Dipartimento di Politiche Pubbliche e Scelte Collettive – POLIS
Department of Public Policy and Public Choice – POLIS

Working paper n. 118

June 2008

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Piermassimo Pavese and Roberto Zanola

UNIVERSITA' DEL PIEMONTE ORIENTALE "*Amedeo Avogadro*" ALESSANDRIA

Periodico mensile on-line "POLIS Working Papers" - Iscrizione n.591 del 12/05/2006 - Tribunale di Alessandria

Autochthon vs. Blended Wines: Do Objective and Sensory Characteristics Matter?

Piermassimo Pavese

University of Eastern Piedmont

Department of Public Policy and Public Choice, Italy

Roberto Zanola*

University of Eastern Piedmont

Department of Public Policy and Public Choice, Italy

June 4, 2008

Abstract

There are many types of wines. Wine may be classified as traditional such as Barbaresco or Barolo (among the others), or international, such as the case of Merlot, Sauvignon, etc. Do objective and sensory characteristics impact differently on prices according to the wine variety? Using a sample of 3,660 observations, an hedonic technique is applied to investigate this question.

JEL Classification: D49

Key Words: hedonic; wine; variety; blend; authocthon.

* *Correspondent author*: roberto.zanola@unipmn.it

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1 Introduction

In Italy the wine industry is of prominent importance. Italy is the second producer and exporter of wine, with a total of 770.000 firms working in the sector (Istat, 2002). However, the global demand and export supply are expanding rapidly and wine consumers now have the choice between a huge number of different wines. Wines can differ in terms of their costs, which can range from 2 euros to several hundreds of euros per bottle; they can also differ in the time of keeping, from the ready to drink wines to ones that improve after decades of keeping; additionally, wines can differ in the countries of origin, i.e. traditional vs. new world wine countries; etc.(Lecocq and Visser, 2006).

In such a more competitive and globalize environment, an interesting differentiating characteristic wines can differ about is variety, i.e. authocthon vs. international wine varieties. All over the world, in every winemaking area there is a squabble going on between traditional producers and modernists. As modern science has begun to understand some of the chemical reactions taking place in the creation of wine, some of the mystery has been removed. The University of California at Davis has become a leader in what many have termed the international style of wine (hereinafter called "blended wines"). Proponents of these techniques have found that certain procedures and production methods applied to barriques bring out unknown toasted vanilla and spicy notes in the wine, as well as new tastes (particularly fruity tastes).

The purpose of this paper is to analyze how wine prices and wine characteristics are impacted when focusing on variety. In order to answer this question, an hedonic pricing model has been used. Although there is extensive literature on hedonic price functions for wine (Oczkowski. 1994; Ashenfelter et al., 1995; Byron and

Ashenfeletr, 1995; Ginsburgh et al., 1994; Di Vitttorio and Ginsburgh, 1996; Gergaud, 1998; Schamel and Anderson, 2003, Jones and Storchmann, 2001; Oczokowski, 2001; Lecocq and Visser, 2006), the specific analysis of autochthon wines has been partially disregarded so far. To this aim, an extensive original dataset of 3,660 obserbvations has been used, which combines information from two Italian wine guides, the Veronelli and the Espresso wine guides.

The rest of the paper is organized as follows. Section 2 defines the functional form to be estimated. Data is presented in Section 3. Section 4 shows the results of the hedonic regression. Section 5 concludes.

2 Functional form

The hedonic regression framework takes into account the effect of heterogeneity on prices by controlling for a number of differences in characteristics among wines. The dependent variable is the logarithm of sale price. The explanatory variables included in the study are classified in two broad categories, objective and sensory characteristics, defined as follows:

Objective characteristics:

- *Categories:* set of dummy variables which assume value = 1 if the wine category is red wine, *red*; rosè wine, *rose;* or white wine (excluded variable), *white*; 0 otherwise;
- *Classification:* set of dummy variables which assume value = 1 if the official wine classification is IGT, *igt;* DOC, *doc*; or DOCG, *docg* (excluded variable); 0 otherwise;[1]
- *Ageing habitat:* set of dummy variables which assume value = 1 if the aging habitat is respectively steel, *steel*; wooden barrel, *wooden*; or barrique, *barrique* (excluded variable); 0 otherwise;
- *Production techniques:* set of dummy variable which assume value = 1 if the production techniques are respectively organic techniques, *organic*; or green harvest, *green* (excluded variable); 0 otherwise;
- *Proof:* alcohol content of wine, *alcohol*;
- *Sulfite:* dioxide of wine, *sulfite*;

[1] DOC wines (Denominazione di Origine Controllata) are produced in specific well-defined Italian regions, according to specific rules designed to preserve the traditional wine-making practices of the individual regions. DOCG wines (Denominazione di Origine Controllata e Garantita) are similar to DOC wines, but regulated by even stringent norms.

- *Huglin Index:* heat summation index, *hi*, that is used to predict a grape cultivar's ripening capacity and is based on the sunshine hours;
- *Number of bottles:* number of produced bottles, *bottle*;
- *Blended*: dummy variable which assumes value = 1 if the wine is autochthon, *autoc;* 0 otherwise;
- *Time:* set of dummy variables, *dt*, with t = *1999* (excluded variable), ..., *2006,* which assume value = 1 if the wine was produced in year t; 0 otherwise.

Sensory characteristics:

- *Taste:* set of dummy variables which assume value = 1 if the wine taste is sweet, *sweet*; or raisin, *raisin* (excluded variable); 0 otherwise;
- *Aroma:* set of dummy variables which assume value = 1 if the aroma is spicy, *fruity;* or spicy, *spicy* (excluded variable); 0 otherwise;
- *Tasting guides:* wine raiting as expressed in the Veronelli wine guide, *veronelli;* and in the Espresso wine guide, *espresso.*

Formally, our specification is given:

$$\begin{aligned}\ln p_i \quad = \quad & \alpha_0 + \alpha_1 red_i + \alpha_2 rose_i + \alpha_3 igt_i + \alpha_4 doc_i + \alpha_5 steel_i + \\ & \alpha_6 barrique_i + \alpha_6 organic_i + \alpha_7 alcohol + \alpha_8 sulfiite_i + \\ & \alpha_9 hi_i + \alpha_{10} bottle_i + \alpha_{11} autoc + \alpha_{11} d00_i + \alpha_{12} d01_i + \\ & \alpha_{13} d02_i + \alpha_{14} d03_i + \alpha_{15} d04_i + \alpha_{16} d05_i + \alpha_{17} d06_i + \\ & \alpha_{18} sweet_i + \alpha_{19} fruity_i + \alpha_{20} veronelli_i + \alpha_{21} espresso_i + \varepsilon_i \qquad (1)\end{aligned}$$

3 Data

Data was obtained from the Veronelli wine guide and the Espresso wine guide. The Veronelli wine guide provides wine ratings in a 100-point scale for sensory quality. In constrast, the Espresso wine guide provides wine ratings in a 20-point scale. The dataset contains all wines from Piedmont, Valle d'Aosta, and Liguria, which consists of a total of 3,660 observations.[2] The sample contains wines from 1999 to 2006. It comprises records of wines sold and awarded in the two guides, providing information on a number of variables, such as name, type of grapevines, grape price, winery surface, number of produced bottles, categories of wine, production techniques, year of production, etc. Prices are recorded in local Euro currencies. Additionally, weather data was collected by weather stations belonging to the Regional Piedmont Service (RAM).

Summary statistics are presented in Table 1.

Table 1 about here

[2] See Appendix for a complete list of vintages.

4 Results

4.1 The overall sample

Table 2 displays the results of the OLS estimate of the hedonic price equation (1). Following Berndt et al. (1995), standard errors and variance-covariance matrices of the coefficients have been computed by using the White (1980) heteroskedasticity-robust procedure due to heteroskedasticity.

Table 2 about here

Most of the parameter estimates are highly significant. The price of red wines is lower than white wines, while coefficients associated to rosè wines displays a positive sign. Differently from what expected, the premium for both IGT and DOC is positive related to DOCG. The effect of ageing habit on price is negative for steel, while it displays a positive sign in the case of barrique. Alchohol impacts positively on price, showing that the marginal price for alchohol is increasing with increasing proof. This premium still exists in the case of the dioxide of wine, whose coefficient shows a positive sign. As expected, sunshine hours increased the quality of the wine and, consequently, have a positive effect on price. The bottle variable coefficient is negative and it seems to suggest that no percentage price premium exists for rarity. The same negative coefficient is registered in the case of authocthon wines. The production year exerts a different effect according to the year: the 2000 and the 2001 productions shows a positive impact on price. These are expected to be the most valuable wines which rise higher prices. By constrast, the most recent productions display a negative and statistically significant sign on price.

Looking at the sensory characterisctis, the price of sweet and spicy wines is higher relative to raisin and spicy wines. As expected, the value of an additional point in both the Veronelli and the Espresso tasting score is positive and it confirms the

results of previous researches (Schamel and Anderson, 2003).

4.2 Autochthon vs. blended wines

As suggested in the introduction, an interesting differentiating characteristic wines can differ about is variety. Table 2 treats variety as a dummy variable (*autoc*) and, consequently, we cannot look at it in details. However, do varieties differ in some relevant characteristic? Or better yet, do characterisctics impact on the final price in a different way? In order to answer to such a question, we split the sample in two sub-samples: the autochthon wines (2,941 observations) and the blended wines (719 observations). Descriptive statistics are reported in Table 3 and Table 4.

Table 3 about here

Table 4 about here

Table 5 and Table 6 display the results of the White heteroskedasticity-robust procedure for the two sub-samples. An F-test on the autochthon wine sub-sample versus the blended wine sub-sample is run. The null hypothesis of $\alpha_{1,aut} = \alpha_{1,blend}$,...,$\alpha_{20,aut} = \alpha_{20,blend}$, where the subscript *aut* stands for authocthon blendedsub-sample and the subscript *blend* stands for international blendedsample, is rejected since the F-test yields a test statistic of 92.70 ($\Pr ob > F = 0.0000$).

Table 5 about here

Table 6 about here

A comparison between the statistically significant coefficients of the full sample and those of the two sub-samples shows that the signs are substantially the same. Some differences are of some relevance. Regarding autochthon wine sub-sample categories are not yet statistically significant, including some sensory features (i.e. taste and aroma). By constrast, all time variables, with the exception of the 2000

production, are statistically significant. A quite similar picture emerges in the case of the blended wine sub-sample. Coefficient associated to rosè wines displays a negative sign, while the percentage premium on price is unexpectively negative for organic productions. Finally, the 2001 productions is not yet statistically significant, while the 2003 production shows a positive and significant coefficient.

A specific comment is necessary for tasting guides. The Espresso tasting score is positive and significant in the case of the autochthon wines while it fails to be statistically significant in the blended wine sub-sample. The opposite occurs in the case of the Veronelli wine guide. This may be interpreted as a limited capacity of wine guides to the extent that when specific wine varieties are analyzed they partially fail to associate price premia to a guides's sensory quality ratings.

5 Conclusion

This paper aimed at analysing whether objective and sensory characteristics impact differently on prices according to the wine variety. To this end, a standard hedonic analysis was performed on a sample of 3,660 observations from three Italian regions has been used (Piedmont, Valle d'Aosta, and Liguria). Findings suggest that no percentage price premium exists for autochthon wines. However, treating variety as a dummy variable does not allow us to understand how objective and sensory wine characteristics impact on prices. Hence, we split the sample in two sub-samples: the authocthon wines and the blendedwines. Almost all objective and sensory characteristics show the expected sign, with some specific difference between sub-samples.

A peculiar result is registered in the case of the tasting guides. The Espresso tasting score implies a perentage price premium only for the autochthon wines, while the Veronelli tasting score impacts positively for the blendedwines. As a consequence, the necessity emerges to further investigate the role of tasting scores, the analysis of which will be the aim of future research.

Acknowledgements

This work was completed while the second author was visiting at University of Bologna, Faculty of Economics in Rimini. I want to thank my colleagues there, especially Guido Candela and Antonello Scorcu. We are also grateful to participants to the 15th Enometrics, 2008, for useful comments to an early version of the paper. The usual disclaimers apply.

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Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
price	14.86456	15.6000	3.5	195
red	.712568	.452626	0	1
white	.265300	.441553	0	1
rose	.097541	.296733	0	1
igt	.005464	.07373	0	1
doc	.683333	.465240	0	1
docg	.262568	.440090	0	1
steel	.207377	.405483	0	1
wooden	.355191	.478637	0	1
barrique	.190164	.392484	0	1
organic	.093169	.290709	0	1
green	.412841	.492412	0	1
alcohol	10.8664	3.45421	5	15.5
sulfite	68.5529	18.0031	25	127
hi	1,577.01	354.133	1,078	2,463
bottle	18,612.04	33,533.03	500	250,000
autoc	.803552	.397365	0	1
blend	.196448	.397365	0	1
d99	.021858	.146239	0	1
d00	.032240	.176662	0	1
d01	.118033	.322691	0	1
d02	.048907	.215703	0	1
d03	.204098	.403096	0	1
d04	.422131	.493967	0	1
d05	.141803	.348896	0	1
d06	.010929	.103983	0	1
sweet	.099454	.299311	0	1
raisin	.054918	.227851	0	1
spicy	.296721	.456875	0	1
fruity	.193169	.394839	0	1
veronelli	87.3178	3.40126	80	98
espresso	14.4852	1.01367	12	17

Table 2. Results (full sample)

Variable	Coef.	Robust Std. Err.	t	P > |t|
red	-0.1271453	0.0162379	-7.83	0.000
rose	0.0651347	0.0173355	3.76	0.000
igt	0.2652399	0.0368071	7.21	0.000
doc	0.1224619	0.0164683	7.44	0.000
steel	-0.1621816	0.0179255	-9.05	0.000
barrique	0.1185997	0.0161938	7.32	0.000
organic	-0.0081806	0.0177767	-0.46	0.645
alcohol	0.0360872	0.002905	12.42	0.000
sulfite	0.0024179	0.000305	7.93	0.000
hi	0.0001554	0.0000242	6.42	0.000
bottle	-6.77e-07	1.83e-07	-3.71	0.000
autoc	-0.8004832	0.0274039	-29.21	0.000
d00	0.3363252	0.0699782	4.81	0.000
d01	0.1518976	0.0342644	4.43	0.000
d02	-0.0119067	0.035552	-0.43	0.000
d03	0.0289592	0.0355687	0.81	0.416
d04	-0.303604	0.0348383	-8.71	0.000
d05	-0.2236983	0.0389438	-5.74	0.000
d06	-0.5734366	0.0487502	-11.76	0.000
sweet	0.4057121	0.0263885	15.37	0.000
fruity	-0.383605	0.0203479	-1.89	0.059
veronelli	0.0076652	0.0016573	4.63	0.000
espresso	0.0101509	0.0058832	1.73	0.085
R-squared	0.7237			

Table 3. Descriptive statistics: autochthon wines (2,941 obs.)

Variable	Mean	Std. Dev.	Min	Max
price	14.0446	15.534679	3.5	195
red	.726284	.445941	0	1
rose	.120707	.325842	0	1
igt	.006800	.082198	0	0
doc	.670860	.469981	0	1
docg	.294458	.455876	0	1
steel	.184291	.387787	0	1
wooden	.366202	.481847	0	1
barrique	.155049	.362013	0	1
organic	.066304	.248855	0	1
green	.403264	.490636	0	1
alcohol	10.4267	3.51895	5	15.5
sulfite	69.1792	17.7000	25	127
hi	1,511.13	239.9702	1,078	3,311
bottle	20,554.55	34,004.05	500	250,000
d99	.006800	.082198	0	1
d00	.018361	.134276	0	1
d01	.088065	.283438	0	1
d02	.054403	.226850	0	1
d03	.184291	.387787	0	1
d04	.472628	.499335	0	1
d05	.161950	.368375	0	1
d06	.013601	.115846	0	1
sweet	.094526	.292608	0	1
raisin	.013601	.115846	0	1
spicy	.288677	.453225	0	1
fruity	.197552	.398220	0	1
veronelli	87.1584	3.40938	80	98
espresso	14.4005	.969634	12	17

Table 4. Descriptive statistics: blended wines (719 obs.)

Variable	Mean	Std. Dev.	Min	Max
price	14.82345	15.4567	3.5	195
red	.65647	.475218	0	1
rose	.002782	.052704	0	1
igt	0	0	0	0
doc	.734353	.441984	0	1
docg	.132128	.338866	0	1
steel	.301808	.459362	0	1
wooden	.310153	.462878	0	1
barrique	.333797	.471896	0	1
organic	.203060	.402557	0	1
green	.452002	.492412	0	1
alcohol	12.6648	2.46358	5	15
sulfite	68.9917	18.9915	30	120
hi	1,846.47	559.304	1,213	2,463
bottle	10,666.42	30,283.6	500	250,000
d99	.083449	.276753	0	1
d00	.089012	.28496	0	1
d01	.240612	.427753	0	1
d02	.026426	.160509	0	1
d03	.285118	.451785	0	1
d04	.215577	.411508	0	1
d05	.059805	.237291	0	1
d06	0	0	0	1
sweet	.119611	.324731	0	1
raisin	.223922	.417161	0	1
spicy	.329624	.470404	0	1
fruity	.175243	.380440	0	1
veronelli	87.9694	3.29077	80	98
espresso	14.8317	1.11212	12	17

Table 5. Results: autochthon wines

Variable	Coef.	Robust Std. Err.	t	P > |t|
red	-.004788	.015634	0.31	0.000
rose	-.122685	.015331	0.80	0.424
igt	.163392	.031579	5.17	0.224
doc	.230281	.018945	1.22	0.000
steel	-.147735	.016111	-9.17	0.000
barrique	.117393	.013710	8.56	0.000
organic	-.002381	.015456	0.15	0.878
alcohol	.038229	.003367	11.37	0.000
sulfite	.001229	.000229	5.36	0.000
hi	.000147	.000027	5.39	0.000
bottle	-4.64e-07	1.46e-07	-3.17	0.002
d00	.000290	.042065	-0.07	0.945
d01	.340995	.030717	11.10	0.000
d02	.276729	.027738	9.98	0.000
d03	-.319041	.025354	12.58	0.000
d04	.443786	.219564	2.02	0.043
d05	.112274	.021452	5.23	0.000
d06	-.271541	.03852	-7.05	0.000
sweet	.357908	.026059	13.73	0.000
fruity	.190476	.015421	1.24	0.217
veronelli	.000719	.001485	0.48	0.628
espresso	.012041	.005038	2.39	0.017
constant	1.11518	.120279	9.27	0.000
R-squared	0.3928			

Table 6. Results: blended wines

Variable	Coef.	Robust Std. Err.	t	P > |t|
red	-.589424	.048696	-12.10	0.000
rose	-.244039	.068308	-3.57	0.000
igt	(dropped)			
doc	.187103	.048480	3.86	0.000
steel	-.172585	.051792	-3.33	0.001
barrique	.432323	.379523	11.39	0.000
organic	-.137149	.048750	-2.81	0.005
alcohol	.092984	.012486	7.45	0.000
sulfite	.000394	.001144	3.44	0.001
hi	.000177	.000045	3.93	0.000
bottle	-2.47e-06	7.29e-07	-3.39	0.001
d00	.497025	.1045890	4.75	0.000
d01	.199254	.065059	0.31	0.759
d02	-.150066	.145679	-1.03	0.303
d03	-.149779	.088139	-1.70	0.090
d04	-.697197	.782977	-8.90	0.000
d05	-.899003	.094383	-9.53	0.000
d06	(dropped)			
sweet	.636492	.112807	5.64	0.000
fruity	-.236004	.079427	-2.97	0.003
veronelli	.037598	.006993	5.38	0.000
espresso	.193527	.020686	0.94	0.350
constant	-1.62076	.624590	9.27	0.000
R-squared	0.6871			

Appendix 1. List of variables

Variable	Mean	Std. Dev.	Min	Max
price	14.86456	15.6000	3.5	195
red	.712568	.452626	0	1
white	.265300	.441553	0	1
rose	.097541	.296733	0	1
igt	.005464	.07373	0	1
doc	.683333	.465240	0	1
docg	.262568	.440090	0	1
steel	.207377	.405483	0	1
wooden	.355191	.478637	0	1
barrique	.190164	.392484	0	1
organic	.093169	.290709	0	1
green	.412841	.492412	0	1
alcohol	10.8664	3.45421	5	15.5
sulfite	68.5529	18.0031	25	127
hi	1,577.01	354.133	1,078	2,463
bottle	18,612.04	33,533.03	500	250,000
autoc	.803552	.397365	0	1
blend	.196448	.397365	0	1
d99	.021858	.146239	0	1
d00	.032240	.176662	0	1
d01	.118033	.322691	0	1
d02	.048907	.215703	0	1
d03	.204098	.403096	0	1
d04	.422131	.493967	0	1
d05	.141803	.348896	0	1
d06	.010929	.103983	0	1
sweet	.099454	.299311	0	1
raisin	.054918	.227851	0	1
spicy	.296721	.456875	0	1
fruity	.193169	.394839	0	1
veronelli	87.3178	3.40126	80	98
espresso	14.4852	1.01367	12	17

Appendix 2. List of vintages

Grapevine	Obs	Mean	Std. dev	Min	Max
Arneis	160	13.5975	4.3901	9.41	20.92
Barbera	566	18.3269	12.0477	6.00	54.00
Blanc de Morgex	20	10.4600	0	10.46	10.46
Bosco	80	96.5300	18.6400	78.00	115.06
Brachetto	44	11.3041	4.5077	6.80	17.78
Chardonnay	190	17.3500	12.7280	7.00	44.50
Cornalin	18	12.5500	0	12.55	12.55
Cortese	92	13.9204	21.8932	3.66	202.40
Croatina	135	10.9397	4.4977	7.32	20.92
Dolcetto	380	9.7633	1.9871	8.37	12.55
Erbaluce	80	12.0300	6.5504	6.28	23.01
Freisa	60	13.9466	5.6186	8.37	20.92
Fumin	80	18.0450	2.7244	14.64	21.97
Grignolino	120	9.93667	1.4531	8.37	12.55
Groppello	40	14.6450	3.1749	11.51	17.78
Invernega	20	13.6000	0	13.60	13.60
Maiolina	20	33.4700	0	33.47	33.47
Malvasia di Casorzo	60	15.8033	9.4117	9.00	29.00
Malvasia di Castelnuovo DB	39	7.83154	0.5317	7.32	8.37
Mayolet	20	12.5500	0	12.55	12.55
Moscato	180	13.1333	6.6176	8.37	31.38
Moscato di scanzo	40	36.6100	0	36.61	36.61
Nebbiolo	747	11.9825	8.8506	5.00	60.15
Neretto di bario	20	9.41000	0	9.41	9.41
Pelaverga	40	10.4600	1.0634	9.41	11.51
Petit rouge	167	13.8172	5.6946	10.46	28.24
Petit rouge	40	9.41500	1.0583	8.37	10.46
Pigato	60	14.9933	5.7328	10.46	23.01
Pinot nero	140	16.2857	11.3000	8	43
Priè Blanc	20	8.37000	0	8.37	8.37
Priè rouge	20	11.5100	0	11.51	11.51
Viognier	20	13.0000	0	13	13

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