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Drinking cheaply: the demand for basic wine in Italy

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The wine market has evolved dramatically over the last three decades. The premium wine segment has expanded significantly to the detriment of basic wines. Nevertheless, in traditional wine producing and consuming countries, inexpensive wines still account for a large market share, both in volume and value. Marketing strategies for such wines are changing in an attempt to tap this increasingly crowded market segment. Despite its importance, the basic wine segment has not been studied in-depth and is often assumed to have no product differentiation. This paper tried to ascertain the existence of a possible degree of heterogeneity within nonpremium wines and to measure, by means of elasticity computation, the relationships among categories of wines aggregated with criteria that go beyond price. A demand system (censored QUAIDS) was estimated, using a statistically representative panel of 6,773 Italian households, to see to what extent, if any, substitution occurs in home consumption of basic wines, which is the main channel of distribution of inexpensive wines in Italy. Although price is an important lever in supply policies, our results also suggest the importance of packaging, such as carton as an alternative to glass.

Key words: basic wine, censored demand system, elasticity computation, Italian wine sector, Quadratic Almost Ideal Demand System.

1. Introduction

In the past three decades or so, the world wine market has experienced dramatic upheavals. One of the major changes has involved the structure of wine demand (Labys and Cohen 2006; Anderson and Nelgen 2011). In the larger traditional producing and consuming countries, Italy and France, the annual *per capita* consumption of wine was, until the 1970s, higher than 100 litres (Corsi *et al*. 2004), while, in the last three decades, it has declined to between 50 and 40 litres (OIV 2012). During the same time span in the United States, the increase in the number of wine drinkers, combined with a higher *per capita* consumption, has pushed the aggregate national wine consumption to the same level as Italy and France. Indeed, while during the 1970s wine consumed in France and Italy accounted for 40 per cent of world consumption, nowadays the two countries account for about 25 per cent (Anderson and Nelgen 2011).

In traditional producing and consuming countries, the dramatic change in wine quantity consumed has been accompanied by major changes in consumption habits: from a necessary component in the daily diet to

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nonessential addition to a meal (Mäkelä *et al*. 2006). Consumption habits in traditional and new consuming countries are converging. Expensive wines have gained a considerable market share, becoming an accessible good no longer confined to a restricted elite of consumers (Ritchie 2009). At the same time, less expensive wines are reaching a place in the market similar to that of other widely consumed goods.

In order to have a clearer overview of the wine market, its characteristic high price range also deserves mention. This peculiarity has called for the development of commercial terminology to define different product categories based on specific price ranges. In the wine trade, it is common to distinguish wines into two broad classes according to price category: nonpremium, less expensive wines with basic quality characteristics; and premium, more expensive wines with complex quality characteristics and a high-value image (Anderson and Nelgen 2011). In the light of the absolute increase and relative importance of more expensive wines, a more detailed classification has been made in the wine business, dividing premium wines into subcategories (Ernst and Young Entrepreneurs 1999; Rabobank 2003). Nevertheless, a pan-national segmentation of the wine market is complex, and any estimation of the market share in each category, in aggregate terms or per country, is no trivial task (Steenkamp and Ter Hofstede 2002). However, estimation has been attempted according to a three-category classification of wine supply for 2009: nonpremium, commercial premium and superpremium (Anderson and Nelgen 2011). Nonpremium wines account for only one-seventh of the global wine trade in value (US$ 7 billion) but almost half in volume terms. It seems evident that nonpremium wines[1] represent a sizeable part in the world wine market. Together with the search for increasing value for products, this is one of the main reasons why suppliers are still hugely interested in the market for nonpremium wines (Ritchie 2009).

Despite the importance of nonpremium wines, very few studies have specifically investigated this segment (Torrisi *et al*. 2006). One possible reason explaining this lack of coverage could be the presumption that, in a wine category with a narrow price range, there is almost perfect homogeneity due to wines with simple intrinsic attributes, little quality complexity and hence not much differentiation. However, observation of the current supply shows a wide variety of products and various supplier's marketing styles. Therefore, in-depth investigation of basic wine is of paramount importance to better understand how key parameters combine. A study is thus called for to explore the needs and motivations sustaining the demand for nonpremium wines. Besides a large number of studies concerning the demand side on premium wines, or alcohol in general (Gallet 2007; Davis *et al*. 2008; Gil and Molina 2009), the literature on demand for basic wines appears to be almost completely lacking. In this perspective, the objective of this paper is to ascertain the existence of a possible

[1] From now on in this paper, the authors have taken the liberty to use nonpremium, less expensive and basic wines as synonymous.

degree of heterogeneity within nonpremium wines and to measure, by means of elasticity computation, the relationships among categories of wines aggregated with criteria that go beyond price.

Studies of nonexpensive wines have to be country-specific for two reasons. First, markets for nonpremium wines have average selling prices that differ because of different import tariffs and consumer taxes (Anderson and Nelgen 2011); second, consumer product perception varies on a country by country basis (Mäkelä *et al.* 2006). The focus of this study was Italy. Together with France, Italy has the largest traditional wine consumption market, and the variety of strategies adopted by suppliers is one of the widest: suppliers seek to capture customer interests by looking at all intrinsic and extrinsic product attributes and working on communication and distribution (Caracciolo *et al.* 2013). Although all these aspects of supply are important (Fraser 2005), pricing in a market with very small margins assumes great importance and the availability of appropriate information to support price fine-tuning is therefore crucial.

The empirical strategy adopted was based on two steps. The first consisted in collecting information directly interviewing key informants to delineate the driving factors of supply on Italian retail shelves. Such factors allowed us to classify wines within the nonpremium category using wine business driven criteria (e.g. labelling, types of packaging, and price). The second step was to estimate a demand system on a statistically representative sample of Italian households provided by AC-Nielsen.

2. Data description and categorisation of WAH consumption of wine in Italy

Wine purchased for at-home drinking (WAH) accounts for the largest slice of the Italian wine market: about 70 per cent of the total consumption in volume and 30 per cent in expenditure. The difference between the consumption figures in volume and in value highlights the extent to which cheap wine consumption is concentrated at home. WAH is supplied by many channels, but the most important, in terms of volume, are the supermarket chains which sell about 70 per cent of wine (Pomarici *et al.* 2012). The remaining percentage is purchased in neighbourhood grocery stores and wine shops, while direct purchase at wineries occurs especially in rural areas.

Wine for at-home drinking can be investigated using scanner data from consumer panels. The data used in this study were provided by the AC-Nielsen home scan, a statistically representative panel of Italian households. Households involved in the Nielsen panel regularly record their purchases through a scanner (Consumer Scan, The Nielsen Company, Milan, Italy). The data analysed thus consist of household wine expenditure at grocery stores (including neighbourhood and specialised grocery stores, convenience stores, small and large retail outlets) and are representative of Italian consumption of WAH. The information collected concerns value (euro), volume (litres) and the main extrinsic attributes of WAH purchases made by 6,773 Italian

households (for a total of 71,760 purchases of 6,251 different types of wines from 956 wine producers) during 2010 (from January to December). Household purchases were aggregated across the entire 12-month time period to form a single cross section of data. Because data collection was conducted during various seasons of the year, on a daily basis, the aggregated sample reflects potential different seasonal wine consumption patterns for an entire year.

The 6,251 types of wines recorded in the AC-Nielsen database need to be aggregated in fewer categories. This segment is of great complexity due, for example, to a broad variety of brands, packaging, production areas, possible origin labels and grape variety certifications. However, any aggregation of wines belonging to the nonpremium wines needs the criteria to be identified as objectively as possible. Nevertheless, the literature contains no indication on nonpremium wine categorisation. Our study attempts to identify criteria for aggregating nonpremium wines which allow homogeneous categories to be obtained. The empirical approach used was to proceed according to the same principles with which the supply of more economical wines is structured on the shelves of large retailers, which is the main site of purchase of packaged economical wines. To illustrate, management of the many retail items is a key problem in designing shelf assortment in large retailers (Franco 2001). A category management process addresses this problem and helps to eliminate unnecessary duplication. The aim is to structure assortments efficiently, such as to ensure a balance in product turnover on the shelves. In the absence of guidelines in the scientific literature, we thus surveyed the 'baggage' of empirical knowledge used in business practice to manage the category of basic wines. Three top commercial managers in leading wine producers were therefore interviewed with the specific aim of gaining information on the boundary line of the category of basic wines in Italy and on the criteria of assortment structuring in this category.

The sales director of *Gruppo Italiano Vini S.p.A.* (top Italian group by sales) and the director of commercial relations with large retailers at *Marchesi dè Frescobaldi* (one of the top 15 companies in Italy by turnover) were involved in an in-depth semi-structured interview in autumn 2011. The interviews, carried out individually with each of the two interviewees, were preceded by sending out the subject of the interview. On the basis of the interview results, we developed an aggregation scheme of the single nonpremium products sold in Italy. The results of this scheme were submitted to a third expert for final verification, director of the *Gruppo CEVICO* of relations with large distributors (Cevico is one of the top 15 Italian companies by turnover). The results can be summarised as follows. Key informants indicated the threshold that defines nonpremium wines as €3 per litre.[2] Starting from this information, the distribution of WAH

[2] The cut-off price between nonpremium (basic) and premium wines confirms the Rabobank classification which is substantially equivalent to that proposed by Anderson and Nelgen (2011).

consumption by price, divided into nonpremium and premium, from AC-Nielsen home scan data, is shown in Table 1. Wine sold under €3 per litre represents nearly 60 per cent of the total value and about two-thirds of the total volume.

In addition, the key informants all agreed that the critical factors behind the diversification of the supply of nonpremium wines on the shelves are as follows: (i) packaging; (ii) branding; (iii) price. Packaging is currently an element of supply diversification as it is the field where many producers have explored the way to add value to wine with significant innovations able to improve the service delivered to the client and, at times, perception of sustainability. Such innovations have concerned the material of containers, mainly introducing the carton, as an alternative to glass bottles. As for the branding criterion, the key informants all agreed that a retail shelf must contain the market leader and the private labels, together with a set of wines with only locally recognisable brands. Concerning the third criterion, the retail shelf is formed to cover all price ranges in order to give any consumer the possibility of choosing a product based on his/her own preferences/budget. In particular, the range has to contain wines with a unit price ranging from two to three euro per litre, with characteristics that emulate premium wines, and wines with a unit price below 2 euro/litre, which typically have the profile of convenience products. The supply of nonpremium wines on the retail shelves also appears diversified for other elements such as wine colour and certification category (e.g. protected denomination of origin or PDO, protected geographical indication or PGI). However, these elements were not indicated by the experts as being major factors in forming the assortment of wines. To illustrate, certification of origin chiefly comes with wines retailing at between €2 and €3 per litre. However, the choice of the origin of wines falling within the assortment of basic wines is not made on the basis of specific criteria. Indeed, the composition of the assortment in terms of geographical origin depends on the succession of the various producers making up the shelf which normally occurs in large stores. As for 'red–white' wine colour, the experts pointed out that this criterion is not taken into account in the process of structuring a retail shelf. The reason is that red or white wines are the same within each of these categories. Put differently, consumers make a choice between red and white based on variables, or attributes, which go beyond the choice set of attributes available in a retail shelf.

Table 1 Premium and nonpremium Italian distribution of wines

Price classes (€ per litre)	Share on expenditure (%)	Share on volume (%)
Nonpremium wines (<€3)	58	67
Premium wines (>€3)	42	33
Total	100	100

Source: authors' calculations based on data from AC-Nielsen (2010).

The categorisation scheme potentially yields 18 categories of wines: two packaging types (glass and carton); three levels of branding (market leader, private label, and others); three price levels (below €2 per litre, between €2 and €3 per litre, above €3 per litre). However, the information gathered by the experts has to be matched with, or confirmed by, the actual consumption data available in the AC-Nielsen data set. Among the set of types/levels, the one that has to be explicitly identified in the AC-Nielsen data set is the market leader. According to the market share in volume, Caviro can doubtless be considered the market leader with the highest market share in volume terms (12.5 per cent); all other competitors show a market share lower than 1.51 per cent (Table 2). Caviro mainly promotes two brands, Tavernello and Castellino, both sold in cartons, with a communication strategy directly geared to consumers, using TV and media advertising extensively with aim to stimulate demand and brand loyalty. The main theme in advertising is the integrity and safety of the wine as a result of strict controls over every link in the supply chain, from vineyard management and winemaking through packaging and marketing, ensuring consistent quality throughout the entire process.

Private labels are those supplied by using the names of big distribution chains. The number of private labels available in the Nielsen database is 30, and the brands with the highest market share are Conad, Carrefour, COOP, GS, and LD. The 30 private labelled wines account for 7.89 per cent in terms of market share (in volume terms) and are sold at an average price of 0.98 euro per litre, mainly in carton packaging. A summary of statistics from the AC-Nielsen data set, organised by criteria suggested by experts, is shown in Table 3. Some categories of wines are represented in small percentages. The criterion used to aggregate products was to consider, as a single category, those products represented in at least two per cent in terms of market share (in volume terms). Those categories below that threshold were aggregated into the neighbouring category.

From the merging of information collected from experts and the Nielsen data, we aggregated the products into categories. The outcome is an ex-ante categorisation of the nonpremium wine market. The whole set of wines

Table 2 Top four firms of the Italian wine at-home market

Wine brand	Market share in volume (per cent)	Mean price (€ per litre)
Caviro	12.48	1.42
Conad	1.51	1.39
Soldo	1.41	1.48
San Matteo	1.32	1.58

Source: Authors' calculations based on data from AC-Nielsen (2010).

Table 3 Summary statistics of wines organised by experts' suggested criteria (volume per cent of total wine at-home consumption)

	Price categories (€ per litre)		
	<2	2–3	>3
Carton			
Caviro*	11.79	–	–
Private label	6.08	–	–
Other	14.86	0.02	0.02
Glass			
Caviro*	0.69	–	–
Private label	1.81	0.20	0.60
Other	24.10	12.64	27.19
Total	59.33	12.86	27.81

Source: authors' calculations based on data from AC-Nielsen (2010).
*Caviro is the market leader that sells wines almost exclusively in carton packaging.

contained in the AC-Nielsen data set was therefore subdivided into six categories. Thus, the WAH market becomes divided into the following categories:
wines sold in carton at an average price below €2 per litre:

1. Market leader (ML): Caviro wines.
2. Private labels (PL): private label brand wines.
3. Other wines in cartons (OC): wines with no specific or recognisable brand;

wines sold in glass (bottle of 0.75 litre), one for each of the price categories:

1. Other wines below €2 per litre (BG: Basic Glass).
2. Other wines between €2 and €3 per litre (TB: Top Basic).
3. Other wines over €3 per litre (PW: Premium wines).

This categorisation permits analysis of brand-specific relationships among basic wines while jointly evaluating the role of packaging and price. Table 4 provides volumes (litres) and expenditure (euro) of wine as grouped according to the above market categorisation.

3. Empirical model specification

In this section, we present the empirical model adopted to estimate the demand system. A Quadratic Almost Ideal Demand System (QUAIDS) was implemented (Banks *et al.* 1997). The use of a model allowing a more general Engel curve shape than the popular Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980) was required. The reasons are well rooted in the literature. In particular, Banks *et al.* (1997) show that the demand for some goods, particularly alcohol and clothing, has a quadratic relationship with the logarithm of total expenditure at higher income levels.

Table 4 Consumption, expenditure share and purchase frequency by wine category

	Mean expenditure (per cent)	Household purch (per cent)*	Purch. in only one category (per cent)†	Mean litre consump. (per cent)
Market leader (ML)	12	32	5.4	14
Private label (PL)	6	22	2.7	8
Other wines carton (OC)	12	35	5.1	15
Other wines glass below €2 (BG)	16	41	4.3	18
Other wines glass between €2 and €3 (TB)	12	40	2.4	12
Premium wines over €3 (PW)	42	61	14.1	33
Total	100		34.0‡	

Source: authors' calculations based on data from AC-Nielsen (2010).
*Percentage of all households having made at least one purchase of a wine in the categories.
†Percentage of households having purchased wines in only one of the categories.
‡Percentage of households having purchased wines in all categories is 1.6.

The QUAIDS stochastic representation of the system of equations for the budget share w_i of the ith good (wine) is as follows (household subscript omitted here and elsewhere):

$$w_i = \alpha_{i*} + \sum_{j=1}^{J} \gamma_{ij} \ln P_j + \beta_i \ln \left[\frac{m}{a(\mathbf{p})}\right] + \frac{\lambda_i}{b(\mathbf{p})} \left\{\ln \left[\frac{m}{a(\mathbf{p})}\right]\right\}^2 + u_i \quad \forall \{i = 1, \ldots, I \quad (1)$$

where a_{i*} is the intercept of the model expressed as a linear function of some socioeconomic and demographic attributes (residence, age, income class). It serves to assess the potential differences in household preferences and behaviour (Deaton and Muellbauer 1980):

$$a_{i*} = a_i + \sum_{k=1}^{K} \delta_{ik} D_k \quad \forall \{i = 1, \ldots, I \quad (2)$$

where $\delta_{i,k}$ represents the contribution of the k-th characteristics of the households on the intercept of the i-th equation representing a category of wine.

γ_{ij} are the parameters to be estimated of prices P_j related to the j-th good (wine). β_i are the total expenditure (m) parameters to be estimated, while λ_i represent the quadratic terms of expenditure.

$\ln a(\mathbf{p})$ has the translog form:

$$\ln a(\mathbf{p}) = \alpha_0 + \sum_{i=1}^{I} \alpha_{i*} \ln P_i + \frac{1}{2} \sum_{i=1}^{I} \sum_{j=1}^{J} \gamma_{ij} \ln P_i \ln P_j \quad (3)$$

$b(\mathbf{p})$ is the Cobb-Douglas price aggregator:

$$b(\mathbf{p}) = \prod_{i=1}^{I} P_i^{\beta_i} \quad (4)$$

Finally, u_i are the error terms.

Information on prices paid by each household for the *i*-th wine is provided through unit values (€ per litre) in order to generate a volume-weighted average of the category price. As suggested by Deaton and Zaidi (2002), the unavailable prices due to household nonconsumption of the listed category were imputed by the median of the reported price by the purchasers, differentiating the value per region of residence and the household's income class.

From an empirical point of view, according to the established consensus, demand system estimates based on household cross-sectional data can be cumbersome on several grounds. One of these is that household consumption variables are censored at zero. In demand studies using cross-sectional microdata the zero-food consumption problem is a frequent issue; only a subset of households shows a positive consumption for the *i*-th good (wine) during the selected observation period. In the investigated wine demand system, percentages of zero-food consumption (censoring) are substantial: Private label wines are consumed by 22 per cent of households, other wines over €3 per litre by 61 per cent. Since the seminal work of Heien and Wessells (1990), several empirical procedures for censored data have been developed such as those suggested by Perali and Chavas (2000), Golan *et al.* (2001) and Shonkwiler and Yen (1999). The latter approach is that commonly used in the literature (Akbay *et al.* 2007; Caracciolo *et al.* 2014). Shonkwiler and Yen (1999) modelled zero-food consumption for a demand system of I equations as below:

$$w_i^* = w_i(\mathbf{p}, m; \mathbf{\Gamma}_i)\Phi_i(\mathbf{z}\boldsymbol{\theta}_i) + \tau_i\phi_i(\mathbf{z}\boldsymbol{\theta}_i) + e_i \quad \forall\{i = 1, \ldots, I \tag{5}$$

and

$$\begin{aligned} e_i = u_i + w_i(\mathbf{p}, m; \mathbf{\Gamma}_i)\left[\left[\Phi_i(\mathbf{z}\boldsymbol{\theta}_i) - \Phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)\right]\right] \\ + \tau_i\left[\phi_i(\mathbf{z}\boldsymbol{\theta}_i) - \phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)\right] \quad \forall\{i = 1, \ldots, I \end{aligned} \tag{6}$$

where $\mathbf{\Gamma}_\mathrm{i}$ is a vector containing system demand parameters, $\mathbf{z}$ is a vector of exogenous variables, $\boldsymbol{\theta}_\mathrm{i}$ is a conformable vector of parameters, $\phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)$ and $\Phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)$ are the probability density function (PDF) and the cumulative distribution function (CDF), respectively. Estimation of equation (5) can be performed in two steps, where in the first step the maximum-likelihood probit estimates of $\phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)$ and $\Phi_i(\mathbf{z}\hat{\boldsymbol{\theta}}_i)$ are obtained using equation (7):

$$y_i^* = (\mathbf{z}\boldsymbol{\theta}_i + v_i) \quad \forall\{i = 1, \ldots, I \tag{7}$$

with v_i the random errors and

$$y_i = \begin{cases} 1 & if \quad y_i^* > 0 \\ 0 & if \quad y_i^* \leq 0 \end{cases} \quad \forall\{i = 1, \ldots, I \tag{8}$$

and then estimating $\mathbf{\Gamma}_i$ and τ_i in the augmented system where

$$w_i^* = y_i w_i \quad \forall \{i = 1, \ldots, I \tag{9}$$

Equation (1) therefore becomes:

$$\begin{aligned} y_i w_i = & \left\{ \alpha_{i*} + \sum_{j=1}^{J} \gamma_{ij} \ln P_j + \beta_i \ln \left[\frac{m}{a(\mathbf{p})} \right] + \frac{\lambda_i}{b(\mathbf{p})} \left\{ \ln \left[\frac{m}{a(\mathbf{p})} \right] \right\}^2 \right\} \Phi_i(\mathbf{z}\boldsymbol{\theta}_i) \\ & + \tau_i \phi_i(\mathbf{z}\boldsymbol{\theta}_i) + e_i \; \forall \{i = 1, \ldots, I \end{aligned} \tag{10}$$

To estimate the above system of I equations, a nonlinear feasible generalised least square (FGLS) (Davidson and MacKinnon 2004) estimating technique was followed, following the recommendations of Tauchmann (2005). Only socio-economic and demographic characteristics were included among the explanatory variables $\mathbf{z}$ in the selection equations (7), as suggested by Yen and Lin (2006).

The economic theory provides a set of restrictions that are known as homogeneity, adding-up and symmetry. The symmetry and homogeneity conditions are, respectively, imposed by

$$\gamma_{ij} = \gamma_{ji} \quad \forall i,j = 1, \ldots, I; \tag{11}$$

and

$$\sum_j \gamma_{ij} = 0 \quad \forall i,j = 1, \ldots, I. \tag{12}$$

Using the above specifications, the maximum-likelihood estimation of the variance–covariance matrix of the residuals is not singular (determinant not equal to zero). Therefore, the adding-up condition is not *a-priori* imposed by the share format of demand systems as usually happens. Estimation of the complete system (without the deletion of an equation) was performed (Drichoutis *et al.* 2008).

4. Empirical results

The complete list of explanatory variables included in the demand system is reported in Table 5. The average prices of wine categories have a limited variability (SD), expecting a considerable degree of substitutability or complementarity among wines of different categories, except for the other wines category insofar as it contains wines at over €3 per litre. The presence of the latter category in the model, though lying outside the specific objectives in this paper, ensures a higher degree of completeness in representing the demand system. In the model, the purchasers are characterised by means of

Table 5 Description of variables used in the food demand system

Parameter	Variables	Mean	SD	Min	Max	Censoring (per cent)
$\gamma_{i,j:ML}$	Price of market leader (ML)	1.42	0.14	1.01	1.91	68
$\gamma_{i,j:PL}$	Price of private label (PL)	0.98	0.16	0.56	1.29	78
$\gamma_{i,j:OC}$	Price of other wines carton (OC)	1.03	0.27	0.27	2	65
$\gamma_{i,j:BG}$	Price of other wines basic glass (BG)	1.59	0.4	0.66	2.88	59
$\gamma_{i,j:TB}$	Price of other wines top basic glass (TB)	2.47	0.36	1.35	3.82	60
$\gamma_{i,j:PW}$	Price of premium wines over €3 (PW)	5.22	2	2.32	49.99	39
β_i	Total wine expenditure of the household (€/year)	67.36	112.36	1	1,780	–
$\delta_{i,k:1}$	Share of household purchases in 'discount' stores	0.1	0.25	0	1	–
$\delta_{i,k:2}$	Share of household purchases for local wine	0.25	0.32	0	1	–
$\delta_{i,k:3}$	Income class (1 low – 4 high)*	2.51	0.98	1	4	–
$\delta_{i,k:4}$	Age class of the household head (1 young – 5 old)†	3.09	1.21	1	5	–
$\delta_{i,k:5}$	One if the household lives in North-East Italy	0.19	0.39	0	1	–
$\delta_{i,k:6}$	One if the household lives in Southern Italy	0.28	0.45	0	1	–
$\delta_{i,k:7}$	One if the household lives in North-West Italy	0.3	0.46	0	1	–
$\delta_{i,k:8}$	Share of household purchases for 'red wine'	0.5	0.37	0	1	–
$\delta_{i,k:9}$	Share of household purchases for certificated wine	0.36	0.36	0	1	–

Source: our elaboration on AC-Nielsen data (2010).
Income and age are expressed, respectively, in four and five classes. They are implemented in the model as ordinal variables.
*Income class cut-offs are (euro per household component equivalent) up to 535, up to 908, up to 1,389, >1,389.
†Age class cut-offs are ≤34, between 35 and 44, between 45 and 54, between 55 and 64, ≥65 years old.

some socio-economic variables (parameters: $\delta_{i,k:1to9}$) directly obtained from information contained in the database used (income classes, age classes, place of residence) and behavioural variables constructed *ad hoc* (tendency to purchase in discount stores and to purchase red wines, wines from the region of residency and certification of origin wines). These are important elements that directly or indirectly reflect different consumption habits. Their introduction in the model thus allows the heterogeneity of wine purchasers to be represented in the analysis.

The demand model estimation results are shown in Table 6. Starting from the bottom of the table, coefficients τ_i and λ_i are, respectively, the probability density function estimated parameter and quadratic component of equation (10) estimated parameter.

As for the latter, the statistical significance of the coefficient in four equations over six implemented confirms the appropriateness of a quadratic

Table 6 Demand system parameter estimation and level of significance

	Market leader	Private label	Other Wines carton	Other wines basic glass	Other wines Top B. glass	Premium wines over 3€
i,j:	ML	PL	OC	BG	TB	PW
α_i	0.872***	0.058	−1.784***	0.177	−0.388**	0.689***
$\gamma_{i,j:ML}$	−1.352***	–	–	–	–	–
$\gamma_{i,j:PL}$	0.231***	−0.069***	–	–	–	–
$\gamma_{i,j:OC}$	0.338***	−0.154***	0.038*	–	–	–
$\gamma_{i,j:BG}$	0.369***	0.127***	−0.007	−1.023	–	–
$\gamma_{i,j:TB}$	0.588***	0.017	−0.247***	0.046**	−0.361***	–
$\gamma_{i,j:PW}$	−0.175***	−0.152*	0.032***	0.488***	−0.043***	−0.149***
β_i	−0.028*	0.099***	−0.222***	0.076***	0.006	0.022***
$\delta_{i,k:1}$	−0.102*	0.101**	−0.093*	−0.202**	0.176***	−0.127***
$\delta_{i,k:2}$	0.142***	0.028	−1.176***	−0.088*	0.105***	−0.063***
$\delta_{i,k:3}$	0.030***	−0.028***	−0.078***	−0.012	−0.007	0.003
$\delta_{i,k:4}$	−0.044***	0.010	0.062***	0.008	0.025***	−0.010***
$\delta_{i,k:5}$	0.151***	−0.030	−0.048	0.115***	−0.109***	0.061***
$\delta_{i,k:6}$	0.125***	0.056***	0.065**	0.068*	0.008	0.009
$\delta_{i,k:7}$	−0.002	−0.003	−0.049	0.075***	−0.002	0.008
$\delta_{i,k:8}$	−0.101***	0.104***	−0.170***	−0.219***	0.200***	−0.085***
$\delta_{i,k:9}$	0.223**	−0.278***	−1.858***	−0.862***	0.120***	0.139***
λ_i	0.002	−0.013***	0.044***	−0.017***	−0.002	−0.003**
τ_i	−0.081	0.068	0.000	−0.216***	0.02	−0.019

Note: *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

form of the demand system. Coefficient τ_i is statistically significant only for BG. Even though only one coefficient appears to be statistically significant in isolation, taken together they are all different from zero. In fact, a joint null hypothesis that all τ_i are equal to zero was performed and rejected. Coefficients $\delta_{i,k}$ represent socio-demographic characteristics. They show the major importance of socio-demographics proved by the level of significance reached for the most part. It is worth pointing out the estimated coefficients of the variables 'income class' ($\delta_{i,k:3}$) and 'age class of the household head' ($\delta_{i,k:4}$).[3] As regards the former the only positive sign, statistically significant, is that of the category 'market leader (ML)' ($\delta_{ML,k:3} = 0.030$), while the other two significant coefficient are negative. For the latter ($\delta_{i,k:4}$), the sign is negative ($\delta_{ML,k:4} = -0.044$ and $\delta_{PW,k:4} = -0.010$, respectively) while no other estimated coefficient for all the other categories was statistically significant. It is also worth noting a high propensity to purchase red wine related to a low propensity to purchase PW and ML wines (coefficients $\delta_{i,k:8}$). It may be explained by the fact that those who are more inclined towards red wine reduce their purchase of PW and ML, which have relatively high prices. As for share of household purchases for certificated wine (coefficients $\delta_{i,k:9}$), it might be pointed out that households expending more on certified wines show

[3] It is worth reminding that income and age are ordinal variables ranging, respectively, from 1 to 4 and from 1 to 5. Estimated coefficients identify the average effect among the successive levels.

a tendency to expend proportionally more on those categories of wine with more differentiated characteristics, such as PW, ML and TB.

The effect of prices will be discussed after calculation of elasticities. Elasticities were calculated for each household and then averaged across them. From estimating the parameters of prices ($\gamma_{i,j}$) and expenditure (β_i) of equation (10), we obtained Marshallian elasticity values for prices (direct $\eta_{i,i}$ and cross $\eta_{i,j}$), using the procedure suggested by Banks *et al.* (1997) and Yen *et al.* (2002):

$$\eta_{i,i} = \frac{\partial_{w_i}}{\partial \ln P_i} \Phi_i(z\hat{\theta}_i)/w - 1 \tag{13}$$

$$\eta_{i,j} = \frac{\partial_{w_i}}{\partial \ln P_j} \Phi_i(z\hat{\theta}_i)/w \tag{14}$$

Marshallian elasticity represents the sum of net price effect and expenditure effect. Table 7 also reports the net price and expenditure effects. Hicksian elasticity values were calculated applying Slutsky's equation, while expenditure elasticity was calculated as follows:

Table 7 Marshallian, Hicksian and expenditure elasticity values

	ML	PL	OC	BG	TB	PW
Mashallian						
Market leader (ML)	**−1.18****	−0.05**	−0.24***	0.10*	−0.29*	0.60**
Private label (PL)	−0.27**	**−1.44*****	0.18***	0.31***	0.94	−0.41
Other wines carton (OC)	0.54***	1.92***	**−3.04***	0.79	1.78	−2.13***
Other wines basic glass (BG)	0.13*	0.30**	−0.06	**−1.38***	−0.20***	0.34***
Other wines top basic glass (TB)	0.33*	0.04	0.39	0.18	**−1.50****	−0.57*
Premium wines over €3 (PW)	0.13***	0.29*	0.02***	0.05***	−0.06***	**−1.37*****
Hicksian						
Market leader (ML)	**−1.08****	0.01	−0.14*	0.23*	−0.19*	0.94**
Private label (PL)	−0.23**	**−1.42*****	0.22***	0.37***	0.98	−0.26
Other wines carton (OC)	0.56***	1.93***	**−3.02***	0.81	1.80	−2.07***
Other wines basic glass (BG)	0.21*	0.34**	0.02	**−1.27***	−0.12***	0.61***
Other wines top basic glass (TB)	0.44	0.10	0.50	0.33	**−1.39***	−0.18
Premium wines over €3 (PW)	0.25***	0.35*	0.13***	0.20***	−0.06***	**−0.97*****
Expenditure elasticity	**0.93***	**0.35*****	**0.15*****	**0.66*****	**0.82**	**0.96****

The elasticities in the *j*th column indicate the change in the demand for all *i* goods as the *j*th good's price changes.
Bootstrap estimate of the significance level: *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.
Own-price elasticities are in bold.

$$\omega_i = \frac{\partial_{w_i}}{\partial \ln m} \Phi_i(z\hat{\theta}_i)/W_i + 1 \tag{15}$$

It is worth reporting both compensated and uncompensated elasticity estimates because while economists are interested in the so-called pure price effects, as Hicksian elasticity values are generally reported in academic studies, policymakers are generally more interested in uncompensated effects (Fogarty 2010).

For a given demand equation, the relationships between Marshallian and Hicksian elasticity values are well known (Theil and Clements 1987). Our expenditure elasticities being below one, Marshallian own-price elasticity estimates are more price responsive than Hicksian elasticity values (Fogarty 2010). In Table 7, along the rows, we may read the effect on the quantity consumed of the *i*-th wine category of the change in price of the *j*-th wine represented in the column. A *t*-test on the null hypothesis that each own-price elasticity is inelastic (H_0: $\eta_{ii} > -1$) was performed. Results show that the null hypothesis fails to be rejected for market leader, other wines glass below €2 and other wines glass between €2 and €3, while it can be rejected for private label (PL) and premium wines over €3 (at 1 per cent). A general outlook of statistical significance of calculated elasticity values confirms indirectly the goodness of the categorisation made. Price elasticities between carton wine are all statistically significant (upper left block) as well as those among bottle wines (eight of nine values in the lower right-end block). Cross-price elasticity values between carton and wine in bottle have fewer significant elasticities (five of nine in the upper right-hand block and six of nine in the lower left-hand block). So, the general pattern that can be identified is that there are fewer price relationships between carton and bottle wines.

As for own-price elasticity values, Marshallian estimates only slightly differ (more elastic) from the Hicksian ones. The expenditure effect seems to be substantial only on premium wines over €3 (PW), going from −1.37 to −0.97. Demand for each of the six product categories considered in the analysis reacts to own-price variations in a different way, albeit within a limited range for all categories varying from −1.18 to −1.50 (Marshallian values), and from −1.08 to −1.42 (Hicksian values). The only exception is the 'other wines carton (OC)', a category which, with a value of −3.04 (−3.02 as Hicksian), describes a particularly elastic behaviour of demand. As pure price effect, only PW shows inelastic elasticity. Among basic wines, one product category – market leader – has a fairly low elasticity in both Marshallian and Hicksian estimates. The latter differences show the effectiveness of being a market leader, which ensures a lower degree of vulnerability to price variations. The marketing implemented by Caviro is also effective with regard to basic wines sold in glass bottles (both BG and TB), although the latter benefit from a higher degree of market penetration (Tab. 4). The cross-elasticities, in turn, show a very complex picture of substitution trends with rare cases of reciprocity. Brand cartons (market leader and private label) and nonbrand

cartons (other wine cartons, OC) show a fairly differentiated demand behaviour in terms of substitution. Brand cartons are substituted by wine in glass: the market leader is substituted by more costly wines (PW), even if the opposite does not hold at the same magnitude; private label wines tend to be substituted by other wine carton (OC) and other wines basic glass (BG), also in this case without reciprocity in magnitude. Other wine cartons (OC), whose demand is very price-sensitive, have various (fairly high) coefficients of cross-elasticity, although the most frequent substitution is with private label wines. Basic wines in glass bottles (BG) tend to be substituted mainly by private label wines (PL) – in this case one of the few cases of reciprocity occurs – or by more costly wines in glass bottles (PW). Top basic glass (TB) wines tend to be substituted by market leader (ML) and premium wines (PW). Lastly, premium wines (PW) show a moderate tendency to be substituted by all the other cheaper wines, with the exception of TB. Moreover, such wines tend to substitute only two product categories and are overall a rather isolated category.

5. Concluding remarks

The aim of this paper was to investigate the domestic consumption of wine, with the focus on nonpremium wines. In order to do so, a censored demand system (QUAIDS) was estimated using AC-Nielsen homescan data, statistically representative of Italian households in the year 2010. Categorisation of nonpremium wines was necessary in order to synthesise a wide range of wines in fewer categories. Some key informants of the Italian wine were interviewed who described how the supply of wines takes place in the Italy's big retail chains. It emerged that the market for nonpremium wines, apparently showing thousands of products, can be aggregated into five categories. Some important considerations may be inferred on the strategies to be implemented with a view to consolidating demand–supply relations and on the possible evolution of the market for basic wines. Consumption data provided by AC-Nielsen were managed to fit that picture on the consumption side. The statistically significant level of almost all coefficients estimated by means of the demand system confirms that the categorisation implemented seems to capture the key elements of that particular market side. We may thus confirm what was stated in the first part of the paper: the market for cheaper wines is complex, and products, categorised as proposed, show a significant degree of heterogeneity.

Particular elements may be found which allow hypotheses to be postulated on the functioning of the market in the period in question and on its possible evolution. The most salient elements are low elasticities for carton wine of the market leader (ML) and high elasticity of nonbrand wine in cartons (OC). Albeit with the necessary caution, on the basis of the results, it may be stated that also in the segment of more economical wines, brand is an effective instrument of diversification. The brand effect, though to a lesser extent, is also recognised in private label carton wines which, proposed with a similar

price to that of carton wines without a recognisable brand, have a much lower elasticity than the latter. Examination of the cross-elasticities allows further reflection on carton wine of the market leader and that with private label. The data show that as the price of the market leader grows, purchase of this product declines in favour of the premium wine; as the price of private label wine grows, purchases are shifted towards other basic products, except for the market leader carton. The two branded wines in the carton are not substitutable.

Hypothesising on the evolution of the market size for more economical wines, it may be noted that only for two categories, the carton wine of the market leader and basic wine in glass is a tendency shown to shift purchases towards premium wines. Indeed, most of the substitutions of purchases seem to remain within the circle of nonpremium wines.

Another aspect worth underlying is the development of a specific consumer loyalty towards products that are market leaders and towards PL. Such consumer loyalty derives from two very different pathways. Consumer loyalty towards PL is the result of policies of loyalty building undertaken by the large retail chains, which also affect the sale of wine (Grewal *et al*. 2004). By contrast, consumer loyalty towards the market leader is the result of effective brand-building action taken directly by a wine producer. The communication strategy supporting the brand is based on an integrated communication strategy which follows the typical lines of promotion of widely consumed products, including television advertising, a communication tool which is not considered suitable for the world of wine (Hall and Mitchell 2008). In reality, in the Italian market, it has been possible to observe in recent years various communication campaigns based on the use of publicity in the mass media, including TV, but only for limited periods and without continuity. Such behaviour is attributed to the failure to achieve the hoped-for results, followed by the maintenance of strategies based on communication chiefly targeting retailers. Such events appear to conflict with the success in constructing consumer loyalty for the ML. However, it may be observed that the ML has become such due to more than 20 years of perseverance in its brand-building strategy and, presumably, by allocating suitable resources to communication with consumers and coordinating the other necessary activities of communication and marketing (Litwak 2001). The building of strong brands in the sector of basic wines would thus appear possible but only with long-term strategies.

Our findings encourage the launching of further studies, including those on the demand structure, in line with that presented in this paper. New studies will require that the categorisation of nonpremium wines implemented herein be verified. In this sense, the experience of professionals operating in the supply chain of nonpremium wines is undoubtedly essential. This approach could, however, be supplemented by surveys of consumers in order to analyse directly how the great variety of the supply of nonpremium wines is viewed and perceived. Future research could be developed on the two other topics which would improve estimation results: on the one hand, a specific study on

the effects of consumption seasonality during the year and, on the other, explicit implementation in the demand system of promotions applied by the large retail chains.

References

Akbay, C., Boz, I. and Chern, W.S. (2007). Household food consumption in Turkey, *European Review of Agricultural Economics* 34, 209–231.

Anderson, K. and Nelgen, S. (2011). *Global Wine Markets, 1961 to 2009: A Statistical Compendium*. The University of Adelaide Press, Adelaide.

Banks, J., Blundell, R. and Lewbel, A. (1997). Quadratic Engel curves and consumer demand, *Review of Economics and Statistics* 79, 527–539.

Caracciolo, F., Cembalo, L. and Pomarici, E. (2013). The hedonic price for an Italian grape variety, *Italian Journal of Food Science* 3, 65–78.

Caracciolo, F., Cembalo, L. and Thompson, G. (2014). Distributional effects of maize price increases in Malawi, *Journal of Development Studies* 50, 258–275.

Corsi, A., Pomarici, E. and Sardone, R. (2004). Italy, in Anderson, K. (ed), *The World's Wine Markets: Globalization at work*. Cheltenham, Edward Elgar, London, pp. 73–97.

Davidson, R. and MacKinnon, J.G. (2004). *Econometric Theory and Methods*. Oxford University Press, New York, NY.

Davis, T.R., Ahmadi-Esfahani, F.Z. and Iranzo, S. (2008). Demand under product differentiation: an empirical analysis of the US wine market, *Australian Journal of Agricultural and Resource Economics* 52, 401–417.

Deaton, A. and Muellbauer, J. (1980). An almost ideal demand system, *The American Economic Review* 70, 312–326.

Deaton, A. and Zaidi, S. (2002). Guidelines for Constructing Consumption Aggregates for Welfare Analysis, *LSMS Working Paper No. 135*, World Bank, Washington.

Drichoutis, A.C., Klonaris, S., Lazaridis, P. and Nayga, R.M. Jr (2008). Household food consumption in Turkey: a comment, *European Review of Agricultural Economics* 35, 93–98.

Ernst and Young Entrepreneurs (1999) *Etude des Filières et des Stratégies de Développement des Pays Producteurs de Vins dans le Monde: Analyse de la Filière Viticole Australienne*. ONIVINS, Office National Interprofessionnel des Vins, Paris.

Fogarty, J.J. (2010). The demand for beer, wine and spirits: a survey of the literature, *Journal of Economic Surveys* 24, 428–478.

Franco, G.A. (2001). Category Management, in Moulton, K.S., and Lapsley, J.T. (eds), *Successful Wine Marketing*, Springer, Ed, New York, NY, pp. 153–164.

Fraser, I. (2005). Microeconometric analysis of wine grape supply contracts in Australia, *Australian Journal of Agricultural and Resource Economics* 49, 23–46.

Gallet, C.A. (2007). The demand for alcohol: a meta-analysis of elasticities, *Australian Journal of Agricultural and Resource Economics* 51, 121–136.

Gil, A. and Molina, J. (2009). Alcohol demand among young people in Spain: an addictive QUAIDS, *Empirical Economics* 36, 515–530.

Golan, A., Perloff, J.M. and Shen, E.Z. (2001). Estimating a demand system with non-negativity constraints: Mexican meat demand, *Review of Economics and Statistics* 83, 541–550.

Grewal, D., Levy, M. and Lehmann, D.R. (2004). Retail branding and customer loyalty: an overview, *Journal of Retailing* 80, 249–252.

Hall, C.M. and Mitchell, R. (2008). *Wine Marketing: A Practical Guide*. Elsevier, ed. BH, Oxford, UK.

Heien, D. and Wessells, C.R. (1990). Demand systems estimation with microdata: a censored regression approach, *Journal of Business & Economic Statistics* 8, 365–371.

Labys, W.C. and Cohen, B.C. (2006). Trends versus cycles in global wine export shares, *Australian Journal of Agricultural and Resource Economics* 50, 527–537.

Litwak, L. (2001). Advertising, in Moulton, K.S. and Lapsley, J.T. (eds), *Successful Wine Marketing*, Springer Ed, New York, NY, 137–152

Mäkelä, P., Gmel, G., Grittner, U., Kuendig, H., Kuntsche, S., Bloomfield, K. and Room, R. (2006). Drinking patterns and their gender differences in Europe, *Alcohol and Alcoholism* 41, 8–18.

OIV: Organisation Internationale de la Vigne et du Vin (2012). *Report of the Director General of the OIV on the World Vitiviniculture Situation in 2011*. International Organisation of Vine and Wine, Paris, available from URL: http://www.oiv.int/oiv/info/enconjoncture?lang=en [accessed 11 April 2012].

Perali, F. and Chavas, J.P. (2000). Estimation of censored demand equations from large cross-section data, *American Journal of Agricultural Economics* 82, 1022–1037.

Pomarici, E., Boccia, F. and Catapano, D. (2012). The wine distribution systems over the world: an explorative survey, *New Medit* 4, 23–38.

Rabobank (2003). *Wine is Business*. Rabobank, Utrecht.

Ritchie, C. (2009). The culture of wine buying in the UK off trade, *International Journal of Wine Business Research* 21, 194–211.

Shonkwiler, J.S. and Yen, S.T. (1999). Two-step estimation of a censored system of equations, *American Journal of Agricultural Economics* 81, 972–982.

Steenkamp, J.-B. and Ter Hofstede, F. (2002). International market segmentation: issues and perspectives, *International Journal of Research in Marketing* 19, 185–213.

Tauchmann, H. (2005). Efficiency of two-step estimators for censored systems of equations: Shonkwiler and Yen reconsidered, *Applied Economics* 37, 367–374.

Theil, H. and Clements, K.W. (1987). *Applied Demand Analysis: Results from System-wide Approaches*. Ballinger, Cambridge, MA.

Torrisi, F., Stefani, G. and Seghieri, C. (2006). Use of scanner data to analyze the table wine demand in the Italian major retailing trade, *Agribusiness* 3, 391–404.

Yen, S.T. and Lin, B.H. (2006). A sample selection approach to censored demand systems, *American Journal of Agricultural Economics* 88, 742–749.

Yen, S.T., Kan, K. and Su, S. (2002). Household demand for fats and oils: two-step estimation of a censored demand system, *Applied Economics* 34, 1799–1806.