Consumers' Valuation for European food quality labels: Importance of Label Information Provision

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1. Introduction

The demand for credence attributes in food products has been increasing in recent years due to consumers' interest in food safety, health, and the environment. However, asymmetric information issues frequently arise in markets mostly characterized by credence attributes, which cannot be directly observed by consumers even after purchase. Therefore, specific information cues provided to consumers might increase their awareness about the quality characteristics of food products. According to Unnevehr et al. (2011), information is crucial for determining, maintaining, and communicating food product quality, differentiation, and safety. In this context, food labels could mitigate the imperfect information problems, promoting market incentives (Caswell & Padberg, 1992; Unnevehr et al. 2011) and highlighting product attributes that may be desirable for specific niche markets (Golan et al. 2001; Unnevehr et al. 2011). Two of the labels that have recently received extensive attention among policy makers, firms, and consumers are "geographical origin" and "organic farming" labels. Informing consumers of the origin of food products via labelling is motivated by the presence of a link between the area of production and the quality attributes of the product. For instance, a specific area of production could be considered as a determinant of a product's quality (Menapace et al., 2011). In fact, the European Union has provided protection to specific quality characteristics connected with the place of origin of the food product and special methods of production through the implementation of labeling systems (EC Regulation 510/06; EC Regulation 834/2007). The basic categories of labels recognized in these regulations are the two geographical indications (GI) labels: Protected Designation of origin (PDO) and the Protected Geographical Indication (PGI), and the Organic Farming label. According to the European Community Regulations, a PDO refers to an agricultural or food product which is produced, processed and prepared in a defined geographical area, while a PGI label describes a product that is produced *and/or* processed *and/or* prepared in a defined geographical area. Finally, the organic farming label identifies products containing at least 95% of ingredients produced by organic production methods, which respects natural systems and cycles excluding the use of genetically modified organisms (GMO) and chemicals.

The presence of these food labels on food products should facilitate consumers' identification of specific quality attributes, for which they reveal a particular sensitivity and interest. However, consumers appear to be confused and disoriented with the interpretation of the contents of European labels with regard both to organic farming and GI labels (Aprile et al. 2009; Carbone and Sorrentino, 2003). This observation confirms the fact that the presence on the European market of labels highlighting peculiar features of food quality cannot completely fill the information gap between consumers and producers and, thus, solve asymmetric information problems. According to Freebairn (1967), when consumers are uncertain about product quality, the provision of information can help to better align choices with preferences.

While several studies have assessed consumers' preferences and willingness to pay (WTP) for GIs or for organic food products, no other known studies have investigated how consumer preferences and WTP

change when information on the meaning of the labels is provided. This study extends literature of consumer preferences for European quality labels in two ways: first, we evaluated the trade-off between labels bearing geographical indication, organic farming labels, and organoleptic properties of olive oil; second, it contributes to the analysis of the effects of information on the structure of consumers' preferences and WTP in food labeling market research. While a number of studies have focused on how information on health and nutrition affects consumer demand of food products (e.g., Capps and Schmitz, 1991; Chern, et al. 1995; Ippolito and Mathios, 1993) as well as on how the supply of information on food safety and technology issues through media affects consumers preferences (e.g., Verbeke et al. 2000), no known studies have investigated empirically the effect of provision of information about the meaning of European quality labels on consumers' choice.

To fill this void, we carried out a choice experiment (CE) survey to assess consumers' valuation for EU quality labels (PDO, PGI, and Organic Farming). Also, to test differences in consumers' preferences across uninformed and informed choices, we included two different treatments in our CE survey: with and without information about the meaning of the labels.

The paper is organised as follows: in the next sections we briefly review the previous literature about PDO, PGI, and organic farming labels, followed by a discussion of the experimental methods and procedures, the empirical model, and results of the analysis, conclusions.

2. Background

Growing attention has been paid in the literature to the role of GI labels as an important tool to communicate quality aspects of food products. According to Loureiro and Umberger (2007), the presence of such labels in the market allows consumers to identify a type of producer to whom they would relate more closely. Markovina and Caputo (2010) have shown that even when consumers reveal a strong preference for domestic food products, the country of origin label is an important attribute that can influence consumers' buying decisions. In this context, the GI labels have received extensive attention in the economics and marketing literature. Several empirical studies have been conducted to investigate on consumers' preferences and WTP for GI labels, with a specific reference to some official regional designations protected by the EU regulation such as PDO and PGI, which inform consumers that the name of the regional product is protected and that the regional product is authentic (EC Regulation No. 510/2006).

Loureiro and McCluskey (2000), using a hedonic approach, calculated consumers' WTP for fresh meat products bearing PGI label. Their results show that the PGI label is an effective signal of quality only in combination with other indicators or quality signals such as a high price level.

Bonnet and Simioni (2001), in a study carried out to evaluate consumers' WTP for French Camembert cheese displaying a PDO label and a brand, found that consumers' preferences are more affected by the presence of a brand than a PDO label. In fact, at the same price, only a small proportion of consumers would prefer to buy a similar Camembert brand with a PDO label than without it.

Van Ittersum et al. (2007) investigated consumer's image of the regional certification labels with regard to PDO label and proposed a model that relates this image to consumer's willingness to buy and pay for protected regional products. They found that consumer's image of regional certification labels consists of a quality guarantee and an economic support dimensions, which positively relate to consumers' willingness to buy and pay for the protected regional product.

A number of studies have also investigated consumers' valuation for GI labels in olive oil products. In particular, Menapace et al. (2011), based on the importance of GI labels as an information tool, investigated whether Canadian consumers of extra virgin olive oil recognise and value the informational content of a variety of GI labels with different levels of geographical differentiation with regard to PDOs

and PGIs. They found that Canadian consumers are willing to pay an additional premium for GI labelled olive oils. However, Canadian consumers valued extra virgin olive oil bearing a PDO label more than PGI bearing olive oil although the result is not as strong as that found for GIs versus non-GIs.
Krystallis and Ness (2005), from a consumer's survey carried out in Greece found that several consumer segments attach a great importance to the PDO certified brand and the organic label as relevant cues for the purchase of high quality olive oils.
Santos and Ribeiro (2005), using a hedonic price function, found that Portuguese consumers resort to the use of the region of origin cue as a surrogate quality index when it is not possible to distinguish objectively between products on the basis of intrinsic quality. With regard to the olive oil, their results indicate that consumers are willing to pay up to a 30 percent price premium for GIs labels, such as PDO.
Van der Lans et al. (2001), in a study conducted to test whether certified denominations of origin are perceived by consumers as a quality signal, highlighted the significant effect of PDO label on Italian consumers' preferences as an indicator of the oil's quality. They found that PDO labels only affect consumer preferences indirectly through their perception of the oil's quality without any direct effect.
Finally, Scarpa and Del Giudice (2004), using a choice experimental approach to assess Italian consumers' preferences and WTP for extra virgin olive oil in Italy, found out that origin of the product matters and that there is a bias in preferences towards local products. Specifically, they revealed that certified oil from the south of Italy is more frequently preferred in the south than in the north of Italy.
None of these studies, however, investigated the effect of provision of information about the meaning of food quality labels. Considering the distinct possibility that many consumers do not know how to interpret these labels, there is a need to find out if provision of information about the meaning of these labels can influence consumer choice or WTP.

3. Experimental methods and procedures

We designed a CE survey to test whether the provision of information about the meaning of European quality labels and other quality cues affect consumers' preferences and WTP for such labels. The CE approach is used because it presents subjects with a choice that explicitly highlights the trade-off among different attributes that often have to be evaluated in actual purchasing decision, allowing simultaneously valuation of different attributes. In addition, it is consistent with random utility theory (McFadden, 1974) and Lancaster theory of consumer demand (Lancaster, 1966), which posit that utilities for goods can be decomposed into separate utilities for their component characteristics or attributes. Using olive oil as our product of interest, we assess consumers' preferences and valuation for a set of European quality labels (i.e., geographical indication labels and organic farming label) and other quality cues (i.e., price and type of olive oil). We choose olive oil as the product since it is a traditional component of the Mediterranean diet, widely adopted throughout Italy, and quite essential to the sustainability of the rural economy of southern Italy (Scarpa & Del Giudice). For each of these attributes we considered different levels. Two levels were considered for the European organic farming label (present /absent), three for the European geographical indication labels (PDO, PGI, and absent), and two levels for the quality cue describing the type of olive oil: virgin and extra-virgin. Finally, four price levels were chosen to reflect the current price levels found in Italian supermarkets (3.50 Euros, 5.50 Euros, 7.50 Euros, and 9.50 Euros) per a liter of olive oil.
The choice set design follows Street and Burgess (2007). First, a fractional factorial design was performed to reduce the 48 original possible combinations of attributes and levels ($4x3x2^2$), resulting in 16 'treatments'. Then, starting from this fractional factorial design, the generators for four attributes with 4, 3, 2 and 2 levels and two alternatives suggested by Street and Burgess (2007) were used to obtain a practical set of profiles for the choice experiment. Eighteen pairs are obtained after discarding

duplicates, leading to a 96.7% efficient design based on D-efficiency. To avoid fatigue effects associated with multiple scenario valuation tasks, the 16 choice sets were randomly split into 2 blocks of 8 choices. Using the choice sets obtained from the experimental design, two hypothetical surveys were carried out, each with same number of subjects. The first is what we term *olive oil survey without information,* in which people were asked to select among three options: two product profiles that differed by a series of attributes, and one no buy option considering that some respondents might choose this option when shopping. The second, named *olive oil survey with information* was devoted to providing background information on the meaning of the labels used to describe the olive oil right before the choice questions. In terms of background, the following information was provided:

▪ *Definition of PDO label*. According to the Council Regulation (EC) No 510/2006 of 20 March 2006, a *PDO* label **(*Protected Designation of Origin*)** covers agricultural products and foodstuffs which are produced, processed and prepared in a defined geographical area – region, a specific place or, in exceptional cases, a country - whose quality or characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors.
▪ *Definition of PGI label.* According to the Council Regulation (EC) No. 510/2006 of 20 March 2006, a *PGI* label **(*Protected Geographical Indication*)** covers agricultural products and foodstuffs closely linked to a defined geographical area. At least one of the stages of production, processing or preparation takes place in the area. These products possess a specific quality, reputation or other characteristics attributable to the geographical origin.
▪ *Definition of Organic farming label.* According to the Council Regulation (EC) No. 834/2007 of 28 June 2007, the ***Organic Farming*** label identifies agricultural products which are obtained from an overall system of farm management and food production that combines environmental practices in line with the respect of nature's systems and cycles, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method which uses natural substances and processes excluding the use of genetically modified organisms (GMO) and chemicals. Besides, this label covers foodstuffs which contain 95% of ingredients of organic agricultural origin.
▪ *Definition of extra-virgin olive oil*. According to the Council Regulation (EC) No. 1513/2001 of 23 July 2001, ***an extra virgin olive oil*** is a superior-category of olive oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions that do not lead to alterations in the oil, which have not undergone any treatment other than washing, decantation, centrifugation or filtration, to the exclusion of oils obtained using solvents or using adjuvants having a chemical or biochemical action, or by re-esterification process and any mixture with oils of other kinds. Virgin olive oil having a maximum free acidity, in terms of oleic acid, of 0.8 g per 100 g.
▪ *Definition of virgin olive oil.* According to the Council Regulation (EC) No. 1513/2001 of 23 July 2001, ***a virgin olive oil*** is an olive oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions that do not lead to alterations in the oil, which have not undergone any treatment other than washing, decantation, centrifugation or filtration, to the exclusion of oils obtained using solvents or using adjuvants having a chemical or biochemical action, or by re-esterification process and any mixture with oils of other kinds. Virgin olive oil having a maximum free acidity, in terms of oleic acid, of 2 g per 100 g.
▪ *Price.* ***Prices*** refer to a liter of extra virgin or virgin olive oil.

The questionnaire was pre-tested on a small sample of individuals (i.e., 30 people), with the goal of testing the appropriateness of the chosen attributes and the clarity of the questions. The final version of the survey instrument contained the CE questions and other questions regarding local foods consumption and socio-demographics characteristics in both treatments. Also, given the hypothetical nature of our CE investigation and the possible presence of hypothetical bias related with this type of

studies, we included a cheap talk script. Following Silva et al. (2011), our script is generic, short enough to be applied in a retail survey, and neutral with respect to the direction of hypothetical bias[1].

4. Data and results: sample socio-economic characteristics, empirical model, Estimates Willingness-to-pay

4.1 Sample socioeconomic characteristics

Face to face surveys were conducted during summer 2010 in Naples, Italy. About 400 adult food shoppers, 200 for each treatment, were randomly selected in different grocery stores. Interviewers approached the randomly selected participants and asked them a screening question related to whether they purchase and consume olive oil. As the population can be considered infinite, our sample size results in a sampling error of about +/- 7%, with a confidence level of 95.5% (k=2), assuming p=0.5. Summary statistics of the demographic characteristics of the sample are reported in table 1. The majority of respondents are females (58%); the majority of respondents are between 30 – 44 years old (36.3%) with an annual household income between € 15,000 and € 29,999, and their higher education level included a high school degree.

Table1. Socio-demographic characteristics of the sample, sample size (N) = 400

Socio-demographic characteristic (% of total)			
Gender		**Educational level**	
Male	42%	Primary school	2.8%
Female	58%	Secondary school	13.3%
Age groups		High school	47.8%
18-29 years	22%	College degree	36.3%
30-44 years	36.3%	Professional Degree (Masters, PhD)	0.3%
45-64 years	34.3%	**Average household income** (missing data=1.3%)	
65-74 years	6.5%	Less than €15,000	13.5%
75 years or older	1.%	€15,000 - €29,999	39%
Marital status		€30,000 - €44,999	32.5%
Single	36.3%	€45,000 - €59,999	8%
Married	57.5%	€60,000 - €89,999	4.5%
Other	6.3.%	€90,000 - €120,000	0.8%
		More than €120,000	0.5%

Our sample appears to be consistent with the demographic characteristics of the Neapolitan population detected by the last Italian census. For instance, according to the Italian census of 2001 (www.comunedinapoli.it), the Neapolitan population consists of 47.85% males and 52.15% of females; 29.66% of the population are within the 25-40 age range and 50.53% of the population have a high school degree.

4.2 Empirical model

Consumers' preference for the European quality labels is analyzed within a choice modelling framework, using a mixed logit error component model (MxLEC). We used the MxLEC model since it allows us to investigate the heterogeneity in preferences across individuals and to test for correlation

[1] The cheap talk script used is available upon request.

across utilities. The final specification of the utility function includes an alternative-specific constant representing the no buy choice options and the other olive oil attributes. The utility function is:

$$U_{nj} = \alpha_0 + \alpha_1 * p_{nj} + \beta'_{nj} * x_{nj} + \sigma_j + \varepsilon_{nj}$$

where *p* is price, which is treated as continuous variables; *x*'s are the other olive oil attributes such as PDO, PGI, organic farming, and extra virgin olive oil, which are coded as dummy variables that take the value of 1 if they are present in option j and 0 otherwise; $\sigma_j = \grave{\mu} z_j$ is the error components that induce heteroskedasticity and correlation over alternatives in the unobserved portion of utility; and ε_{nj} is the error term. As in Revelt and Train (1998), we assume the price coefficients are invariant across individuals, whereas the coefficients of the other olive oil attributes and levels are assumed as random parameters with a normal distribution, such as $\beta_{nj} = \beta_j + \Gamma v_{nj}$, where the coefficients β_j is the mean of attribute preferences across all individuals in the sample, Γ_j is the lower triangular matrix, and v_{nj} is the random term with mean vector zero and covariance matrix I. In addition, in order to test for correlation across taste parameters (Scarpa & Del Giudice, 2004; Barreiro-Hurle et al., 2010), we estimate the Cholesky matrix of the random parameters, with a full covariance matrix of the random parameter equal to $\Sigma = \Gamma \Gamma`$. In each treatment, we estimated the MxLEC model using 1600 observations, based on responses from 200 individuals performing 8 choice tasks each, with three options per choice task for a total of 4800 alternatives to be evaluated. For the estimation, 500 Halton draws rather than random draws are used since the former provides a more efficient simulation for this model (Train, 2003). Results from both treatments (without and with information) (see tables 2) suggest that the hypothesis that all parameters are zero is rejected by a likelihood ratio test (p-value < 0.01).

Table 2. MxLEC estimates for *hypothetical olive oil surveys without and with information.*

	Hypothetical Surveys	
	without information	***with information***
Variables		
No buy	-1.76*	-1.07*
	(0.24)	(0.28)
Price	-0.25*	-0.35*
	(0.02)	(0.02)
PDO	1.22*	1.79*
	(0.21)	(0.22)
PGI	1.36*	0.86*
	(0.22)	(0.17)
Organic farming	1.02*	1.42*
	(0.18)	(0.18)
Extra-virgin	1.56*	0.69*
	(0.19)	(0.09)
Standard deviations of parameter distributions		
PDO	1.11*	1.26*
	(0.21)	(0.24)
PGI	1.26*	1.00*
	(0.21)	(0.30)
Organic farming	1.32*	1.63*
	(0.37)	(0.36)
Extra Virgin	1.56*	0.80*
	(0.37)	(0.11)
Standard deviation of the latent random effect		
σ_ε	2.29*	1.83*
	(0.31)	(0.20)
Log likelihood	-1307.82	-1265.54

N	1600	1600

*****statistically significance at the 0.01 level or higher.
[a] Number in parentheses are standard error.

Moreover, the hypothesis of correlation across utility is verified since the σ_ε for the alternative specific constants is statistically significant. All price coefficients and the constants (α_0) are negative, as expected, and statistically significant at the 0.01 level; hence the utility that consumers derive from choosing none of the proposed alternative products (alternative C) is lower than the utility from buying one of them (A or B) at the given prices. Also, increasing increments on the price are associated with a lower likelihood of purchase. All other remaining coefficients are positive and different from zero at the 0.01 significance level. In particular, with regard to the treatment or survey without information (first column of table 2), results suggest an increasing probability of consumers choosing olive oil alternatives possessing label bearing extra-virgin olive oil expressions, followed by PGI, PDO, and organic farming labels. On the other hand, in the treatment or survey with information (second column of table 2), consumer utility increases when a PDO label is present followed by the presence of other attributes such as *organic* farming, PGI, and extra-virgin olive oil labels. In both treatments, the hypothesis of heterogeneity of consumers' preferences is confirmed since the derived standard deviations of the coefficients are statistically significant at the 0.01 level. To further evaluate preference heterogeneity, we also examined estimates of the Cholesky matrices (appendix A). As shown, the presence of some significant correlation across attributes is detected in the diagonal value of the Cholesky matrix obtained from MxLEC models, indicating that preferences for the olive oil attributes vary across consumers and suggesting that some random parameters are indeed correlated. For example, in the treatment without information, the diagonal Cholesky values indicate that the correlation between extra – virgin and PDO labels is negative, while the correlation between extra-virgin olive oil label and organic farming label is positive. These findings may suggest that people, who place more emphasis on extra-virgin olive oil, might associate higher organoleptic properties of the product with organic production method rather than with a geographical area. On the other hand, the positive and statistical significance of diagonal Cholesky elements for PDO and organic farming labels in the treatment with information suggests that PDO and organic farming labels are preference complements in the sense that preference intensities for these attributes across consumers move in the same direction. Thus, when people are informed about the meaning of these labels, they show particular attention to origin and production method aspects. In fact, organic farming and Extra-virgin olive oil labels are negatively correlated, suggesting that consumers with relatively high preferences for organic farming labels, which describe the production method used to produce the olive oil, tend to dislike information related to organoleptic property of the olive oil, and vice-versa.

4.3 Estimates of Willingness-to-pay: the effects of information

A distribution of 1,000 WTP values for each label was generated using a Krinsky & Robb (1986) bootstrapping method. In particular, the 1,000 observations were drawn from a multivariate normal distribution parameterized by using the estimated means and variance from the MxLEC model estimated for each CE survey. The means and 95% confidence intervals of simulated WTP for each label across the two treatments are reported in table 3. The WTP for the labels without information are presented in the first column of Table 3.

Table 3. Consumers WTP for olive oil attributes [95% confidence intervals] – (WTP value are in €/liter)

Attribute	$WTP_{without\_info}$	WTP_{with_info}	p-value
PDO	4.96	5.17	0.57
	[2.27, 9.16]	[3.10, 8.07]	

PGI	5.56	2.50	0.00
	[2.83, 8.67]	[0.83, 4.26]	
Organic farming	4.18	4.11	0.48
	[1.90, 7.16]	[2.52, 5.96]	
Extra –virgin	6.39	2.00	0.00
	[3.71, 10.24]	[1.24, 2.98]	

By examining the magnitudes of the means of the WTP values and the overlapping of the confidence interval levels, our results suggest that respondents who were not provided any information about the meaning of the labels are willing to pay the highest premium price for labels indicating: *extra-virgi*n olive oil, followed by *PGI, PDO,* and, *Organic farming* labels. On the other hand, respondents who were given information about the meaning of the labels (second column of table 3) tend to have greater WTP for the *PDO, organic farming*, and *PGI* labels than the *extra-virgin* olive oil label. Non-parametric tests comparing consumers' WTP for each label across the two treatments are also reported in table 3. As in Lusk and Schroeder (2004), we used the computational method suggested by Poe et al. (2001) to measure differences of empirical WTP distribution across the two treatments. Specifically, a combinatorial test is carried out by comparing the 1,000 bootstrapped values from the "without information" WTP for each label and MxLEC model with the 1,000 bootstrapped values from the "with information" WTP for the same label and econometric model. Thus, 1,000*1,000=1,000,000 differences in WTP are obtained for each simulated WTP. The third column of table 3 shows that the p-value associated with the one-tailed test in the "without information" WTP distribution of each label is greater (or less) than the "with information" WTP distribution of the corresponding labels. Results suggest that changes in consumers' valuation for olive oil attributes across the two treatments are related either to the relative importance attached to each olive oil label or to the magnitudes of the WTP estimates. However, according to the parametric test, results also show that only the differences in WTP between PGI and extra-virgin olive oil labels are statistically significant across the two treatments. On the other hand, differences in consumers' valuation between PDO and Organic farming labels are not statistically significant. The fact that consumers' valuation for PGI label changes in a significant way across the treatments might suggest that consumer's confidence on the PGI label is lower than that on PDO and organic farming labels; thus, consumers valuation for the European quality labels depends on their knowledge about the meaning of the labels. With regards to the label "extra-virgin" olive oil, consumers' WTP decreases in a statistically significant way in the "with information" treatment, where such label became less preferred than in the "without information" treatment. This result might suggest that for informed consumers, the presence of labels such as PDO or organic farming might become a proxy for other quality characteristics. Specifically, consumers might perceive PDO and organic labels as a guarantee for the presence of other quality aspects of olive oil such as organoleptic properties.

5. Conclusion

A number of studies have been conducted on consumers' preferences and WTP for credence attributes displayed on food labels. However, the presence on the market of labels highlighting peculiar features of quality products might not completely fill the information gap between consumers and producers and, thus, solve asymmetric information problems. Consumers' acceptability of food labeling programs may depend on the level of available information on the market and on consumers' awareness of the food characteristics guaranteed by such labels. According to Lusk & Briggeman (2009), when people have little knowledge or experience on food product attributes, the corresponding measured preferences may be less stable. This seems to be case for the PDO, PGI, and organic farming labels in Europe. Consumers are confused and disorientated by the meaning of these labels (Aprile et al. 2009; Carbone

and Sorrentino, 2003). Consequently, the European Commission is developing strategic initiatives to facilitate information flows between farmers, buyers and consumers to improve and simplify these food quality related labels. An example is represented by the geographical indication European schemes for which the Commission plans to simplify the existing system by creating a single register that brings together PDO and PGI labels. However, while several studies have been done to estimate consumers' preferences and WTP for such labels, no other known study has directly examined how consumers' WTP changes when information on the meaning of specific food labelling programs is provided to them. To achieve this objective, we designed and conducted a CE survey and analyzed the data using the MxLEC model. We used olive oil as a product of interest. Specifically, we displayed on this product a series of labels indicating: price (3.50 Euros, 5.50 Euros, 7.50 Euros, and 9.50 Euros); European geographical indication (PDO, PGI, and absent); European organic farming (present/absent); and type of olive oil (extra/virgin). Finally, using the same product profiles, we carried out two treatments or surveys: one in which information on the meaning of the labels was provided right before the presentation of the choice questions (treatment *with information*); and another one without any information on the labels *(treatment without information*).

Results generally suggest that both kinds of European quality labels – Geographical Indication (i.e., PDO, PGI) and Organic Farming - and quality cues describing the organoleptic properties of olive oil positively affect consumers' choice. However, there are important differences in results between the "with information" and "without information" treatments. In the "without information" treatment, our respondents revealed that they are willing to pay the highest premium price for labels indicating extra-virgin olive oil, followed by PGI, PDO, and Organic Farming labels. On the other hand, respondents in the "with information" treatment tend to value PDO label the most, followed by Organic farming and PGI labels. In this treatment, the label for extra-virgin olive oil was not valued as much as the other labels. Thus, consumers' WTP changed in an economically important way when information on the meaning of the labels was provided to respondents. Specifically, according to the non parametrical combinatorial test, changes in WTP are found to be statistically significant for "extra-virgin" and PGI olive oil labels, while differences in WTP for PDO and organic farming labels are found not to be statistically significant. The observed changes in consumers' valuation for PGI label across the two treatments might be linked to a lower consumer's confidence on PGI label compared to the PDO and Organic farming labels. This finding is consistent with the hypothesis that consumers' valuation for European quality labels is directly linked to the level of knowledge about the meaning of these labels. It is possible that when consumers are informed about the meaning of the labels, the PDO and organic farming labels are perceived to be a proxy for organoleptic properties, thereby reducing the value attached to labels displaying "extra – virgin" in olive oil.

Our results generally confirm the current debate surrounding the EU Green Paper, which reflects the general public discontent of the status-quo. In fact, it seems that the presence of food quality labels has not solved the asymmetric information problems between consumers and producers, resulting to a persistent information gap for consumers. Thus, strategic orientations need to be improved by the European Union in terms of the communication of the certification and labeling programs. Also, from a producers' prospective, our findings suggest the need to accompany the presence of such labels with additional information about the meaning of these labels since consumers seem to value food quality labeled products more if accompanied by information about the meaning of the labels.

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Appendix A: ***Cholesky Matrix from* MxLEC *models****

Table A.1. Cholesky Matrix from MxLEC estimates in survey without information

	1	*2*	*3*	*4*
PDO (1)	1.00			
PGI (2)	**-1.09344**	1.00		
Organic farming (4)	0.36305	**0.67736**	1.00	
Extra-virgin(5)	**- 0.97687**	0.68514	**0.89009**	1.00

*Parameters in bold are statistically significant at 0.05 level or higher

Table A.2. Cholesky Matrix from MxLEC **estimates in survey with information**

	1	*2*	*3*	*5*
PDO (1)	1.00			
PGI (2)	-0.38424	1.00		
Organic farming (4)	**0.54693**	**0.55975**	1.00	
Extra-virgin(5)	**-0.35836**	-0.18932	**-0.33896**	1.00

*Parameters in bold are statistically significant at 0.05 level or higher.