romagna (+70.9%), Tuscany (+63.2%), Basilicata – Calabria (+47.2%), Apulia (+43.7%); Sardinia (+34.8%), Sicily (+29.6%), Liguria (+16.5%), Campania (+15.7%) and Lazio (+14.9%). The higher the values, the higher the price premium on a national basis.

Table 4.5 – Estimated of PDO Premiums Within and Outside the production region

Region		*Coefficient*	*Std. Err.*	Sign	% premium within region	Δ premium region – country
Abruzzo-Molise	249	55	***	28.1	10.7	
Basilicata - Calabria	412	111	***	50.0	2.8	
Campania	306	82	***	35.3	19.5	
Emilia Romagna	520	76	***	67.8	-3.1	
Friuli Venezia Giulia		Omitted				
Lazio	195	77	**		-14.9	
Liguria	205	30	***	22.7	6.2	
Lombardia	717	29	***	104.8	3.4	
Marche	57	100				
Piemonte - Valle D'Aosta		Omitted				
Puglia	229	26	***	25.7	-17.9	
Sardegna	339	33	***	40.2	5.4	
Sicilia	376	35	***	45.6	16.0	
Toscana	450	21	***	56.9	-6.4	
Trentino Alto Adige	768	72	***	115.0	-13.2	
Umbria	563	29	***	75.5	0.0	
Veneto	563	27	***	75.6	3.7	

*Note: *, ** and *** are, respectively 10, 5 and 1% significancy levels*

Then we considered the price markup of regional PDOs only in their region of origin (Table 4). The regions where PDOs achieve the highest premium price locally are Campania (+16.9%) and Sicily (12.3%). While there are significant markdowns for PDOs sold locally for Apulia (-12.5%).

Then, we compared the two price premia in pairs to evaluate a reputation performance, computing the difference (Local Premium Price - National Premium Price) (Table 4.5). Results fall into three main categories:

1) The first case comprehends PDOs that receive a premium price that is much higher locally compared to a broader level. Regional products that have these kind of results are from: Campania (+ 19.5%), Sicily (+16%), Abruzzo-Molise (+10.7%), Liguria (+6.2%) Sardinia (+5.4%), Veneto (+3.7%) and Lombardia (+3.4%).
2) In some regions this difference is negligible: Basilicata – Calabria (+2.8%), Umbria (0) and Emilia Romagna (-3.1%).
3) Regional products with a premium price higher in the whole country compared to the local one are from: Apulia (-17.9 %), Trentino Alto Adige (-13.2%) and Tuscany (-6.4 %).

4.6 Conclusions

The study has been set up in order to assess how different quality attributes affect the price of extra-virgin olive oils in Italy, and to test for the reputation of different geographic quality denominations (PDO and PGI) decomposed by origin area and sale area.
Analyzing the price performance of the different quality dimensions of olive oil, the results of the model related to aggregate values for the whole country (Table 4.3) suggest a first reason for a price premium linked to the size of packaging (Martínez and others 2002). Concerning the place of bottling, it is prized as a proxy for origin, in line with prior literature (Del Giudice and others 2015). "100% Italian" and Organic attributes, they have a price premium too, respectively 17.3% and 28.3%, the same is for No Filtered (+17%). Cold Processing and Single Cultivar, two production characteristics particularly linked to the flavor of the product, give no important markup, so no importance is shown on the consumer's side. Then, sensory characteristics have a positive premium price, except for intense taste that has a negative effect on the final price; this confirms the discrepancy between the sensory profile characteristics that characterize healthier products with what consumers prefer (Cicia and others 2016).
Considering PDO and PGI products, price premia can give a score for reputation in a scenario where too many certified products are present and they can actually confuse the consumer (Annunziata and Vecchio 2011), furthermore, we have to take into account that selling outside the origin region entails a larger market, but also increases costs (Klein and Leffler 1981), that should be covered by premium prices, otherwise, the market expansion may be not be convenient. So, the results of this study can be interpreted to have an evaluation on how effective are quality schemes in determining price premium of products.

At an absolute level, results from the first model allows for a reputation comparison among the different Italian regional PDOs (Table 4.5). The highest markups are achieved by: Trentino Alto Adige, Lombardia, Umbria and Veneto. Since Trentino Alto Adige, Lombardia and Veneto share a common PDO (DOP Garda), we can suppose that this is the most appreciated by Italian consumers, and that this is the product with the highest reputation within the Italian production scenario.

Then, going deeply in the analysis of regional certified products, with the analysis of the difference between the two price premia, we have indications on the most convenient markets, ceteris paribus, for each regional product according to the premium price of the single PDO. The results are not homogeneous for all the regions of Italy, and this confirms previous results (Carbone and others 2014). Within the first category of results there are products that have an higher local score; these are products that do perform well only locally, where their reputation can be considered as valuable. Ceteris paribus, the premium price does not justify sales of these products at a national level, as most revenues are expected locally. In the second category, there are regional products that have a stable premium price even if changing the geographical level. In this case the results do not allow for practical suggestions. The regions in the third category are the ones that have the most known PDOs at a national level. Their reputation is valuable as proved by the price premia achieved. In this case we can expect significant revenues achieved by national sales more than local sales, this allows to compensate higher transportation and distribution costs.

Comparing the two model results, we can conclude that the highest price premia at an absolute level, identified for Trentino Alto Adige, Lombardia, Umbria and Veneto are not homogenous on a national basis. In fact, the price premia of products from Trentino Alto Adige are present at a national level and not in the region itself. So, the important reputation is achieved at a level that is not local, but national. Price premia of products from Lombardia and Veneto are sustained mostly by local sales, so their reputation in not broadly recognized. Peculiar is the case of Umbria, that has only one PDO product (DOP Umbria) its products receive an important premium price that is homogenous throughout the country and so does the reputation.

Concluding our findings are consistent with other literature (Carbone and others 2014) as we find that that PDO and PGI products can have very different performance on the market, depending upon the local market where they are sold. The products that appear to be highly priced and that match the goals that European quality schemes aim to achieve, are only a small fraction of the total set of PDO and PGI products. This insight can be useful for policymakers

interested in developing the market opportunities for PDO products. If a territorial product is well known outside its origin area, it may be worth it to promote it on a larger scale compared to others that seem to generate significant revenues only in a limited geographical region. This would also be useful for producers to tailor their offerings of products according to the local preference of consumers. Furthermore, the positive results associated only to a small number of PDO and PGI products seems to suggest to policymakers that the effectiveness of quality schemes is achieved only for few products, so extending the PDO and PGI certification to products that are not widely known at a national level has no result on sustaining farmers and local economies.

5. Visual elements of packaging shaping evaluations of consumers: the case of olive oil

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5.1 Abstract

Visual elements of food products can play an important role in determining food choice. Symbols and logos have the role of conveying information to consumers, but they can be interpreted in different ways. We investigated how visual elements of the packaging can influence healthiness perception towards two products, olive oil and butter combined with olive oil. An online questionnaire was completed by a sample of Dutch and Italian consumers in order to have cross-national results. The elements that have been tested are: the colour of the glass bottle/plastic container, sensory quality claims, and logos about organic production, country of origin (COO), and cold processing. Consumers' healthiness perception towards packaging alternatives with combinations of these elements were related to consumer traits such as: nutritional knowledge, openness to new technologies, sustainability behaviour and familiarity with the product. Healthiness perception was enhanced by elements on the label such as: organic production, COO and cold processing; while it is lowered by sensory indications of pungent properties. The colour of packaging was differently interpreted depending to the nationality of respondents.

Practical Applications Most of the packaging elements were perceived similarly by the Dutch and Italian consumers, this suggests that there is no need to create different labels for products sold in different countries. The exception relies in the indication to use dark packages for products sold in Italy and transparent for products sold in the Netherlands. Pungent features,

even if tied with superior healthy properties, are just for niche products. The product's label and packaging can be used to better communicate the healthiness of the products, so indicating the origin, organic production and process information can be useful for companies, regardless of the country in which they operate. A positive trend of preference toward olive oil in emerging consuming countries, as The Netherlands, is expected, as the use of this product is spreading within the population as healthy concerns about diet is becoming increasingly important.

Keywords: healthiness perception, olive oil, contingent ranking, food packaging, sensory properties of olive oil

5.2 Introduction

Since consumers tend to make heuristic decisions, especially in the case of frequent and not so expensive products, environmental stimuli have much importance in determining food choices (Hoyer 1984; Janiszewski 1998). Among those, packaging plays a central role providing most of the cues the consumers uses for their decisions (Chrea and others 2011; Piqueras-Fiszman and others 2011; Ares and others 2013), besides its primary role of protecting food from outside influences or damages.

In the Western society, food consumption has evolved to a model in which fats, especially saturated ones, are increasingly available, this has led to a situation in which some diseases linked to unhealthy diets are spreading and, thus, the health concern of consumers is increasing (Kearney 2010). The importance of the type of fats that characterizes the diet is very important for a healthiness point of view, and it greatly varies across different countries within Europe. For instance, in Northern Europe the main source of fats is represented by dairy products (Menotti and others 1999) that are high in saturated fats (German and others 2009), while in Southern Europe olive oil is mostly used (International Olive Oil Council 2015), widely recognized for its healthiness features (Owen and others 2000). The use of these products can have an important impact on the healthiness of the diet. In fact, the Mediterranean diet, that is based on the use of olive oil, is considered to be the healthiest in the world (Trichopoulou and others 2014). In Northern Europe, fat intake tradition is different as it is based mostly on dairy products, and this is particularly valid in the case of the Netherlands (Goldbohm and others 2011). It is for this reason that, as a case study in the current work, two types of olive oil products, olive oil and butter combined with olive oil, were chosen as product stimuli.

Packaging can be important to underline healthy features of products: symbols and colours can be used in a way that allows the consumer to quickly identify what are the healthier products for their diet. Despite the vast amount of research investigating how nutritional information and logos can influence healthier choices of consumers (Scott and Worsley 1994; Grunert and Wills 2007; Feunekes and others 2008; Van Herpen and Van Trijp 2011), there is a gap in the existent literature on what consumers interpret from the packaging as a whole, that is, not just nutritional labels and logos, when making a healthy choice.

Several packaging elements have been shown to have an effect on healthiness perception, according to the existent literature about decision making (Petty and Cacioppo 1986; Steenkamp 1990; Schifferstein and others 1999; Grunert 2002; Burke and Leykin 2014), effect of packaging on food choices (Cardello 2003; Ares and others 2013; Kumar and Kim 2014; Piqueras-Fiszman and Spence 2015), olive oil (Nielsen and others 1998; Chan-Halbrendt and others 2010; Delgado and Guinard 2011; Recchia and others 2012; Mtimet and others 2013; Del Giudice and others 2015) and health perception due to labels (Borgmeier and Westenhoefer 2009; Piqueras-Fiszman and Spence 2015). The present study considered some of the most relevant ones for olive oil products: colour of the container, organic production, country of origin, and process information.

Labels and visual elements have an important role in shaping consumers' preferences. Due to the risk of information overload, symbols should provide immediate and discrete information (Crilly and others 2004). They also represent the immediate factors that the consumer uses to form beliefs about a product and to categorize it (Bloch 1995; Piqueras-Fiszman and others 2011), this effect is particularly strong on healthiness perception: this influence exists even when no direct reference is made to health or nutrition (Carrillo and others 2014). Furthermore, visual elements have a role in the saliency of the elements to the consumer while he is making a choice, in most cases, this is a heuristic process, which relies only on salient information and cues. Visual elements can also play a role in the actual experience with the product: their firstly affect associations and expectations (Ares and others 2013) that, in turn, affect the satisfaction judgement, but they can also affect the actual taste perception of the product (Wansink and Park 2002).

Within the purchase context, colours are used to trigger attention from the individual. Therefore, contrasting colours are often used on package of products in order to enhance saliency (Pettigrew and Pescud 2013), which is particularly important in low involvement decisions or with time pressure (Petty and Cacioppo 1986). Colours on the package, however, also have other roles as they are used to convey some information about the features of products. For example

brown and green are often used for organic products, as they are linked to naturalness. Besides, green is also the best colour to convey healthiness especially for people that consider healthy eating as very important (Schuldt 2013). Absence of colours is important, too. In fact, transparency of packaging is important especially for food and it is supposed to be appreciated as it allows to see better the product that is going to be bought (Ragaert and others 2004; Peters-Texeira and Badrie 2005; Eldesouky and others 2015).

Considering credence attributes of food products, organic production is a special case as it is a concept embracing multiple credence attributes, such as: protection of the environment, superior healthy features (Sandalidou and others 2002), food safety and ethic values (Fernqvist and Ekelund 2014). This attribute is a marketing tool to differentiate products due to a conspicuous segment that values organic production (Hoogland and others 2007), but does not entail differences in the taste experience, compared to conventional products (Woese and others 1997; Piqueras-Fiszman and Spence 2015). The effect of organic labelling leads to positive liking scores (Caporale and Monteleone 2004) that sometimes can be higher compared to other types of claims (Kihlberg and others 2005). To help the decision making of people, aspects of organic and sustainable production are conveyed to customers through the use of symbols and logos of certifying bodies (Hoogland and others 2007).

In addition, how foods are produced and processed is very important for the intrinsic final quality of the product, but this is an aspect that can be differently valued by consumers. The concern for production methods is raising due to globalization and innovative methods of production (Piqueras-Fiszman and Spence 2015). Processing techniques linked to sustainability are given increasing importance nowadays, but it is strictly referred to personal values and beliefs of people (Gil and others 2000) and expectations play a big role in influencing the final evaluation of the product (Cardello 2003). When the consumer is not so knowledgeable about the production, the name or the description can directly affect consumers' expectations (Tuorila and others 1994; Fernqvist and Ekelund 2014; Piqueras-Fiszman and Spence 2015), more than the process itself.

Finally, country of origin (COO) is an important element linked to the traceability of the product (Caporale and Monteleone 2001; Loureiro and Umberger 2007). For example, in Caporale et al. (2006) it is shown how the information on the origin of products can affect sensory expectations in familiar consumers, leading to a concept of "typicality". One reason of the importance of the COO labelling can be referred to the halo effect (Ahmed and others 2002) or summary effect (Han, 1989). Furthermore, the effect of COO is supposed to be higher when consumers are

highly involved with the product (Engelbrecht and others 2014). Sometimes consumers rely on COO labelling for ethnocentrism (Van der Lans and others 2001) and also because buying products from another country may seem immoral (Shimp and Sharma 1987) or unpatriotic (Ahmed and others 2002).

From the consumer's side, the first element to be considered is the familiarity with the product, as it can lead to different perception of uncertainty. The expectations of unfamiliar consumers will be more likely to show an assimilation effect of expectations (Deliza and MacFie 1996). While the risk perception is lowered in the case of familiar products (Verneau and others 2014). Consumers are more willing to try foods with health claims when they are familiar with them, that is why there is a need to inform consumers through reliable, and then trusted, claims (Ares and others 2008).

A trait that also received some attention is food involvement. This trait identifies people that are more willing to invest time and money in searching for information, purchasing and preparing food (Bell and Marshall 2003). They also appear to be more acceptant towards novel food (van Trijp and others 1996).

In addition, consumers' nutritional knowledge can affect healthiness perception of food (Wansink and others 2005; Ares and others 2013; Vidal and others 2013). It has a direct effect on the attitude toward the product (Crites and Aikman 2005) and it influences the person to follow healthier food patterns (Werblow and others 1978). Furthermore, the consumer that is more knowledgeable about food, is less likely to be influenced by the external environment during food choice. Knowledgeable consumers are more able to extract information from labels and, thus, they are more willing to give them their attention. In turn, less knowledge makes external environment influences have a stronger effect on the evaluations of consumers (Cheung and others 2014).

Since there can be some differences linked to the nationality of consumers, we based our research on a sample made by Italian and Dutch respondents. We choose these nationalities since they are characterized by strong differences in terms of familiarity with the product. The study will allow to differentiate the two samples according to food choice and habits, at a general level and also according to olive oil products. Consumers have, subsequently, been characterized according to their nutritional knowledge, openness to new technologies, familiarity with the product and sustainability concern.

Therefore, the aim of this study is to examine the effect of cues such as symbols and/or health claims on the perception of healthiness of olive oil products of two populations with different

levels of familiarity and cultural habits towards olive oil consumption. In addition, how the consumer's characteristics moderate this evaluation is also investigated.
Through a contingent ranking study, labels and packages of some olive oil based products were manipulated in order to understand how are specific visual elements of products understood and how can they influence healthiness perception.
The hypotheses stemming from the study of literature that we tested in our empirical study were about health perception of products that increases with: (a) a darker color of the container, (b) The information about organic production, (c) the indication of The Country Of Origin (COO), (d) process information, such as cold processing, (e) nutritional knowledge of consumers, (f) openness to new technologies, (g) familiarity of the consumers with the product, and (h) sustainability concern of consumers influence positively the healthiness perception of products. On the other hand, the sensory property pungent taste is expected to influence negatively the healthiness perception of products.

5.3 Materials and Methods

5.3.1 Experimental design

The study consisted in two surveys: one investigated how healthiness perception is influenced by olive oil attributes and another tested the effect of the same attributes on a product made by a combination of olive oil and butter. The reason of the choice of two slightly different products is in the different traditions about fat (namely olive oil) consumption in different European countries. This allows to better extend the results of the study.
The product attributes tested and their levels (Table 5.1) are: the colour of the bottle (dark green or transparent glass bottles in the case of olive oil and plastic containers in the case of butter combined with oil); cold processing logo (present vs. absent); organic production (products have or not the indication of organic production); pungent sensory properties (products have or not this sensory claim on the label); country of origin (products have or not the 100% Italian certification).

Table 5.1 - Attribute and levels for each profile

Profile	Origin	Pungent	Bottle	Cold processing	Organic
1	Italy	No	Light	Yes	Yes
2	Europe	Yes	Light	Yes	Yes
3	Italy	No	Light	No	No
4	Europe	Yes	Dark	Yes	No
5	Europe	No	Dark	No	Yes
6	Italy	Yes	Light	No	No
7	Italy	Yes	Dark	No	Yes
8	Italy	No	Dark	Yes	No

For each study, a total of 8 labels were shown. Each profile contained the combinations of all attribute levels specified above following an orthogonal design developed through the Orthoplan procedure with the software SPSS, as shown in the Table 5.1. Using orthogonal design allows to analyse the effects of the attributes without using the full profile set, still allowing robust results (Green and Srinivasan 1990).

5.3.2 Participants

The sample was composed by Italian and Dutch consumers, this contributed to a broader generalization of results. The two experiments were run on a total of 428 respondents of which 52% from Italy and 48% from The Netherlands, 66% female and 34% male. The participants belonged to all the age intervals of population: from 18 to 25 (33%), from 26 to 34 (30%), from 35 to 54 (21%), from 55 to 65 (10%) and above 65 (6%).

5.3.3 Consumer survey

The respondents were asked to rank the 8 profiles in terms of healthiness perception ("If you were looking for an olive oil that you believe is the healthiest for you to use on a regular basis, which one would you prefer?"). A few questions have been asked about their general knowledge about olive oil. Then, the questionnaire followed with firstly the relevant items from Nutritional

Knowledge Questionnaire (Parmenter and Wardle 1999) and from the questionnaire about general knowledge, attitudes, beliefs and behaviours related to sustainability from Laureati et al. (2013). At the end, some demographic questions helped to define the characteristics of the sample of respondents.

5.3.4 The Model and Data Analysis

In order to test the effect of elements on the label in conveying an healthier image of the product we used a contingent ranking method (Cicia and others 2016). This method belongs to the group of Choice Models; choice modelling allows to highlight how consumers make a trade-off among different elements they use for choice, in this case we will test how different types of labels are perceived by consumers to make a judgement of healthiness of the product through a contingent ranking model (Green and Srinivasan 1990; Bateman and others 2002).

Following Lancaster's theory (1966), products are seen as a bundle of attributes with different levels. Attributes are the features that characterize each product. For each attribute we can identify several levels that are the specifications of the single attribute. So it is possible to set up a choice set made by different products that have a balanced combination of attributes and levels. This allows to have the part worth for each attribute requiring a simple task by the respondent: a ranking of profiles; this simplicity makes the method easy to set up and to replicate (Moskowitz and others 2006). The results can be straightforwardly interpreted as the relative importance of manipulated elements of the product (Green and Srinivasan 1990). In literature choice modelling has been extensively used to explain how the decision making of the consumers for these products takes place, mostly under the form of conjoint analysis (Deliza and others 2003; de DS Carneiro and others 2005; Ares and others 2010; Ares and Deliza 2010; i Furnols and others 2011; Claret and others 2012; Vidal and others 2013), but also using choice experiment (Alfnes and others 2006; Loureiro and Umberger 2007) and contingent ranking (Johnston and Roheim 2006; Cicia and others 2016).

The data from the ranking task and the subsequent questions have been analysed using a Rank-ordered Logit. We start from defining the concept of Random Utility Maximization Model, it assumes that, from a researcher's point of view, consumers do not always seem to choose what they prefer (McFadden 1974), so the utility function is made by a deterministic part and a stochastic error term:

$$U_{j,n}=\nu_{j,n}+\varepsilon_{j,n}$$

where:

$U_{j,n}$ = utility accruing to individual *n* from consuming alternative *j*;

$v_{j,n}$ = observable component of utility accruing to individual *n* from alternative *j*;

$\varepsilon_{j,n}$ = stochastic or unobservable component of utility accruing to individual *n* from alternative *j*.

The deterministic part is made by the assumption that the outcome is a preference ordering of utilities (*U*) corresponding to each profile (ξ):

$U_{\xi_j^1} \geq U_{\xi_j^2} \geq \ldots \geq U_{\xi_j^J}$ that depends on a taste parameter (β_h) multiplied by each attribute ($x_{j,h,n}$)represented by a row vector **x** (Cicia and others 2002):

The probability that the respondent will choose alternative *j* out of the set of other possible

$$U_{j,n}=v_{j,n}+\varepsilon_{j,n}=\sum_{h}^{H}\beta_h x_{j,h,n}+\varepsilon_{j,n}=\mathbf{x}_{j,h,n}+\varepsilon_{j,n}$$

alternatives, depends on the probability that this alternative will provide the highest utility over the other alternatives within the choice set ($\neq j$):

$$\Pr(U_{j,n})=\Pr(U_{j,n}\geq U_{\neq j,n})$$

McFadden (1974) demonstrates that if the unobservable component of utility, $\varepsilon_{j,n}$, is independently and identically Gumbel distributed, with scale parameter $\mu>0$, then the probability of choosing alternative *j* is logit:

$$\Pr(U_{j,n})=\frac{exp(\mathbf{x}_{j,h,n})}{\sum_{j\in J} exp(\mathbf{x}_{j,h,n})}$$

In a complete ranking, we observe *J*-1 sequential choices. The joint probability of a sequence of ordering is:

$$\Pr(U_{j',n}\geq U_{j'',n}\geq \ldots \geq U_{j,n})=\prod_{i=0}^{J-1}\frac{exp(\mathbf{x}_{j,h,n})}{\sum_{j\in J} exp(\mathbf{x}_{j,h,n})}$$

This model assumes the Independence of Irrelevant Alternatives, so the attributes of other alternatives do not influence the ratings, for example if we add or delete an alternative we do not have influence on how are ranked the remaining choices (McFadden 1974).
At this point, maximum-likelihood method provides consistent and efficient estimates of the $\hat{\beta}$ taste-parameters vector. These are the values that indicate how the attributes contributes to final utility. In the model we also inserted covariates, they are elements that can best explain what elements, other that levels and attributes, contribute to the final outcome.

5.4 Results

5.4.1 Participants' characteristics

The characteristics of the respondents can be seen in Table 2 and Table 3 for the olive oil and the butter-with-oil studies respectively. The mean values have been compared through ANOVA to highlight noticeable differences between the two samples. The first noticeable differences are highlighted by personal traits concerning the main source of fat for the diet. What characterizes mainly the Italian sample is the highest share of olive oil as a main source of fat in the diet: this is valid for almost the whole sample of Italians, while this habit for Dutch respondents is less present. Furthermore, we can characterize Dutch respondents for having higher scores regarding nutritional knowledge questions (related to olive oil), while Italians have higher scores related to sustainable behaviour. The questions that highlighted the level of knowledge about the norms on olive oil highlight that Italians are more aware about the strict requirements needed to indicate origin on the label, while Dutch respondents are the ones that are more aware about the rules of the requirements needed to have sensory claims on label.
The study helped to characterize the two nationality respondents as follows (Table 5.2 and Table 5.3). The mean values have been compared through ANOVA to highlight noticeable differences between the two samples. The first noticeable differences are highlighted by personal traits concerning the main source of fat for the diet. What characterizes mainly the Italian sample is the highest share of olive oil as a main source of fat in the diet: this is valid for almost the whole sample of Italians, while this habit for Dutch respondents is less present. Furthermore, we can characterize Dutch respondents for having higher scores regarding nutritional knowledge questions (related to olive oil), while Italians have higher scores related to sustainable behaviour. For what concerns the rules on olive oil labels, Italians appear to be more aware about how the

indication of origin is normed, while Dutch respondents seem to be more of the mandatory requirements for sensory claims.

Table 5.2 - ANOVA results of screening questions for olive oil experiment

Variable	Dutch	Std. Dev.	Italian	Std. Dev.	Mean	F	Prob > F
Knowledge about norms (0-1)							
Rules about origin on labels	0.54	0.50	0.70	0.46	0.61	**34.93**	0.000
Rules about sensory aspects on labels	0.61	0.49	0.34	0.47	0.49	**101.17**	0.000
Effects on healthiness perception (0-1)							
Cold processing	0.23	0.42	0.53	0.50	0.37	**136.66**	0.000
Organic	0.25	0.43	0.45	0.50	0.39	**55.30**	0.000
Dark container	0.48	0.50	0.70	0.46	0.58	**65.50**	0.000
Important elements in food choice (0-7)							
Quality	5.81	0.91	6.07	1.38	5.93	**10.02**	0.000
Health care	5.84	0.87	5.80	1.31	5.82	0.42	0.517
Country Of Origin (COO)	3.95	1.55	5.37	1.46	4.60	**268.80**	0.000
Taste	6.27	0.79	5.89	1.33	6.09	**37.89**	0.000
Environment	5.11	1.16	5.13	1.55	5.12	0.06	0.813
Recycling	4.77	1.49	4.99	1.70	4.87	**5.60**	0.018
Organic	4.05	1.62	4.58	1.64	4.29	**32.23**	0.000
Appearance	4.90	1.16	4.63	1.46	4.78	**13.09**	0.000
Habit	4.39	1.57	4.79	1.73	4.57	**18.42**	0.000
Personal traits (0-1)							
Diet	0.14	0.35	0.18	0.39	0.16	3.34	0.068
Use of olive oil	0.66	0.47	0.94	0.23	0.78	**166.46**	0.000
Other traits (0-5)							
Nutritional knowledge	3.08	1.79	2.75	1.58	2.93	**12.10**	0
Sustainable behavior	2.94	0.95	3.37	0.94	3.14	**88.47**	0

Mean values and nationality differences for the screening questions of the olive oil survey. In brackets there are the likert scales corresponding to each question.

Table 5.3 - ANOVA results of screening questions for butter with olive oil experiment

Variable	Dutch	Std. Dev.	Italian	Std. Dev.	Mean	F	Prob > F
Knowledge about norms (0-1)							
Rules about origin on labels	0.41	0.49	0.72	0.45	0.56	**147.19**	0.000
Rules about sensory aspects on labels	0.47	0.50	0.26	0.44	0.37	**68.21**	0.000
Effects on healthiness perception (0-1)							
Cold processing	0.31	0.46	0.52	0.50	0.41	**64.35**	0.000
Organic	0.42	0.49	0.44	0.50	0.43	0.24	0.622
Dark container	0.43	0.50	0.64	0.48	0.53	**59.64**	0.000
Important elements in food choice (0-7)							
Quality	6.06	0.76	6.35	0.78	6.20	**50.50**	0.000
Health care	5.95	1.06	6.04	0.98	5.99	2.18	0.140
Country Of Origin (COO)	4.25	1.50	5.22	1.14	4.73	**182.37**	0.000
Taste	6.18	0.77	6.18	0.83	6.18	0.03	0.863
Environment	5.25	1.18	5.34	1.44	5.30	1.56	0.212
Recycling	5.16	1.20	4.94	1.47	5.05	**9.25**	0.002
Organic	4.29	1.55	4.49	1.56	4.39	**6.08**	0.014
Appearance	4.47	1.38	4.59	1.40	4.53	2.43	0.119
Habit	4.05	1.52	5.14	1.49	4.59	**181.63**	0.000
Personal traits (0-1)							
Diet	0.12	0.33	0.17	0.37	0.14	**4.97**	0.026
Use of olive oil	0.57	0.50	0.95	0.21	0.77	**336.37**	0.000
Other traits (0-5)							
Nutritional knowledge	3.02	1.63	2.68	1.56	2.86	**15.72**	0.000
Sustainable behavior	3.10	0.02	3.29	0.75	3.19	**20.14**	0.000

Mean values and nationality differences for the screening questions of the butter with olive oil survey. Mean values and nationality differences for the screening questions of the olive oil survey.

The two groups of participants have been further characterized according to the main determinants of general food choice. The big difference is represented by COO as a driver in

food-related decision making: this reason appears to be stronger for the Italian sample that also scores higher in the importance of traditionalism in food habits. On the other side, Dutch consumers can be characterized by the importance assigned to taste and appearance of food.
We also asked explicitly if consumers are aware about the links between cold processing, organic production and dark container, with healthiness of the product. Italians appear to be more familiar with olive oil products as they are more aware, compared to Dutch consumers, about the existence of these links.

5.4.2 Olive oil products

Results, as shown in Table 5.4, suggest that the strongest effect on healthiness perception of olive oils seems to be given by Italian origin (the coefficient is +0.501), there is an exception for people that state that habit is important in their food choice who do not see this element as positive (-0.370). Organic production is seen as a positive attribute in healthiness perception (+0.461), but this effect is also dependent on sustainability behaviour of the respondents: people that score high in this characteristic seems to perceive lower healthiness in organic production, but the relationship is still positive (+0.336). Pungency has a negative effect on healthiness perception (-0.213). This effect is dependent on the Dutch nationality of respondents, in fact, results suggest for Italian sample it has a neutral effect as the coefficient is not statistically significant. Another point of divergence between the two nationalities of respondents seems to be the colour of the bottle: Italians seem to prefer a darker colour of glass (+0.279), while Dutch consumers prefer a lighter colour (dark colour has a coefficient of -0.643). From the results there is no significant interaction between cold processing and healthiness of the final product as the coefficient is not statistically significant.

Table 5.4 - Rank Ordered Logit output for olive oil products

Variable	Coef.	
Italian_origin	**0.501**	***
Pungent_taste	**-0.213**	**
Dark_bottle	**-0.643**	***
Cold_processing	-0.071	
Organic	**0.461**	***

Variable	Coef.	
*Italian_nationality*Pungent_taste*	0.194	
*Italian_nationality*Dark_bottle*	**0.279**	*
*Importance_to_COO*Dark_bottle*	**0.335**	*
*Importance_to_habit*Italian_origin*	**-0.370**	**
*Importance_to_COO*Dark_bottle*	**0.331**	**
*Sustainable behavior*organic*	**0.336**	**

*Significancy levels *= <0.10; **=<0.05; ***=<0.01*

5.4.3 Butter combined with oil products

The data have been analysed as the ones from the previous experiment through a rank ordered logit. The results (Table 5.5) suggest that the element that mostly affects healthiness perception is cold processing: it is seen positively correlated with healthiness (+1.986). But there are some differences within the sample: people for which taste is important in their food choice show a negative correlation between cold processing and healthiness perception (-1.920). This effect seems to be also mediated by the importance of the appearance of food (+0.295). Then, organic production is seen as negatively correlated with healthiness, this effect is mediated by several elements: first of all, there is a nationality difference in that: Italian consumers score lower on the negativity between organic production and healthiness of the product (-0.303). The effect is reversed for environmental concerned people (+0.606) and for nutritionally knowledgeable consumers (+0.310). Then, the results also suggest an important effect of the packaging on healthiness perception (+0.601). A lighter packaging is also seen as positive for healthiness by people that give importance to the appearance of food (-0.415). A cross-national preference is outlined for pungent products from male respondents (+0.362).

Table 5.5 - Rank Ordered Logit output for butter combined with oil products

Variable	Coef.	
Italian_origin	**0.305**	***
Pungent_taste	**-0.159**	**
Dark_bottle	**0.601**	***
Cold_processing	**1.986**	***

Variable	Coef.	
Organic	**-0.997**	**
*Italian_nationality*Importance_to_Origin*	**0.432**	***
*Italian_nationality*Organic*	**-0.303**	**
*Gender*Pungent_taste*	**0.362**	***
*Importance_to_health_care*Organic*	**1.167**	***
*Importance_to_taste*Cold_processing*	**-1.920**	***
*Importance_to_environment*Organic*	**0.606**	**
*Importance_to_appearance*Dark_bottle*	**-0.415**	***
*Importance_to_appearance*Cold_processing*	**0.295**	*
*On_a_diet*Italian_origin*	**-0.442**	**
*Nutritional Knowledge*Organic*	**0.310**	**

*Significancy levels *= <0.10; **=<0.05; ***=<0.01*

5.5 Discussion

The results of the study suggest that, firstly, healthiness perception, in this case, depends on the origin of the product and this is confirmed by the literature, which states that origin is one of the most important attributes regarding the preferences for olive oil products (Nielsen and others 1998; Ward and others 2003; Scarpa and others 2005; Dekhili and others 2011; Santosa and Guinard 2011). The effect of pungent taste depends on the nationality of the respondents and this is also already expected from previous literature (Del Giudice and others 2015). Italian respondents have less negative scores in terms of liking and healthiness perception (Tables 5.2 and 5.3). Another divergence found between the two populations related to the colour of the bottle: Dutch respondents seem to prefer a lighter packaging while Italians a darker one. Another effect was also found with regards to the cold processing label, this element appears to be important in general, but it is not evaluated as positive by people that give the most importance to taste in their food choice. The results for the effect of organic production were opposite in the two experiments: in the first one organic production was identified as a driver for healthiness, while in the second one about butter it was considered positive only to people concerned about environmental issues linked to food.

Summing up the results of the study in terms of the hypothesis formulated upon the available literature we can conclude that healthiness perception is affected by:
- A darker colour of the container: this hypothesis is partially accepted. In fact, it can be valid only for the Italian sample, as we explained, Dutch respondent showed their preference for a transparent packaging;
- The information about organic production: This hypothesis is accepted, with some exceptions, as we found mainly positive correlations between organic productions and healthiness perception;
- The indication of country of origin (COO): This hypothesis is accepted as we found a positive effect on healthiness perception by the symbol that we used to indicate Italian origin of products;
- Process information, such as cold processing: this hypothesis can be accepted as there is a positive correlation between the presence of the logo of "cold processing" and healthiness perception;
- Familiarity of the consumers with the product: this hypothesis can be accepted as people that are more familiar with the product tend to give higher ratings of healthiness to the products;
- Sustainability concern of consumers influence positively the healthiness perception of products: this hypothesis can be accepted as there is a positive correlation between healthiness perception of products and the score related to sustainable behaviour of consumers.

While the healthiness perception is not affected by:
- Nutritional knowledge of consumers: this hypothesis can be rejected as there is no valuable relation between the level of nutritional knowledge and the healthiness perception of products;
- Openness to new technologies: this hypothesis can be rejected as people that are more open to new technologies do not have a higher healthiness perception of products;
-The expected negative correlation between the sensory property pungent taste and healthiness perception of products is confirmed as consumers showed to not like this attribute as an indicator of healthiness of olive oil products.

5.6 Conclusions and managerial implications

In this study we investigated how the the combination of different elements of the packaging affects the perception of healthiness of two groups of consumers with different cultural habits

toward the product. The importance of the packaging is especially true when the consumer is involved in a quick decision making when they rely on immediate cues to make a decision.
The results suggest that there is less differences than expected between evaluations made by the two samples of consumers: the first noticeable difference relies in the results for different colours of packaging. In fact, Dutch consumers expressed that a lighter packaging provides an image of a healthier product, while the opposite was found for the Italian sample. Another point of discrepancy between the two groups of consumers is about the pungent taste of olive oil products. Although this can be an indicator of the healthiness of the product from a scientific point of view, it was seen as negative for the overall healthiness perception. Besides, there was a slight difference between the two samples: Italians show a higher acceptance towards products with a pungent taste, compared to the Dutch sample of respondents. Evaluations of these two elements seem to be influenced by the familiarity with the product that is the main difference between the two groups.
With regard to the characteristics of the product, organic production, COO, and processing information on the label have a positive effect in enhancing the healthiness perception of products. Concerning the elements connected to the consumer, nutritional knowledge had no effect on healthiness perception, openness to new technologies had a negative effect, while familiarity with the product and sustainability concern seemed to have a positive effect on healthiness perception.
This study allows for some practical implications for market research. Most of the packaging are not perceived as different from different nationality consumers, this entails that there is no need to create different labels for products sold in different countries. The only exception regards the use of dark packages for products sold in Italy and transparent bottles/boxes for products sold in the Netherlands. The results seem to suggest that these indications can be extended to countries that have a similar level of familiarity with olive oil products. Besides, we also have an indication that pungent features, even if tied with superior healthy properties, are not appreciated by a big share of consumers. Instead, pungent products can represent a niche for the small portion of population that shows a preference for complex sensory profile products. However, the possibility to find a niche with this preference seems to be more likely to occur in Italy, according to our study. This means that pungent products can gain attention firstly in countries in which the olive oil has a longer tradition in its use.
Furthermore, we had an indication that communicating the characteristics of the product through the label and packaging can enhance the healthiness perception of the products.

Indicating the origin, organic production and process information can be useful for companies to convey an image of healthiness for their products, regardless of the country in which they operate.
Generally speaking, the fact that familiarity with the product has a positive effect on healthiness perception of the product, indicates that a positive trend of preference toward olive oil in emerging consuming countries, as The Netherlands, is expected, as the use of this product is spreading within the population as healthy concerns about diet is becoming increasingly important.

5.7 Limitations and further research

Limitations of this study rely firstly in the sample, an analogous study on a larger basis and on a sample more representative of the population can give a clearer picture on how the packaging can influence the healthiness perception of products. Furthermore, these factors can be tested in studies involving consumers from other European nationalities, this would allow to state if the differences between consumers with several degrees of familiarity with the product are persistent or not in a context different from the one we investigated.
The insights from this study, about the importance of environmental stimuli during decision making, can be compared with what happens in the case of products that are extensively elaborated in the mind of consumers, in which the stimuli of the packaging can have a different role. This allows a broader understanding of the role of visual elements in affecting perception and purchasing decision.

6. Summary of main findings

This work analyzed consumers' preferences for EVOO in different dimensions. We can draw a series of conclusions from the papers constituting the entire work.

From the literature it is clear the major importance of origin and all its various specifications for the preferences toward this product. Brand is another important attribute: national and international brands of large retailers, thanks to their reputation, manage to supply the consumer with a guarantee not only of organoleptic quality and food safety but also of environmental (integrated production with the use of low input) and social sustainability (ethical certifications like SA8000). Organic certification represents an element of product differentiation, related to safety and the environment, which the consumer clearly appreciates.

Going deeply in the analysis of origin, we investigated the performance of different PDO and PGI products on the market and we highlighted that the results are very different according to the different Italian regional production. The products that appear to be highly priced and that match the goals that European quality schemes aim to achieve, are only a small fraction of the total set of PDO and PGI products. Furthermore, the products that established a good reputation homogeneously at a national level appear to be only the ones from Umbria, while other regional productions still have to struggle to achieve a premium position on the market.

Another element to be considered is the preferences of consumers towards products that have a taste that is mostly flat and neutral. This is opposite to the evolution desired by European Union as expressed by its guidelines and Regulations for quality products. This may be considered a failure on the part of public regulations which have steered the development of products according to a quality concept that is not understood by consumers, who do not have necessary background knowledge to appreciate some attributes (Bech-Larsen and Scholderer, 2007). This allows for the intervention of policymakers to match the two quality perspectives in order to allow the products to have a proper return from the market.

The last part of the work was dedicated to the investigation on perceptions of consumers as induced by the packaging of products. Organic production, indication of the Country Of Origin and processing information on the label have a positive effect in enhancing the healthiness

perception of products. On the consumer's side, nutritional knowledge has no effect, openness to new technologies has a negative effect in evaluating the healthiness of products, while familiarity with the product and sustainability concern seem to have a positive effect. The perception of healthiness can also change according to the color of the packaging and the sensory claims, but this effect is mediated by the familiarity and the knowledge of the consumer.

From these main findings it is clear that there are a lot of factors that interact within and outside the consumer while he is making a choice or gathering information to build an attitude toward a product. From these studies it is clear the major importance of the origin attribute that needs to be appropriately valued through interventions that allow the regional products to build a reputation that allows to compete with major brands and to sustain rural areas producers. Furthermore the consumer needs to be educated about the sensory features that characterize the products with superior health properties in order to match the perspective on quality as supported by European Union with the one that the consumers appreciates. In turn, enhancing the familiarity and the knowledge of the consumer toward EVOO will allow to have less heterogenous results in terms of preferences of the consumers and to better focus the development of products toward what can guarantee to this product the success on the market.

REFERENCES

Ahmed ZU, Johnson JP, Pei Ling C, Wai Fang T, Kah Hui A. 2002. Country−of−origin and brand effects on consumers' evaluations of cruise lines. International Marketing Review 19(3):279-302.

Alfnes F, Guttormsen AG, Steine G, Kolstad K. 2006. Consumers' willingness to pay for the color of salmon: a choice experiment with real economic incentives. American Journal of Agricultural Economics 88(4):1050-61.

Anania G, Pupo D'Andrea M. 2008. The Global Market for Olive Oil: Actors, Trends, Policies, Prospects and Research Needs. TRADEAG, FP VI Project. Working Paper 08/2. http:// ageconsearch. umn. edu/bitstream/6109/2/wp080002. pdf.

Annunziata A, Vecchio R. 2011. Functional foods development in the European market: A consumer perspective. Journal of Functional Foods 3(3):223-8.

Anselmsson J, Vestman Bondesson N, Johansson U. 2014. Brand image and customers' willingness to pay a price premium for food brands. Journal of Product & Brand Management 23(2):90-102.

Aprile MC, Caputo V, Nayga Jr RM. 2012. Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels. International Journal of Consumer Studies 36(2):158-65.

Ares G, Besio M, Giménez A, Deliza R. 2010. Relationship between involvement and functional milk desserts intention to purchase. Influence on attitude towards packaging characteristics. Appetite 55(2):298-304.

Ares G, Deliza R. 2010. Studying the influence of package shape and colour on consumer expectations of milk desserts using word association and conjoint analysis. Food Quality and Preference 21(8):930-7.

Ares G, Giménez A, Bruzzone F, Vidal L, Antúnez L, Maiche A. 2013. Consumer Visual Processing of Food Labels: Results from an Eye-Tracking Study. Journal of Sensory Studies 28(2):138-53.

Ares G, Giménez A, Gámbaro A. 2008. Understanding consumers' perception of conventional and functional yogurts using word association and hard laddering. Food Quality and Preference 19(7):636-43.

Baourakis G, Apostolakis I. 1999. A statistical assessment of consumers' criteria regarding organic agricultural products: the case of organic olive oil. Foundations of Computing and Decision Sciences 24:21-31.

Baourakis G, Baltas G. 2003. Comparative behavioural analysis in selected EU countries: A brand modelling approach. Operational Research 3(2):165-82.

Barham E. 2003. Translating terroir: the global challenge of French AOC labeling. Journal of rural studies 19(1):127-38.

Bateman IJ, Carson RT, Day B, Hanemann M, Hanley N, Hett T, Jones-Lee M, Loomes G, Mourato S, Özdemiroglu E. 2002. Economic valuation with stated preference techniques: a manual. Economic valuation with stated preference techniques: a manual.

Bech-Larsen T, Nielsen NA, Grunert KG. 1996. Means-End Chains for low involvement food products: A study of Danish consumers' cognitions regarding different applications of vegetable oil. 21st Annual IAREP Conference, Social and Economic Representations, Paris.

Bech-Larsen T, Scholderer J. 2007. Functional foods in Europe: consumer research, market experiences and regulatory aspects. Trends in Food Science & Technology 18(4):231-4.

Bell R, Marshall DW. 2003. The construct of food involvement in behavioral research: scale development and validation☆. Appetite 40(3):235-44.

Belletti G, Marescotti A. 1998. The reorganization of trade channels of a typical product: the Tuscan extra-virgin olive-oil. Typical and traditional products: rural effects and agro-industrial problems. 52nd Seminar, Università di Parma, Facoltà di Economia: Citeseer. p. 271-86.

Bernués A, Olaizola A, Corcoran K. 2003. Extrinsic attributes of red meat as indicators of quality in Europe: an application for market segmentation. Food Quality and Preference 14(4):265-76.

Bertozzi L. 1995. Designation of origin: quality and specification. Food Quality and Preference 6(3):143-7.

Bevilacqua M, Ciarapica FE, Marchetti B. 2012. Development and test of a new fuzzy-QFD approach for characterizing customers rating of extra virgin olive oil. Food Quality and Preference 24(1):75-84.

Bi X, Gao Z, House La, Hausmann DS. 2015. Tradeoffs between sensory attributes and organic labels: the case of orange juice. International Journal of Consumer Studies 39:162-71.

Bimbo F, Bonanno A, Viscecchia R. 2016. Do Health Claims' Add Value? The Role of Functionality, Effectiveness, and Brand. European Review Of Agricultural Economics.

Bloch PH. 1995. Seeking the Ideal Form: Product Design and Consumer Response. Journal of Marketing 59(3):16-29.

Borgmeier I, Westenhoefer J. 2009. Impact of different food label formats on healthiness evaluation and food choice of consumers: a randomized-controlled study. BMC public health 9:184-.

Bower JA, Saadat MA, Whitten C. 2003. Effect of liking, information and consumer characteristics on purchase intention and willingness to pay more for a fat spread with a proven health benefit. Food Quality and Preference 14(1):65-74.

Bracco C, Caniglia E, D'Amico M, Di Vita G, Pappalardo G. 2009. Analisi del consumo e percezione della qualità dell'olio extravergine d'oliva biologico in Italia. Agricoltura Biologica: sistemi produttivi e modelli di commercializzazione e consumo. Palermo: Università degli Studi di Palermo, Dipartimento di Economia dei Sistemi Agro Forestali.

Breusch TS, Pagan AR. 1979. A simple test for heteroscedasticity and random coefficient variation. Econometrica: Journal of the Econometric Society:1287-94.

Bruner GC, Pomazal RJ. 1988. Problem Recognition: the Crucial First Stage of the Consumer Decision Process. Journal of Services Marketing 2(1):43-53.

Burke RR, Leykin A. 2014. Identifying the Drivers of Shopper Attention, Engagement, and Purchase : Shopper Marketing and the Role of In-Store Marketing. Review of Marketing Research, Volume 11.

Cabrera E, Arriaza M, Rodríguez-Entrena M. 2015. Is the extra virgin olive oil market facing a process of differentiation? A hedonic approach to disentangle the effect of quality attributes. Grasas y Aceites 66(4):e105.

Caporale G, Monteleone E. 2001. Effect of expectations induced by information on origin and its guarantee on the acceptability of a traditional food: olive oil. Sciences des Aliments 21(3): 243-54.

Caporale G, Monteleone E. 2004. Influence of information about manufacturing process on beer acceptability. Food Quality and Preference 15(3):271-8.

Caporale G, Policastro S, Carlucci A, Monteleone E. 2006. Consumer expectations for sensory properties in virgin olive oils. Food Quality and Preference 17(1-2):116-25.

Caporaso N, Savarese M, Paduano A, Guidone G, De Marco E, Sacchi R. 2015. Nutritional quality assessment of extra virgin olive oil from the Italian retail market: Do natural antioxidants satisfy EFSA health claims? Journal of Food Composition and Analysis 40:154-62.

Carbone A, Caswell J, Galli F, Sorrentino A. 2014. The Performance of Protected Designations of Origin: An Ex Post Multi-Criteria Assessment of the Italian Cheese and Olive Oil Sectors. Journal of Agricultural & Food Industrial Organization 12(1):121-40.

Cardello AV. 2003. Consumer concerns and expectations about novel food processing technologies: effects on product liking☆. Appetite 40(3):217-33.

Carlucci D, De Gennaro B, Roselli L, Seccia A. 2014. E-commerce retail of extra virgin olive oil: an hedonic analysis of Italian SMEs supply. British Food Journal 116(10):1600-17.

Carrillo E, Fiszman S, Lähteenmäki L, Varela P. 2014. Consumers' perception of symbols and health claims as health-related label messages. A cross-cultural study. Food Research International 62:653-61.

Caswell J, Mojduszka EM. 1996. Using Informational Labeling to Influence the Market for Quality in Food Products. American Journal of Agricultural Economics:1248-53.

Chan-Halbrendt C, Zhllima E, Sisior G, Imami D, Leonetti L. 2010. Consumer preferences for olive oil in Tirana, Albania. International Food and Agribusiness Management Review 13:55-74.

Cheung CMK, Xiao BS, Liu ILB. 2014. Do actions speak louder than voices? The signaling role of social information cues in influencing consumer purchase decisions. Decision Support Systems 65:50-8.

Choi SC, Coughlan AT. 2006. Private label positioning: Quality versus feature differentiation from the national brand. Journal of retailing 82(2):79-93.

Chrea C, Melo L, Evans G, Forde C, Delahunty C, Cox DN. 2011. An Investigation Using Three Approaches to Understand the Influence of Extrinsic Product Cues on Consumer Behavior: An Example of Australian Wines. Journal of Sensory Studies 26(1):13-24.

Cicia G, Caracciolo F, Cavallo C, Del Giudice T. 2016. Trends in European Policy for Extra-Virgin Olive oil: are consumers provided with the quality they want?

Cicia G, Cembalo L, Del Giudice T, Verneau F. 2012. Il sistema agroalimentare ed il consumatore postmoderno: nuove sfide per la ricerca e per il mercato. Economia agro-alimentare.

Cicia G, Del Giudice T, Ramunno I. 2009. Environmental and health components in consumer perception of organic products: Estimation of willingness to pay. Journal of food products marketing 15(3):324-36.

Cicia G, Del Giudice T, Scarpa R. 2002. Consumers' perception of quality in organic food: A random utility model under preference heterogeneity and choice correlation from rank-orderings. British Food Journal 104(3/4/5):200-13.

Cicia G, Del Giudice T, Scarpa R. 2005. Welfare loss due to lack of traceability in extra-virgin olive oil: a case study. Cahiers Options Méditerranéennes 64:19-32.

Cicia G, Perla C. 2000. La percezione della qualità nei consumatori di prodotti biologici: uno studio sull'olio extra-vergine di oliva tramite conjoint analysis. Qualità e valorizzazione nel mercato dei prodotti agroalimentari tipici, Edizioni Scientifiche Italiane, Napoli:237-52.

Claret A, Guerrero L, Aguirre E, Rincón L, Hernández MD, Martínez I, Peleteiro JB, Grau A, Rodríguez-Rodríguez C. 2012. Consumer preferences for sea fish using conjoint analysis: Exploratory study of the importance of country of origin, obtaining method, storage conditions and purchasing price. Food Quality and Preference 26(2):259-66.

Combris P, Lecocq S, Visser M. 1997. Estimation of a hedonic price equation for Bordeaux wine: does quality matter? The Economic Journal:390-402.

Cooke L, Wardle J, Gibson E, Sapochnik M, Sheiham A, Lawson M. 2004. Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. Public health nutrition 7(02):295-302.

Costanigro M. 2007. Product Characteristics and Reputation Effects in the Wine Market. Washington State University.

Costanigro M, McCluskey JJ, Goemans C. 2010. The Economics of Nested Names: Name Specificity, Reputations, and Price Premia. American Journal of Agricultural Economics 92(5):1339-50.

Cox DN, Evans G. 2008. Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale. Food Quality and Preference 19(8):704-10.

Crilly N, Moultrie J, Clarkson PJ. 2004. Seeing things: consumer response to the visual domain in product design. Design Studies 25(6):547-77.

Crites SL, Aikman SN. 2005. Impact of nutrition knowledge on food evaluations. European journal of clinical nutrition 59(10):1191-200.

Cuellar SS, Claps M. 2013. Differential effects of brand, ratings and region on willingness to pay: a hedonic price approach. Journal of wine research 24(2):138-55.

D'agostino RB, Belanger A, D'Agostino Jr RB. 1990. A suggestion for using powerful and informative tests of normality. The American Statistician 44(4):316-21.

Darby MR, Karni E. 1973. Free competition and the optimal amount of fraud.

de DS Carneiro J, Minim VP, Deliza R, Silva CH, Carneiro JC, Leão FP. 2005. Labelling effects on consumer intention to purchase for soybean oil. Food Quality and Preference 16(3): 275-82.

De Graaff J, Eppink L. 1999. Olive oil production and soil conservation in southern Spain, in relation to EU subsidy policies. Land use policy 16(4):259-67.

Dekhili S, d'Hauteville F. 2009. Effect of the region of origin on the perceived quality of olive oil: An experimental approach using a control group. Food Quality and Preference 20:525-32.

Dekhili S, Sirieix L, Cohen E. 2011. How consumers choose olive oil: The importance of origin cues. Food Quality and Preference 22:757-62.

Del Giudice T, Cavallo C, Caracciolo F, Cicia G. 2015. What attributes of extra virgin olive oil are really important for consumers: a meta-analysis of consumers' stated preferences. Agricultural and Food Economics 3(1):1-15.

Del Giudice T, D'Elia A. 2001. Valorizzazione dell'olio extra-vergine di oliva meridionale: una proposta metodologica per l'analisi delle preferenze. Rivista di Economia Agraria 56(4): 571-609.

Del Giudice T, Panico T, Caracciolo F, Cicia G. 2012. Le preferenze dei consumatori italiani nei confronti dell'attributo biologico nell'olio extra-vergine di oliva alla luce della nuova normativa sull'etichettatura. V Workshop Nazionale GRAB-IT 2012. Ancona.

Del Nobile M, Ambrosino M, Sacchi R, Masi P. 2003. Design of plastic bottles for packaging of virgin olive oil. Journal of food science 68(1):170-5.

Delgado C, Gómez-Rico A, Guinard J-X. 2013. Evaluating bottles and labels versus tasting the oils blind: Effects of packaging and labeling on consumer preferences, purchase intentions and expectations for extra virgin olive oil. Food Research International 54(2):2112-21.

Delgado C, Guinard J-X. 2011. How do consumer hedonic ratings for extra virgin olive oil relate to quality ratings by experts and descriptive analysis ratings? Food Quality and Preference 22(2):213-25.

Delgado C, Guinard JX. 2012. Internal and external quality mapping as a new approach to the evaluation of sensory quality–A case study with olive oil. Journal of Sensory Studies 27(5): 332-43.

Deliza R, Macfie H, Hedderley D. 2003. Use of Computer-Generated Images And Conjoint Analysis To Investigate Sensory Expenctations. Journal of Sensory Studies 18(6):465-86.

Deliza R, MacFie HJH. 1996. The Generation Of Sensory Expectation By External Cues And Its Effect On Sensory Perception And Hedonic Ratings: A Review. Journal of Sensory Studies 11(2):103-28.

Deselnicu OC, Costanigro M, Souza-Monteiro DM, McFadden DT. 2013. A meta-analysis of geographical indication food valuation studies: What drives the premium for origin-based labels. Journal of Agricultural and Resource Economics 38(2):204-19.

Di Vita G, D'Amico M, La Via G, Caniglia E. 2013. Quality perception of PDO extra-virgin olive oil: which attributes most influence Italian consumer. Agricultural Economics Review 14(2):46-58.

Dios-Palomares R, Martínez-Paz JM. 2011. Technical, quality and environmental efficiency of the olive oil industry. Food Policy 36(4):526-34.

Duval S, Tweedie R. 2000. Trim and fill: a simple funnel–plot–based method of testing and adjusting for publication bias in meta–analysis. Biometrics 56(2):455-63.

Eldesouky A, Pulido A, Mesias F. 2015. The Role of Packaging and Presentation Format in Consumers' Preferences for Food: An Application of Projective Techniques. Journal of Sensory Studies 30(5):360-9.

Engelbrecht AJ, Herbst F, Bruwer J. 2014. Region-of-origin (ROO) certification as marketing strategy in the South African wine market. International Journal of Wine Business Research 26(2):139-62.

Erdem T, Swait J. 1998. Brand equity as a signaling phenomenon. Journal of consumer Psychology 7(2):131-57.

Fandos C, Flavián C. 2006. Intrinsic and extrinsic quality attributes, loyalty and buying intention: an analysis for a PDO product. British food journal 108(8):646-62.

Fandos Herrera C, Flavián Blanco C. 2011. Consequences of consumer trust in PDO food products: the role of familiarity. Journal of Product & Brand Management 20(4):282-96.

Favati F, Condelli N, Galgano F, Caruso MC. 2013. Extra virgin olive oil bitterness evaluation by sensory and chemical analyses. Food chemistry 139(1):949-54.

Feenstra RC. 1995. Exact hedonic price indexes. National Bureau of Economic Research.

Fernqvist F, Ekelund L. 2014. Credence and the effect on consumer liking of food – A review. Food Quality and Preference 32:340-53.

Feunekes GIJ, Gortemaker IA, Willems AA, Lion R, van den Kommer M. 2008. Front-of-pack nutrition labelling: Testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite 50(1):57-70.

Finardi C. 2010. Preferenze dei consumatori per l'indicazione di origine e inidcazioni sulla salute circa l'olio extra-vergine di oliva.

Finardi C, Giacomini C, Menozzi D, Mora C. 2009. Consumer preferences for country-of-origin and health claim labelling of extra-virgin olive-oil Consumer preferences for country-of-origin and health claim labelling of extra-virgin olive-oil.1-11.

Finco A, Padella M, Sargentoni T. 2010. Disponibilità a pagare per la qualità di un olio extravergine locale. Economia agro-alimentare XII:77-98.

Finotti E, Bersani AM, Bersani E. 2007. Total quality indexes for extra−virgin olive oils. Journal of Food Quality 30(6):911-31.

Fotopoulos C, Kafetzopoulos D, Gotzamani K. 2011. Critical factors for effective implementation of the HACCP system: a Pareto analysis. British Food Journal 113(5): 578-97.

Fotopoulos C, Krystallis A. 2001. Are quality labels a real marketing advantage? A conjoint application on Greek PDO protected olive oil. Journal of International Food & Agribusiness Marketing 12(1):1-22.

Fotopoulos C, Krystallis A. 2002. Purchasing motives and profile of the Greek organic consumer: a countrywide survey. British Food Journal 104(9):730-65.

Fotopoulos C, Krystallis A. 2003. Quality labels as a marketing advantage: The case of the "PDO Zagora" apples in the Greek market. European Journal of Marketing 37(10):1350-74.

Fregapane G, Gómez−Rico A, Inarejos AM, Salvador MD. 2013. Relevance of minor components stability in commercial olive oil quality during the market period. European Journal of Lipid Science and Technology 115(5):541-8.

Frewer L, Bergmann K, Brennan M, Lion R, Meertens R, Rowe G, Siegrist M, Vereijken C. 2011. Consumer response to novel agri-food technologies: implications for predicting consumer acceptance of emerging food technologies. Trends in Food Science & Technology 22(8):442-56.

Fucito R, Vizzarri G. 2004. Strategie d'impresa e qualità nel comparto degli oli extra-vergini di oliva molisani. Centro studi di estimo e di economia territoriale-ce set:49-81.

Gámbaro A, Ellis AC, Raggio L. 2013. Virgin Olive Oil Acceptability in Emerging Olive Oil-Producing Countries. Food and Nutrition Sciences 2013(October):1060-8.

García JM, Yousfi K, Mateos R, Olmo M, Cert A. 2001. Reduction of oil bitterness by heating of olive (Olea europaea) fruits. Journal of agricultural and food chemistry 49(9):4231-5.

Gázquez-Abad JC, Sánchez-Pérez M. 2009. Factors influencing olive oil brand choice in Spain: an empirical analysis using scanner data. Agribusiness 25(1):36-55.

German JB, Gibson RA, Krauss RM, Nestel P, Lamarche B, Van Staveren WA, Steijns JM, De Groot LC, Lock AL, Destaillats F. 2009. A reappraisal of the impact of dairy foods and milk fat on cardiovascular disease risk. European journal of nutrition 48(4):191-203.

Gil JM, Gracia A, Sanchez M. 2000. Market segmentation and willingness to pay for organic products in Spain. The International Food and Agribusiness Management Review 3(2): 207-26.

Gimeno E, Castellote A, Lamuela-Raventós R, De la Torre M, Lopez-Sabater M. 2002. The effects of harvest and extraction methods on the antioxidant content (phenolics, α-tocopherol, and β-carotene) in virgin olive oil. Food Chemistry 78(2):207-11.

Glass GV. 1976. Primary, secondary, and meta-analysis of research. Educational researcher 5(10):3-8.

Goldbohm RA, Chorus AM, Garre FG, Schouten LJ, van den Brandt PA. 2011. Dairy consumption and 10-y total and cardiovascular mortality: a prospective cohort study in the Netherlands. The American journal of clinical nutrition:ajcn. 000430.

Gordon RJ. 2007. The measurement of durable goods prices: University of Chicago Press.

Green PE, Srinivasan V. 1990. Conjoint Analysis in Marketing: New Developments with Implications for Research and Practice. Journal of Marketing 54(4):3-19.

Griffin A, Page AL. 1993. An Interim Report on Measuring Product Development Success and Failure. Journal of Product Innovation Management 10(4):291-308.

Grunert K, Wills J. 2007. A review of European research on consumer response to nutrition information on food labels. J Public Health 15(5):385-99.

Grunert KG. 2002. Current issues in the understanding of consumer food choice. Trends in Food Science & Technology 13(8):275-85.

Grunert KG. 2005. Food quality and safety: consumer perception and demand. European Review of Agricultural Economics 32(3):369-91.

Grunert KG, Bredahl L, Brunsø K. 2004. Consumer perception of meat quality and implications for product development in the meat sector—a review. Meat science 66(2):259-72.

Gutierrez Gonzales-Quijano R, Janer del Valle C, Janer del Valle M, Gutiérrez Rosales F, Vazquez Roncero A. 1977. Relationship between polyphenol content and the quality and stability of virgin olive oil. Grasas Aceites 28:101-6.

Higgins JP, Green S. 2008. Cochrane handbook for systematic reviews of interventions: Wiley Online Library.

Hoch SJ, Banerij S. 1993. When Do Private Labels Succeed? | MIT Sloan Management Review.

Hoogland CT, de Boer J, Boersema JJ. 2007. Food and sustainability: do consumers recognize, understand and value on-package information on production standards? Appetite 49(1): 47-57.

Hoyer WD. 1984. An Examination of Consumer Decision Making for a Common Repeat Purchase Product. Journal of Consumer Research 11(3):822-9.

Huang CL, Lin B-H. 2007. A Hedonic Analysis of Fresh Tomato Prices among Regional Markets. Review of Agricultural Economics 29(4):783-800.

i Furnols MF, Realini C, Montossi F, Sañudo C, Campo M, Oliver M, Nute G, Guerrero L. 2011. Consumer's purchasing intention for lamb meat affected by country of origin, feeding system and meat price: A conjoint study in Spain, France and United Kingdom. Food Quality and Preference 22(5):443-51.

Inarejos-Garcia AM, Androulaki A, Salvador MD, Fregapane G, Tsimidou MZ. 2009. Discussion on the objective evaluation of virgin olive oil bitterness. Food research international 42(2):279-84.

International Olive Oil Council. 2012. Table 4: Consumption.

International Olive Oil Council. 2015. World Olive Oil Figures.

Ioannidis C, Silver M. 1999. Estimating exact hedonic indexes: an application to UK television sets. Journal of Economics 69(1):71-94.

ISMEA. 2010. Report Economico Finanziario. Roma.

Janiszewski C. 1998. The Influence of Display Characteristics on Visual Exploratory Search Behavior. Journal of Consumer Research 25(3):290-301.

Jiménez-Guerrero JF, Mondéjar-Jiménez JA, Gázquez-Abad JC, Huertas-García R. 2012. Consumer preferences for olive-oil attributes: A review of the empirical literature using a conjoint approach: INTECH Open Access Publisher.

Johnston RJ, Roheim CA. 2006. A battle of taste and environmental convictions for ecolabeled seafood: A contingent ranking experiment. Journal of Agricultural and Resource Economics: 283-300.

Karipidis P, Tsakiridou E, Tabakis N. 2005. The Greek olive oil market structure. Agricultural Economics Review 6(1):64.

Kauppinen-Räisänen H, Luomala HT. 2010. Exploring consumers' product-specific colour meanings. Qualitative Market Research: An International Journal 13(3):287-308.

Kearney J. 2010. Food consumption trends and drivers. Philosophical transactions of the royal society B: biological sciences 365(1554):2793-807.

Keller KL. 1993. Conceptualizing, measuring, and managing customer-based brand equity. the Journal of Marketing:1-22.

Kennedy PE. 1981. Estimation with correctly interpreted dummy variables in semilogarithmic equations [the interpretation of dummy variables in semilogarithmic equations]. American Economic Review 71(4).

Kihlberg I, Johansson L, Langsrud Ø, Risvik E. 2005. Effects of information on liking of bread. Food Quality and Preference 16(1):25-35.

Klein B, Leffler KB. 1981. The role of market forces in assuring contractual performance. The Journal of Political Economy:615-41.

Koza BJ, Cilmi A, Dolese M, Zellner DA. 2005. Color enhances orthonasal olfactory intensity and reduces retronasal olfactory intensity. Chemical senses 30(8):643-9.

Krishnan HS. 1996. Characteristics of memory associations: A consumer-based brand equity perspective. International Journal of research in Marketing 13(4):389-405.

Krystallis A, Fotopoulos C, Zotos Y. 2006. Organic consumers' profile and their willingness to pay (WTP) for selected organic food products in Greece. Journal of International Consumer Marketing 19(1):81-106.

Krystallis A, Ness M. 2005. Consumer preferences for quality foods from a south European perspective: A conjoint analysis implementation on Greek olive oil. International Food and Agribusiness Management Review 8(2):62-91.

Kumar A, Kim Y-K. 2014. The store-as-a-brand strategy: The effect of store environment on customer responses. Journal of Retailing and Consumer Services 21(5):685-95.

Ladd GW, Martin MB. 1976. Prices and demands for input characteristics. American Journal of Agricultural Economics 58(1):21-30.

Ladd GW, Suvannunt V. 1976. A model of consumer goods characteristics. American Journal of Agricultural Economics 58(3):504-10.

Lancaster KJ. 1966. A new approach to consumer theory. The journal of political economy: 132-57.

Landon S, Smith CE. 1997. The use of quality and reputation indicators by consumers: the case of Bordeaux wine. Journal of Consumer Policy 20(3):289-323.

Lange C, Martin C, Chabanet C, Combris P, Issanchou S. 2002. Impact of the information provided to consumers on their willingness to pay for Champagne: Comparison with hedonic scores. Food Quality and Preference 13(7-8):597-608.

Laureati M, Bergamaschi V, Pagliarini E. 2014. School-based intervention with children. Peer-modeling, reward and repeated exposure reduce food neophobia and increase liking of fruits and vegetables. Appetite 83:26-32.

Laureati M, Jabes D, Russo V, Pagliarini E. 2013. Sustainability and organic production: How information influences consumer's expectation and preference for yogurt. Food Quality and Preference 30(1):1-8.

Laurent G, Kapferer J-N. 1985. Measuring Consumer Involvement Profiles.

Lazaridis P. 2004. Olive oil consumption in Greece: A microeconometric analysis. Journal of family and economic issues 25(3):411-30.

Lee PY, Lusk K, Mirosa M, Oey I. 2014. The role of personal values in Chinese consumers' food consumption decisions. A case study of healthy drinks. Appetite 73:95-104.

Leonetti L, Imami D, Stefanllari A, Zhllima E. 2009. The olive and olive oil value chain in Albania. Development Solution Associates (DSA), Tirana:4.

Lipsey MW, Wilson DB. 2001. Practical meta-analysis: Sage Publications, Inc.

Loureiro ML, McCluskey JJ. 2000. Consumer preferences and willingness to pay for food labeling: A discussion of empirical studies. Journal of Food Distribution Research 34(3): 95-102.

Loureiro ML, Umberger WJ. 2007. A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability. Food Policy 32(4):496-514.

Lozano-Sanchez J, Cerretani L, Bendini A, Segura-Carretero A, Fernandez-Gutierrez A. 2010. Filtration process of extra virgin olive oil: effect on minor components, oxidative stability and sensorial and physicochemical characteristics. Trends in food science & technology 21(4): 201-11.

Lusk JL. 2010. The effect of Proposition 2 on the demand for eggs in California. Journal of Agricultural & Food Industrial Organization 8(1).

Madau FA. 2009. Trends in the world olive-oil sector market. MPRA Paper, available at: http:// mpra. ub. uni-muenchen. de/26803/(accessed 10 July 2013).

Maguire KB, Owens N, Simon NB. 2004. The price premium for organic babyfood: a hedonic analysis. Journal of Agricultural and Resource Economics:132-49.

Maheswaran D, Mackie DM, Chaiken S. 1992. Brand name as a heuristic cue: The effects of task importance and expectancy confirmation on consumer judgments. Journal of Consumer Psychology 1(4):317-36.

Mane-Kapaj A, Kapajb I, Chan-Halbrendtc C, Totojanid O. 2010. Assessing the comparative advantage of Albanian olive oil production. International Food and Agribusiness Management Review 13(1).

Marchini A, Diotallevi F, Fioriti L. 2010. Le interdipendenze competitive nella vendita degli oli extravergine di oliva: un'analisi network-based [Competitive interdipendencies in olive oil selling: a network-based analysis]. University Library of Munich, Germany.

Martínez MG, Aragonés Z, Poole N. 2002. A repositioning strategy for olive oil in the UK market. Agribusiness 18(2):163-80.

McEwan JA. 1994. Consumer attitudes and olive oil acceptance: the potential consumer. Grasas y aceites 45(1-2):9-15.

McFadden D. 1974. Conditional logit analysis of qualitative choice behavior. Frontiers in econometrics:105-42.

Menapace L, Colson G, Grebitus C, Facendola M. 2008. Consumer preferences for extra virgin olive oil with country-of-origin and geographical indication labels in Canada.1-19.

Menapace L, Colson G, Grebitus C, Facendola M. 2011. Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market. European Review of Agricultural Economics 38(2):193-212.

Menotti A, Kromhout D, Blackburn H, Fidanza F, Buzina R, Nissinen A. 1999. Food intake patterns and 25-year mortality from coronary heart disease: Cross-cultural correlations in the Seven Countries Study. European Journal of Epidemiology 15(6):507-15.

Mili S. 2006. Olive oil marketing on non-traditional markets: prospects and strategies. NEW MEDIT (CIHEAM).

Mili S, Zúñiga MR. 2001. Exploring future developments in international olive oil trade and marketing: a Spanish perspective. Agribusiness 17(3):397-415.

Millstone E, Lang T, Naska A, Eames M, Barling D, van Zwanenberg P, Trichopoulou A. 2000. 'European Policy on Food Safety': Comments and suggestions on the White Paper on Food Safety. Trends in Food Science & Technology 11(12):458-66.

Mittal B. 1989. A Theoretical Analysis of Two Recent Measures of Involvement by Banwari Mittal.

Mittal B, Lee M-S. 1989. A causal model of consumer involvement. Journal of Economic Psychology 10(3):363-89.

Moher D, Liberati A, Tetzlaff J, Altman DG. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine 151(4): 264-9.

Monroe KB, Krishnan R. 1985. The effect of price on subjective product evaluations. Perceived quality 1:209-32.

Monteleone E, Carlucci A, Caporale G, Pagliarini E. 1997. Use of slope analysis to characterize consumer preference for virgin olive oil. Italian journal of food science 9(2):133-40.

Morales M, Rios J, Aparicio R. 1997. Changes in the volatile composition of virgin olive oil during oxidation: flavors and off-flavors. Journal of agricultural and food chemistry 45(7): 2666-73.

Morales MT, Aparicio R. 1999. Effect of extraction conditions on sensory quality of virgin olive oil. Journal of the American Oil Chemists' Society 76(3):295-300.

Morgan LA. 1985. The Importance of Quality. In: Jacoby J, Olson J, editors. Perceived Quality. Lexington, MA: Lexington Books. p. 61-4.

Moskowitz H, Gofman A, Beckley J. 2006. USING HIGH–LEVEL CONSUMER–RESEARCH METHODS TO CREATE A TOOL–DRIVEN GUIDEBOOK AND DATABASE FOR PRODUCT DEVELOPMENT AND MARKETING. Journal of sensory studies 21(1):54-100.

Mtimet N, Kashiwagi AK, Zaibet L, Masakazu N, N CM, All MN. 2008. Exploring Japanese olive oil consumer behavior Paper prepared for presentation at the 12 th EAAE Congress ' People , Food and Environments : Global Trends and European Strategies ', Exploring Japanese olive oil consumer behavior. (August):26-9.

Mtimet N, Kashiwagi K, Zaibet L, Masakazu N. 2009. Japanese olive oil consumer behavior: a conjoint analysis approach. Consumer behavior. New York: Nova Science Publisher:27-47.

Mtimet N, Ujiie K, Kashiwagi K. 2011. The effects of Information and Country of Origin on Japanese Olive Oil Consumer Selection.1-12.

Mtimet N, Zaibet L, Zairi C, Hzami H. 2013. Marketing olive oil products in the Tunisian local market: The importance of quality attributes and consumers' behavior. Journal of International Food & Agribusiness Marketing 25(2):134-45.

Nakano K, Kubo H, Matsumura S, Saito T, Fushiki T. 2013. Effects of aroma components from oxidized olive Oil on preference. Bioscience, biotechnology, and biochemistry 77(6):1166-70.

Nelson JP, Kennedy PE. 2009. The use (and abuse) of meta-analysis in environmental and natural resource economics: an assessment. Environmental and resource economics 42(3): 345-77.

Nielsen NA, Bech-Larsen T, Grunert KG. 1998. Consumer purchase motives and product perceptions: a laddering study on vegetable oil in three countries. Food Quality and Preference. p. 455-66.

Oude Ophuis PAM, Van Trijp HCM. 1995. Perceived quality: A market driven and consumer oriented approach. Food Quality and Preference 6(3):177-83.

Owen RW, Giacosa A, Hull WE, Haubner R, Würtele G, Spiegelhalder B, Bartsch H. 2000. Olive-oil consumption and health: the possible role of antioxidants. The lancet oncology 1(2): 107-12.

Pagliarini E, Badiale PS, Semeria L. 1994. Study of the subjective affective meaning and motivational aspects towards extra virgin olive oil. Grasas y aceites 45(1-2):65-7.

Palmquist RB. 1989. Land as a differentiated factor of production: A hedonic model and its implications for welfare measurement. Land economics:23-8.

Pan L-Y, Chiou J-S. 2011. How much can you trust online information? Cues for perceived trustworthiness of consumer-generated online information. Journal of Interactive Marketing 25(2):67-74.

Panico T, Del Giudice T, Caracciolo F. 2014. Quality dimensions and consumer preferences: A choice experiment in the Italian extra-virgin olive oil market. Agricultural Economics Review 15(2):100.

Panzone LA. 2011. The lost scent of Eastern European wines in Western Europe: A hedonic model applied to the UK market. British Food Journal 113(8):1060-78.

Parasuraman A, Zeithaml VA, Berry LL. 1988. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. Journal of Retailing.

Parmenter K, Wardle J. 1999. Development of a general nutrition knowledge questionnaire for adults. STOCKTON PRESS.

Peters-Texeira A, Badrie N. 2005. Consumers' perception of food packaging in Trinidad, West Indies and its related impact on food choices. International Journal of Consumer Studies 29(6):508-14.

Pettigrew S, Pescud M. 2013. The salience of food labeling among low-income families with overweight children. Journal of nutrition education and behavior 45(4):332-9.

Petty RE, Cacioppo JT. 1986. The Elaboration Likelihood Model of Persuasion. Advances in Experimental Social Psychology 19:123-205.

Piccolo D, Capecchi S, Iannario M, Corduas M. 2013. Modelling Consumer Preferences For Extra Virgin Olive Oil: The Italian Case. Pagri/iap 25.

Piqueras-Fiszman B, Ares G, Varela P. 2011. Semiotics and perception: Do labels convey the same messages to older and younger consumers? Journal of Sensory Studies 26(3):197-208.

Piqueras-Fiszman B, Spence C. 2015. Sensory expectations based on product-extrinsic food cues: an interdisciplinary review of the empirical evidence and theoretical accounts. Food Quality and Preference 40:165-79.

Pliner P, Hobden K. 1992. Development of a scale to measure the trait of food neophobia in humans. Appetite 19(2):105-20.

Poonnakasem N, Pujols KD, Chaiwanichsiri S, Laohasongkram K, Prinyawiwatkul W. 2016. Different Oils and Health Benefit Statements Affect Physicochemical Properties, Consumer Liking, Emotion, and Purchase Intent: A Case of Sponge Cake. Journal of food science 81(1):S165-S73.

Pupo D'Andrea M. 2007. Il mercato mondiale dell'olio di oliva: attori, dinamiche, prospettive e bisogni di ricerca. AGRIREGIONIEUROPA 3(10):20-6.

Ragaert P, Verbeke W, Devlieghere F, Debevere J. 2004. Consumer perception and choice of minimally processed vegetables and packaged fruits. Food Quality and Preference 15(3): 259-70.

Rahman I, Stumpf T, Reynolds D. 2013. A Comparison of the Influence of Purchaser Attitudes and Product Attributes on Organic Wine Preferences. Cornell Hospitality Quarterly 55(1): 127-34.

Ramirez-Tortosa MC, Granados S, Quiles JL, Yaqoob P. 2006. Chemical composition, types and characteristics of olive oil. Olive Oil and Health. Ed. Quiles JL, Ramirez-Tortosa CM, Yaqoob P., CAB International London:45-61.

Ranalli A, De Mattia G, Patumi M, Proietti P. 1999. Quality of virgin olive oil as influenced by origin area. Grasas y aceites 50(4):249-59.

Rastrelli L, Passi S, Ippolito F, Vacca G, De Simone F. 2002. Rate of degradation of α-tocopherol, squalene, phenolics, and polyunsaturated fatty acids in olive oil during different storage conditions. Journal of agricultural and food chemistry 50(20):5566-70.

Recchia A, Monteleone E, Tuorila H. 2012. Responses to extra virgin olive oils in consumers with varying commitment to oils. Food Quality and Preference 24(1):153-61.

Reynolds TJ, Gutman J. 1988. Laddering theory, method, analysis, and interpretation. Journal of advertising research 28(1):11-31.

Ribeiro JC, Santos JF. 2004. Portuguese olive oil and the price of regional products : does designation of origin really matter? : Universidade do Minho. Núcleo de Investigação em Políticas Económicas.

Ritchey PN, Frank RA, Hursti U-K, Tuorila H. 2003. Validation and cross-national comparison of the food neophobia scale (FNS) using confirmatory factor analysis. Appetite 40(2):163-73.

Roheim CA, Asche F, Santos JI. 2011. The elusive price premium for ecolabelled products: evidence from seafood in the UK market. Journal of Agricultural Economics 62(3):655-68.

Rollin F, Kennedy J, Wills J. 2011. Consumers and new food technologies. Trends in Food Science & Technology 22(2-3):99-111.

Romo Muñoz R, Lagos Moya M, Gil JM. 2015. Market values for olive oil attributes in Chile: a hedonic price function. British Food Journal 117(1):358-70.

Rosen S. 1974. Hedonic prices and implicit markets: product differentiation in pure competition. The journal of political economy:34-55.

Rothstein HR, Sutton AJ, Borenstein M. 2006. Publication bias in meta-analysis: Prevention, assessment and adjustments: John Wiley & Sons.

Sandalidou E, Baourakis G, Siskos Y. 2002. Customers' perspectives on the quality of organic olive oil in Greece: A satisfaction evaluation approach. British Food Journal 104(3/4/5): 391-406.

Santosa M, Abdi H, Guinard J-X. 2010. A modified sorting task to investigate consumer perceptions of extra virgin olive oils. Food Quality and Preference 21(7):881-92.

Santosa M, Guinard J-X. 2011. Means-end chains analysis of extra virgin olive oil purchase and consumption behavior. Food Quality and Preference 22(3):304-16.

Scarpa R, Del Giudice T. 2004. Market Segmentation via Mixed Logit: Extra-Virgin Olive Oil in Urban Italy. Journal of Agricultural & Food Industrial Organization 2(1).

Scarpa R, Philippidis G, Spalatro F. 2005. Product-country images and preference heterogeneity for Mediterranean food products: A discrete choice framework. Agribusiness 21(3):329-49.

Schifferstein HN, Kole AP, Mojet J. 1999. Asymmetry in the disconfirmation of expectations for natural yogurt. Appetite 32(3):307-29.

Schmidt JB, Spreng Ra. 1996. A Proposed Model of External Consumer Information Search. Journal of the Academy of Marketing Science 24:246-56.

Schuldt JP. 2013. Does green mean healthy? Nutrition label color affects perceptions of healthfulness. Health communication 28(8):814-21.

Scott V, Worsley AF. 1994. Ticks, claims, tables and food groups: A comparison for nutrition labelling. Health Promotion International 9(1):27-37.

Servili M, Esposto S, Fabiani R, Urbani S, Taticchi A, Mariucci F, Selvaggini R, Montedoro G. 2009. Phenolic compounds in olive oil: antioxidant, health and organoleptic activities according to their chemical structure. Inflammopharmacology 17(2):76-84.

Shimp TA, Sharma S. 1987. Consumer ethnocentrism: construction and validation of the CETSCALE. Journal of marketing research:280-9.

Sillani S, Esposito A, Del Giudice T, Caracciolo F. 2014. Le preferenze dei consumatori della provincia di Trieste per l'olio extra vergine di oliva d'alta gamma. Economia Agro-alimentare.

Silver M. 1999. An evaluation of the use of hedonic regressions for basic components of consumer price indices. Review of Income and Wealth 45(1):41-56.

Simpson R, Pearson K. 1904. Report on certain enteric fever inoculation statistics. The British Medical Journal:1243-6.

Soler F, Gil JM, Sánchez M. 2002. Consumers' acceptability of organic food in Spain: Results from an experimental auction market. British Food Journal 104(8):670-87.

Solinas M, Di Giovacchino L, Mascolo A. 1978. I polifenoli delle olive e dell'olio d'oliva. Nota III: Influenza della temperatura e della durata della gramolatura sul contenuto in polifenoli degli oli. Riv. Ital. Sost. Grasse 55:19-23.

Stark AH, Madar PZ. 2002. Olive oil as a functional food: epidemiology and nutritional approaches. Nutrition reviews 60(6):170-6.

Steenkamp J-BEM. 1990. Conceptual model of the quality perception process. Journal of Business Research 21(4):309-33.

Stefani G, Romano D, Cavicchi A. 2006. Consumer expectations, liking and willingness to pay for specialty foods: Do sensory characteristics tell the whole story? Food Quality and Preference 17(1):53-62.

Szathvary S, Trestini S. 2014. A Hedonic Analysis of Nutrition and Health Claims on Fruit Beverage Products. Journal of Agricultural Economics 65(2):505-17.

Thompson SG, Sharp SJ. 1999. Explaining heterogeneity in meta–analysis: a comparison of methods. Statistics in medicine 18(20):2693-708.

Tirole J. 1996. A theory of collective reputations (with applications to the persistence of corruption and to firm quality). The Review of Economic Studies:1-22.

Tregear A, Arfini F, Belletti G, Marescotti A. 2007. Regional foods and rural development: the role of product qualification. Journal of Rural studies 23(1):12-22.

Trichopoulou A, Kyrozis A, Rossi M, Katsoulis M, Trichopoulos D, La Vecchia C, Lagiou P. 2014. Mediterranean diet and cognitive decline over time in an elderly Mediterranean population. European journal of nutrition.

Tripoli E, Giammanco M, Tabacchi G, Di Majo D, Giammanco S, La Guardia M. 2005. The phenolic compounds of olive oil: structure, biological activity and beneficial effects on human health. Nutrition research reviews 18(1):98-112.

Tsakiridou E, Mattas K, Tzimitra-Kalogianni I. 2006. The influence of consumer characteristics and attitudes on the demand for organic olive oil. Journal of International Food & Agribusiness Marketing 18(3-4):23-31.

Tsimidou MZ, Georgiou A, Koidis A, Boskou D. 2005. Loss of stability of "veiled"(cloudy) virgin olive oils in storage. Food chemistry 93(3):377-83.

Tuorila H, Meiselman HL, Bell R, Cardello AV, Johnson W. 1994. Role of sensory and cognitive information in the enhancement of certainty and linking for novel and familiar foods. Appetite 23(3):231-46.

Underwood RL, Klein NM, Burke RR. 2001. Packaging communication: attentional effects of product imagery. Journal of Product & Brand Management 10(7):403-22.

Van der Lans IA, Van Ittersum K, De Cicco A, Loseby M. 2001. The role of the region of origin and EU certificates of origin in consumer evaluation of food products. European Review of Agricultural Economics 28(4):451-77.

Van Herpen E, Van Trijp HC. 2011. Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. Appetite 57(1):148-60.

van Trijp HCM, Hoyer WD, Inman JJ. 1996. Why Switch? Product Category: Level Explanations for True Variety-Seeking Behavior. Journal of Marketing Research:281-92.

Van Wezemael L, Caputo V, Nayga RM, Chryssochoidis G, Verbeke W. 2014. European consumer preferences for beef with nutrition and health claims: A multi-country investigation using discrete choice experiments. Food Policy 44:167-76.

Verbeke WAJ, Viaene J. 1999. Ethical Challenges for Livestock Production:Meeting Consumer Concerns about Meat Safety and AnimalWelfare. Journal of Agricultural and Environmental Ethics 12(2):141-51.

Verneau F, Caracciolo F, Coppola A, Lombardi P. 2014. Consumer fears and familiarity of processed food. The value of information provided by the FTNS. Appetite 73:140-6.

Vidal L, Antúnez L, Sapolinski A, Giménez A, Maiche A, Ares G. 2013. Can Eye–Tracking Techniques Overcome a Limitation of Conjoint Analysis? Case Study on Healthfulness Perception of Yogurt Labels. Journal of Sensory Studies 28(5):370-80.

Wang X, Li D. 2012. A dynamic product quality evaluation based pricing model for perishable food supply chains. Omega 40(6):906-17.

Wansink B, Park S-B. 2002. Sensory suggestiveness and labeling: Do soy labels bias taste? Journal of Sensory Studies 17(2002):483-91.

Wansink B, Westgren RE, Cheney MM. 2005. Hierarchy of nutritional knowledge that relates to the consumption of a functional food. Nutrition 21(2):264-8.

Ward RW, Briz J, de Felipe I. 2003. Competing supplies of olive oil in the German market: An application of multinomial logit models. Agribusiness 19(3):393-406.

Werblow JA, Fox HM, Henneman A. 1978. Nutritional knowledge, attitudes, and food patterns of women athletes. Journal of the American Dietetic Association 73(3):242-5.

Willett WC, Sacks F, Trichopoulou A, Drescher G, Ferro-Luzzi A, Helsing E, Trichopoulos D. 1995. Mediterranean diet pyramid: a cultural model for healthy eating. The American journal of clinical nutrition 61(6):1402S-6S.

Wilson WW. 1984. Hedonic prices in the malting barley market. Western Journal of Agricultural Economics:29-40.

Woese K, Lange D, Boess C, Bögl KW. 1997. A Comparison of Organically and Conventionally Grown Foods—Results of a Review of the Relevant Literature. Journal of the Science of Food and Agriculture 74(3):281-93.

Yangui A, Costa Font M, Gil Roig JM. 2014. Revealing additional preference heterogeneity with an extended random parameter logit model: the case of extra virgin olive oil. Spanish journal of agricultural research 12(3):553-67.

Yangui A, Font MC, Gil JM. 2013. The effect of food related personality traits and lifestyle orientation on consumer's behavior related to extra virgin olive oil: estimation of an extended hybrid choice model. 4th International Conference of the African Association of Agricultural Economists. p. 22-5.

Yangui A, Gil JM. 2014. Revealing additional preference heterogeneity with an extended random parameter logit model : the case of extra virgin olive oil. Spanish Journal of Agricultural Research 12(3):553-67.

Zaichkowsky JL. 1987. The Emotional Affect of Product Involvement.

Zanoli R, Naspetti S. 2002. Consumer motivations in the purchase of organic food. British Food Journal 104(8):643-53.

Zeithaml VA. 1988. Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. The Journal of marketing:2-22.