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The Italian *Grappa* Market: An Analysis of Consumer Preferences Through Hedonic Price Analysis

by

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First draft

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Abstract:

This work carries out a hedonic price analysis in the Italian *grappa* market. We use a dataset composed of around 15.576 observations of retail chain prices (related to transactions taken place in Italy in the period 1997-2004) and product characteristics. We estimate the implicit price of the main product attributes. Results show that particularly bottle format, high alcohol content and brand affect the consumer's willingness-to-pay for *grappa*. In particular, the Prime Uve variable presents statistically significant, positive estimated coefficients, with high magnitude, which we interpreted as a "fads and fashion effect". In addition, we are able to capture consumer taste evolution over time and consumer taste differences in space (different consumer preferences across Italian regions).

1. Introduction

Grappa, the Italian distillate made from grape pomace, is a minor competitor in world distilled beverages markets but in the Italian market it is the number one contestant. Especially in the last ten years a technical and marketing revolution has brought about a re-launch of grappa in Italy that slowly starts to trickle into foreign markets as well. From the once rough and strong product, grappa has developed into a complex and refined spirit that attracts all kinds of consumers. Grappa can be young and fresh or aged and sophisticated. It can be made from a mixture of grape varieties or from

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a single variety, pure or aromatized with fruit or smoke. The array is endless and thus puts the consumer in difficulty when deciding on a grappa to buy, similar to what can occur with wine. Brands do not help very much either since there are about 500 which are sold in retail chains and many more directly at the producer's premises. The top 10 brands sold at retail chains account for about 48% of total sales which is low for consumer products but higher than for the even more fragmented wine market. In a market like this, it is not straightforward to understand what consumers base their decisions on, so this study tries to shed light on the aspects that can be deducted from a grappa bottle before opening it.

This paper is organized as follows: section 2 gives the motivation for this work and a literature survey, section 3 describes the dataset and the analyzed variables, section 4 specifies the implemented model, section 5 explores the results, section 6 summarizes the study and the appendix contains tables with detailed results.

2. Motivation and Literature Survey

In an attempt to better understand consumer choices in the Italian grappa market, this paper analyzes revealed consumer preferences based on actual transaction data. The methodology applied is hedonic price analysis, which is based on the hypothesis that goods are aggregations of attributes (Lancaster, 1966) and that consumers base their buying decisions on these attributes. We thus apply the hedonic price analysis to the Italian grappa market in order to estimate the implicit value that consumers attribute to product characteristics.

As far as we know there are no cases of hedonic price analysis applied to grappa so far. The only related works apply hedonic price analysis to grappa's sister product, bottled wine. Among them are Oczkowski (1994), Ashenfelter *et al.* (1995), Combris *et el.* (2000), Sumner and Bombrun (2003) and Steiner (2004b).

Oczkowski applies the method to Australian premium table wine, using recommended retail prices as opposed to actual sales prices. He considers attributes printed on the bottle label, such as vintage, vineyard region and grape variety and combines these with scores of a popular Australian wine guide in order to prove that wine prices are linked to rankings.

Ashenfelter *et al.* argue that the quality of mature red Bordeaux wines can be predicted by the weather during the growing season. They take into account the characteristics vintage and weather conditions and show that these alone explain more than 80% of the price variation for a given wine in their sample.

In their Burgundy wine study Combris *et al.* (2000) take into account both sensory and objective variables, that is appellation ranking, vintage and red or white wine. Their results demonstrate that objective characteristics such as ranking and vintage have a much more significant impact on price than sensory characteristics and thus confirm the outcomes of their 1997 study on Bordeaux wine. This might be due to the fact that objective characteristics are more easily identifiable by non expert consumers.

Sumner and Bombrun (2003) analyze the recommended retail price of 8460 samples of Californian wine distributed over five varieties and 12 vintages. They take into account the following explanatory variables: Wine Spectator's tasting score, age of the wine at release, grape variety, region of origin, label designation and vintage. The variables that have considerable impact on price are tasting score, age at release, region of origin and to a lesser extent label designation and vintage year.

Steiner (2004b) studies the wine characteristics that are specified on bottle labels of Australian wine sold in the British off-license channel, that is retail. He combines these with retail outlet attributes to take into account aspects that do not interfere with tasting qualities. The variables considered are color, vintage, grape variety, volume, region of origin, place of bottling, importer, producer and retail outlet. Findings are that consumers value grape varieties and regional origins, with the latter gradually losing ground to brands. Another interesting result is the fact that consumers place importance on the distinct characteristics of the specific retail outlet and are willing to pay a price premium for above average services.

3. Dataset Description

In contrast to other papers on hedonic price analysis of wine this research does not use recommended retail prices but actual transaction prices that were collected from a sample of about 14000 super- and hypermarkets representing all Italian points of sales of this category.

The dependent variable is the retail price for 1 liter of grappa. We consider price per liter and not per single item, because grappa bottles differ in size and design. Therefore it is not correct to compare the price of a 50 cc bottle with the price of a 70 c.c. bottle.

Our dataset consists of 15576 observations, covering items sold in entire Italy (in the four macro regions (South, Center, North-East, North-West), between 1997 and 2oo4.[3]

Table 1 contains a description of the main variables and some descriptive statistics.

Table 1: Descriptive statistics and variables

Variables	Description	Average	Min - Max	Standard Deviation
Price / liter	Price of grappa in Euro per liter Dependant variable	15.84	1-1476	20.30
Logprice	Logarithm of Price / liter Dependant variable	2.55	0-7.29	0.56
Cabernet	Grape variety. Dummy variable.	D = 1; 320 Observations		
Chardonnay	Grape variety. Dummy variable.	D = 1; 1067 Observations		
Moscato	Grape variety. Dummy variable.	D = 1; 699 Observations		
Muller Thurgau	Grape variety. Dummy variable.	D = 1; 70 Observations		
Pinot	Grape variety. Dummy variable.	D = 1; 823 Observations		
Prosecco	Grape variety. Dummy variable.	D = 1; 442 Observations		
Myrtle	Aromatized grappa. Dummy variable.	D = 1; 221 Observations		
Pear	Aromatized grappa. Dummy variable.	D = 1; 164 Observations		
Peach	Aromatized grappa. Dummy variable.	D = 1; 25 Observations		
Rue	Aromatized grappa. Dummy variable.	D = 1; 619 Observations		
Aromatized Grappa	Grappa type. Dummy variable.	D = 1; 3192 Observations		
White Grappa	Grappa type. Dummy variable.	D = 1; 4986 Observations		
Distilled Grape	Grappa type. Dummy variable.	D = 1; 305 Observations		
Aged Grappa	Grappa type. Dummy variable.	D = 1; 453 Observations		
Single Variety	Grappa type. Dummy variable.	D = 1; 5818 Observations		
35 Percent[4]	Alcohol by volume. Dummy variable.	D = 1; 198 Observations		
38 Percent	Alcohol by volume. Dummy variable.	D = 1; 1821 Observations		
40 Percent	Alcohol by volume. Dummy variable.	D = 1; 7699 Observations		
44 Percent	Alcohol by volume. Dummy variable.	D = 1; 164 Observations		
45 Percent	Alcohol by volume. Dummy variable.	D = 1; 1267 Observations		
50 Percent	Alcohol by volume. Dummy variable.	D = 1;182 Observations		
62 Percent	Alcohol by volume. Dummy variable.	D = 1; 18 Observations		
0.35 Liters	Bottle contents in liters. Dummy variable.	D = 1; 556 Observations		
0.50 Liters	Bottle contents in liters. Dummy variable.	D = 1; 5840 Observations		
0.70 Liters	Bottle contents in liters. Dummy variable.	D = 1; 6211 Observations		
1.00 Liters	Bottle contents in liters. Dummy variable.	D = 1; 2085 Observations		
1.50 Liters	Bottle contents in liters. Dummy variable.	D = 1; 331 Observations		
North-East	Geographic area of sales. Dummy variable.	D = 1; 4394 Observations		
North-West	Geographic area of sales. Dummy variable.	D = 1; 3793 Observations		
Center	Geographic area of sales. Dummy variable.	D = 1; 3936 Observations		
South	Geographic area of sales. Dummy variable.	D = 1; 3453 Observations		

[3] All prices are in Euro. The Euro currency entered into force on 1 January 2002. Therefore, prices before that date were converted from Italian Lira into Euro using the official exchange rate.

[4] According to Italian law grappa has to have a minimum alcohol content of 37.5 degrees but lower graded 'grappa' can be found on the shelves nonetheless.

1997	Year of sales. Dummy variable.	D = 1; 1446 Observations
1998	Year of sales. Dummy variable.	D = 1; 1619 Observations
1999	Year of sales. Dummy variable.	D = 1; 1658 Observations
2000	Year of sales. Dummy variable.	D = 1; 1446 Observations
2001	Year of sales. Dummy variable.	D = 1; 2288 Observations
2002	Year of sales. Dummy variable.	D = 1; 2398 Observations
2003	Year of sales. Dummy variable.	D = 1; 2443 Observations
2004	Year of sales. Dummy variable.	D = 1; 2276 Observations
Bassanina	Brand[5]. Dummy variable.	D = 1; 107 Observations
Bassanina Nostrana	Brand. Dummy variable.	D = 1; 16 Observations
Bocchino	Brand. Dummy variable.	D = 1; 196 Observations
Bocchino Sigillo Nero	Brand. Dummy variable.	D = 1; 37 Observations
Bonollo	Brand. Dummy variable.	D = 1; 31 Observations
Bottega	Brand. Dummy variable.	D = 1; 226 Observations
Brotto	Brand. Dummy variable.	D = 1; 531 Observations
Candolini	Brand. Dummy variable.	D = 1; 60 Observations
Da Ponte	Brand. Dummy variable.	D = 1; 43 Observations
Duchessa Lia	Brand. Dummy variable.	D = 1; 102 Observations
Faled	Brand. Dummy variable.	D = 1; 161 Observations
Fiordivite	Brand. Dummy variable.	D = 1; 42 Observations
Franciacorta	Brand. Dummy variable.	D = 1; 212 Observations
Franciacorta La Corte	Brand. Dummy variable.	D = 1; 18 Observations
Frattina	Brand. Dummy variable.	D = 1; 145 Observations
Gaiarine	Brand. Dummy variable.	D = 1; 145 Observations
Ilas	Brand. Dummy variable.	D = 1; 166 Observations
Julia	Brand. Dummy variable.	D = 1; 88 Observations
Julia RS	Brand. Dummy variable.	D = 1; 34 Observations
Maschio	Brand. Dummy variable.	D = 1; 134 Observations
Nardini	Brand. Dummy variable.	D = 1; 119 Observations
Nonino	Brand. Dummy variable.	D = 1; 185 Observations
Nonino UE	Brand. Dummy variable.	D = 1; 88 Observations
Piave Cuore	Brand. Dummy variable.	D = 1; 61 Observations
Prime Uve	Brand. Dummy variable.	D = 1; 20 Observations
Turchetto	Brand. Dummy variable.	D = 1; 76 Observations
Valdoglio	Brand. Dummy variable.	D = 1; 256 Observations
Vecchio Podere	Brand. Dummy variable.	D = 1; 60 Observations
Vite Pura	Brand. Dummy variable.	D = 1; 45 Observations
Zanin	Brand. Dummy variable.	D = 1; 166 Observations
Number of observations: 15576		

[5] We selected the top 30 brands according to turnover.

4. Model Specification

Whereas the use of hedonic models dates back to Court (1941), Lancaster, (1971) and Griliches (1971), this methodology was used to analyze qualitative characteristics in the wine market only recently. The intuition behind the hedonic approach is that the (logged) price of an item can be decomposed into the implicit prices of the different characteristics. Thus the price may be described by a simple linear regression such as:

$$1. \quad Inp_{i,t} = \alpha_0 + \sum_{J=1}^{J} b_j x_{j\,t} + \varepsilon_{i,t}$$

where $ln\ p_{i,,t}$ is the logarithm of the price of the bottle i; i =1, 2, . . ., N, sold at time t; t =1, 2,. . ., T; $x_{j,t}$ is the jth (possibly qualitative) characteristic of the bottle i,; $\varepsilon_{i,t}$ is an error term; β_J, is a parameter and α_0 is the constant.

After several checks on various specifications, we select the basic regression model of equation (2):

$$2. \quad Inp_{i,t} = \sum_{J=1}^{J} b_j x_{j\,t} + \sum_{t=1}^{T} d_t z_t + \varepsilon_{i,t}$$

where $lnp_{i,t}$ (the logged price of bottle i sold at time t) is the dependent variable; $x_{j,t}$ is the jth (possibly qualitative) characteristic of the bottle i sold at time t; z_t is a dummy variable taking the value of 1 if the item is sold in year t and 0 otherwise and $\varepsilon_{i,t}$ is an error term. Again, β_J, δ_t, are parameters. An important difference between the two models, is that the regression model in Equation (2) does not contain a constant. This is mainly due because the many dummy variables we use might cause multicollinearity problems. In order to avoid this, we eliminate the constant from the regression model[6]. In addition, most of the product characteristics $x_{j,t}$ are implemented as dummy variables, taking the value of 1 when the characteristic is present and 0 otherwise. In fact, we include dummy variables for the grappa variety, grappa segment, alcohol content, bottle format, geographic place of sale and grappa brand (producer).

It order to highlight different price structures, the dataset has been split into different subgroups, distinguishing among geographical areas (North-East; North-West; Center; South) and different

[6] See M. Verbeek (2001).

time periods (1997, 2000, 2004). In the latter case, the selected regression model is described in Equation (3)[7].

$$3. \quad \ln p_{i,t} = \sum_{J=1}^{J} b_j x_{j\,t} + \varepsilon_{i,t}$$

5. Results

Table 2 and 3 show the results of our OLS estimation of model (2), with the complete dataset (15. 576 observations). In Table 3, in particular, all reported estimated coefficients are statistically significant; t-statistics and the uncentered R-squared are fairly high. Surprisingly, the estimated coefficients for z_t are not statistically significant, and therefore we do not report them in the final results tables. In general, the geographic dummies have statistically significant, positive estimated coefficients, with large magnitude.

In general, we find that the variables representing different formats of the grappa bottle present positive estimated coefficients, with a high magnitude. The estimated coefficients for those dummies representing different alcohol content are positive. The variables grappa type single variety, aged grappa and aromatized grappa present positive estimated coefficients. The same holds true for those variables representing different Italian macro-regions. An interesting and original result concerns the estimated coefficients for those variables representing different grappa brands, implemented and interpreted as product characteristics. The only statistically significant coefficients, among all brands and related variables, are Brotto, Da Ponte, Duchessa Lia, Franciacorta, Frattina, Gaiarine, Ilas, Prime Uve and Vecchio Podere. In particular, Brotto, Duchessa Lia, Franciacorta and Prime Uve present positive estimated coefficients. This might be interpreted as a preference for such brands. Ceteris paribus, the Brotto grappa increases the expected price of around 34%; the Duchessa Lia of around 90%; the Franciacorta of around 36% and the Prime Uve grappa of more than 100%. The latter case can be interpreted as a typical "fads and fashion-effect[8]"that affects consumers' preferences and consumption.

Table 4 and 5 respectively show the results of our OLS estimation of model (3). Table 4, in particular, shows the results for the datasets with different time periods (1997, 2000 and 2004). This

[7] For the sake of simplicity we adopt a linear, cross-sectional model. Further research might focus on the adoption of a panel data.

[8] See Cooper (1999) and Becker and Murphy (2000). Fads and fashion are social externalities that affect individual consumption.

preliminary implementation aims at capturing possible differences in consumers' taste formation across time. Also in these cases, reported estimated coefficients are statistically significant; t-statistics and the uncentered R-squared are fairly high.

For the 1997 regression exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 20%; the 150 centiliters format decreases the expected price of around 18%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 45 degrees that positively increases the expected price of around 21%. The variable "grappa type single variety" presents a negative estimated coefficient. Finally, most of the grappa brands present statistically not significant estimated coefficients, with the exception of Brotto (positive), Bassanina (negative) and Frattina (negative).

For the 2000 regression exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 16%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 45 degrees that positively increases the expected price of around 31%. The variables "grappa type single variety" and "aged grappa" present negative estimated coefficients. Finally, a difference with the 1997 estimation results emerges. More grappa brands (variables) present statistically significant estimated coefficients. For example, the Brotto grappa, ceteris paribus, increases the price of around 21%; the coefficient for Prime Uve indicates that this brand is expected to sell at a 99% higher price than another brand[9] and so on.

For the 2004 regression exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 10%, whilst the 70 centiliters format increases the expected price of around 7%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 44 degrees that positively increases the expected price of around 31%. The variable "grappa type single variety" presents negative estimated coefficients. Also in this case, more grappa brands (than in 1997 and 2000) present statistically significant estimated coefficients. The estimated coefficient for Prime Uve is not statistically significant.

Table 5 shows the results for the datasets with different Italian geographic areas (Center, South, North-East, North-West, 1997, 2000 and 2004). We have decided to split the dataset and form the four macro-regions in order to capture consumers' different tastes across places. We have added the variable "year", in order to roughly capture time variations. As expected, this variable presents

[9] The high magnitude of the estimated coefficient can be interpreted as a "fashion-effect".

positive estimated coefficients with small magnitude, meaning a slight price increase across the considered time span. Estimated coefficients are statistically significant; t-statistics and the uncentred R-squared are fairly high.

For the Italy Centre region estimation exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 19%, whilst the 70 centiliters format increases the expected price of around 7% and the 150 centiliters format increases the price of around 21%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 44 and 50 degrees that positively increase the expected price of around 14% and 50%. The variables “grappa type single variety” and aromatized present negative estimated coefficients. Grappa brands present statistically significant (positive and negative) estimated coefficients. Also in this case, like in 2000, the estimated coefficient for Prime Uve is statistical significant and of high magnitude.

For the Italian North-East region estimation exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 18%, whilst the 150 centiliters format increases the price of around 12%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 44, 45 and 50 degrees that positively increase the expected price of around 20%, 7% and 18%. The variable “grappa type single variety” presents negative estimated coefficients. Aged grappa increases the price of around 8%. Grappa brands present statistically significant (positive and mostly negative) estimated coefficients. Also in this case, like in 2000 and in the Centre region, the estimated coefficient for Prime Uve is statistically significant and of high magnitude. We interpret again this result as a “fads and fashion-effect”.

For the Italian North-West region estimation exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 13%, whilst the 150 centiliters format increases the price of around 16%. The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 44 and 45 degrees that positively increase the expected price of around 15% and 19%. The variable “grappa type single variety” presents negative estimated coefficients. Aged grappa increases the price of around 2%. Grappa brands present statistically significant (positive and mostly negative) estimated coefficients.

For the Italian South region estimation exercise, we find that, ceteris paribus, the 100 centiliters format of the grappa bottle increases the expected price of around 10%.The estimated coefficients for those dummies representing different alcohol content are negative, with the exception of 45 degrees that positively increases the expected price of around 17%. The variable “grappa type single variety” presents negative estimated coefficients. Grappa brands present statistically

significant (positive and mostly negative) estimated coefficients. In particular, the estimated coefficient for Prime Uve is statistical significant and positive (around 65%). The variable Grappa JuliaRS presents a positive, statistically significant coefficient (73%).

6. Conclusions

In this paper, we have used a dataset (from which we have derived several sub-datasets) containing information about prices of grappa bottles sold at super- and hypermarkets in Italy during 1997-2004 and a set of intrinsic (aged, distilled, aromatized, single variety, multiple variety, alcohol content) and extrinsic (bottle format, brand) characteristics. By estimating simple linear models without a constant, we have performed hedonic pricing analysis in order to capture the implicit price of the selected grappa characteristics and, therefore, elicit information about consumer preferences.

The main results are the following. First, consumers pay attention to the bottle format, preferring the 100 centiliters version. Second, consumers prefer those grappas with a high alcoholic content; third consumers do not show strong preferences for the different grappa segments (one of the five grappa types single variety, multiple variety, distilled grape, aromatized and aged). Finally, the brand of the grappa matters in consumers' preferences. In particular, the Prime Uve variable presents statistically significant, positive estimated coefficients, with high magnitude. We interpreted this result as a "fads and fashion effect".

In general, we can observe a common trend across time and regions: grappa is becoming a refined, fashionable product. In fact, consumers are willing to spend for those characteristics related to fads (mostly brand and format).

Further research should focus on the attempt to test different model specifications (i.e. non-linear) and estimation techniques (i.e maximum likelihood).

7. Bibliography

Ashenfelter, O., Ashmore, D. and Lalonde, R. (1995). Bordeaux Wine Vintage Quality and the Weather, Chance 8:7-14.

Becker, G. and Murphy, K. (2000). Social Economics: Market Behaviour in a Social Environment, Harvard University Press.

Cooper, W. (1999). Coordination Games. Complementarities and Macroeconomics, Cambridge University Press.

Combris, P., Lecocq, S. and Visser, M. (1997). Estimation of a Hedonic Price Equation for Bordeaux Wine: Does Quality Matter? Economic Journal 107:390-402.

Combris, P., Lecocq, S. and Visser, M. (2000). Estimation of a Hedonic Price Equation for Burgundy Wine, Applied Economics 32:961-67.

Court, L. (1941). Entrepreneurial and consumer demand theories for commodities spectra, Econometrica 9:135–62 and 241–97.

Figini, P. and Onofri, L. (2005). Pricing Old Masters Paintings: Price Formation and Policy Implications. In Alain Marciano and Jean Michel Josselin (Eds.), The Law and Economics of the Welfare State: A Political Economy Approach, Edward Elgar Publisher.

Golan, A. and Shalit, H. (1993). Wine Quality Differentials in Hedonic Grape Pricing, Journal of Agricultural Economics 44(2):311-21.

Griliches, Z. (1961). The price statistics of the federal government. In Z. Griliches (Ed.), Hedonic price indexes for automobiles: An econometric analysis of quality change. National Bureau of Economic Research, General Series No. 73. New York: National Bureau of Economic Research, University of Chicago Press.

Griliches, Z. (1971). Price Indexes and Quality Change, Cambridge, MA.: Harvard University Press.

Houthakker, H.S. (1952). Compensated Changes in Quantities and Qualities Consumed, Review of Economic Studies 19:155-64.

Lancaster, K.J. (1966). A New Approach to Consumer Theory, Journal of Political Economy 74(2):132-57.

Lecocq, S. and Visser, M. (2006). What Determines Wine Prices: Objective vs. Sensory Characteristics, Journal of Wine Economics 1(1):42-56.

Oczkowski, E.A. (1994). A Hedonic Price Function for Australian Premium Table Wine, Australian Journal of Agricultural Economics 38(1):93-110.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition, Journal of Political Economy 82(1):34-55.

Steiner, B. (2004a). French Wines on the Decline? Econometric Evidence from Britain, Journal of Agricultural Economics 55(2):267-88.

Steiner, B. (2004b). Australian Wines in the British Wine Market: A Hedonic Price Analysis, Agribusiness 20(3):287–307.

Sumner, D.A., Bombrun, H. (2003). What determines the price of wine?, AIC Issues Brief 18, University of California Agricultural Issues Center.

Verbeek, M. (2004). A guide to modern econometrics, 2. ed. Chichester, J. Wiley

8. Appendix

Table 2: OLS results, dependent variable logprice (model without constant)

Variable	Estimated Coefficient	P-value
0.70 Liters	0.0335	0.0010
1.00 Liters	0.1575	0.0000
1.50 Liters	0.1510	0.0000
35 Percent	-0.4107	0.0000
38 Percent	-0.3902	0.0000
40 Percent	-0.3390	0.0000
44 Percent	0.1479	0.0010
45 Percent	0.1134	0.0000
50 Percent	0.1008	0.0130
Aromatized	-0.0478	0.0000
Aged	0.0541	0.0690
Single Variety	-0.1686	0.0000
Center	2.8106	0.0000
North East	2.7906	0.0000
North West	2.8048	0.0000
South	2.8034	0.0000
Bassanina	-0.3972	0.0000
Bassanina Nostrana	0.1235	0.2389
Bocchino	0.1134	0.0030
BocchinoSN	0.0890	0.2236
Bonollo	0.0697	0.3153
Bottega	0.0006	0.6854
Brotto	0.2567	0.0000
Candolini	0.1340	0.0460
Da Ponte	-0.7031	0.0000
Duchessa Lia	0.2537	0.0000
Faled	0.0094	0.5701
Fiordivite	-0.1423	0.0950
Franciacorta	-0.1456	0.0000
Franciacorta La Corte	-0.1380	0.1806
Frattina	-0.3894	0.0000
Gaiarine	-0.1982	0.0000
Ilas	-0.1101	0.0070
Julia	-0.1854	0.0010
Julia RS	-0.0006	0.6910
Maschio	-0.0434	0.2361
Nardini	-0.0526	0.1993
Nonino	-0.1543	0.0000
Nonino UE	0.0996	0.0740
Piave Cuore	-0.1753	0.0090
Prime Uve	0.7565	0.0000
Turchetto	-0.1353	0.0230
Valdoglio	-0.0875	0.0080
Vecchio Podere	-0.3270	0.0000
Vite Pura	0.0199	0.5549
Zanin	-0.0696	0.0771
Number of observations: 15576	**R^2 (uncentered) = 0.9611**	

Table 3: OLS results, only with statistically significant estimated coefficients, dependent variable logprice (model without constant)

Variable	Estimated Coefficient	P-value
0.70 Liters	0.7649	0.000
1.00 Liters	1.2007	0.000
1.50 Liters	1.1732	0.000
38 Percent	0.8408	0.000
40 Percent	0.5495	0.000
44 Percent	1.0515	0.000
45 Percent	1.0877	0.000
50 Percent	0.8949	0.000
Aromatized	0.8589	0.000
Aged	0.7844	0.000
Single Variety	0.9091	0.000
Center	1.0341	0.000
North East	1.0363	0.000
North West	1.0662	0.000
Brotto	0.3841	0.000
Da Ponte	-0.6887	0.000
Duchessa Lia	0.9037	0.000
Franciacorta	0.3605	0.000
Frattina	-0.8882	0.000
Gaiarine	-0.3548	0.000
Ilas	-0.2621	0.000
Prime Uve	1.0636	0.000
Vecchio Podere	-0.7512	0.000
Number of observations: 15576	**R^2 (uncentered) = 0.8685**	

Table 4: OLS results, only with statistically significant estimated coefficients, dependent variable logprice (model without constant), years 1997, 2000, 2004

Variable	**Estimated Coefficient**		
	Year 1997	**Year 2000**	**Year 2004**
0.70 Liters			0.0733
1.00 Liters	0.1984	0.1613	0.1086
1.50 Liters	-0.1805		
35 Percent	-0.4653	-0.5396	-0.2297
38 Percent	-0.3323	-0.3841	-0.1463
40 Percent	-0.3269	-0.3217	
44 Percent			0.5137
45 Percent	0.2165	0.3103	
Aged		-0.1308	
Single Variety	-0.1886	-0.1197	-0.1858
Bassanina	-0.3789	-0.4111	-0.3023
Brotto	0.2349	0.2108	0.2008
Da Ponte		-0.7757	-0.5720
Duchessa Lia		0.3966	
Franciacorta			-0.2228
Frattina	-0.3537	-0.4185	-0.4954
Gaiarine			-0.3851
Nardini			-0.2154
Nonino		-0.3918	0.4133
Piave Cuore			-0.5459
Prime Uve		0.9973	
Vecchio Podere		-0.5287	-0.3693
Zanin			-0.3156
Center	2.8108	2.7731	2.5537
North East	2.7938	2.7855	2.5600
North West	2.8104	2.8049	2.5726
South	2.7302	2.8270	2.5943
Number of observations	*1446*	*1448*	*2276*
R^2 *(uncentered)*	*0.9620*	*0.9613*	*0.9612*

Table 5: OLS results, only with statistically significant estimated coefficients, dependent variable logprice (model without constant), geographic areas

Variable	Estimated Coefficient			
	North-West	**North-East**	**Center**	**South**
0.70 Liters			0.0853	
1.00 Liters	0.1331	0.1870	0.1951	0.1056
1.50 Liters	0.1684	0.1227	0.2176	
35 Percent	-0.3787	-0.3921	-0.5220	-0.4449
38 Percent	-0.3146	-0.3291	-0.4548	-0.4354
40 Percent	-0.3278	-0.3008	-0.3984	-0.3510
44 Percent	0.1501	0.2077		
45 Percent	0.0903	0.0782	0.1456	0.1789
50 Percent		0.1870	0.2550	
Aged	0.0297	0.0893		
Aromatized			-0.0424	
Single Variety	-0.1700	-0.1568	-0.1643	-0.1358
Bassanina	-0.4534	-0.3466	-0.2579	-0.4473
Bocchino			0.2156	
Brotto	0.3925	0.2593	0.2052	0.2292
Candolini		0.2365		
Da Ponte	-0.7214	-0.6754	-0.7346	-0.6165
Duchessa Lia		0.3458	0.5048	
Franciacorta		-0.3150	-0.2292	
Frattina	-0.4249	-0.3535	-0.3685	-0.4179
Gaiarine		-0.2150	-0.1484	
Ilas	-0.1533			
Julia	-0.2297	-0.1765		
JuliaRS				0.7338
Maschio		-0.1915		0.5244
Nardini		-0.2242		
Nonino	-0.2299		-0.2553	
Nonino UE				0.2376
Piave Cuore			-0.3207	
Prime Uve	0.4427	1.1860	1.0181	0.6494
Turchetto	-0.2843			
Valdoglio		-0.1211		
Vecchio Podere	-0.2710	-0.3902	-0.3243	-0.3166
Zanin				
Year	0.0014	0.0014	0.0014	0.0014
Number of observations	*3793*	*4394*	*3936*	*3453*
R^2 (uncentered)	*0.9619*	*0.9610*	*0.9622*	*0.9606*