Review of Economics & Finance
Submitted on 21/09/2017
Article ID: 1923-7529-2018-03-39-16

Italian Extra-Virgin Olive Oil: Impact on Demand on Being Market Leaders, Private Labels *or* Small Producers

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Abstract: This paper proposes a quantitative analysis of extra-virgin olive oil's market designed to study the intra-sector competition and to analyze the profitability of pricing strategies for different types of companies: small producers, large manufacturers and Private Labels.

The analysis focuses on trade within the modern grocery sector, which represents the first distribution channel of extra-virgin olive oils at the national level.

The study refers to the theory of industrial organization and, through the demand estimation, measures the price-cost margins. The most important results relate to the concerns of the smaller producers' respect to Private Labels, big and international companies in the event of a further fall of extra-virgin olive oil's prices. Implications address policy makers to strengthen product differentiation policies coupled to collective branding, and give further support to vertical integration and cooperation.

Keywords: Integration and differentiation policies; Extra-virgin olive oil demand; Pricing strategies; Industrial and distribution strategies.

JEL Classification: C53, D30, L11, L12

1. Introduction

Extra-virgin olive oil, due to the crisis and an ever more liberalized market, now suffers wider price volatility. The supply chain is thus profoundly transforming, addressing mainly the downstream stages of the agricultural production process (De Gennaro and Roselli, 2011). Supply concentration, begun many years ago, is accelerating (Anania and Pupo D'Andrea, 2007). CR_4[1], in fact, in 2010 has reached a total of 70% in volume, due to enlargement of market shares of large companies such as Salov (group that includes brands such Sagra, Rastrelli and Filippo Berio) and SOS-Deoleo (Bertolli, Carapelli, Sasso)[2], capable of aggressive pricing strategies finalized to the expansion of market shares. Similar behaviors also appear in large national companies as Agri Desantis Monini and Farchioni (Marchini *et al.*, 2012; Medicamento *et al.*, 2013). Moreover, vertical integration strategies are becoming more widespread, and this is the case of distribution companies developing "Private Labels" (Private Labels), leading to a substantial decrease in transaction costs along the supply chain and, at the same time, in a potential reduction of the final prices aimed at gaining market shares. This creates the realistic danger of a price war. The market power and competition policy in food chains have an important role in the policy agenda (Swinnen and Vandeplas, 2010).

In such a situation of high market power in the supply chain, dominant positions-given the presence of big distributors and large multinational and national brands over a large number of small producers-and the chance of price wars enlarging market shares, the weaker actors could be small producers, which could have very little maneuverability as both price takers for production and prices sellers in retail.

In this competitive context, a few questions arise. Do these structural and organizational characteristics of the supply chain affect consumers' behavior, and hence, demand? How could market volatility affect the coexistence of different type of firms competing on the market? Do different types of actors of the olive oil sector gain different level of profitability? Can policies intervene in this context?

When demand for competing products shows different reactivity to market, product pricing could be a very strategic decision tool (Friedeberg, 1983 and 1989).

Our study aims to empirically estimate the demand for Italian extra-virgin olive oil, differentiated by the organizational profile of the supply chain and size of the companies involved. The primary and general purpose is to obtain strategic information on consumers' demand. Second, we aim to calculate market power and profitability in the sector[3]. Another objective is to analyze the olive oil industry from not only a technical point of view (Dios Palomares and Martinez-Paz, 2011) but a general economic one.

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[1] Concentration ratio, referring to the market share, of the four largest companies.

[2] There has been a continuous process of acquisition of Italian brands from various food industry groups, Carapelli was acquired by SOS Cuetara which went bankrupt after just one year. Currently the company was recapitalized in the Deoleo - S. A. group that also owns Carapelli, Sasso, and Bertolli.

[3] The initial assumption concerned products being differentiated by the type of producing company, justified by the fact that leaders and Private Labelss could generate more brand loyalty and consumer trust than minor producers.

The expected result is to identify the key levers of the olive oil sector and consider several decisive policies to establish the correct market competitive context (see Swinnen, 2010).

The model is the Almost Ideal Demand System of Deaton and Muellbauer (1980a, and 1980b); scanner data on extra-virgin olive oil sales[4], acquired by *SymphonyIRI,* informs the analysis.

The econometric specification of the model proposes a demand system that assumes products from different companies as "imperfect substitutes"; and suggests their demand as a function of their prices, prices charged by competitors and promotions, endogenous to competitive strategy.

2. Framework

According to the IOC, the world production of olive oil in 2012 has exceeded 3 million tons, of which over 2.18 million is concentrated in the European Union (Aspacicio, 2013). Spain, with 1.35 million tons, is the largest producer on the world, followed by Italy (440,000 tons).

The economic-agricultural literature has already widely debated the importance of the olive oil supply chain in Italy and its market by the (Anania and Pupo D'Andrea, 2007; Antonelli, 2005; Casini *et al.*, 2002; Cicia *et al.*, 2006; De Gennaro *et al.*, 2007; Fardella, 2007; Furesi *et al*., 2013). Italy holds many records in this sector: largest olive oil consumer (35% of total European consumption); first country to have over 300 olive "cultivars"; largest product flows in import (986 millions of euro in 2011) and exports (more than 1 billion euro in 2011) (ISMEA, 2012).

The market has two product categories: "quality oils," obtained by simple mechanical pressing of the olives ("virgin" and "extra virgin" olive oil) and other olive oils whose commercial and production importance are in continuous decline (Martino *et al*., 2017). The segment of quality olive oil is one of the most significant items in the Italian agro-food sector, in terms of total turnover (around €2 billion), and export (€939 million).

The importance of extra-virgin olive oil is also growing within modern distribution (Retailers). In 2011, about 216 million liters of oil sold, and extra-virgin represented 72% (157 million). So the consumption of quality products is increasing, with a gradual shift in the consumption of the extra-virgin oils.

Changing consumer preferences in the last decade have pushed companies to important and strategic choices, such as product differentiation, to maintain or improve their competitive position. Note the development of new market segments within extra-virgin olive oils (PDO and BIO, "100% Italian" oils, etc.), driven by EU policies to promote positive consumer response (Resano *et al.*, 2012; Riganelli *et al*., 2016; Mancini *et al*., 2016;). Another interesting example is progressive "vertical integration" of farms and oil cooperatives that have gone from simple manufacturing of bulk oils to reaching the consumer (Diotallevi *et al*., 2014). Finally, "production concentration" has resulted from many mergers and acquisitions of oil packaging companies.

[4] The model is developed assuming a multi-stage decision-making process. In the first step, the consumer decides how to allocate his income between oil and other goods; in the second stage, he chooses which oil to buy. At the last stage, he decides how to allocate this part of his income between the different extra-virgin olive oils offered by competitors, grouped as follows: multinational brand leader, national brand leader, PL and minor brands.

Moreover, many big retailers have significantly increased their investments in promotion and development for olive oil PL, which in 2009 passed a sales volume of approximately 15% of consumption and 28% of overall retail distribution (MassMarket, 2010).

In this production and competitive context, the international financial crisis hit the Western economies. This and the growth of world production of olive oil slashed the extra-virgin olive oil price at the starting point[5].

In the present competitive national view, four types of enterprises present substantially different structural, financial, and strategic profiles (Unaprol, 2010): leading multinational companies, national leaders, distributors with Private Labels, and minor producers.

In scientific economic literature, olive oil has raised many questions, such as the effects of promotional activities and price maneuvers on the retail channel, which could be a key factor for the success of many manufacturers and distributors (Rao *et al.*, 1999; Garcia *et al.*, 2002; Neslin, 2002; Simpson, 2006). Labeling and branding, crucial to strategy, have also attracted hypothesis testing (Louriero and McCluskey, 2000; Hanf and Kuhl, 2005).

Di Vita *et al*. (2013) focused on another strategic aspect of olive oil, the PDO certification. Their qualitative analysis of consumer behavior in some areas of Italy aimed at detecting extra-virgin olive oil's main attributes, to identify the main variables that drive local and regional production. Findings highlighted the leading role of price and the positive influence of PDO certification in consumers' choice.

Finally, Pomarici and Vecchio (2013) compared the Italian olive oil sector with its international competitive arena. In particular, they tried to trace the difficulties of Italian olive oil industry competing on the world market. They found the main limiting factors were stagnant demand and strong competition.

Important contributions come from Spain, the first world producer. In particular, Aubert *et al*. (2014) analyzed price transmission at national level and their impact on the international market.

Xiong *et al*. (2014) have carried out an interesting work analyzing the US market. They estimated a demand system using monthly import data. Their analysis revealed that virgin oils produced in the EU are far more price-elastic than those produced in Virginia.

Given the limited empirical work on the understanding of olive oil demand, our study could represent an important source for prediction of the evolution of intra-sector competition in the coming years, even for further dropping prices at origin. In addition, by comparing the profitability of strategies and the conduct of leaders, PL, and smaller producers, we can provide additional guidance for competitive strategies.

A further element to be included into the analysis is the role of "market power" expressed as the capacity of companies to impose consumption prices above marginal costs. To investigate this point, we must analyze both components of the extra-virgin olive oil market: supply and demand. With the analysis, we can calculate marginal costs and, given the prices, measure of profitability relatively to a particular supply chain strategy. The estimation of the demand allows measuring the

[5] Prices for native extra-virgin olive oil prices in Italy had grown until 2006, and then decreased (varying within 2.5 to 4.7 €/kg). The euro exchange rate has contributed to this price drop because it favored the supply of extra-EU oils (Mediterranean countries) over major packaging industries operating in Italy. At present, prices in the 2010-2011 campaign are at minimum levels, and in any case, the gap between producer prices and consumer prices is always large and not likely to shrink (Istat, 2012).

effect of prices on brand switch, the effect on demand of market changes, and the impact of promotions in terms of the demand shift.

3. The Theoretical Model

The theoretical approach consists of considering pricing decisions fundamentally linked with the structure of demand for each brand. To represent the market, therefore, we must analyze the demand and supply and finally obtain the *price cost margin* through the *Lerner Index* (LI) (see Pierani and Rizzi, 1991). The components of model and the theory assumptions follow:

3.1 The demand

The analysis through the application of the statistical relationship between amount of extra-virgin olive oil purchased, price, promotional activities and other determinants, requires the specification of a functional form of the equations of market demand consistent with the economic theory (Gracia and De Magistris, 2008). In our context, the study of categories/brands considered implies interdependencies; we can overcome this complication by estimating a demand system conditional upon the expenditure level, allowing for own-price and cross-price elasticities. The model best understood in the scientific economic literature is the Almost Ideal Demand System (Deaton and Muellbauer, 1980a and 1980b). It has attracted the attention of many analysts and seen extensive use on cross-section, time-series and panel data. In it, the dependent variables are the market share for each of four categories in a given period of time. The independent variables are the logarithms of unit prices for that category at that time.

$$w_{it} = p_{it}\, q_{it} / x_t$$

where i is the product category, t is the reference period, p is price, q is the volume sold and x is the total expenditure for all categories. The Almost Ideal Demand System general specification, given k classes, is:

$$w_{it} = \alpha_i + \sum_k \gamma_{ik} \log(p_{it}) + \beta_i \log(x_t / P_t) + \varepsilon_{it}$$

where log(P) is the Laspeyers prices index (see Moschini, 1995 and 1999), and ε is an error vector of stochastic nature with distribution N(0, Ω). The m-shifter, Z, of the demand is specified as:

$$\alpha_i = \mu_i + \Sigma_m \lambda_m Z_{mti}$$

The Almost Ideal Demand System model has to respect theoretical properties of demand such as homogeneity (Eq. 4) additivity (Eq. 5) and symmetry (Eq. 6) of preferences[6]; so we imposed on the system the following linear restrictions:

$$\Sigma_i \gamma_{ik} = 0;\ \Sigma_i \alpha_i = 1;\ \Sigma_i \beta_i = 0, \text{ and } \gamma_{ik} = \gamma_{ki}, \text{ for each } i \text{ and } k$$

The estimation of Marshallian elasticities, which include price and income effect, is conducted from estimated parameters in the demand system as suggested by Green and Alston (1990), as well as Hicksian compensated elasticities, which consider only the price effect.

$$\varepsilon_{ik} = -\delta_{ik} + \gamma_{ij} / w_i - \beta_i w_k / w_i$$
$$\varepsilon^*_{ik} = \varepsilon_{ik} + w_j (1 + \beta_i / w_i)$$

[6] The "convexity" of preferences is checked and can be set only through a decomposition and backward reconstruction of the model, where the Hessian matrix is negative semi-definite (Moschini, 1999). Given the demand shifters, we respect additivity of demand by imposing that the sum across the equations for each variable equals one.

3.2 The supply

In markets with differentiated products, the basic hypothesis to consider supply is that the group of brands/companies $i = 1, ..., n$ (multinational and national market leaders, Private Labels or minor producer) maximizes its profits, using the price as a strategic decisional variable. The strategy for achieving competitive position, then, is to fix the price in consideration of the behavior of their competitors.

$$\max_{pi} \pi_i = q_i (p_i - c_i) - F_i$$

where c refers to the ith company's marginal costs, F to fix costs and q to quantity. Assuming that the strategic decision on price is a Bertrand-Nash equilibrium, the optimization process allows you to define a vector of first order conditions, as shown in Nevo (2001) and Bonanno (2010):

$$p_i - c_i = \Omega^{-1} q_i (p_i)$$

where Ω corresponds to the product between the "ownership matrix" and the matrix partial derivatives of shares on prices. A direct consequence of the last formula would be the equation that defines the *price cost margins* (PCM) as following. For full derivation of PCM, see Nevo (2001) and Bonanno (2010).

$$\mathrm{LI_i} = (p_i - c_i) / p_i = - (\varepsilon_{ii} + \textstyle\sum_{(i \neq k)} \varepsilon_{ik} \Omega_{ik} p_i / p_k)^{-1}$$

This is the result that we would obtain also solving FOCs for all the firms simultaneously, as required by the Nash equilibrium. However, the equation shows that it is not necessary to have information on the supply curve to calculate the marginal costs. So it is possible to use unit prices as revenues to determine implicitly the profitability of the business conduct. The information on demand elasticities matrix and on market prices is all that is needed.

The *LI* (Lerner Index) is a measure of market power. Assuming a perfectly competitive market, price equals marginal costs. In this situation, it is demonstrated that *LI* is zero because the demand elasticity refers to a single company tends to infinity in absolute value. Assuming instead that the market is concentrated, the price elasticities are smaller in absolute value, given a more limited number of substitute products. In these cases, the company could push its prices above marginal costs and, thus, it obtains a positive *PCM*. In an extreme case of oligopoly, in which market is concentrated and the actors collude; *PCM* will certainly be higher than that measured with Bertrand-Nash equilibrium.

Researchers such as Nevo (2003, 2001), Hausman and Leonard (2002) and Bonanno (2010) have largely applied this approach to individual firms; however, in the application here we do not refer to individual firms, implying overestimation of actual profits. Nonetheless, our results do not aim at providing actual measures to antitrust authorities but a mere description of the sector to observe the proportionality of profits among the different types of companies.

About the strategy assumed, this paper does not consider collusion games among the group of firms or geographical differentiation of products, but it refers to Bertrand competition theory, through which we can study the pricing strategies of firms under the hypothesis of products differentiated by multinational brands, big Italian brands, small company brands and Private Labels. We can also make other assumptions about the behavior of the retailing companies: the composition of the market depends upon the portfolio choices of the distributor, which associates brand leaders with niche products and low-quality products with highly differentiated ones. This hypothesis, although containing very strong assumptions, can still be explored by considering that the ownership matrix is a *block diagonal matrix*, not an identity matrix as for the mark-ups calculated for the Bertrand-Nash equilibrium.

4. Data and Methodology

4.1 Descriptive analysis

We conduct the econometric analysis of demand for Italian extra-virgin olive oil using scanner data on purchases (monthly observations) of all brands in Italian supermarkets between May 2010 and May 2012. These data come from a Census platform provided by *SymphonyIRI*[7] Company, articulated into the five Nielsen area (North East, North West, Centre, South and Islands, Italy). In particular, for each product (or brand), the dataset concerns the following variables:

- The volume of monthly sales for the period observed;
- The average price per period;
- The volume of products sold on promotion.

The descriptive analysis highlights that Italian extra-virgin olive oil is highly differentiated because of the multiplicity of brands and the variety of sizes, packaging and different prices. In the examined period, a high number of products were on the retailers' shelves. The resulting large number of parameters makes estimation of demand for each brand impossible, and equations would lead into an overly specific analysis, inapplicable to the objectives of this study. Therefore, to keep the analysis reasonable, synthetic and relevant, we decide to represent the segment of the market through four categories (Table 1):

- I. The small producers;
- II. The big national groups;
- III. The private labels;
- IV. International groups.

Table 1. Typology Classification

	Company/Brand type	Cases
I. Small Producers		1,686
II. Big National Producers	*Agri Desantis*	35
	Costa D'oro	44
	Farchioni Olii	91
	Monini	56
	Olearia Desantis	29
	Pietro Coricelli	42
III. Private Labels		27
IV. International Groups	*Salov*	29
	Sos	111
	*Ufi**	22

* Commercial *Agreement for "Bertolli" brand*.

Source: Authors' elaborations on *SymphoniIRI* data, (2011)

In the observed period, the market shares of extra-virgin oils clearly show the importance of the major national brands, which registered a volume growth over 20%. The volumes of the Private Labels and international brands have decreased (see Table 2 on the next page).

[7] The Census-Infoscan dataset contains all the information recorded at purchase time by scanning of EAN codes. We bought 2,172 brands for 4.500 sale points (Hypermarkets, Supermarkets and Superettes). The observation period is not particularly recent, but this aspect should not worry the reader because the observations do not delineate the current competitive framework but aim to be a useful model specification for comparative analyses over time.

Table 2. Extra-virgin olive oil national trend on modern retail

	Markets	International Groups	Big National Groups	Small Producers	Private Labels
Price (€/L)	Northeast	4.83	4.89	5.16	4.87
	Northwest	4.75	4.81	5.77	4.98
	Center	4.52	4.55	4.41	4.66
	South	4.74	4.33	4.38	4.40
	National	4.74	4.65	4.93	4.63
	05 - '07 Changes	***5.96%***	***1.77%***	***6.65%***	***12.27%***
Market shares (%)	Northeast	0.30	0.29	0.23	0.18
	Northwest	0.36	0.25	0.24	0.15
	Center	0.24	0.32	0.28	0.16
	South	0.31	0.33	0.28	0.08
	National	0.31	0.29	0.25	0.15
	05 - '07 Changes	***-8.07%***	***11.84%***	***2.10%***	***-8.85%***
Average monthly volumes (t)	Northeast	828	808	614	512
	Northwest	1.143	761	630	444
	Center	929	1.216	1.270	605
	South	693	778	656	180
	National	3.593	3.563	3.170	1.741
	05 - '07 Changes	***-4.40%***	***21.12%***	***7.84%***	***-7.91%***

Source*:* Authors' elaborations on *SymphoniIRI* data, (2011)

Table 2 shows that the average total volume increase is associated with a price increase in all categories (+3.9%).

Data also show a possible general trend explaining an increase in total consumptions, independent of prices as demand shifters. However, confirming this trend would require a more extended dataset over time.

The *C4* concentration index (70%), moreover, shows that this market is highly concentrated and allows hypothesizing that the price increase is a result of "market power," the ability of a producer or distributor to increase the price without a significant effect upon profit after demand contraction.

Another key element concerns the price trend of the brands. Predictably, the Private Labels have an average price slightly lower than the other categories considered, while the smaller producers show the highest prices.

However, the percentages measured over 2005–2007 show increased more for Private Labels than big national producers, which saw a price increase below inflation rates.

4.2 Econometric analysis

The estimation ensued after data "cleaning" and aggregation in the categories identified[8]. The empirical specification of the demand system, considers the percentage of products sold on promotion a demand shifter. This is because promotions primarily have a display function, through a repositioning of the product on the shelves or coupling gadgets, and are not always linked with a reduction in price; Nielsen area includes 4-1 dummies that divide the Italian regions, such as the criteria of *AC-Nielsen*, into four areas (Table 2)[9].

Despite the four categories, the additivity restrictions allow the reduction of the equations to three, otherwise it would incur in problems of singularity. However, the restrictions allow obtaining indirectly the parameters of the omitted equation.

The estimation is conducted through a 3SLS estimator (three-step least square), which considers and solves the endogeneity problems of choice variables through instrumental variables set. The work studies and reports each company's modern retailing demand and pricing strategies. From its theoretical assumptions behind, the price is the independent variable that could lead to problems of endogeneity. We sought exogenous variables, not strategic for companies considered, to eliminate the effect on the estimated parameters of price's endogeneity. Therefore, we have set the prices at origin, minimum and maximum, from commodity exchange of Bari, and, like Bonanno (2009), the costs related to production like energy and oil (ISTAT, 2012), the general level of wages and agriculture, the agricultural GDP, and trade balance values or the agro-industry (OECD, 2010).

4.3 Results and discussion

The results, in Table 3 on the next page, show the coefficients and their significance[10], and highlight promotions' consistent effect, though limited in their ability to alter the distribution of market shares in selected companies. The coefficients of price portend significant substitution effects (Table 3).

The estimated coefficients are not directly interpretable for quantitative assessments, but allow an initial analysis of differentiation and product switch, through the interpretation of their signs. One characteristic of extra-virgin olive oils demand is the substitution effect between small producers, big companies and Private Labels. Although the first can develop differentiation policies through the enhancement of niche products and quality, this result confirms a certain level of approval, at least in the perception of consumers between products belonging to different categories. On the contrary, the products of big national companies are less vulnerable to substitution effects due to pricing strategies. The Private Labels seem to be less vulnerable because they have very low substitution coefficients. Therefore, the sector has major competitive vulnerability and Private

[8] In particular, the sales of sizes smaller than 0.5 liters (single-dose, promotional packs, and others) were removed from dataset. In fact, the highest unit price reported for these products would generate outliers and altered the estimates, so we have contracted the dataset to 2,146 references.

[9] The specification of the model for each equation, given promotional and geographical information, is $\alpha_{ik} = \theta_{ik} + \sum_z \lambda_{iz} GEO_z + \eta\ PROM_i$; where *z* indicates the total number of dummies, minus one, shifting demand at each geographical area.

[10] The estimate was obtained by iteration of the 3SLS estimator until the estimated coefficients have not reached a stable enough to meet the tolerance level imposed (one thousandth). The convergence of the model was achieved after eight iterations, producing an estimate with a good fitness, as shown by R^2 in all cases greater than 0.670.

Labels seem to have a dominant position, less exposed to competitive pressures from other producers.

Table 3. Extimated Coefficients

Variables	International Groups		National Groups		Small Producers	
	Coef.	*St.Err.*	*Coef.*	*St.Err.*	*Coef.*	*St.Err.*
logP1	-0.427	0.000	-	-	-	-
logP2	0.236	0.000	-0.501	0.000	-	-
logP3	0.214	0.000	0.169	0.000	-0.616	0.000
logX	-0.036	0.002	-0.028	0.010	0.032	0.039
trend	-0.001	0.000	0.000	0.143	0.000	0.505
Nord west	-0.005	0.669	-0.090	0.000	0.071	0.000
Nord east	-0.053	0.000	-0.004	0.598	-0.012	0.275
Centre	-0.093	0.000	0.029	0.002	-0.020	0.091
South	0.818	0.000	0.661	0.000	-0.187	0.415
Promotions	0.001	0.000	0.001	0.000	-0.001	0.001
Rectrictions for PL parameters						
logX	0.031	0.007				
logP1	-0.023	0.443				
logP2	0.097	0.003				
logP3	0.233	0.000				
logP4	-0.307	0.000				
LM-Het. Test	14.14^{***}		5.087^{**}		13.722^{***}	
Durbin-Watson	1.456		1.585		1.459	
Jaque-Bera	7.531^{**}		4.899^{*}		145.75^{***}	
R-squared	0.875		0.821		0.676	

Source: Authors' elaborations on *SymphoniIRI* data, (2011)

Notes: The asterisks *,**, and *** indicate the marked values are statistically significant at the level of 10%, 5%, and 1%, respectively.

A further element concerns the effect of promotional activities: as expected, they can temporarily move extra-virgin olive oil demand to the right. Note, however, the negative sign in correspondence of the smaller producers. This highlights the ineffectiveness of the promotions for these companies. Instead, the promotions made on PL products are much more effective than those made by leader companies. Although coefficients indicate some of the mechanisms that govern the extra-virgin olive oil market, the compensated elasticities permit quantitative assessments (see Table 4 on the next page).

Table 4. Hicksian Elasticities and price cost margins (PCM)[Δ]

		Price				PCM% (Bertrand-Nash)	PCM% (Collusive Strategy)
		International Groups	**National Groups**	**Small Producers**	**Private Labels**		
Quantity	**International Groups**	-2.073*** (0.148)				48.2%	61.2%
	National Groups	1.061*** (0.112)	-2382*** (0.190)			42.0%	52.7%
	Small Producers	0.940*** (0.124)	0.813*** (0.144)	-3.245*** (0.248)		30.8%	47.3%
	Private Labels	0.074 (0.095)	0.471*** (0.108)	1.089*** (0.154)	-2.947*** (0.251)	33.9%	100.6%

[Δ] Gli Standard Errors calculated with DeltaMethod

Source: Auhors' elaborations on *SymphonyIRI*, (2011)

Notes: The asterisks *** indicate the marked values are statistically significant at the level of 1%. The numbers in parentheses are standard deviations of the above elasticities.

Table 4 shows compensated elasticities and the *price cost margin* values of two conduct models assumed. To evaluate *brand switch* effects, we calculated the elasticity values using the formula suggested from Green and Alston (1990), then used corresponding price equal to the median. This allowed us to obtain the elasticity regarding expenditure (income) equal to one, equivalent to the hypothesis that we have "normal" goods, quite realistic for extra-virgin olive oil[11].

4.3.1 Quantitative analysis of market

This result allows classifying and assigning the real importance of the effects measured. Looking at the own-price elasticities, arranged along the main diagonal of the matrix, we could observe that generally the segment of extra-virgin olive oil in Italy shows an elastic demand because the average elasticity is approximately equal to -2.6. This result confirms market changes, thus increases or reductions in prices lead to significant expansions or compressions of volumes sold.

The average absolute value is pulled upward by "small producers" oil demand, which, unlike the demand of big companies for products, is much more elastic. This difference is probably due to several factors, including the strength of brands, linked to the strategies of the company and its reputation, and the consumer's loyalty, linked to the consumption habits, to the recurrence of a brand on shelves or in advertisements and to the perceived quality of the product. The consequent reduction in demand restrains the ability to push the price of extra-virgin olive oils up. Then the smaller producers must lower the price close to marginal costs to maximize market shares. In fact, the results show low consumer loyalty for these products, although the category is very broad aggregation of products and single product market behavior could be different for each case.

[11] While the additivity, homogeneity and symmetry are imposed to equations, the convexity of preferences is verified because the matrix of elasticities is negative semi-definite.

Moreover, the leading international companies have an elastic demand, but are less reactive than the big national producers. This result confirms that, although the rational "cause-effect" relationship between sensitivity of demand and market share can be inverted by the determining mechanism of the competitive performances of a company, one can raise prices without getting large contractions in demand, and this is a measure of company's market power and leadership.

The extra-virgin olive oil demand of Private Labels has an intermediate behavior between national and international leaders. However, the "name" of the retailer adds value to the product, and this is certainly a key element to transfer the loyalty from the distributor's sign to its product.

4.3.2 Quantitative analysis of competition

Looking at the elements outside the main matrix diagonal, the cross-elasticity, we can confirm the qualitative analysis in the estimated coefficients. The Private Labels are very similar to international leaders and small producers in substitution elasticities. The cross-elasticities and "substitution effects," is an excellent indicator of brand or conduct competition. Therefore, it is possible to conclude that, although Private Labels' demand is quite elastic, their high vulnerability to competition does not allow retailing companies to increase their prices. Instead, price war would greatly reduce competition. We have seen in the descriptive variables that the PL category includes products whose prices have risen even less than inflation. Looking at the cross-elasticities of smaller producers, although their demand is much more vulnerable to price increases, we can conclude that they suffer less from competition, probably due to the qualitative differentiation of products that already have a higher price.

4.3.3 Quantitative analysis of profitability of different strategies

The estimated elasticities allow us to derive indirectly the Lerner index without having to know the cost and supply structure, but only the costs to the balance point, which can be derived from the difference between the price that would prevail in perfect competition and the equilibrium price in a market with a different structure and conduct.

This study estimated the price cost margin, assuming two different conduct strategies. The first is a simple pricing strategy that considers the behavior of competitors in a differentiated market and arrives at Bertrand-Nash equilibrium. According to this hypothesis, the profitability of a company's strategy results from the actions of a homogeneous group of companies regarding to the behavior of their competitors. Our results identify the average margins amounted to 20.9%. However, the large number of small producers pushes their margins down. Therefore, a possible "price war" totally stifles small producers. On the other hand, big international producers achieve margins of 48%, more than the big national producers and Private Labels. These results, however, highlight PL profitability despite the low price increases in the years under analysis, demonstrating the strength of the PL strategy capable of surviving any price wars.

Not assuming any collusive game that would raise profits further up, we can find the upper limit, by calculating the PCM with the assumption of a portfolio strategy in which the modern distribution decides entirely the assortment of extra-virgin oil on the shelves. The mark-up hence is attributed to distribution and not to manufacturers. Our results show, as expected, that the portfolio strategy generates the highest PCM of the Bertrand pricing strategies. The leader companies generate higher profits thanks to their market power. Small producers generate positive profits but are at the bottom of the brands observed. Private Labels generate the highest profits under this hypothesis. This means that modern distribution's ability to set the price in its market, observing the pricing strategies of competitors, would allow higher profits.

5. Conclusions

We focus on extra-virgin olive oil consumers in terms of merchandising policies of the retail sector, promotions, and strategies for brand loyalty. The sector appears to be concentrating horizontally and vertically. This evolution is giving rise to a wide heterogeneity of company types and strategies. Various promotional activities and pricing are squeezing down small and traditional producers. Moreover, extra-virgin olive oils price at origin shows high volatility and a slow decline, while the "gap" between production and consumption prices is widening (Marchini *et al*., 2015).

In this context, our analysis contributes qualitatively to the understanding of the impact of this evolution. On the basis of our results, we suggest some policy actions for the sector's development and sustainability.

The price trend seems to reward big companies and to a lesser degree Private Labels, penalizing small producers. The latter, due to their small size and the closeness to the agricultural sector more than to market and distribution, have great difficulty in reducing production cost as a strategic response to the price drop at the origin. Big industrial brands, on the other hand, can reduce it by increasing the oil supply share from non-European countries due to the high value of the euro, dropping prices further at the origin.

This brings the set of small oil production companies to operate below marginal costs, at worst forcing them out of production. In the best case, strategic responses to this stringent competition could see positive and negative reactions: positive such as product and packaging innovations and logistic and managerial improvements; negative such as illegal blending with foreign or cheap oil despite labeling it "made in Italy." At this point, traceability and the guarantee/certification that oil is 100% Italian, even though they represent a means of differentiation, may not be sufficient strategy for small producers. Better policies must strengthen those differentiation tools. Conversely, private product differentiation initiatives such as the development of a segment of "High Quality" would provide positive outcomes such as escaping from stringent competition.

Given the context and our results, we can urge further support for vertical integration strategies because they could reduce transaction costs and let small producers remain competitive in such a harsh market. The development of collective or regional brands could strengthen a territory's image and develop consumers' loyalty toward regional olive oils from traditional producers. This could reduce the gap of brand loyalty between Private Labels and small producers.

Horizontal integration through the creation of cooperatives and producers' organizations, which will be further supported by EU in the next CAP and CMO agenda (COM (2010) 672, and COM (2011) 627), could be an added policy instrument to small producers by concentrating supply and furnishing a new competitive strength.

Last but not least, antitrust authority should conduct a brand-specific study to confirm our results at the aggregate level.

Finally, a more detailed regulatory framework of the contracts between modern distribution and small producers would help traditional producers compete. Such an illiberal proposal will surely reduce the distortions created by such a disproportion in the market.

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