

Market power and price competition in Italian wine market

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Abstract

The analysis explores the Italian wine sector and provides information on the industry structure and its conduct in terms of market power and price competition. In order to depict pricing behavior and market power measures, the Bertrand-Nash equilibrium is estimated through brand-level demand relative to the first 9 wine brands in terms of market share. The method used consists of a censored QAIDS, chosen for its flexibility. The results consist of demand price responsiveness and product substitutability measures. Estimates allow the calculation of Lerner Indexes for each brand as well as mark-ups, the ability of a firm to push its prices above marginal costs. With those measures, policy and industry implications are drawn in terms of targeted actions in order to increase consumers' welfare and brand loyalty indicators.

INTRODUCTION: THE ITALIAN WINE INDUSTRY

Italy produces about 55 million hl and offers about 400 wine varieties on the market (Seccia et al., 2009). The number of producers operating in the sector is huge; the last census, in fact, reported about 73,000 wineries (ISTAT, 2008). Another feature of the Italian wine sector is the variety of firms in terms of size and level of integration. Thus, a useful approach for describing how the Italian wine industry is structured concerns the degree of vertical integration. Similarly to other European countries, farm wineries and cooperatives are vertically integrated and own tiny market shares. Industrial wineries, on the other hand, exhibit different characteristics, although few cooperatives own large market shares (Agea, 2006). This classification highlights the first issue relative to the wine industry structure: many large producers are not vertically integrated, so they could exercise oligopsony power when setting grape prices for farmers. Price data at the farm level, unfortunately, are scarce. Hence, despite the wide interest in analyzing the effect of oligopsony on producers' welfare, we leave this analysis to further studies. Another convenient approach for describing the industry structure is the classification of wineries into artisanal and medium-big-scale¹. The interesting outcome of this classification is that artisanal wineries comprise 92% of wineries and MBS wineries just 8% (Agea, 2006). By contrast, MBS wineries comprise 95% of national production, and just 1% produces 50% of national production.

An additional piece of information about the Italian wine market is the price trend. The last decade, in fact, has seen Italian wine prices increasing steadily at about a 20% annual rate (ISMEA, 2009). The size-share paradox and price trends hide the possibility that there could be market power exercised in the Italian wine market that adversely affects wine consumers' welfare.

Given these introductory considerations, the objective of the paper is to estimate Italian wine demand in order to understand the market structure and price competition. Furthermore, the model used allows the calculation of the firm's market power and derive mark-up measures. The outcomes provide a description of the pricing behavior of the main Italian wine-producing firms.

The findings allow the depiction of policy implications relative to the interests of anti-trust authority, which aims at observing and controlling market power and unregulated pricing. The industry could also find interesting hints by looking at the results as a measure of consumers' loyalty to brands. Through a backward process, wine stakeholders could look at the results and contemporarily analyze the loyalty creation process in order to determine the best strategy.

The remainder of the paper provides the scientific framework through an analysis of the most closely related literature and illustrates the theoretical background of the model. This is followed by the presentation and the description of the data as well as the empirical procedure and results. Finally, conclusions and suggestions for further research are presented in the last paragraph.

SCIENTIFIC FRAMEWORK

Market power has been analyzed extensively in industrial organization literature. Studies such as Cotteril (1993), Cotteril and Haller (1997), Dhar et al. (2005), and Rojas (2008) contributed to this section by estimating the gains relative to oligopolistic power, market power, unilateral market power, and price competition, respectively. The common aspects of these studies concern the focus on the agro-food sector, which probably involves a whole set of industry structure problems, and the methodological approach, which refers to demand estimation in providing elasticity estimates that are subsequently used for measuring market power by means of the Lerner Index. As highlighted by the chronological

¹ The definition of artisanal winery refers to the official definition and listing of the National Chamber of Commerce, their production is mostly below 100 hl, and they produce mostly GI wine. MBS wineries in some cases include cooperative wineries, which produce primarily table wine.

sequence of these studies, the sophistication in methods has grown, passing from single-equation demand (Cotteril, 1993) to a system of demands with attribute differentiation correctors (Rojas, 2008).

Wine demand has been analyzed extensively in the economic literature. Most of these studies have focused on wine in comparison to other spirits, while just a few contributions were concerned more narrowly with the analysis of the demand for wine and various types of wine differentiation perspectives, e.g. brand differentiation, color, quality, source, etc. Laure et al. (1990), Pompelli and Heien (1991), Buccola and Vander-Zanden (1997), Seale et al. (2003), and Carew et al. (2004) analyzed source, color, and source differentiation, finding significant substitution among wines of different provenance but no significant cross-effect among wines of different colors. From the methodological perspective, with the exception of Pompelli and Heien (1991) and Buccola & Vander-Zanden (1997), they all used an almost ideal demand system as the theoretical model for their investigation.

Brand-level demand is a less common issue in these analyses. Torrisi et al. (2006) estimated Italian demand relative to five categories: the first three Italian major brands, an aggregate category of private labels, and other brands sold at retail. They used IRI-Infoscan data, which are representative of Italians' food expenditures at grocery stores. Their results highlight substitution among one brand and all the others and the relatively high own-price elasticities for the two major brands, a sign of low consumer loyalty.

Brand loyalty, on the other hand, has been also analyzed in wine business and marketing studies. Most of these studies used polarization methods (Fader & Shmittlein, 1993; Jarwis & Goodman, 2005; Jarwis et al., 2007; Casini et al., 2008), which accounts for repeated purchases. Italian consumers' loyalty to various categories of wines using scanner data has also been analyzed by Casini et al., (2008). Their results have emphasized higher loyalty towards table and DOC wines and equal loyalty across major Italian brands.

This study contributes to the existent body of the literature by analyzing brand-level demand using a censored QUAIDS on consumer, not market, scanner data, with respect to the 9 Italian brands wine owning the largest market share. We measured market power, raising interesting implications for policy makers and marketers. Additionally, we compare the brand loyalty results from the studies that define it as repeated purchase, to our loyalty interpretation and results that define loyalty as inelastic demand.

THEORY AND METHODS

Market concentration indexes are commonly used to analyze market structure and draw performance implications as suggested by the structure-conduct-performance (hereafter SCP) model. While structure could play a crucial role in highly concentrated markets, it cannot be a fundamental element for determining performance in highly populated sectors such as the Italian wine market. Thus, after calculating the concentration indexes², we focus more specifically on wine firms' conduct by studying price competition and market power in order to draw performance and policy implications.

The basis of the empirical work is demand theory and price competition through the analysis of the Bertrand-Nash equilibrium.

In perfect competition, at the equilibrium point, the firm sets the price equal to the marginal costs. In such a context, if price increases, consumers tend to decrease consumption and dedicate part of their budget-share to a substitute product. Thus, if the firm increases the price, it will lose market share and revenue. When the market is not perfectly competitive, a firm could potentially increase the price and have no significant effect on consumption. In this way, the firm will generate profits.

² Concentration indexes are calculated by adding up market shares after having ranked firms by market share in descending order. C_1 will correspond to the market share of the 1st firm, C_2 to the join market share of the 1st firm and the 2nd firm, etc.

In order to study price competition in a market of differentiated products, such as wine, we refer to the Bertrand model, in which producers maximize their profits by choosing prices, not quantities, in consideration of the pricing behavior of their rivals.

The simplest case looks at two firms that play a Bertrand game. Given that their marginal costs are fixed, they will maximize profits by setting the price as high as possible in consideration of the pricing strategy of the rival, (1) and (2). The outcome of such a game corresponds to Bertrand-Nash equilibrium, (3):

$$\max_{p_i} \pi = (p_i - c_i)q_i(p_1, p_2) \quad (1)$$

$$F.O.C.: q_i(p_1, p_2) + (p_i - c_i) \partial q_i / \partial p_i = 0 \quad (2)$$

$$(p_i - c_i) / p_i = 1 / |\epsilon| \quad (3)$$

where p indicates the price, q the quantity, and ϵ the demand own-price elasticity.

The main assumption of the Bertrand competition model is that quantities are assumed to be fixed; hence, the game is based just on prices. This assumption could be realistic in the wine market, as supply is generally inelastic because of the heavy structure of wine-producing firms/wineries. In such a market, wineries tend to maximize their profits by increasing their prices, but reasonable price increases in the real world should be justified to consumers by product differentiation, quality signaling, creation of consumer loyalty, etc. Those strategies aim at reducing the effect of price increases in terms of lower consumption and substitution with other types of wine.

While low price responsiveness refers theoretically to inelastic demand due to strong consumer preferences/needs and loyalty, substitution effects depend upon the level of differentiation/similarity among products. When a firm produces goods for which consumers show potentially high loyalty but market rivals produce substitutes that consumers could choose in case of price increases, merging with the direct competitors could be the easiest strategy for producers to increase their prices without having negative effects on their profits. If the product demand is inelastic and substitution effects are low, a price increase will not generate losses in market shares but increase the firm's profits. On the other hand, when a firm is able to price its product higher than the marginal costs, there will be losses in consumer welfare compared to the perfect competition situation in which price equals marginal costs.

The distance between actual pricing and perfect competition is a typical approach for measuring market power. The Lerner Index (hereafter LI), in fact, corresponds to eq. (3) and measures the distance between price (P) and marginal costs as a percentage of price, which is also a measure of mark-up.

In a more complex market, where there are more than two firms, LI will be proportional to the firm's specific market share s and inversely related to the own-price elasticity of its demand, as follows:

$$LI = s / |\epsilon| \quad (4)$$

Generally, we expect that e_p will increase as market competition increases, so an increase in the number of rivals lowers a firm's LI.

Although LI is already a measure of mark-up, it is possible to rearrange the terms in order to obtain a price-cost ratio as a more crude and interpretable measure of how much a firm is capable of pushing its price above marginal costs, as follows:

$$LI = (p-c)/p = s / |\epsilon|$$

$$1 - c/p = s / |\epsilon| \quad (5)$$

$$\text{Mark-up} = p/c = 1/(1 - s/|\epsilon|)$$

Valid market power measures need reliable elasticity estimates. In this work, we proceed with the estimation using the censored³ QUAIDS, first introduced by Banks et al. (1997) and successively modified through the censoring correction by Mutuc et al. (2008). The model has been chosen for its flexibility when analyzing consumer-level data. It takes the form of a system of equations where each wine budget share equation follows the representation:

$$w_t = \alpha_t + \sum_{j=1}^n \gamma_{tj} \ln p_j + \beta_t \ln \left[\frac{x}{P^*} \right] + \frac{\lambda_t}{b(p)} \left\{ \ln \left[\frac{x}{P^*} \right] \right\}^2 \quad (6)$$

P^* represents the translog price index as in Deaton and Muellbauer (1980) and $b(p)$ is a Cobb-Douglas price aggregator, as in Banks et al. (1997). The advantage of this method, compared to the simpler Almost Ideal Demand, concerns Engel curve flexibility. In fact, the relationship between shares and expenditures with respect to products such as wine, could be more complex, e.g. quadratic rather than linear as in AIDS. The censoring approach follows the suggestion of Shonkwiler and Yen (1999). This approach allows correction for bias due to non-purchase decisions. This type of corner solution, in fact, could be due to high prices but also to consumer preferences, as expected with respect to wines. Thus, the purchase decision has been modeled through a binary probit in which independent variables are household-level socio-demographics. The cumulative distribution function and the probability distribution function have been included in the model (6) as in Mutuc et al. (2008) in order to correct for the sample selection bias (Heckman, 1979).

Expenditure and price effects are measured through the following formulas. Given the partial derivatives:

$$\mu_t = \frac{\partial w_t}{\partial \ln x} = \beta_t + \frac{2\lambda_t}{b(p)} \left\{ \ln \left[\frac{x}{P^*} \right] \right\} \quad (7)$$

$$\mu_{tj} = \frac{\partial w_t}{\partial \ln p_j} = \gamma_{tj} - \mu_t \left(\alpha_j + \sum_k \gamma_{jk} \ln p_k \right) - \frac{\lambda_t \beta_j}{b(p)} \left\{ \ln \left[\frac{x}{P^*} \right] \right\}^2 \quad (8)$$

The budget elasticities are given by:

$$\epsilon_t = \frac{\mu_t}{w_t} + 1 \quad (9)$$

The uncompensated price elasticities are given by:

$$\epsilon_{tj}^u = \frac{\mu_{tj}}{w_t} - \delta_{tj} \quad (10)$$

³ The censoring approach refers to Shonkwiler and Yen (1999) and allows consideration in the model of consumers that do not purchase all brands included in the system.

where δ_{ij} is the Kronecker delta, which equals 1 when $i=j$. The compensated price elasticities are:

$$\epsilon_{ij}^c = \epsilon_{ij}^h + \epsilon_i w_j \quad (11)$$

DATA AND EMPIRICAL APPROACH

The data employed are drawn from the ACNielsen Italian Home-Scan panel. The particular sample of 6,701 households includes unit prices and quantities consumed of all types of wine over the two-year period from December 2002 to December 2004; expenditures on all other types of beverages and food are not included. The socio-demographic variables for each household are also available. Data concerns only retail purchases, so no restaurant or ho.re.ca. (hotel, restaurant and catering) purchase is hereafter considered. Thus, the total number of wineries selling to retail included in the database is 695.

TAB. 1 – Price descriptive statistics

	1	2	3	4	5	6	7	8	9	10
Average	1.549	1.49	1.643	1.771	1.592	1.495	1.557	1.532	1.561	2.974
Min	0.19	0.05	0.143	0.308	0.24	0.423	0.537	0.089	0.45	0.012
Max	5.134	6.666	10.493	5.346	6.263	18.533	4.066	8.387	19.132	50.666

Wines are classified into 10 categories such that the first 9 types concern the main brands classified by market share, and the 10th category includes the remaining brands. Price ranges are reported in Table 1, showing that leading firms in the wine market show approximately similar average prices, although firm 3, 6, and 9 have wider price distributions, which could be due to a wider product portfolio. The highest average price concerns firm 4. Looking at the whole retail market, including firm 10, which comprises the rest of the market, a clear deduction is that leading firms produce lower-priced wines. The 10th category, by contrast, has high average prices.

RESULTS

Demand has been estimated through a 3SLS estimator, which allows correction for endogenous expenditure, over a set of 5,150 Italian wine consumers⁴. Estimates are not directly interpretable. However, they have been used to calculate elasticities.

TAB. 2 – Compensated elasticity estimates for the Italian wine market; prices in columns and quantities in rows⁵

Quantity	Price									
	1	2	3	4	5	6	7	8	9	10
1	-1.68	-0.05	0.32	0.04	0.12	0.05	0.11	0.37	-0.11	0.62
2	0.06	-2.81	0.34	-0.13	0.40	0.60	0.40	0.66	0.53	0.06
3	0.07	0.46	-0.06	-0.79	-0.31	0.38	-0.50	1.25	-0.11	-0.15
4	-0.18	-0.27	-0.51	-4.32	-0.29	-0.25	-0.32	-1.30	-1.86	-0.10
5	0.01	0.31	-0.23	-0.24	-1.00	-0.26	0.23	1.78	-0.61	0.00

⁴ The remaining consumers from the full set of 6,701 households are not wine consumers and hence are not accounted for in the model.

⁵ Names and details about the firms could be not reported due to contractual limitations with AcNielsen.

6	-0.01	0.28	0.21	-0.08	-0.19	-7.68	0.17	2.25	2.24	0.00
7	-0.02	0.37	<i>-0.44</i>	-0.40	0.17	0.23	-1.78	-0.04	0.72	0.08
8	0.07	0.60	0.47	-1.05	1.31	2.50	-0.13	-8.68	1.60	0.15
9	0.59	0.83	-0.72	-1.74	-0.71	4.29	0.25	1.31	-3.57	0.24
10	2.20	0.70	-0.29	0.61	0.57	0.97	0.29	0.10	0.40	-0.59

Bold-face data are significant at 95% probability value; italicized data are significant at 85% value

Elasticities show a highly price-responsive demand for firms 1, 2, 4, 6, and 8. In fact, own-price elasticities are smaller than -1, indicating weak consumer loyalty to those brands. By contrast, firm 3 shows inelastic demand. In fact, a price increase would not affect its demand, which is a sign of brand loyalty. Looking at the substitution elasticities, it is possible to notice a certain degree of substitution between the wine of firms 1 and 3. Firm 2, firm 6, and firm 8 products substitute for each other, and a similar relation has been found for the demand relative to firm 7 and firm 8. A high degree of substitution could influence merging decisions or tacit agreements in order to push their prices above marginal costs.

TAB. 3 – Concentration and market power indexes

Brand	Market Share	Lerner-Index	Cn	Mark-up
1	0.12	0.07	0.12	1.08
2	0.04	0.02	0.16	1.02
3	0.04	0.69	0.20	3.23
4	0.03	0.01	0.23	1.01
5	0.02	0.02	0.25	1.02
6	0.02	0.00	0.27	1.00
7	0.02	0.01	0.28	1.01
8	0.02	0.00	0.30	1.00
9	0.01	0.00	0.31	1.00
695	0.69	-	1.00	-

Tab. 3 shows the measures of concentration, market power, and price competition. The Lerner Index indicates the presence of market power. The result relative to firm 3 shows the ability of this firm to push prices above marginal costs.

A mark-up of one indicates that prices are fixed at the firm's production optimum level of MR=MC. Above the level of one, mark-up indicates the exercise of market power by the firm; in our case, firm 3 exercises market power, pushing the price three times above its marginal costs.

CONCLUSIONS AND SUGGESTIONS TO FURTHER RESEARCH

A certain degree of market concentration appears in almost half of the Italian wine market, despite the large number of firms operating in the wine sector and the steady increase in prices over the last decade, leading us to analyze the wine market by means of the SCP model.

As concentration could not be highly informative, conduct has been analyzed in more detail in order to understand pricing strategies in the Italian wine market. In order to do so, market power and mark-ups have been analyzed.

A first issue relative to the empirical analysis concerns data. While at the national level about 73,000 wineries have been counted, our data show about 700 wineries. Although the largest firms are represented, the smallest firms are not included in the sample. Fortunately, obvious computational problems relative to the estimation of a 700-equation system led to our choice to estimate using a smaller, 10-equation model. Limited information relative to the single wineries led to reject a bigger set of firms. Nevertheless, we believe that the top 9 firms representing a significant market share are enough to investigate the presence of unilateral market power.

The details of elasticities show a competitive market in which, except for brand 3, demand is elastic and shows the presence of a certain number of substitutes. Relevant information includes the wines of firm 3 and firm 8, which substitute for each other. While firm 3 seems to have a steady and strong market, firm 8 has weak demand in terms of both own- and cross-price elasticities. Firm 8, in fact, could be interested in merging with firm 3. Further research should investigate the effects of an eventual merger.

Concentration indexes do not give important information, while market power indexes and mark-up measures showed that firm 3 wines reflect an anti-trust market. This firm, according to our estimates, could potentially exercise the ability to push prices three times above marginal costs. Firm information allowed us to conclude that product differentiation could be the main reason behind this market power.

Consumer welfare is affected when prices are higher than marginal costs; thus, anti-trust authorities could be interested in investigating the origin of firm 3's market power. Further research, in fact, should focus on this exploration. Product differentiation, communication, quality, packaging, integration, or collusion strategies could all be a source of these high prices. There are also policy implications: formal activities leading to a guarantee of competition in the wine market and the maximizing of consumer welfare should be undertaken. Through a backward process, wine stakeholders could look at the results and contemporarily analyze the loyalty creation process in order to identify the best strategy.

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