DO ITALIAN CONSUMERS EXHIBIT "HOME BIAS"?

A STUDY OF ITALIAN RETAIL DEMAND FOR RED PREMIUM WINE

by

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AKNOLEDGEMENTS

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ABSTRACT

Consumers in Italy have historically shunned imported wines, showing "home bias" in wine consumption.

This study employs ACNeilsen panel data of Italian household wine purchases over the period: January 2002- December 2004. In order to facilitate products comparisons, data are aggregated over time and households. Finally, specific wines are aggregated into several categories: table; IGT; DOC; DOCG; and foreign. Only premium red wines are included in this analysis, € 3-7.

Each type of wine is considered as a separate "good" in a quadratic almost-ideal demand system, which is estimated using generalized method of moments. The econometric specification controls for seasonality, Christmas holidays, introduction of the Euro, paycheck effects as promotions.

Preliminary results show that as high-quality foreign wines become more widely available at competitive prices, the home bias of Italian wine consumers may diminish, implying domestic producers will need to compete more keenly on pricing and quality.

CHAPTER 1

INTRODUCTION

During the last decade European and Italian wine economy is facing a decrease in total consumption and a remodeling of consumers' preferences, which are moving towards higher quality wines. The change in lifestyle, towards a metropolitan stereotype, is bringing to a consequent change in dietary habits. Wine, therefore, is perceived always more as an experience good rather than the consuetudinary beverage of the Mediterranean diet.

Data on consumption of imported wine highlight the presence of home bias: "*A preference, by consumers or other demanders, for products produced in their own country compared to otherwise identical imports*" (Deardorff 2001).

Foreign wine industries, usually of big size, are able to develop strong marketing plans and more effective actions toward brand loyalty than Italian firms. Since preferences are changing and the Italian market is attractive because of the high consumption of wine, there exists the risk that imported wine could gain in market shares and compete with Italian wine avidly. At this point, an important issue is to identify which of domestic wines compete with foreign wines, hence, which of the Italian wines is perceived as "otherwise identical" to the imported wine, and to measure the degree of substitution among these.

Italian wine is one of the most diversified markets, counting about 700,000 farms producing grapes, indicative of at least the same number of wine produced (ISMEA-ACNielsen, 2005). In this situation, brands, as well as other product characteristics that could potentially generate consumer's loyalty, have small effect. In such market, competition among products is mostly based on information signals. Thus, wine price, grapes variety, origin and certification are all information influencing the probability that a wine will be purchased. In Europe, and especially in Italy, a set of Appellation of Controlled Origin has been introduced. These denominations group wines in categories and guarantee the respect of certain norms of quality, generating phenomena of brand recognition and facilitating consumers' quality recognition and subsequent loyalty. Wine producers earning the appellation are, hereafter, able to adopt ad hoc marketing strategies. After several years from the introduction of appellations, consumers became confident with the meaning and the role of Appellations of origin, using them to distinguish wines.

Nowadays, whether the distinction of wines through their appellation effectively helped the market to be less diversified and confusing is the issue of many debates. An even more important interrogative is whether this classification, based on quality and area of origin, contributed to diversify the price response for each of the different categories of wines.

Red premium wine, EUR 3-7, was chosen because wines belonging to different price segments, colors, and typologies (e.g. dessert and sparkling wines) are assumed to be different products. Multiple reasons may clarify this assumption.

Branding and labeling strategies, quality, packaging and level of diversification within each segment may justify this choice. In fact, the high diversification combined with strong wine identities for higher quality wines, or the heterogeneous packaging and volume for lower quality wines would have made the analysis intractable. Moreover, wines of different color are usually drunk with different meals. Their consumption, thus, can be intended as independent.

Only few studies in the literature analyzed wine demand, especially in Europe where wine products are highly diversified and difficult to aggregate. Scanner data availability allowed empirical studies to grow in number and researchers to develop more sophisticated and flexible methodologies allowing for more disaggregate products categories, maintaining consistency with consumer theory and consumers' behaviors. (Deaton and Muellbauer 1980; Banks et al. 2001; Fang 2002; Moschini and Rizzi 2007; Torrisi et al. 2006; Pompelli and Heien 1990; Buccola and VanderZanden 1997; Seale et al. 2003; Carew et al. 2004; Chang and Bettington 2001; Seale et al. 2003)

The subsequent parts of this thesis are organized as follows: Chapter Two discusses the world perspectives for wine demand and distribution. Chapter Three examines the Italian wine policy and market. Chapter Four discusses the segmentation of wine market in price points. Chapter Five discusses and reviews the existing literature. Chapter Six examines the ACNielsen homescan panel's data generating process. Chapter Seven reviews and summarize the consumer theory relative to the analysis of demand systems. Chapter Eight discusses the estimation

technique and methods for determining the statistical accuracy. Chapter Nine discusses the empirical analysis and describes the sample used for the estimation. Chapter Ten lists and comments the results. Finally, Chapter Eleven summarizes and concludes the thesis.

CHAPTER 2

WINE BUSINESS: WORLD PERSPECTIVES FOR DEMAND AND DISTRIBUTION

EUR 150 billion is the value of world wine business for consumers and EUR 60 billion for wholesales. The world production of wine is 275 million hl per year. Of these, only 220 million are consumed as wine, the rest is distilled.

The world industry is facing a number of important changes. The key elements of change are:

1. Shifting demand towards lower volumes and higher prices;
2. Increasing retail power;
3. The increasing importance of brands on consumers' preferences;
4. Increasing competition between wine countries and companies;

SHIFTING DEMAND

Shifting demand is particularly important especially in a sector like wine, where quantity produced exceeds demand. The composition of demand is changing as preferences for color, variety, origin, quality, brand, and place at the moment of consumption evolve. Secondly, but not less important, is the decline in total consumption in the last three decades. The most consistent decrease in

consumption concerns the wine under EUR 3 per bottle – what is termed popular wine – while the quality wines consumption registers stability and in some countries has increased. In fact, an increasing number of consumers are becoming more educated and able to discern among wines. Consumers, in fact, are not purchasing just red, white or rose, but also country, variety, etc. This information leads to the conclusion that wine market is moving from undifferentiated quasi-commodity wines to higher quality differentiated wines – what are going to be called premium wines.

Another factor shifting the demand is the change in distribution channels. Eating out and in a fashionable way has favored the trade of higher quality wines. The retail chains have also discovered the advantage of adding wine to their range of products; in fact, they have been the largest growth segment in wine sales. This has popularized wines tremendously and allows consumers to become more acquainted with every segment of wine.

A less important factor shifting the wine demand, with the increasing power of the retail chains, together with the consumers buying more wine from retail chains, is the increase in consumers' power. Frequent-purchaser cards, club cards, discount coupons, and promotions influence the moment and price of the purchase. A consumer buying a wine other than the usual one, using a discount coupon, may lead to think about strict exogeneity of prices. Torrisi et al, 2006, Hosken et al, 2002, argued that prices should not be treated as exogenous, in demand equation, if the

moment of the purchase corresponds to the promotional activity. This assumption, obviously, will be reconsidered in the chapter “theory and empirical analysis”.

The wine market in many countries is considered to be saturated. Consumption of fruit drinks and soft drinks has become a challenge for wine market, which is victim of substitution effect. Public health recommendations, in addition, have also determined part of the decrease in consumption even if it has been found that the consumption of a moderate amount of wine has same positive effects on health.

Especially in Old World countries, consumers are starting to drink wine at a later age. The wine industry, in fact, is challenging this decline by attempting to make wine attractive also for younger consumers.

While the New World wine industry has grown faced with these market problems, the Old World industry, which includes France, Italy, and Spain, has been slower to adjust and sometimes reluctant to face these changes in the demand. Moreover, the New World wine industry has sparked the interest of consumers wanting to experience new wines. Once familiar with these brands, consumers found easier keep buying the same brand. New World wine is increasing its share of the global market. At this point, the question is if the New World wines will be rediscovered by consumers.

Future demand is going to be difficult to predict because the market, generally, seems to be more sensitive to trends. It is unknown how much New World wine will substitute the Old World wine and vice versa.

INCREASING RETAIL POWER

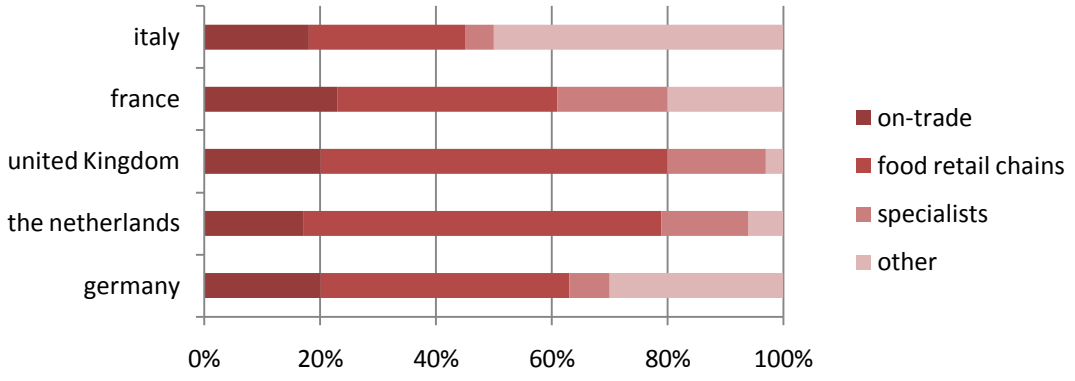
Consumers are buying more wine from retail chains and supermarkets are increasing their share of specialty shelves. The manifestation of the increasing power of retailers has two implications: at lower price points with richer assortments, private labels and promotional activities; ay higher price points with medium-high quality wines where retailers have the largest market share.

Increasing retail power is an important factor affecting the wine market in the last two decades. In the majority of European markets few retailers account for more than 70% of the wine sales. This leads to the conclusion that few buyers are buying larger volumes of wine, possibly creating an oligopsonistic market.

In Europe on average 10-20% of wine volume is sold through specialized retail liquor shops, but their distribution share is declining. In traditional producing countries, like Italy, direct sales to the consumer account for up to 20% in some cases. The biggest share remains to retail chains in each of these cases.

For retailers wine has become more important with years. Although wine sales represent only 1% of the total sales of retailers with slow shelf turnover, retailers finds the wine assortments as a tool to differentiate themselves from the competition.

FIGURE 1 - WINE DISTRIBUTION IN EUROPE



Source: Rabobank International, 2003.

In the future retail chains are expected to increase their distribution share. More table wines will be sold as retailers' private label under the name of the retailer.

CREATING BRAND VALUE

Brands in wine are not new and have been created in the Old World. Brand offers reliability and consistency across years. In the wine industry consistency is difficult to achieve given the sensitivity of this product to climate. Because of this difficulty in the last decades only fortified wines and sparkling wines, including champagne, have developed strong brands. In addition, brands create consumer loyalty, and in doing so, create price premiums.

While Old World brands have lost their momentum, New World wines, which were first launched with a heavy marketing investment, are gaining in brand image. In recent years the Old World is treating branding more seriously.

The range of wines available nowadays confuses consumers. In this context loyalty is not difficult to create. Simultaneously, the brand life cycle is getting shorter. Therefore, there are possibilities for new brands to emerge, especially in the premium segment where consumers consider wine an experience good.

Wine brand is not only a trade mark; it includes regions, controlled origin appellations – AOC (Appellation d'Origine Controle'), variety and even countries. All these factors contribute to the development of the brand image. It is possible that a good wine, if it is produced in a region with a poor image, may have adverse impact on its brand value.

INCREASING COMPETITION

World production of wine has been declining in the last 25 years. This decline is caused mainly by France, Spain and Italy. EU, in fact, has a structural overproduction – 12 to 25 millions of hectoliters – which is converted in alcohol through distillation. Secondly, climate change is also affecting the variability in wine production.

The change in competitiveness is evident by looking at the export shares of new wine countries, which increased in the last two decades. Although volume is important, the quality of the exports is fundamental in evaluating competitiveness in wine.

TABLE 1 – EXPORT VOLUMES AND PRICES OF MAJOR WINE EXPORT COUNTRIES (MILLIONS OF LITERS – EURO)

	Avg. volume export per year (1990-1995)	Avg. export price per year (1990-1995)	Avg. volume export per year (1995-2000)	Avg. export price per year (1995-2000)
France	128.1	32.24	166.8	32.37
Italy	148.9	10.19	164.8	13.70
Spain	76.3	10.25	92.8	12.82
Chile	9.6	12.37	36.2	12.87
Germany	30.0	15.19	25.9	16.40
USA	12.7	13.22	25.7	17.59
Portugal	20.9	21.23	23.2	22.26
Australia	10.0	19.50	22.3	29.38
South Africa	4.9	13.23	12.9	14.37
Argentina	7.5	4.70	12.7	10.07
New Zealand	0.8	26.57	2.1	29.42

Source: Rabobank International, 2003.

It is important to understand where and, in particular, in which quality segment increasing competition will occur. Given the huge marketing investment of the New World in lower quality wine is expected to have a more intense competition in this segment.

Investments and innovation, consolidation of wine companies into fewer brands, competition for the best distributor and shelf space are all factors that will determine the future competition for wine.

[If not cited, the source of data and information presented is: Rabobank International, 2003]

CHAPTER 3

ITALIAN WINE MARKET

APPELLATIONS

In 1963 the Italian legislature adopted the EU wine legislation designed around the French concept of *terroir*. Recognizing the essential role of soil and climate in wine production, the European regulation was designed to support the national government's intervention in regulating quality, based on classification of wine. With the adoption of Appellation de Origin Controllée (AOC) the Italian government pursued two main goals: to preserve the identity of quality wines of particular regions from frauds and, to facilitate commercialization through wine classification and brand recognition.

Nowadays, Italian wine is classified into three main categories: table wine, AOC wine and special wine. The first category usually refers to a standardized and not much differentiated product; the second category is based on geographic origin criteria; the third is based on wine type, such as *spumanti* (sparkling wines), liqueur wine, and aromatized wine. Within the category of AOC we find the controlled origin denomination – DOC (Denominazione di Origine Controllata), controlled and guaranteed origin denomination and DOCG (Denominazione di Origine Controllata e Garantita). In the category of table wines, there is the geographic and typical indication – IGT (Indicazione Geografica Tipica) and table wines. The first two

appellations are earned by adhering to codified winemaking criteria. The designation of these appellations depends on criteria of recognition of the wine as a traditional product, and strict regulations that establish the production area, the grape varieties for the blend, the grapes' yield, the wine/grapes' yield, the alcoholic content, and label specifications (DOCG criteria, in addition to DOC regulations, includes bottling rules). Wines that do not meet these strict criteria are simply named as table wines. The third appellation – IGT – is a compromise between DOC and table wine and it has been introduced lately in order to include several high quality wines that could not be designated as DOC.

PRODUCTION OF WINE

Italian winegrowing is characterized by small-sized family farms, most of which are not specialized in the cultivation of grapes alone. In 1997 there were about 700,000 farms growing grapes, with vineyards occupying an area of about 772,000 hectares, mostly in the southern Italy. Grapes are a traditional crop for Italian farms, and they are grown on one-third of all farms. Two thirds of the wine grape area is destined for the production of table wines and IGTs, while the area for DOC or DOCG wines accounts for just 36%. DOC and DOCG wine grapes are mainly concentrated in northern Italy, where about 60% of the area is devoted to high-quality wine production. (Anderson 2004)

Nationally, over three quarters of farms have less than 1 hectare of grape vines, while barely 3% have over 5 hectares. In particular, for all regions producing

table and IGT wines, farms have less than 1 hectare on average. The average size of AOC wines is slightly larger: 57% have less than 1 hectare of vine and 7% have more than 5 hectares. (Anderson 2004)

TABLE 2 – ITALIAN PRODUCTION OF WINE PER AREA

	Wine (millions of liters)				importance %			
AREA	DOC DOCG (ha)	IGT (ha)	Table wine (ha)	Total (ha)	DOC. + DOCG /tot area	IGT /tot area	Table wine /tot area	DOC+DOCG +IGT/ tot area
Italy	14.79	12.59	19.72	47.11	0.31	0.27	0.42	0.58
North	8.29	7.31	4.27	19.88	0.42	0.37	0.21	0.33
Center	3.49	2.02	1.91	7.44	0.47	0.27	0.26	0.12
South	3.00	3.25	13.53	19.79	0.15	0.16	0.68	0.13

Source: ISTAT (Istituto Nazionale di Statistica) 2006.

CONSUMPTION OF WINE

In the last five decades the volume of household consumption has decreased in the average of the 2.4% annually, going from 9.65 to 8.57 million of hl. Table wine consumption registered the highest decrease, about 3%, while DOC and DOCG wines only decreased by 1%. Special wine consumption decreased of the 2.4%. Among DOC and DOCG wines, in the recent years consumers have begun to prefer white wine to red. While the consumption of the former decreased substantially, the consumption of the latter increased by 0.6%. The lower price for white DOC/DOCG

wines is the most important factor affecting this change. Rose wine DOC/DOCG registered a 13% decrease of purchased volumes.

Trends in expenditures are distinct. On average, aggregate expenditure on wine increased by 1% per year, going from EUR 1.63 to 1.71 billion. This increase is almost entirely due to the increase of AOC wines, for which the expenditure increased by 4%. Expenditure for table wine and special wines registered a decrease of 0.3%.

TABLE 3 – PENETRATION OF WINES (% OF HOUSEHOLDS BUYING EACH TYPOLOGY OF WINE AT LEAST ONCE PER YEAR)

	2000	2004
Table wine	68.4	64.8
White table wine	54.2	52.4
Red table wine	46.4	46.0
DOC/DOCG wine	44.0	48.4
Special wine	40.7	38.0
DOC/DOCG red	35.0	38.2
DOC/DOCG white	28.7	29.0
Rose table wine	16.9	13.4
DOC/DOCG rose	5.7	6.6
Champagne	4.4	2.4

Source: ISMEA(Istituto di Servizi per il Mercato Agricolo Alimentare) -AcNielsen 2005.

Looking at the penetration of the products, it is possible to notice the decrease in table wines and the increase in AOC wines. In particular the red DOC/DOCG had a bigger penetration in Italian household than table red wine, and also more than DOC/DOCG white.

In terms of consumption per household, from 2000 to 2004 the budget share for table wine decreased but the volume remained constant. On the other hand expenditure increased substantially for DOC/DOCG wines.

FIGURE 2 – EXPENDITURE AND VOLUMES OF WINE PURCHASED IN THE 2000

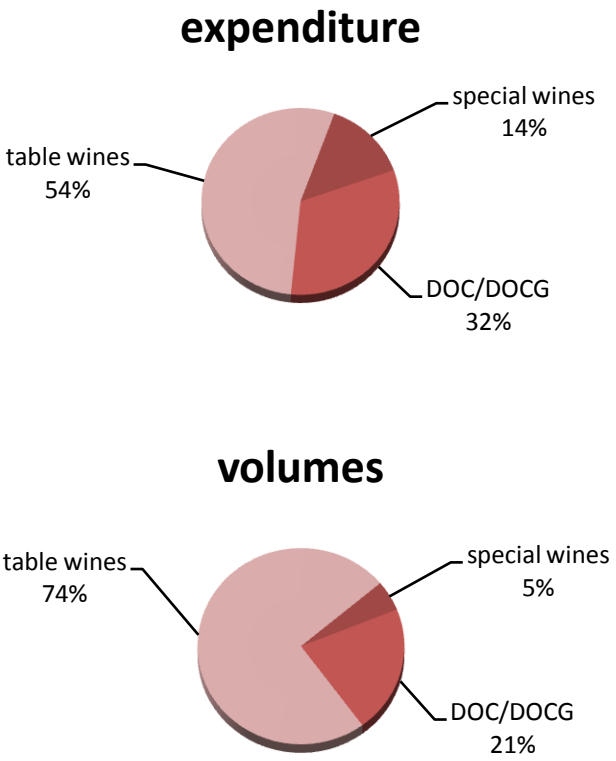
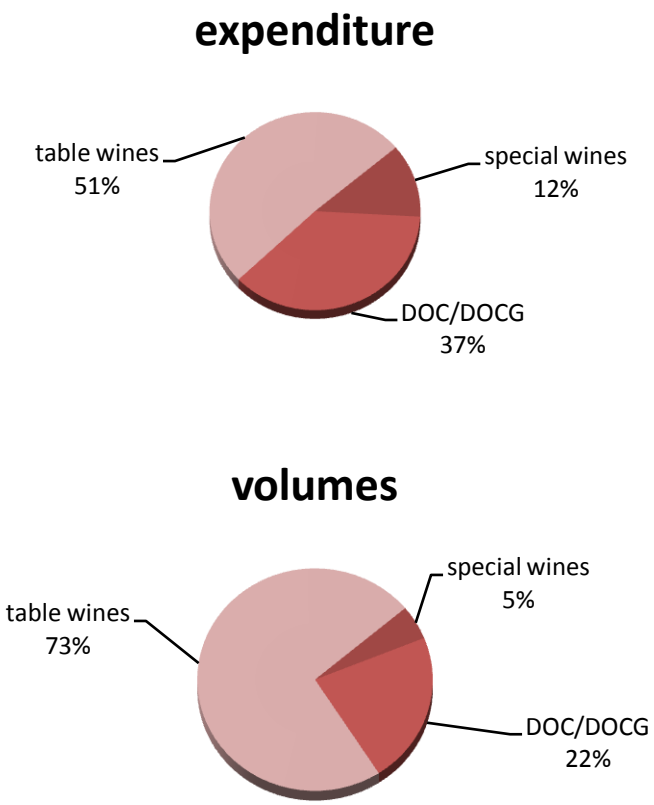


FIGURE 3 – EXPENDITURE AND VOLUMES OF WINE PURCHASE IN 2004



GEOGRAPHICAL DISAGGREGATION

Italians living in the North-West regions of the peninsula are the principal wine consumers of the country, accounting for 32% of the national consumption in volume. They are followed by the Italians from the Center (28%), and the South (22%). North-East people are the last important Italian consumers 18% of total national. Nevertheless, total wine consumption decreased in all the mentioned areas.

Going form general to specific, table wine consumption decreased more in the southern Italy in the period 2000 to 2004. DOC/DOCG wines, the 43% of which

are consumed in the North-Western Italy, decreased the most in this area – about 4% per year.

DISTRIBUTIONAL DISAGGREGATION

As already pointed out, the most important distribution channel for wine is retail, second are the specialty stores (traditional food shops)which include off-licenses and wine-shops. In 2000, specialty stores sold 25% of the wine in Italy, while in 2004 their sale went down to 18%. This gap was completely absorbed by retail chains.

TABLE 4 – MARKET SHARES IN % OF THE VOLUME FOR TABLE WINE

	2000	2001	2002	2003	2004
retail chains	62	68	72	75	73
convenience stores	3	2	2	3	4
discount stores	4	4	3	2	4
traditional food shops	23	20	18	15	12
wine shops	5	3	2	2	4
others	3	3	3	3	3

Source: ISMEA-AcNielsen

TABLE 5 – MARKET SHARES IN % OF THE VOLUME FOR DOC/DOCG WINE

	2000	2001	2002	2003	2004
retail chains	62	68	72	75	73
convenience stores	3	2	2	3	4
discount stores	4	4	3	2	4
traditional food shops	23	20	18	15	12
wine shops	5	3	2	2	4
others	3	3	3	3	3

Source: ISMEA-AcNielsen

TABLE 6 – MARKET SHARE IN % OF THE VOLUME FOR SPECIAL WINES

	2000	2001	2002	2003	2004
retail chains	62	68	72	75	73
convenience stores	3	2	2	3	4
discount stores	4	4	3	2	4
traditional food shops	23	20	18	15	12
wine shops	5	3	2	2	4
others	3	3	3	3	3

Source: ISMEA-AcNielsen

PRICES AND EURO EFFECT

In February 2002 Euro was introduced, substituting for the LIRA. The result of the change was a considerable increase in products price. The most important fact for wine market was the increase in DOC/DOCG rose' wine prices – an increase of 30%

from 2001 to 2002 has been recorded. Generally, table wine prices increased by 6%, AOC wines by 7% and special wines by 3.4% in the same period. In the following two years the price continued to rise but at lower rate.

TABLE 7 – % OF VARIATION IN PRICES DURING THE PERIOD 2000 TO 2004

	2001/00	2002/01	2003/02	2004/03	Annual Avg.
Wines + special wines	5.4	7.0	3.4	1.4	3.4
Wines	7.1	7.2	2.7	2.3	3.8
DOC/DOCGs	9.7	5.7	4.4	6.6	5.2
DOC/DOCG whites	10.6	7.9	-0.9	5.1	4.4
DOC/DOCG reds	8.2	2.8	8.5	7.7	5.4
DOC/DOCG roses	20.2	30.6	0.4	0.1	9.5
Table wines	2.9	6.0	3.6	0.1	2.5
Table white	2.3	4.5	2.6	-3.5	1.1
Table reds	3.7	6.9	4.7	3.3	3.7
Table roses	1.5	6.5	-0.1	-5.3	-0.5
Special wines	-6.3	2.3	5.1	1.3	0.4

Source: ISMEA-AcNielsen

It is important to notice that changes in prices of wine differ by typology of distribution. Usually, prices in retail chains were higher for table wine with respect to other typologies of distribution. Discount stores, more convenient for the purchase of table wines, were the only one adopting a price control policy. AOC

wines and special wines, on the other hand, were more expensive in the specialty stores and wine shops.

HOME-BIAS AND IMPORT OF FOREIGN WINE

According to the International Economic Dictionary home-bias is defined as a preference by consumers or other demanders, for products produced in their own country compared to otherwise identical imports. This definition applies to Italian wine consumers. Although not many data are able to show this effect, import data provide clear evidence of low foreign wine consumption.

TABLE 8 – ITALIAN WINE IMPORT (MILLIONS OF GALLONS)

Year	Production	Export	Import
2002	1,170	401	21
2003	1,165	338	37

Source: FAO Report: World Wine Trade Grew in 2003

[*If not cited, all the data and information reported in this chapter are taken from: ISMEA - AcNielsen, 2005]*

CHAPTER 4

PRICE/QUALITY POINTS IN WINE MARKET: A KEY TO UNDERSTANDING THE WINE INDUSTRY

The wine industry is characterized by a range of quality segments. Each segment follows different trends, has different market requirement and distribution outlets. In EU a major quality criterion is the attribution of appellations (DOC, DOCG, IGT), which guarantee and protect the quality and the origin of wine. The ultimate criterion for quality is the value, as perceived by the market, and expressed in the price per bottle, which is where brand value comes into its own. This allows price distinction in the market and so creates different quality segments.

Price/quality segments are not static but influenced by market dynamics. The conversion to Euro in the EU is a clear example giving reasons to adjust price points.

FIGURE 4 – WINE QUALITY SEGMENTS DENSITY (SOURCE: RABOBANK INTERNATIONAL 2002)

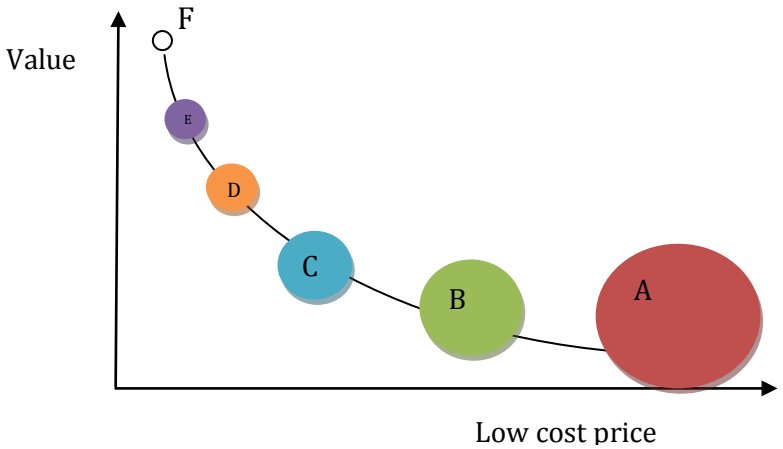


TABLE 9 – WINE PRICE/QUALITY SEGMENTS

Category	Europe ex-winery EUR/bottle	Europe consumer EUR/bottle	Requirement
A) Basic	< 1.10	< 3	Low price, traditional (sweet for older consumers)
B) Popular Premium	1.10 – 1.65	3 – 5	Varietal, fruit, accessible, brand
C) Premium	1.65 – 2.25	5 – 7	Combination of character and accessible, recognizable characteristics of variety, origin and brand
D) Super premium	2.25 – 3.35	7 – 14	Brand, recognition, origin, full body, more characteristics of variety, origin, brand
E) Ultra premium	3.35 – 30	14 – 150	Typical, varietal or good blend, more complexity, typical character, origin, image, quality brand. In the higher price ranges: image, cellaring potential, complexity well received by critics.
F) Icon	> 30	> 150	Long-term image, complexity, cellaring potential, high scores among critics

Source: Rabobank International 2002.

The categories under EUR 5 per bottle are believed to represent 70% of the volume of the continental European market, between EUR 5 and 10 another 20%, 10% for higher price wines. Volume shares for US are estimated to be similar. In value, these are estimated at 45%, 25% and 30% respectively.

Usually, analysis consider popular premium and premium wines as a only price segment ranging from EUR 3 to 7.

CHAPTER 5

LITERATURE REVIEW

EXISTING CONSUMER WINE DEMAND ANALYSIS

Despite the importance of the wine sector in world food and beverages business, not many wine demand analyses are present in the literature. In the past, data availability has been one of the obstacles to the development of wine studies. Having the data, an even more important factor reducing the number of studies is the complexity of the product itself.

As already pointed out, the number of different wines is huge. They might be differentiated by appellations (where applicable), alcoholic strength, color, variety, geographical origin, bottling, vintage, price segment, etc. Italian table tetra-packed wine is the only category that includes fewer wine brands. Torrisi et al. (2006), analyzed the table wine demand in the Italian major retailing trade using scanner data collected by I.R.I. Info Scan. This is the first study attempting to estimate a demand system for five selected brands – one of them is the private label wine – of red tetra-packaged, plastic packaged and bag-in-box table wine. In addition, it is the first and only Italian demand analysis for wine in the economics literature. The article describes the importance of scanner data and its strengths and weaknesses for analyzing the Italian wine business. The study provides price and expenditure elasticities drawn from a linear almost idea demand system. Data were aggregated

for province and month, and estimated using a fixed-effect model that captures the effect of province on quantity demanded. The analysis tests also the effect of temperature, as opposed to seasonality on wine demand, and the effect of promotional activities. While temperature is not significant, the estimates of promotional effects have the expected sign. Results suggest a partially loyal market of table wine, showing a tendency to substitute across brands and a degree of competition among the leading brands. Parameter estimates may not perfectly reliable due to the endogeneity of price during promotional activities, and when discount coupons and/or club cards are used.

The U.S. wine market had also attracted researchers' attention. Pompelli and Heien (1990), focusing on the importance of the change in lifestyles and demographic composition of the population for wine producers, developed a model of domestic and imported white wine demand. Using the data supplied by the National Panel Diary Corporation (NPD), consisting of demographic and economic information along with wine purchase information for 13,000 U.S. households, they estimated a household level demand for wine in U.S. They used a Heckman's two step method to model the discrete/continuous nature of consumer demand of white wine. Hypothesizing different patterns for consumption behavior towards white wine, they subdivided the sample in four categories: heavy domestic users, heavy imported users, light domestic users, light imported users. Analyzing the effect of demographics on demand, they found that heavy domestic wine users are similar to the imported counterpart. Light users, on the other hand are not. Age, income, absence of male head of household and education are relevant for domestic red

wine heavy users, income and wine sale prohibition is important for foreign red wine heavy users. In addition, own and cross price elasticities developed in this study are generally inelastic. Results show high price sensitivity between domestic and imported white wines. Income elasticities, on the other hand do not report substantial differences. Buccola and VanderZanden (1997), noticing producers' development of a niche market for premium wines in Oregon, which differ from the market approach of Californian producers, towards quality image and productive capacity, conducted a study in which a demand system was estimated in order to evaluate the potential substitution or complementarity effect among these wines in Oregon market. Hypothesizing the existence of substitution between red and white wine, and using scanner data from the main retail stores in Portland, Oregon, they used a Rotterdam system to estimate the demand for these four goods. Rejecting the hypothesis of endogenous expenditure they used a Seemingly Unrelated Regression (SUR) method to estimate the parameters. They found that demands are inelastic for red wine and elastic for white. Red and white wine complement each other. Red and white wines, from the two different regions, substitute for each other. Seale et al. (2003), noticing the rapid growth of imports, relative to the consumption of domestic red wine, analyzed the demand for national versus imported wine. The empirical model is a differenced version of the almost ideal demand system (AIDS). Estimated elasticities for U.S. wine price indicated that a decrease in price of red wine will decrease its consumption. In contrast, wine imported from Italy, France and Spain could increase own prices. In order to estimate the demand system they used U.S. Department of Commerce, Bureau of the Census data for imports, and U.S.

Department of Treasury's Bureau of Alcohol, Tobacco and Firearms for domestic data. The demand system they estimated is conditional on U.S. expenditure on domestic and imported red wines. This assumption about budget allocation requires preferences among groups of goods to be independent or weakly separable. The econometric model they used is an AR (1) model, and the formula for own-price elasticity used is the one suggested by Chalfant.

Canadian researchers have also studied wine demand. Carew et al. (2004), noticing the rapid growth of premium quality wine market, quantified the response of consumers to this change. Using scanner data from the British Columbia wine market, they estimated a differenced version of the AIDS with time-varying parameters. This form of demand model allows for country differentiation, and assumes a two-stage budgeting process and a weakly separable utility function. In order to estimate a simpler model they did not distinguish wines by their appellations. Empirical findings reveal that consumers' response to foreign-produced wines differs from that for wine produced locally.

New world producers increased their production not only because of export potentials but also because of the rapid increase in consumption of wine per capita since the Second World War. Owen (1979), noticing that per capita consumption more than doubled during the first 20 years after World War II tried to understand the factors influencing this phenomenon. He found that social and economic factors contributed to this growth; among others increased advertising expenditure and changes in consumers' taste were important. Using Australian Bureau of Statistics

data and price indexes from New South Wales Liquor Trade Supervisory Council, he compared demand for national wines and wines imported from Italy, France, Portugal, Spain and West Germany. He also included the price of beer in his single equation, dynamic, log-linear demand equation in order to measure the substitution effect with wine. He concluded that the stock of migrants, captured by the change of tastes variable, is the most important factor driving the rapid modification of per capita consumption.

Chang and Bettington (2001), estimated the Australian demand of three categories of alcoholic drinks: beer, wine and spirits, in a seemingly unrelated regression framework, either estimated as a demand (LA/AIDS) or as a single equation approach. Australian Bureau of Statistics data from 1975 to 1999 were used in order to estimate expenditure and price elasticities. Results indicate similar elasticities estimates from the two approaches. Moreover, they found that demand for these three goods is price inelastic, that beer and spirits are complements, and that wine is a normal good as well as the other spirits.

OTHER RELATED STUDIES ABOUT WINE

Many studies about wine, surely more numerous than demand analyses, are hedonic experiments. The effect of characteristics of wine, experts ranking, certifications, color, appellations, packaging and many more on price have been always interesting to study.

Costanigro et al. (2007) tested the importance of price segments in describing wine. Using the hedonic model approach they found that wines belonging to different price segments are different products. The data they used are the scores reported in the Wine Spectator magazine for Californian and Washington red wines over ten years period (1991-2000). The variables used were: retail price in California and Washington State, score obtained in expert sensory evaluation, number of cases produced, and years of aging before commercialization. In addition they used indicator variables in order to track the production area and the variety of the wine grape. The estimation of the regressions, one per price segment and a pooled one, was carried out using White's estimator.

Combris (1997), Lecocq and Visser (2000), and Lecocq and Visser (2001) also found that expert evaluation and vintage were important variables affecting the price of a selected segment of wines.

SCANNER DATA AND DEMAND ANALYSES: AGGREGATION AND SEPARABILITY ISSUE

The usefulness of scanner data for analyzing the retail sector is widely seen as a "success story" by both academics and industry participants. It remains an open question, however, whether aggregate-level data can reliably be used to estimate the demand for a set of products, or if store-level data are required. For this purpose, Tenn (2006) testes the hypothesis that aggregation across stores with heterogeneous promotional activities leads to bias results in elasticities estimation. Developing a consumer-level model, the study estimates an aggregated and a

disaggregate demand across stores' promotional activities. Using a random coefficient logit model, own and cross-price elasticities were estimated. Results show that aggregating promotional activities lead to substantial biases in elasticities. Since promotions shift the product demand outward and make the utility curve steeper with respect to price, elasticities of products sold in a promotional context show higher negative elasticities, and the differences with the product sold conventionally depends on the kind of promotion.

Aggregation across products is another important issue to consider. Capps and Love (2002) focused their attention on aggregation using A.C. Nielsen data for fruit juices and drinks. In their work they compared the effect of assuming a multistage decision process versus weakly separable commodity aggregation as in Lewbel. Results show that Lewbel aggregation procedure is useful to reduce the number of commodities. It is also shown that parameters estimates are only marginally affected. On the other hand, Nayga and Capps (1994) showed the usefulness of the assumption of weak separability in order to understand relations among closely related meat products. The study disaggregated products by meat type and quality. After analyzing meat product demand using a Rotterdam model, a weak separability test suggested by Goldman and Uzawa was conducted. The hypothesis was rejected. They concluded scanner data are appropriate for analyzing demand for disaggregated products.

The use of scanner data often requires spatial and temporal aggregation. Hosken et al. (2002) note the importance of taking into consideration biases coming

from these other types of aggregation, especially in the case of demand analyses for antitrust purposes. Aggregation over time in retail data leads to biased elasticities because prices are decided on weekly, or bi-weekly, basis. On the other hand, demand analyses based on weekly data might overestimate elasticities, especially for durable goods for which inventory effects are ignored. Price endogeneity, when promotional activities occur, is another important issue their work describes.

CHAPTER 6

ITALIAN HOMESCAN PANEL DATA

Italian homescan panel data is the collection of purchase records of 6,000 Italian households at retail level. Products' detail information are also included in these data. ACNielsen Homescan panel is demographically balanced and it aims to represent the entire population of households. Industry and academy uses it to understand consumers' preferences and purchasing behavior.

SAMPLING, STRATIFICATION, AND ATTRITION

AC Nielsen uses probability sampling to produce the Homescan panel. The sample is referred to the frame of Italian households. The sampling procedure consists of few steps. First, randomly selected households, from the White Pages book, are sent a letter or e-mail asking them if they would like to participate. If they respond yes, they are mailed a demographic questionnaire and a detailed summary of participation requirements. Once received the information, AcNielsen verifies whether the household respects the sampling design.

The panel is stratified on demographic and geographic criteria. Moreover, it is balanced on region, age of the head of the household, age of the shopping responsible, number of family components, income level, and number of children.

The selection is done in order to match exactly the Italian status of these characteristics. The weighting of the number of households in the panel reflects the national demographic and geographic distribution. Because of the sampling design and properties, AcNielsen homescan panel data can be considered to be representative of the entire national population[1].

Along with advantages, panel data may have a number of specific problems. One of the most serious is attrition. That is, the entry/exit of panel members. Oversampling is used for replenishment of the panel and is done weekly to maintain the panel size (sample size). Replenishment mainly happens when households' dropout, they violate the programs used to evaluate cooperation status, or where households are asked off the panel for no/low participation or failing to meet a predetermined number of static periods. However, reported data is based on households that participate ten out of twelve months. Because of sample attrition and the ten out of twelve month requirement, the size of the panel decreases over the course of a calendar year (Harris 2005). This make the panel unbalanced.

DATA GENERATING PROCESS

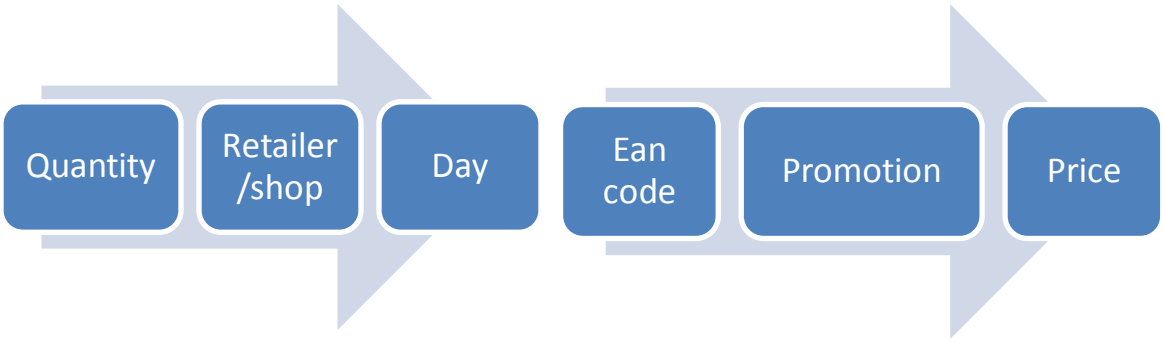
Home scanning technology allows the record and the transmission of the data from the households of the sample to the main server. This technology consists of a mini-computer and an optic reader that records the information from the barcode of the

[1] The Homescan panel does not aim to be representative of the going out consumption, but just of the in-house consumption

product (EAN code). The household, after each shopping, scans the products through the barcode and the retailer/shop barcode. At the end of every week the information are send to the main server through telephone wire technology.

Products information is entered through a specific sequence.

FIGURE 5 – SEQUENCE FOR ENTERING THE INFORMATION



The EAN code identifies what and how much has been purchased, the socio-demographic profile identifies who has purchased, the retailer/shop barcode identifies where it has been purchased, price and promotions identify how the product was purchased, and the day identifies when the product has been purchased.

Once the information is sent to the main server, the family care group, the statistics office and the data validation group verify the exactness of the data. Thus, the information is stored in the main database.

WINE SUBSAMPLE

Of all the products contained in the AcNielsen homescan panel, a subsample regarding only wine products was extracted and purchased by the University of Foggia (Italy). This constitutes the information set from which the data used in this study are taken. The subsample includes all the 6,000 households of the original panel. The information contained in it regards the wine purchases of the sample over the period December 2002- December 2004.

The total information consist of wine products characteristics such as color, appellation, varietal characterization, organic or conventional production, region of provenience, firm producing the product, trade mark, volume, packaging material, day of purchase, retailer/shop, amount purchased, expenditure regarding the single purchase.

CHAPTER 7

THEORY OF DEMAND

FROM SINGLE EQUATION TO DEMAND SYSTEM

The earliest empirical analyses of demand were centered on the extensive use of single-equation approach and elasticity estimation. The adding-up problem was usually thought to be unimportant since early studies considered only a fraction of the total household budget.

One such example is the double logarithmic demand function,

$$\log q_i = \alpha_i + e_i \log x_i + \sum_{k=1}^{n} e_{ik} log\, p_{k,i} + u_i \qquad (1)$$

i=1,…,n and k=1,…K. q is the quantity demanded, x is the income, p are the prices, e is the total expenditure elasticity and e_{ik} is the cross-price elasticity. E.g. estimation can be done using OLS regression and homogeneity can be tested or imposed a priori. On the other hand, the adding-up restriction cannot be accommodated in this specification because it implies that all the elasticities should be equal to one. This assumption does not make the model very flexible. Hence, it is necessary to look for other forms.

Thinking about other ways to test theory in the empirical analysis, a logical sequence of steps starts from Engel curves.

$$q_i = g_i^*(x) \tag{2}$$

This relationship can be multiplied by $p_i$to give expenditures as function of x_i, total household expenditure. Since p_i is the same for all the households, the relation between purchases and household outlays allows the distinction of goods in luxuries, necessities and inferior goods. The first Engel curve analysis to incorporate the adding-up restrictions was estimated by Working (1943). This relates budget shares linearly to the logarithm of outlay (Deaton and Muellbauer, 1980),

$$w_i = \alpha_i + \beta_i \log x_i \tag{3}$$

where $w_i$is the budget share. Adding up requires that $\sum w_i = 1$. This formulation has been incorporated in demand equation in order to satisfy the adding-up criterion in further analysis.

Stone's analysis is one of the first examples of demand estimation in which theory is applied to modify equations. Due to lack of degrees of freedom, because of few data available, Stone transformed the equation (1) into the following form, which consider the compensated cross-price elasticities,

$$\log q_i = \alpha_i + e_i\left(\log x_i - \sum_k w_k \log p_k\right) + \sum_{k=1}^{n} e_{jk}^{*} \log p_k \qquad (4)$$

where $e_{ik}^{*}$is the compensated cross-price elasticity and w_k is the budget share. Equation (4) can be thought to be expressed in terms of the general price index, $\log P$,

$$\log q_i = \alpha_i + e_i \log\left(\frac{x}{P}\right) + \sum_{k=1}^{n} e_k^{*} \log p_k \qquad (5)$$

This gives the demand in terms of real expenditure and "compensated" prices. This transformation allows equation (1) to be converted from a Marshallian to a Hicksian demand function, at least approximately (Deaton and Muellbauer 1980). Besides the passage to Hicksian, which result in additional nice properties of demand like symmetry, Stone's contribution is fundamental, especially for the price index, which is incorporated in alternative models, more flexible, for the estimation of demand.

The Rotterdam model, first proposed by Theil (1965) and Barten (1966), is similar to Stone's approach, but instead of working in levels of logarithms, it works with differentials.

$$w_i \, d \log q_i \; = b_i \, d \log \bar{x} + \sum_j c_{ij} \, d \log p_j \qquad (6)$$

This form is derived from the differential version of equation (1), after introducing the compensated price, as in equation (4).

ALMOST IDEAL DEMAND SYSTEM (AIDS)

Starting from the Engel curve indicated in equation (3), is it possible to include the effect of prices. The parameters of the Engle Curve can be thought as function of prices in many different ways (Deaton and Muellbauer 1980).

Express the cost function as

$$\log c \, (u, p) = a(p) + ub(p) \qquad (7)$$

where *a* and *ub* are functions of price that give rise to demand of the form (3). These functions can be thought as linear in the case of Linear Approximate Almost Ideal Demand System (LA/AIDS) or non linear (Price Independent Generalized Logarithmic, or PIGLOG) in the case of Almost Ideal Demand System (AIDS).

The alternative way of interpreting the cost function results in different price indexes. For the case of LA/AIDS we have:

$$\log P = \sum_k w_k \log p_k \qquad (8)$$

Where w_k represent the share of the budget reserved for the product k. Equation (8) corresponds to the Stone's price index (Green and Alston 1990). For the non linear, or more specifically, translog interpretation we have:

$$\log P = \alpha_0 + \sum \alpha_k \log p_k + \frac{1}{2}\sum_k \sum_l \gamma_{kl} \log p_k \log p_l \qquad (9)$$

Budget shares can be derived from $\partial \log c / \partial \log p_i = w_i$, which gives

$$w_i = \alpha_0 + \sum_j \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{P}\right) \qquad (10)$$

where P is the price index, and the parameters γ are defined by:

$$\gamma_{ij} = \frac{1}{2}\left(\gamma_{ij}^* + \gamma_{ji}^*\right) = \gamma_{ji} \qquad (11)$$

The model defined by (10) is the AIDS of Deaton and Muellbauer (1980). It is a first-order approximation to the general unknown relation between w_i, $\log x$, and the $\log p$'s.

Theoretical restrictions apply directly to the parameters. Adding up requires for all j,

$$\sum_k \alpha_k = 1, \sum_k \beta_k = 0, \sum_k \gamma_{kj} = 0 \qquad (12)$$

Unrestricted estimation of the model automatically satisfies the adding-up restrictions so that only homogeneity and symmetry need to be tested.1

Homogeneity is satisfied if and only if, for all *j*,

$$\sum_k \gamma_{jk} = 0 \qquad (13)$$

While symmetry is satisfied provided

$$\gamma_{ij} = \gamma_{ji} \quad \forall i, j \qquad (14)$$

From the econometric point of view, the most interesting feature is that is linear in parameters[2]. The βs of the AIDS determine whether goods are luxuries ($\beta > 0$), or necessities ($\beta < 0$). The γ parameters measure the change in budget share by a unitary proportional change in *p* with *(x/P)* constant.

The two alternative specifications of the AIDS differ not only geometrically and in number of parameters, but they differ especially for the assumption concerning homotheticity. The LA/AIDS assumes quasi-homotheticity. Although, it

[2] It is linear as long as an index is inserted for P.

is well known that household characteristics are non-linearly related with total expenditure. For this reason, as income increases, consumption does not increase proportionally, and quantity demanded is non-linearly related with income. Finally, "linearity is unacceptable" (Deaton and Muellbauer 1980), even though many studies have used linear specifications for their empirical modeling (Torrisi 2006; Cotteril and Samson 2002; Cotteril and Putsis 2001; Hayes D. et al. 1990)

QUADRATIC ALMOST IDEAL DEMAND (QUAIDS)

Arguing that for many commodities standard empirical demand models do not provide an accurate analysis of behavior across income, or expenditure groups, Banks et al. (1997) elaborated a new interpretation for demand, which is consistent with theory and allows flexibility for different behaviors across income groups. Their argument bases on the assessment of Engel relationships. Finding a significant rank 3 specification in their empirical estimation of Engel curves, they incorporated a second-order polynomial expenditure in the demand system, giving raise to the so called quadratic almost ideal demand system (QUAIDS).

In order to construct a QUAIDS the following general form of demand, consistent with the empirical evidence on Engel curves, is drawn:

$$w_i = A_i(p) + \boldsymbol{B}_i(p) \ln x + C_i(p)\, g(x) \qquad (15)$$

for goods i = 1,…,N, where p is the vector of prices and A,B and C are differentiable functions. Expenditure shares are linear in log expenditure and in another smooth function of expenditure, $g(x)$. This last term allows nonlinearities, whereas the Engel curves look like the PIGLOG having $C_i(p)$ near 0. (Banks et al. 2001)

The quadratic specification begins with considering the Deaton & Muellbauer translog price index:

$$logP^* = \alpha_0 + \sum \alpha_k \log p_k + \frac{1}{2}\sum_k \sum_l \gamma_{kl} \log p_k \log p_l \tag{16}$$

as well as a Cobb-Douglas price aggregator

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i} \tag{17}$$

Finally, the share equation system is

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln \left[\frac{x}{P^*}\right] + \frac{\lambda_i}{b(p)} \left\{\ln \left[\frac{x}{P^*}\right]\right\}^2 \tag{18}$$

where

$$\sum_i \lambda_i = 0 \tag{19}$$

This last restriction is necessary in order to avoid exponential relations between shares and expenditure.

ELASTICITIES CALCULATION IN QUAIDS

Given the partial derivatives

$$\mu_i = \frac{\partial w_i}{\partial \ln x} = \beta_i + \frac{2\lambda_i}{b(p)}\left\{\ln\left[\frac{x}{P^*}\right]\right\} \tag{20}$$

$$\mu_{ij} = \frac{\vartheta w_i}{\vartheta \ln p_i} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_k \gamma_{jk} \ln p_k\right) - \frac{\lambda_i \beta_j}{b(p)}\left\{\ln\left[\frac{x}{p^*}\right]\right\}^2 \tag{21}$$

The budget elasticities are given by

$$e_i = \frac{\mu_i}{w_i} + 1 \tag{22}$$

The expenditure elasticity is greater than unity when β is positive and λ is negative, eventually becoming less than unity as the total expenditure increases and the term in λ becomes more important, Banks et al. (2001)

The uncompensated price elasticities are given by

$$e_{ij}^{u} = \frac{\mu_{ij}}{w_i} - \delta_{ij} \tag{23}$$

Where δ_{ij} is the Kronecker delta, which equals 1 when *i=j.* And compensated price elasticities are calculated using the Slutsky equation,

$$e_{ij}^{c} = e_{ij}^{u} + e_i w_j \tag{24}$$

AGGREGATION, SEPARABILITY AND PREFERENCES

The existence of commodity aggregates is possible thanks to the contribution of Hicks (1936) and Leontief (1936). Their "composite commodity theorem" asserts that if a group of prices moves in parallel through time, then the corresponding group of commodities can be treated as a single good. On the other hand, if it is not possible to relate the constancy of relative prices on external factors, to define commodity groups, it should be asked whether or not preferences themselves might not provide some natural structuring of commodities. Thus, a consumer can rank different food bundles in a well-defined ordering, which is independent of his consumption of housing, fuel, entertainment, etc. Hence, there exist sub-utility functions for each group. These sub-utilities combine to give total utility (Deaton

and Muellbauer 1980). This approach suggests that it is also possible to think in terms of "two-stage budgeting". In the first step the consumer allocates the budget among broad groups of goods, while at the second group expenditures are allocated to the individual commodities. This implies separability of goods. While in the first stage groups of goods are separable, in the second budgeting stage commodities are weakly separable.

The usefulness of this approach consists in excluding possible substitution between goods in different groups. Moreover, detailed commodity expenditure can be related to group outlay and price alone. This has favorable econometric implications since it is possible to explain behavior using a much smaller number of variables (Deaton and Muellbauer 1980).

SIMULTANEITY

In theoretical discussions, expenditure is usually intended to be equal to the income, which is assumed to be imposed on the consumer from outside or fixed in any given time period. On the other hand, in the empirical literature, when aggregating across commodities and estimating a complete system of demand equations, the total expenditure is intended to be the sum of prices times the quantities purchased, alias the sum of the expenditure of the single goods. Clearly then, expenditure is jointly endogenous with the expenditures and ought to be treated as such (Deaton 1986; LaFrance 1991).

CHAPTER 8

ESTIMATION TECHNIQUE AND STATISTICAL METHODS FOR STANDARD ERRORS AND CONFIDENCE INTERVALS

ECONOMETRIC METHODOLOGY: GENERALIZED METHOD OF MOMENTS (GMM)

As will be pointed out, a complete demand system non-linear in expenditure and prices, needs expenditure to be assumed as endogenous. In general, cases of simultaneity lead to the violation of the assumption of a standard regression model where

$$E[\varepsilon|x] = 0 \qquad (25)$$

Since least squares is inconsistent for estimating such a model, it is possible to use instead an Instrumental Variable Estimator, such as 2SLS or 3SLS, which uses the information contained in another variable, the instrument, in order to remove the correlation between regressors and errors, and render consistent estimates. Instruments, in order to be considered good ones, need to be uncorrelated with the error and correlated with the endogenous regressors.

In the case of non linear equations demand system, as pointed out in the cited Theil's hypothesis, the structure of the error is characteristic of the functional form of the model. 2SLS, 3SLS estimator and in general Maximum-Likelihood

estimators require strong and restrictive assumptions about the distribution of the error. Contrarily, the GMM moves away from any sort of parametric assumptions. Moreover, it handles contemporarily endogeneity, non linearity, serial correlation and heteroscedasticity. For this reason GMM estimator should be asymptotically more efficient than Three Stage Least Square (3SLS) or Full Information Least Square (FIML)[3].

The GMM estimation technique is an extension of the method of moments technique, which can be briefly described as the equality between population and sample moment, such as

$$E[y_i] = \mu \tag{26}$$

Estimation using this method, then, proceeds by forming a sample analog to the population expectation (Greene, 2003)

$$E[y_i - \mu] = 0 \tag{27}$$

GMM similarly, in order to estimate the parameters of a generic regression of the kind: $y = x`\beta + \varepsilon$, starts from orthogonality conditions:

$$E[x_i \varepsilon_i] = E[x_i(y_i - x`_i\beta)] = 0 \tag{28}$$

The sample analog

[3] An higher efficiency of GMM is guaranteed only if the model is specified correctly (Greene, 2003)

$$\frac{1}{n}\sum_i x_i(y_i - x`_i\beta) = 0 \tag{29}$$

which is equivalent to the OLS.

For the instrumental variable estimator we have:

$$\left(\frac{1}{n}\mathrm{X`Z}\right)\left(\frac{1}{n}\mathrm{Z`Z}\right)\left(\frac{1}{n}\mathrm{Z`}\hat{\varepsilon}\right) = 0 \tag{30}$$

For the non linear case we have

$$\frac{1}{n}\sum_i \left(\frac{\partial E[y_i|x_i,\beta]}{\partial \beta}\right)(y_i - E[y_i|x_i,\beta]) = 0 \tag{31}$$

All this examples have as many moments equation as many are the parameters. Each equation has a single solution that satisfies exactly the equation.

Method of moments can also be used to minimize a criterion like sum of squares or the weighted sum of squares such as:

$$q = m(\theta)`Wm(\theta) \tag{32}$$

Where m is a matrix of freely correlated elements, W is the inverse of the variance-covariance matrix. θ is chosen to minimize q. This is the GMM estimator, also called Minimum Distance Estimator.

The asymptotic variance-covariance matrix is equal to:

$$V_{GMM} = \frac{1}{n}[\Gamma`W\Gamma]^{-1} \tag{33}$$

Where Γ is the matrix of derivatives where the jth row equal to: $\Gamma^{j} = \text{plim}\frac{\vartheta m_j}{\vartheta \theta`}$

In our case the estimator would be non linear instrumental variable estimator:

$$q = m(\hat{\beta})`Wm(\hat{\beta}) = \left\{\frac{1}{n}[y_i - h(x_i, \hat{\beta})]'Z\right\} W \left\{\frac{1}{n}Z`[y_i - h(x_i, \hat{\beta})]\right\} \tag{34}$$

GMM estimation has several important properties. Obeying to the central limit theorem, empirical moments distribute normally asymptotically, this allows hypothesis testing although the estimation per se does not need any assumption about error. The minimum distance estimator implies also consistency (Hall 2005; Greene 2003)

AN ALTERNATIVE VERSION OF GMM: THE ITERATED GMM

In order to keep notation as simple as possible we consider, from equation (32):

$$[y_i - h(x_i, \hat{\beta})]' Z = \varphi(X_i, \beta) \tag{35}$$

And equation (32) is transformed in

$$\left[\frac{1}{N}\sum_{i=1}^{N}\varphi(X_i,\beta)\right]^{`} W \left[\frac{1}{N}\sum_{i=1}^{N}\varphi(X_i,\beta)\right] \quad (36)$$

It is assumed that the vector $\frac{1}{N}\sum_{i=1}^{N}\varphi(X_i,\beta)$ converges in distribution to a normally distributed random vector with mean 0 and variance W. This estimator might be unfeasible and/or inconsistent because of the difficulty in choosing the weighting matrix W (Hansen et al., 1996). In order to solve this problem an alternative version of GMM estimator is considered. Iterated GMM estimator is based on a two step procedure that iterates the estimation until the model converges. The basic criterion is to adjust the weighting matrix at every iteration, until the convergence criterion is satisfied.

The first step consists of choosing a β^a that minimizes the following equation, which considers an identity matrix instead of the usual weighing matrix:

$$\left[\frac{1}{N}\sum_{i=1}^{N}\varphi(X_i,\beta)\right]^{`} \left[\frac{1}{N}\sum_{i=1}^{N}\varphi(X_i,\beta)\right] \quad (37)$$

Once the weighting matrix is obtained in the first step, the second step consists in choosing a β^b that minimized the equation (34). In the literature this is an estimator per se and it is named two-step GMM estimator. Similarly to the two step version,

the iterated GMM continues from the second step by reestimating the weighting matrix until the difference between β^z and β^{z-1} satisfies the convergence criterion (Hansen et al. 1996).

An advantage of this estimator relative to the previous two is that it is invariant to how the moment conditions are scaled (Hansen et al. 1996).

SINGULARITY OF THE VARIANCE-COVARIANCE MATRIX AND ERROR STRUCTURES

Defining *x* as sum of expenditures, expenditures automatically add-up to total expenditure identically so that the variance-covariance matrix is singular. Therefore, for a set of equations such as (10) or (16), one equation is essentially redundant and all of its parameters and standard errors can be inferred from knowledge of those in the other equations. The solution is obviously to drop one of the equations and estimate the remaining *(n-1)* equations. It is shown that estimates are invariant to the particular equation which is selected for omission (Deaton, 1986).

Another interesting result is the zero mean errors only in case of conditional demand equations linear in expenditure (LaFrance 1991). Therefore, whether or not expenditure is considered as endogenous, if the demand model is nonlinear in expenditure, then the expected values for the conditional error terms depend on the functional form of the demand equations and the specific values of the explanatory variables. Finally, Theil's rational random error hypothesis says that the error

covariance matrix is proportional to the matrix of compensated substitution terms, impliying that expenditure is uncorrelated with the conditional errors to a first-order Taylor-series approximation for all distributions of the error terms and to a second-order approximation for symmetric distributions. This result is exact and confirms that expenditure is uncorrelated with the error only if the demand model is linear in expenditure (Deaton 1986; LaFrance 1991).

NONPARAMETRIC ESTIMATION OF STANDARD ERROR WITH BOOTSTRAP

Since GMM does not require any parametric assumption about the error, although it is asymptotically distributed as a normal, a certain degree of caution should be used while testing hypothesis. Big sample properties, in fact, might be hazardously used to test hypothesis on relatively small samples e.g. 52 observations of this study. In addition, in typical empirical applications the structure of the covariance matrix, used as a weighting matrix in GMM estimation, in finite samples it is well-known that the t test tends to reject too frequently (Atsushi and Mototsugu, 2003). In this work, we consider a bootstrap method for the GMM estimator for the purpose of improving the finite sample performance of the t test for elasticities estimates. Bootstrapping, in addition, provides estimates distributions allowing for calculating asymmetric confidence intervals.

Nonparametric bootstrap is chosen because, similarly to GMM estimation, does not require any structural assumption about the disturbance term. This technique is based on sampling repeatedly from the disturbance term, putting mass $1/n_s$ on each

element (Efron, 1981). This sampling technique is, thus, based on uniform distribution. The standard Monte Carlo approach, used in these types of experiments, refers to random-distribution, which are uniforms asymptotically. Alternatively, a lower error may be obtained using a distribution that is closer to the uniform. (Morokoff and Caflish 1995) Halton quasi-random sequence was chosen for the bootstrap applied in this study, for this purpose.

CHAPTER 9

EMPIRICAL ANALYSIS

DESCRIPTIVE STATISTICS OF THE WINE PURCHASES IN CATEGORIES: ALL PRICE SEGMENTS INCLUDED.

This section shows the distribution of wines per price point. Since price is a good indicator for quality, the following histograms are useful for understanding the role of appellation for quality. Additionally, the plots furnish important information about the price segment in which each wine category analyzed is more competitive.

FIGURE 6 – DISTRIBUTION OF FOREIGN WINE PER PRICE POINT

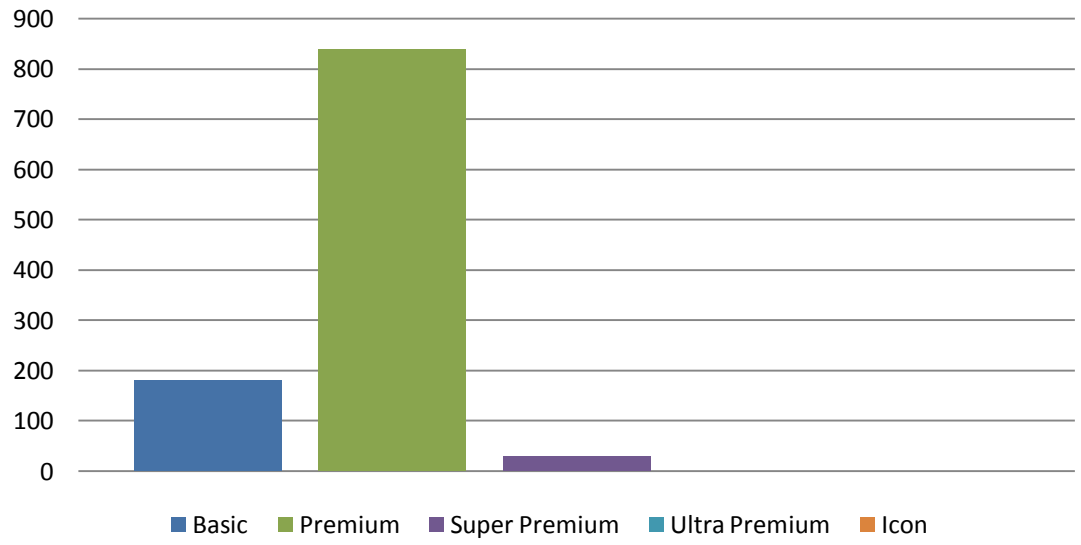


FIGURE 7 – DISTRIBUTION OF DOC WINE PER PRICE POINT

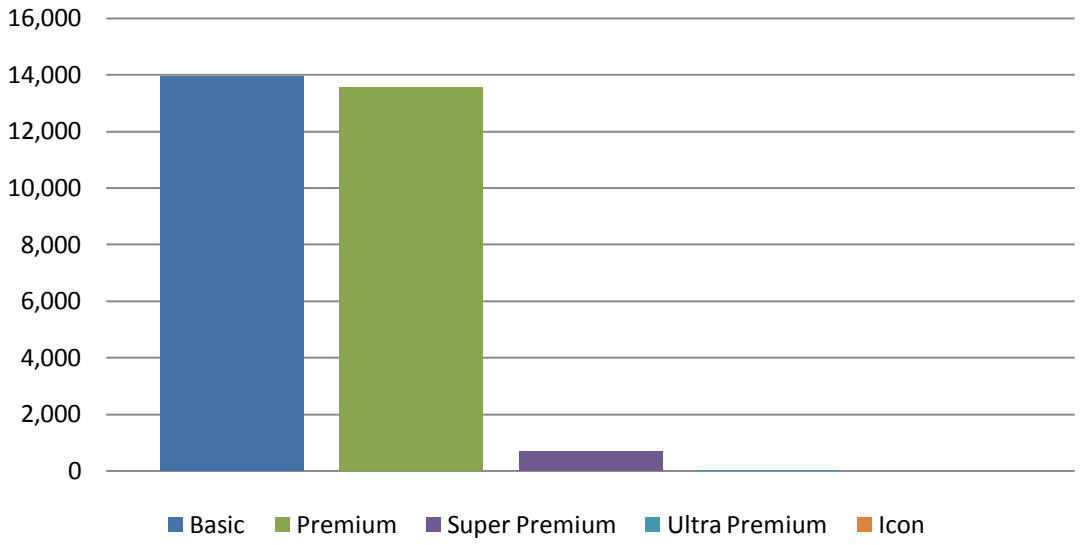


FIGURE 8 – DISTRIBUTION OF DOCG WINE PER PRICE POINT

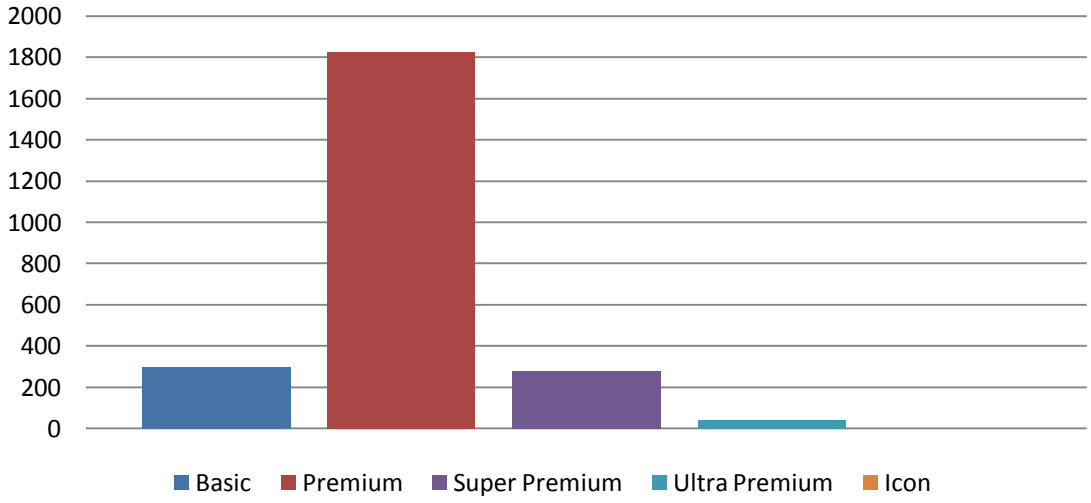


FIGURE 9 – DISTRIBUTION OF IGT WINE PER PRICE POINT

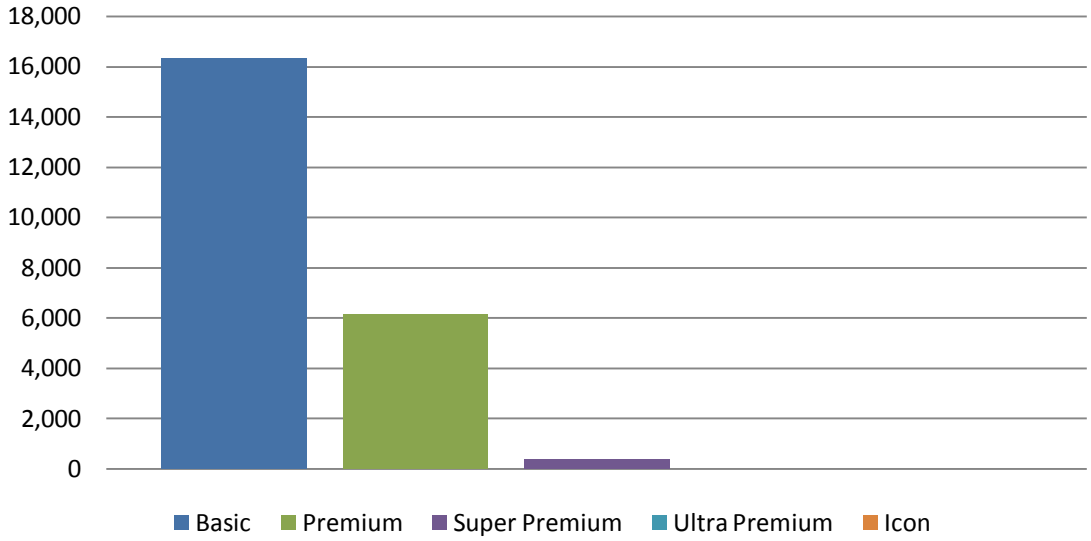
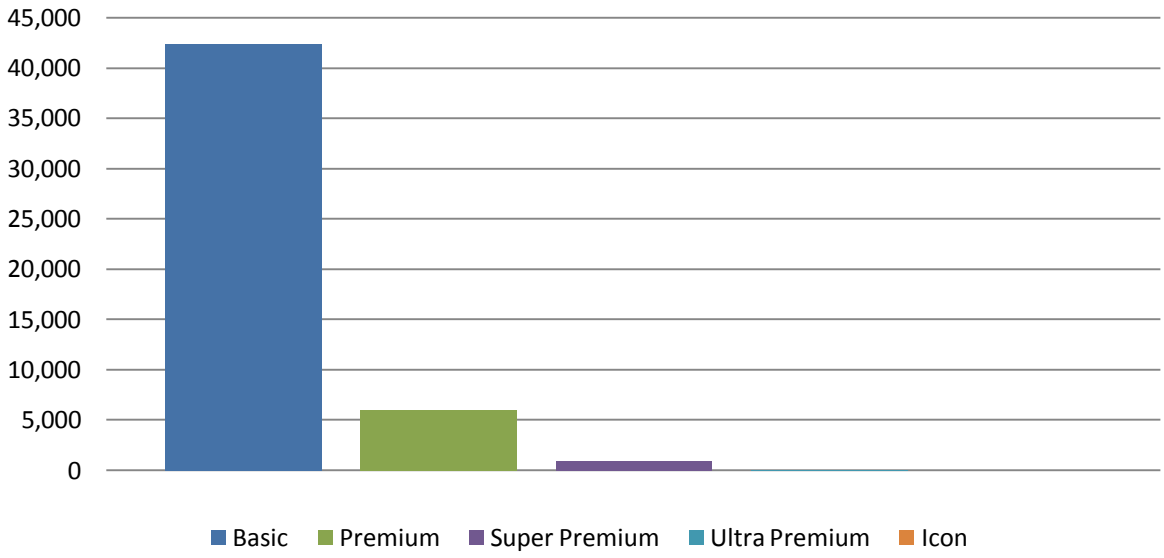


FIGURE 10 – DISTRIBUTION OF TABLE WINE PER PRICE POINT



WHY ONLY RED PREMIUM WINE?

Basic wines (EUR 0-3/liter) market includes mostly wines without appellations, and differentiation is mostly based on packaging (glass bottle, tetra-pack, plastic, 5 liters bottles), and color. In this segment wines with appellation constitutes a small part of the market. By contrast, super and ultra premium wines (> EUR 7/liter), are less numerous but the market for these price segment results highly diversified because of the strong identity of the single wines, which generates a specific consumers' loyalty, which is weakly linked with the appellation. Premium wine segment (EUR 3-7/liter), important for brand and quality recognition and still accessible prices, is expected to be the most interesting segment. Wineries producing for this segment pose much attention to appellation for their marketing strategies. Packaging is not an element of diversification because all the wines in this price range are sold in glass bottles of homogeneous volume.

Wines of different color, as well different appeals such as dessert or sparkling wines, are usually drunk with different meals. Their consumption, thus, can be intended as independent. Hence, the study of substitution effects, in this context, would not enlighten great interest. Additionally, imported wines have is mostly sold if red and if premium. For this reason, the analysis is focused only on premium red wines; whites, sparkling, desert, and other wines are excluded.

AGGREGATION

To facilitate comparisons, the ACNielsen household data are aggregated in several dimensions. Owing to the low frequency of purchase of imported wines by some households, purchase event data are aggregated over time to biweekly periods. The chosen aggregation does not lead to big information loss because prices and promotions are usually decided biweekly, although some promotional activities may regard only few days per the week. The focus of this analysis is on aggregate behavior, not household, so household purchases are aggregated across regions. Without aggregation across time and households, the frequency of zero purchases is large enough to preclude estimation of a panel limited dependent variable model. Finally, specific wines are aggregated into several categories to facility domestic-international comparisons. The analysis is feasible assuming that premium red wines categories as weakly separable goods.

DATA EXPLORATION

SAMPLE DESCRIPTIVE STATISTICS

In this price segment the majority of the purchases are concentrated slightly above the lower bound of the considered price interval. Hence, a weighted average of prices has been calculated for aggregating, in order to give a heavier weight to those prices corresponding to a higher number of purchases. Aggregation over quantity, on the other hand, consisted of a simple sum over each time period.

TABLE 10 – SAMPLE DESCRIPTIVE STATISTICS (EURO, NO. OF BOTTLES)

Variable	Mean	St. deviation	Min	Max
Foreign price	4.501	0.396	3.855	5.463
DOC price	4.013	0.127	3.719	4.364
DOCG price	4.518	0.226	4.059	5.156
IGT price	3.940	0.139	3.617	5.151
Table price	4.534	0.243	4.121	5.151
Foreign quantity	8.588	9.423	1	57
DOC quantity	385.529	183.115	118	1,295
DOCG quantity	71.823	48.860	14	466
IGT quantity	172.098	84.027	60	466
Table quantity	66.490	22.788	34	151
Foreign share	0.012	0.011	0.001	0.049
DOC share	0.532	0.051	0.421	0.615
DOCG share	0.107	0.044	0.047	0.222
IGT share	0.233	0.041	0.174	0.398
Table share	0.113	0.040	0.058	0.255

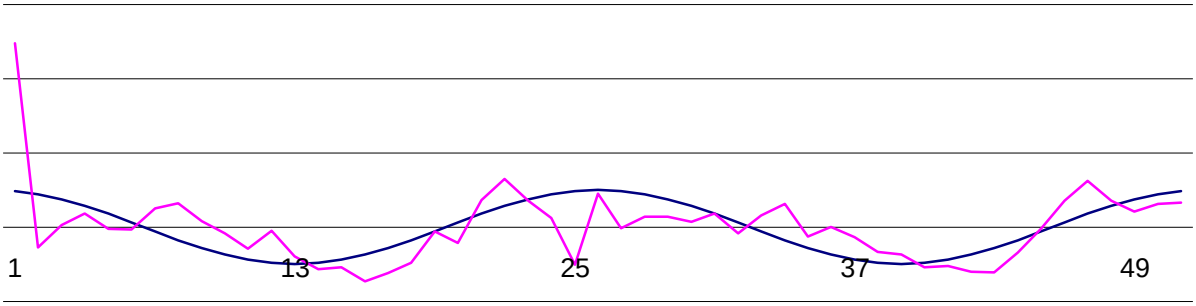
TABLE 11 – PERCENTAGE OF WINE SOLD UNDER PROMOTIONAL ACTIVITIES

Variable	%
Foreign on promotion	33.3
DOC on promotion	6.0
DOCG on promotion	16.8
IGT on promotion	2.5
Table on promotion	4.1

Data show that the most purchased wine for this segment is DOC, followed by IGT. By contrast, the number of wines sold on promotions is higher for DOCG and foreign, which are consumed less.

Prices did not show any seasonal patterns, contrarily to quantities. A positive correlation between quantities and number of promotions was found. The structural change corresponding to the introduction of the new currency, the Euro, was also considered using a dummy. Moreover, in order to account for the specific seasonal pattern the variables $\sin\left(\frac{\pi}{13}\right)$, the paycheck dummy, and the Christmas holidays dummy were also included in the model. The figure below shows the plot of one of the shares' series, representative of all the other, and the chosen trigonometric function.

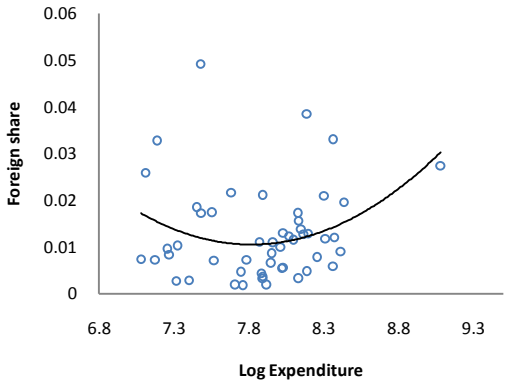
FIGURE 11 – SHARES AND SIN$\left(\frac{\Pi}{13}\right)$ OVER TIME



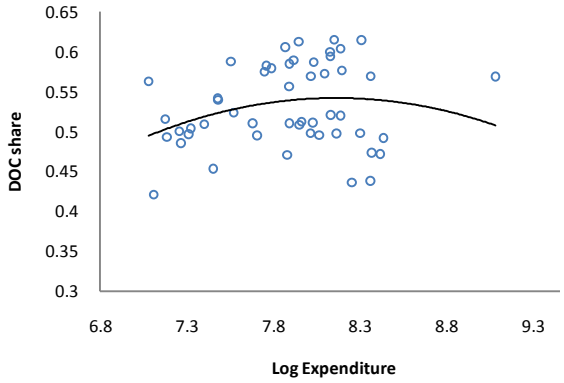
ENGEL CURVES ASSESSMENT

FIGURE 12 – ENGEL CURVES FOR A)FOREIGN WINE, B)DOC WINE, C) DOCG WINE, D) IGT WINE, E) TABLE WINE

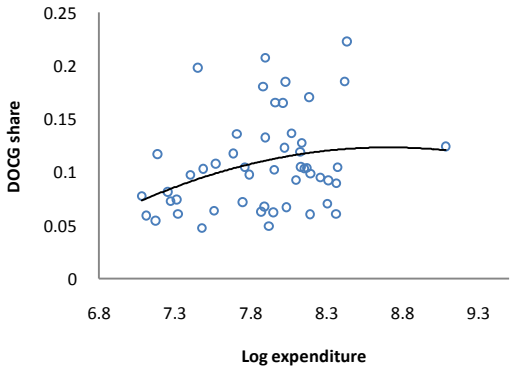
a)



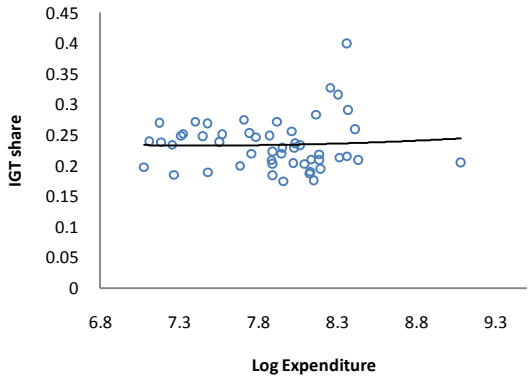
b)



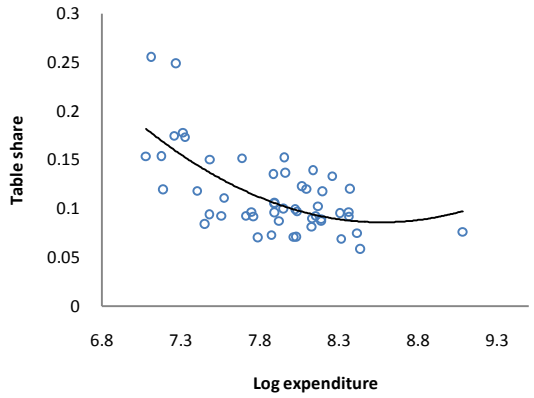
c)



d)



e)



In order to evaluate the significance of the above visualized quadratic Engel curves, they have been estimated using Two Stage Least Squares (2SLS), allowing for taking into consideration the endogeneity of expenditure. The presence of simultaneity is confirmed by the fact that budget shares' denominator corresponds to the total expenditure. An additional confirmation was given by the Durbin-Hausman-Wu test, which resulted in rejecting the hypothesis of coefficients equality, between the model estimated using Ordinary Least Squares and the one estimate by 2SLS. The model specification for the Engel curves is the one proposed by Working (1943), and discussed in the section of Demand Theory, equation (3).

TABLE 12 – ESTIMATES FOR ENGEL CURVES (2SLS ESTIMATOR)

Shares	Foreign	DOC	DOCG	IGT	Table
$logx$	0.001	0.148***	-0.003	0.047***	0.093***
$(logx)^2$	0.001	-0.010**	0.006**	-0.002	-0.010***

*** > 99%, ** > 95%, * > 90% Probability to reject Ho: coef.=0

CHAPTER 10

RESULTS

The nature of the data and the theoretical assumption about the error structure and endogeneity of expenditure suggests the application of iterated-GMM estimator. The instruments employed in order to correct for the endogenous expenditure are: exchange rate EUR/USD, monthly GDP indicator, contractual level of wages, price index for all goods, price index for food, price index for wine, lag version of prices, logarithm of prices, a constant, the trend t, and monthly index for GDP. Chosen the instruments, the orthogonality conditions were set for the estimation.

In order to estimate the demand system, given the adding-up restriction leading to collinearity, the equation for Table wine has been omitted. Finally, the empirical model was specified:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{x}{P^*}\right] + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{x}{P^*}\right]\right\}^2 + \theta_{1i} sin\left(\frac{\pi}{13}\right) + \theta_{2i} Christmas + \theta_{4i} Paycheck + \theta_{5i} Eurointr + \theta_{6i} No.Promotions + \varepsilon_i \quad (38)$$

Where:

$$logP^* = \alpha_0 + \sum \alpha_k \log p_k + \frac{1}{2}\sum_k \sum_l \gamma_{kl} \log p_k \log p_l \quad (39)$$

And

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i} \qquad (40)$$

Where *i=1,…,n-1 (foreign, DOC, DOCG, IGT); k=1,…,K and j=1,…,J.* The restrictions (12), (13), (14) and (19) were imposed as suggested by consumer theory. Further simultaneity issues rise due to the weak endogeneity of the variable "number of promotions". In some cases, especially for foreign wines, the number of products sold under promotional activities corresponds to the total quantity of wines purchased. This variable, hence, has been treated as endogenous, as well as the expenditure.

Equations show a good fit, the Durbin-Watson statistic shows the absence of autocorrelation and the J statistic assess that parameters are over identified by the instruments. Finally, the demand system is homogeneous of degree zero and symmetric, consistently with consumer theory.

Promotions, as expected, have positive effect on all wines purchased. The introduction of the new currency, the EURO, in February 2002, has a positive effect on foreign and DOC wines, a negative effect on the others. The paycheck received at the end of each month has a significant and positive effect on IGT wines. The Christmas holiday time has a positive and significant effect on foreign, DOCG and IGT wines.

TABLE 13 – ESTIMATED DEMAND PARAMETERS

Parameter	Estimates (Standard error)			
R-square	0.142	0.460	0.355	0.618
D. f.	90			
Durbin-Watson	1.876***	2.398***	1.827***	2.069***
J statistic	173.992***			
Homogeneity test	2.099 (1.036)**			
Adding-up and Symmetry imposed				
	Imported wine	DOC wine	DOCG wine	IGT wine
β_i	0.155	-0.035	0.333	0.045
	(0.069)**	(0.191)	(0.120)***	(0.149)
α_i	-0.675	-0.473	0.003	0.046
	(0.244)***	(0.461)	(0.406)	(0.342)
γ_{ij}	-0.029	0.054	-0.138	0.025
	(0.069)	(0.082)	(0.079)*	(0.078)
	0.054	0.436	-0.213	-0.228
	(0.082)	(0.195)**	(0.122)*	(0.132)*
	-0.138	-0.213	-0.154	0.190
	(0.079)*	(0.122)*	(0.140)	(0.271)
	0.025	-0.228	-0.087	0.045
	(0.078)	(0.132)*	(0.104)	(0.154)
	0.230	0.190	0.336	0.069
	(0.257)	(0.271)	(0.280)	(0.274)
λ_i	-0.012	-0.008	-0.014	-0.014
	(0.005)**	(0.006)*	(0.005)**	(0.005)***
$sin(\pi/13)$	-0.002	-0.034	0.019	0.008
	(0.003)	(0.012)***	(0.011)*	(0.008)
Christmas	0.013	-0.033	0.064	0.025
	(0.007)*	(0.027)	(0.024)***	(0.018)*
Paycheck	0.000	-0.001	-0.001	0.018
	(0.003)	(0.011)	(0.010)	(0.007)**
Intro. of Euro	0.027	0.014	-0.084	-0.027
	(0.016)*	(0.056)	(0.050)*	(0.035)
No. Promotions	0.002	0.001	0.001	0.005
	(0.002)	(0.001)*	(0.001)*	(0.001)***

*** > 99%, ** > 95%, * > 90% Probability to reject Ho: coef.=0

ELASTICITIES

Elasticities were calculated, following equations (20), (21), (22) and (24), at the mean and at each sample point. In order to improve the finite sample properties of the estimates, accuracy measures such as standard errors and asymmetric confidence intervals were calculated by carrying out a non-parametric bootstrap that uses Halton sequence for resampling from the disturbance, as described in the estimation technique section.

TABLE 14 – UNCOMPENSATED AND EXPENDITURE ELASTICITIES

	Foreign	DOC	DOCG	IGT	Table	Expenditure
Foreign	2.677**	3.654	-0.308**	3.890*	-2.834	4.269***
DOC	0.073	-0.224	-0.318**	-0.448***	0.452	0.790***
DOCG	0.198	-1.855***	-0.537	-0.259	-2.715	2.942***
IGT	0.210	-1.083***	0.061	-0.800**	0.161	0.633*
Table	-0.133	2.049	-1.360	-0.052	-0.080	0.539

TABLE 15 – COMPENSATED ELASTICITIES

	Foreign	DOC	DOCG	IGT	Table
Foreign	2.732*	5.927**	0.150	4.889**	-2.348
DOC	0.083	0.197	-0.234*	-0.263*	0.542
DOCG	0.235	-0.289	-0.221	0.429	-2.380
IGT	0.218	-0.746**	0.129	-0.652*	0.233
Table	-0.126	2.335	-1.302	0.074	-0.019

Own price elasticities indicate demand sensitivity to own price changes. The results indicate that generally an increase in own price elicits a reduction of the quantity demanded, and the negative sign indicates the negative sloping of the

demand function. This is true for DOCG, IGT and Table wine, before and after compensating for expenditure. Going from Marshallian to Hicksian, DOC own price elasticity switches the sign and looses significance. Foreign/imported wine shows in both cases a positive and significant elasticity. Both these results indicate that an increase in wine price elicits an increase in the quantity demanded. Although the counter intuitive result, which does not match the expectations based on the consumer theory, a possible explanation might be the consumers' perception of price as quality signal or the presence of other typologies of maximizing behaviors. In the case of foreign wine, looking at the small quantities purchased, even at aggregate level, is it possible to assimilate the purchase of foreign wine to a single period game, in which price is signaling for quality because there is no previous experience about the product. In the case of the other wine categories, appellations give precise and trusted information about quality and their repeated purchase enables and/or reinforces knowledge about wine/appellation and forms habitudes.

Alternatively, thinking about other sort of maximizing behaviors is also plausible. The repeated purchase of a large quantity of wine by a single family, such as cases of 12 or 15 wine bottles, in two consecutive weeks indicates storage phenomena, the celebration of special events, or the fact that the purchase concerns the entrepreneurial activity of the household (e.g. wine bar, restaurants, pizzeria, etc.). In the context of "thin markets" such as red premium wines the presence of one or more households assuming this behavior may affect severely the outcomes of the demand system estimates, especially while using extremely flexible model specifications like in this study. The exceptional values found, therefore, may

correspond to other typologies of markets. In the specific case of purchases for entrepreneurial activities, demanders at retail level would be the suppliers of a final market for which no information is available. For example, in a context of margins that are proportional to the price paid, higher price wine would render higher returns to the entrepreneur, letting entrepreneurs' demand shaping like a supply curve. Moreover, in the case of purchase for big events or celebration the maximizing criteria adopted by the demander may not always correspond to the minimization of costs but to the maximization of the satisfaction of the guests. In addition, the storage phenomena, especially for wine would lead to prefer higher price wines because of their better evolution while stored in the cellar. In this last case, knowing that for wine the older the better, the purchase of a priced bottle is an investment with higher returns than a cheaper wine. Hence, consumers' choice will be the result of the maximization of the expected quality of the aged wine, again, not the minimization of costs.

All these behaviors are not consistent with the optimizing model assumed for the demand analysis.

Because of these considerations, since the demand system is theoretically derived by minimizing costs, subject to the maximized utility, the estimation of the model renders results that might not be consistent with the theory.

Cross price elasticities indicate the how wine products compete among each other. Interesting enough is to notice that and increase in DOC price elicits a more than proportional increase in table wine purchase, even if not significant. An even more

interesting result is that an increase in DOC and IGT wines elicit a more than proportional increase in foreign wine purchases both before and after compensating for expenditure. This information indicates that foreign wine is perceived as similar to DOC and IGT wines, thus, it substitutes for them. Similarly, an increase in foreign wine price elicits a less than proportional increase in DOC and IGT wines. Differences in the magnitude of these substitution effects might be explained by the noticeable discrepancy between foreign and DOC, foreign and IGT shares.

Foreign wineries, comparing to Italian producers are usually bigger in size and more capable in promoting their products. Given the size of Italian wine consumption, foreign producers are willing to invest in order to compete more avidly with Italian wines and export more wine to Italy. Foreign wine positioning as competitors of IGT and DOC wines may be the result of targeted campaigns, or just of the unconditioned consumers' perception of these wines. Certainly, there exists the risk that once the "home bias" effect will start decreasing, DOC and IGT wines will be severely affected.

TABLE 16 – EXPENDITURE ELASTICITIES AND CONFIDENCE INTERVALS, RESULTS OF THE NON-PARAMETRIC BOOTSTRAP

	Estimates							Significantly		
	Coef.	t-stat	LB	UB	mean	min	max	≠ -1	≠0	≠1
F	4.269	2.632	1.006	7.382	4.253	-0.499	9.564	1	1	1
D	0.790	2.578	0.190	1.389	0.787	-0.269	1.701	1	1	0
G	2.942	2.252	0.404	5.510	2.935	-1.865	7.129	1	0	0
I	0.633	1.238	-0.343	1.611	0.628	-1.515	2.303	1	0	0
T	0.539	0.320	-2.691	3.980	0.572	-3.970	7.087	0	0	0

F=foreign; D=DOC; G=DOCG; I=IGT; T=table. Lower Bound at 2.5%, Upper Bound at 97.5%.

Significant results indicate that foreign and DOCG wines are luxuries while DOC, IGT and table are normal goods. This result is indicative of the higher quality of the first three compared to the others.

Confidence intervals indicated below suggest that, at uncompensated level, foreign, DOCG (although not significantly different from 0) and IGT wines are price elastics, while DOC and Table wines are inelastic. Price sensitivity for IGT is explained by the fact that this category includes high quality wines that could not be included in DOC/DOCG appellations. In the case of compensated elasticities, results indicate that the substitution effect between foreign wine and DOC, foreign and IGT are significantly different from 0 and -1.

TABLE 17 – UNCOMPENSATED ELASTICITIES, RESULTS FROM THE NON-PARAMETRIC BOOTSTRAP

	Estimates							Significantly		
	Coef.	t-stat	LB	UB	mean	Min	max	≠ -1	≠0	≠1
FF	2.678	1.236	0.301	9.501	3.823	-1.882	15.200	1	1	0
FD	3.655	0.827	-1.695	15.638	5.644	-5.184	24.356	0	0	0
FG	-0.308	-0.112	-5.967	5.497	-0.215	-11.441	9.822	0	0	0
FI	3.890	1.034	-0.293	14.068	5.669	-3.193	28.358	1	0	0
FT	-2.834	-0.347	-31.298	3.335	-7.839	-51.090	12.611	0	0	0
DF	0.073	0.598	-0.068	0.412	0.128	-0.208	0.675	1	0	1
DD	-0.224	-0.615	-0.825	0.587	-0.151	-1.470	1.316	1	0	1
DG	-0.318	-1.522	-0.724	0.125	-0.293	-0.934	0.390	1	0	1
DI	-0.448	-1.817	-0.817	0.157	-0.373	-1.026	0.597	1	0	1
DT	0.452	0.616	-1.390	1.599	0.220	-3.298	2.945	0	0	0
GF	0.198	0.562	-0.537	0.846	0.170	-1.443	1.787	1	0	1
GD	-1.855	-1.787	-3.788	0.254	-1.771	-4.598	1.988	0	0	1
GG	-0.537	-0.464	-3.068	1.527	-0.684	-4.720	2.458	0	0	0
GI	-0.259	-0.301	-1.839	1.470	-0.239	-3.386	2.634	0	0	0
GT	-2.715	-1.048	-7.649	2.600	-2.522	-11.415	9.081	0	0	0
IF	0.210	0.910	-0.069	0.838	0.313	-0.291	1.625	1	0	1
ID	-1.083	-2.189	-1.842	0.148	-0.928	-2.253	0.710	0	0	1
IG	0.061	0.178	-0.582	0.785	0.094	-0.924	1.424	1	0	1
II	-0.800	-1.484	-1.711	0.488	-0.686	-2.228	1.476	0	0	1
IT	0.161	0.135	-2.751	1.941	-0.291	-7.504	2.980	0	0	0
TF	-0.133	-0.152	-3.211	0.333	-0.702	-5.749	0.681	0	0	1
TD	2.049	0.836	-4.443	5.699	1.088	-9.094	9.934	0	0	0
TG	-1.360	-0.766	-4.691	2.399	-1.423	-9.061	6.418	0	0	0
TI	-0.052	-0.026	-5.093	2.745	1.088	-9.094	9.934	0	0	0
TT	-0.080	-0.017	-4.552	14.275	-1.423	-9.061	6.418	0	0	0

F=foreign; D=DOC; G=DOCG; I=IGT; T=table. Lower Bound at 2.5%, Upper Bound at 97.5%.

TABLE 18 – COMPENSATED ELASTICITIES, RESULTS FROM THE NON-PARAMETRIC BOOTSTRAP

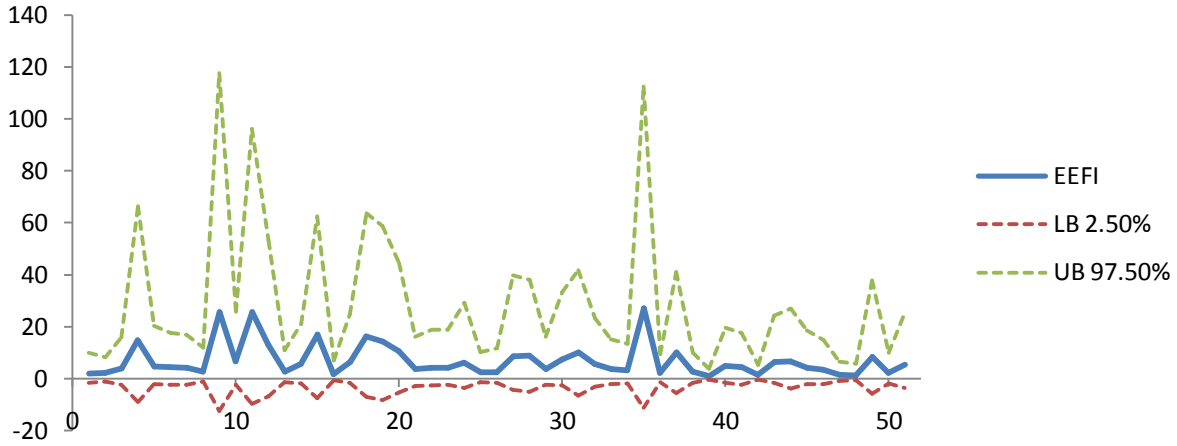
	Estimates							Significantly		
	Coef.	t-stat	LB	UB	mean	min	max	≠ -1	≠0	≠1
FF	2.732	1.263	0.221	8.991	3.877	-1.551	13.82	1	1	0
FD	5.927	1.353	0.553	18.42	7.724	-3.672	30.43	1	1	0
FG	0.150	0.052	-5.988	5.845	0.140	-10.17	11.16	0	0	0
FI	4.889	1.346	0.961	15.19	6.670	-3.136	26.24	1	1	0
FT	-2.348	-0.296	-29.20	4.030	-7.051	-51.39	9.055	0	0	0
DF	0.083	0.693	-0.059	0.434	0.132	-0.221	0.746	1	0	1
DD	0.197	0.501	-0.508	1.047	0.258	-1.009	1.879	1	0	0
DG	-0.234	-1.150	-0.615	0.187	-0.214	-0.841	0.421	1	0	1
DI	-0.263	-1.135	-0.608	0.343	-0.195	-0.860	0.666	1	0	1
DT	0.542	0.803	-1.114	1.741	0.341	-2.873	3.065	0	0	0
GF	0.235	0.649	-0.621	0.879	0.197	-1.099	1.474	1	0	1
GD	-0.289	-0.260	-2.508	1.882	-0.246	-4.056	3.149	0	0	0
GG	-0.221	-0.197	-2.779	1.802	-0.394	-3.870	2.966	0	0	0
GI	0.429	0.559	-1.033	2.009	0.442	-2.156	2.871	0	0	0
GT	-2.380	-0.966	-7.056	2.904	-2.082	-11.37	10.16	0	0	0
IF	0.218	0.953	-0.081	0.868	0.322	-0.328	1.632	1	0	1
ID	-0.746	-1.316	-1.639	0.683	-0.601	-2.178	1.679	0	0	1
IG	0.129	0.347	-0.584	0.933	0.155	-1.071	1.497	1	0	1
II	-0.652	-1.248	-1.485	0.475	-0.539	-2.088	1.229	0	0	1
IT	0.233	0.200	-2.678	1.834	-0.205	-7.354	3.631	0	0	0
TF	-0.126	-0.153	-3.150	0.382	-0.657	-5.048	0.682	0	0	1
TD	2.335	0.880	-4.170	6.730	1.510	-9.646	11.87	0	0	0
TG	-1.302	-0.757	-4.739	2.151	-1.287	-7.182	6.852	0	0	0
TI	0.074	0.039	-4.827	2.753	-0.676	-11.47	4.791	0	0	0
TT	-0.019	-0.004	-4.849	13.72	2.055	-12.33	23.59	0	0	0

F=foreign; D=DOC; G=DOCG; I=IGT; T=table. Lower Bound at 2.5%, Upper Bound at 97.5%.

SEASONALITY IN THE ELASTICITIES

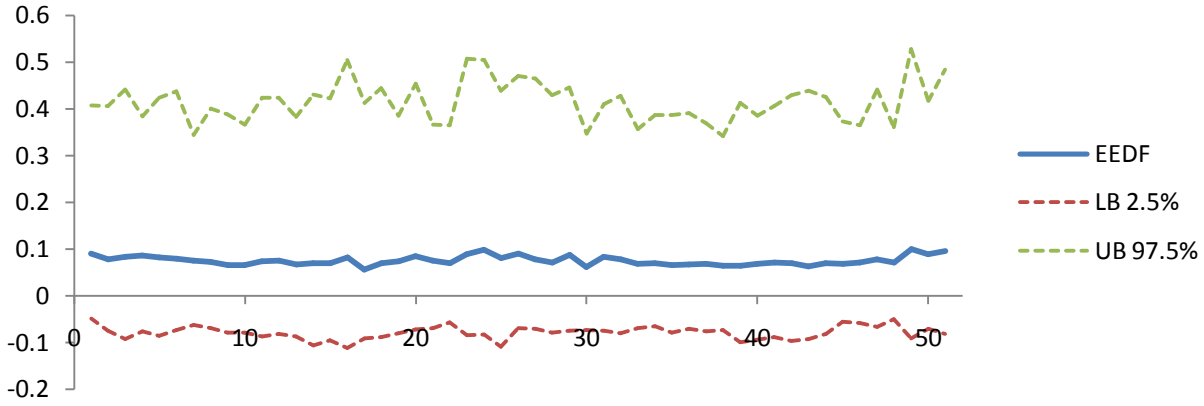
The calculation of the elasticities at a sample point such as the mean gives important indications about consumers' behavior towards the analyzed products. Nonetheless, seasonality or different patterns over time, which deviate elasticities significantly from their mean, may exist. Relations among products, therefore, may change over time and be another important source of information for producers and policy makers.

FIGURE 13 – SUBSTITUTION EFFECT BETWEEN FOREIGN AND DOC WINE ($\mu_{foreign,DOC}$) OVER TIME



During the summer the elasticy shows extremely high variance and peaks. Christmas holidays, on the other hand, show more stable and lower elasticities. Conversely, the substitution effect in the symmetric element of the matrix of uncompensated elasticities does not show any seasonal pattern, as shown below.

FIGURE 14 – SUBSTITUTION EFFECT BETWEEN DOC AND FOREIGN WINE ($\mu_{DOC,foreign}$) OVER TIME



Similarly, concerning about the substitution effect between foreign and IGT wines:

FIGURE 15 - SUBSTITUTION EFFECT BETWEEN FOREIGN AND IGT WINE ($\mu_{foreign,IGT}$) OVER TIME

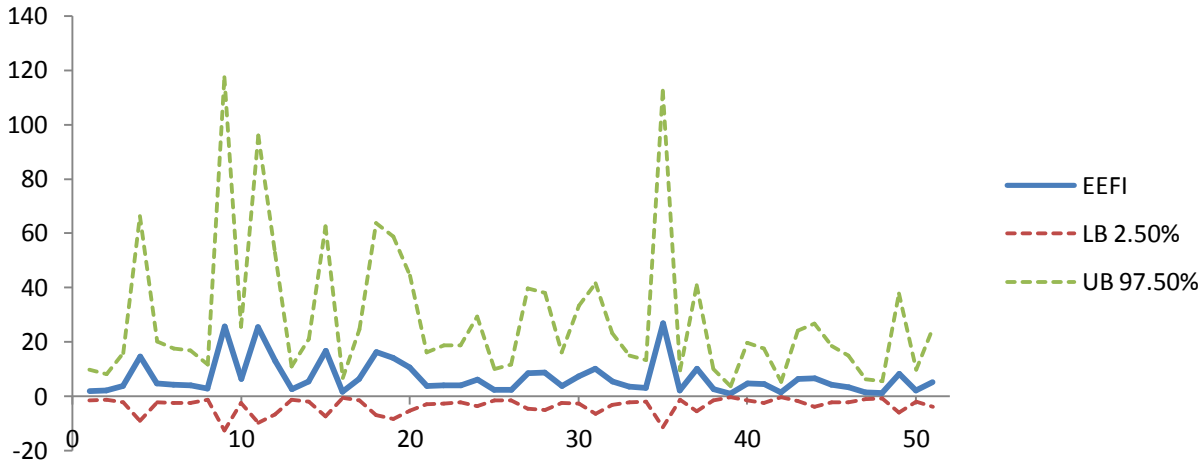


FIGURE 16 - SUBSTITUTION EFFECT BETWEEN IGT AND FOREIGN WINE ($\mu_{IGT,foreign}$) OVER TIME

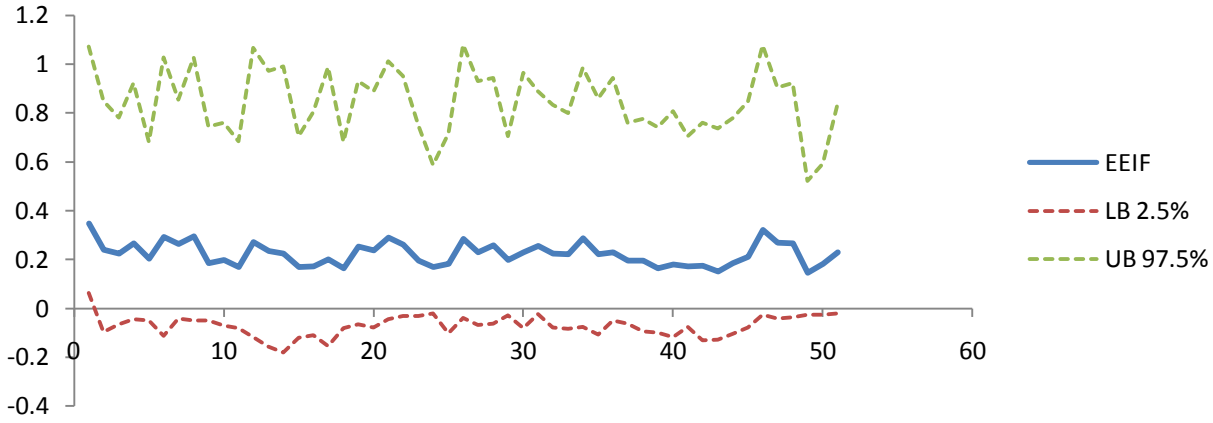
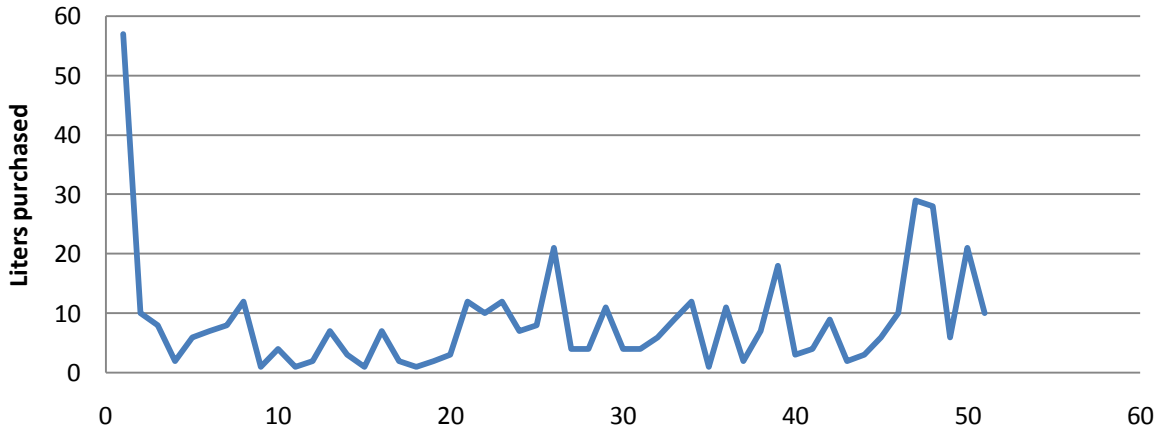


FIGURE 17 – QUANTITIES PURCHASED OF FOREIGN WINE OVER TIME



The most plausible explanation is the winding structure of foreign wines purchases over time. As we can see from the figure above, bigger substitution effects correspond to lower purchasing records and vice versa. In conclusion, an increase in DOC and/or IGT prices will elicit a bigger substitution effect for foreign wine during summertime. Conversely, an increase in price during Christmas time will produce a smaller response in term of foreign wine purchases.

SUMMARY AND CONCLUSIONS

The primary purpose of this thesis is to provide increased understanding of Italian premium red wine demand. More specifically, this work aims to provide measures of the market relationship among Italian wines and Imported wines, to quantify the price sensitivities of wines demand, and to better understand household preferences for wine, at aggregate level. Results of this analysis may give useful information to the businesses involved in the sector and to policy makers.

The price segment considered, EUR 3-7, was chosen because wines belonging to different price segments, colors, and typologies (e.g. dessert and sparkling wines) are assumed to be different products. Multiple reasons may clarify this assumption. Branding and labeling strategies, quality, packaging and level of diversification within each segment may justify this choice. In fact, the high diversification combined with strong wine identities for higher quality wines, or the heterogeneous packaging and volume for lower quality wines would have made the modeling intractable. Moreover, wines of different color are usually drunk with different meals. Their consumption, thus, can be intended as independent.

Interestingly, foreign red wines sold in Italy are mainly positioned in this price range. Moreover, given the ongoing modifications of consumers' preferences toward higher quality wines, this segment is considered to be the most dynamic. Additionally, producers of these wines, which generally have medium-weak identity and medium quality, pose much attention on appellations and certifications, using

them as tool for signaling quality to consumers. In this context, the analysis of the relationships among wines categorized on their denominations of origin is the most suitable if carried out in this price segment.

This study employs ACNielsen panel data of Italian household wine purchases over the two year period from January 2002 through December 2004. The virtue of these data is that they contain product-level information on wine purchased, including country of origin, as well as appellation, grape variety, certification of productions methods, retail promotional information, and unit price.

Aggregating over time and household has hidden the specific retail level information about price decisions. Unfortunately, without aggregating, the frequency of zero purchases combined with the absence of price information precluded the analysis of the original panel though a limited dependent variable model.

Data exploration, which assesses the second order polynomial nature of Engel curves, together with the will to respect consumer theory, suggested that the Quadratic Almost Ideal Demand System (QUAIDS) was the most appropriate model specification for the analysis. Moreover, in order to account for endogeneity, an iterative version of the Generalized Method of Moments estimator has been applied. Additionally, this technique does not need assumptions concerning the error structure maintaining the desirable properties that characterize a good estimator.

Finally, the empirical model was set up, accounting for seasonality in quantities, not in prices, and for demand shifters like the introduction of the Euro currency, the paycheck at the end of the month, and Christmas holidays.

Results show that foreign, DOCG and IGT are price elastic, while DOC and Table wines are not. Within Italian wines, DOC competes with IGT, and an increase in DOC price elicits a more than proportional change in table wine demand. Foreign wine is price elastic and its own price elasticity, positive in sign, tells that consumers perceive foreign wine price as quality information. Given this information, if home bias of Italian wine consumers diminishes, DOC and IGT demand will be severely affected, implying domestic produces will need to compete more keenly on pricing and quality. Finally, substitution effect between foreign and DOC, foreign and IGT wines show peaks and higher variability during summertime, lower values and less variability during Christmas holidays, while other cross price elasticities show stability over the considered time period. Concluding, promotional activities, the paycheck at the end of the month, and the Christmas holydays show positive effects on wine demand.

LIMITS AND FUTURE RESEARCH

Results, although highly informative and useful for marketing purposes, could not be used for welfare analysis without assuming any hazard, since not all the theoretical properties of the demand are respected. The positive price elasticity for foreign wines, in fact, escapes from the ideal downward sloping demand concept.

The belief that an increase in own price will elicit a decrease in the quantity demanded might not be shared by interpreting the result saying that price is a signal for quality.

On the other hand, many other beliefs are hidden behind this analysis. For example, homogeneity of degree zero in prices and expenditure, not income, may be easily violated if the proportional increase in expenditure and prices generates substitution for other categories goods not included in the demand system, because is derived through a two step budgeting procedure. In this case also the symmetry will be violated.

Popper philosophy “falsification is science”, could be adopted and be home free. In this case, also the falsification of the theoretical beliefs implies the belief that the findings of this thesis respect truly the crude reality, the belief that the data analyzed represent a complete set of information and do not contain errors, and the belief that the algorithm for the maximization is correct.

Before falling in the dilemma, the lack of information about the decision process should be invoked. The incomplete information implies approximations and synthesis. The decision making process, complicate in its nature, hides mysteries and need to be synthesized in order to be understood.

An economist, as other behavioral scientists, has to be able to synthesize and use the small information available in order to explain the decision process in an understandable and shared language. Although economic theory is based on

conventions and assumptions sometimes not fully tangible, the respect of it allows the use of the results for the understanding of the implications.

For this reason, in this study it was decided to adhere to the theoretical beliefs. Hence, upward sloping demand curve, that means positive semi-definite Slutsky matrix, geometrically interpreted as quasi-concave utility function, is not acceptable. Future research will aim the imposition of concavity, together with the already imposed theoretical restrictions. This additional restriction will presumably allow the model to be fully consistent with consumer theory and useful for welfare analysis.

Talking about richness of information, a further step in the understanding of wine demand would be the analysis of demand at household level, considering households' characteristics.

Moreover, a demand system, which includes wines belonging to other price segments, to other colors and typologies, would provide additional information for the understanding of the entire wine market reality.

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