RESEARCH ARTICLE

Spanish wines in the US market: What attributes do US consumers look for in Spanish wines?

Álvaro Areta[1], Isabel Bardají[2] and Belén Iráizoz[3]

[1]Coordinadora de Organizaciones de Agricultores y Ganaderos COAG, Servicios Técnicos, Dept. Economía Agraria. c/Agustín de Bethancourt 17, 28003 Madrid, Spain. [2]Universidad Politécnica de Madrid, ETS de Ingeniería Agronómica, Alimentaria y Biosistemas, CEIGRAM, Dept. Economía agraria, Estadística y Gestión de empresas. Ciudad Universitaria s/n, 28040 Madrid, Spain. [3]Universidad Pública de Navarra, INARBE y Dept. de Economía, Campus de Arrosadia. 31006 Pamplona, Navarra, Spain.

Abstract

This paper analysed the impact of different attributes in Spanish quality wines on United States (US) demand behaviour. A hedonic price model was estimated in order to assess the values that US consumers give Spanish wines. The main results showed that the most influential factor on sale price was aging, which had a positive impact. US consumers valued the quality ratings provided by experts, especially in the upper price categories. The year of vintage and size of the winery were considered medium importance factors in decision-making, with the latest vintages and the smallest wineries receiving the highest ratings. Geographical origin (appellation) helped to explain consumer preferences. Although colour was the least important attribute in consumers' purchase decisions, red wines were the most highly rated in this attribute.

Additional keywords: hedonic prices; quality wine; consumer preferences; wine attributes.

Authors' contributions: Conception and design, analysis of data, and writing the paper: AA, IB, BI. Acquisition of data: AA. Supervising the work: IB, BI.

Citation: Areta, A.; Bardají, I.; Iráizoz, B. (2017). Spanish wines in the US market: What attributes do US consumers look for in Spanish wines? Spanish Journal of Agricultural Research, Volume 15, Issue 4, e0120. https://doi.org/10.5424/sjar/2017154-10006

Received: 26 May 2016. **Accepted**: 30 Nov 2017.

Introduction

The wine industry faces new market opportunities created by factors such as increasing trade liberalization and globalization, emerging competition from new market players, and declining consumption in traditional wine-producing countries (Anderson *et al*., 2001; Wittwer *et al*., 2003). Increasing export volumes and added value creation through differentiation strategies are the key ways to maintain profitability in the Spanish wine industry (Albisu & Zeballos, 2014; Del Rey, 2014a). The United States (US) is one of the world's main wine importers, with growing domestic demand. Spain's wine exports to the US have shown significant growth rates, but Spanish market share still remains below that of many competing countries.

In this context, it was relevant to analyse the way in which the various attributes of Spanish quality wines influenced demand behaviour in the US. Knowledge of how US consumers assessed these characteristics could be used by producers, exporters and distributors

to design the necessary strategies to improve their market positioning. To be aware of what factors might influence the wine prices could help producers to take decisions about where to position their product on the market (Cousido Cores, 2017).

Hedonic price modelling represents a valid empirical methodology (Cacchiarelli *et al*., 2016a) and it is widely used to explain the decision-making process leading up to the purchase of a specific product in terms of its combined attributes, by allowing the estimation of the implicit price of each attribute. It has been applied to this end in various sectors and markets. Research on the agriculture and food industry considers products as diverse as livestock (Troncoso *et al*., 2012), apples (Dinis *et al*., 2011) or saffron (Sanjuán-López *et al*., 2009). The high degree of differentiation makes the wine suitable for the application of hedonic methodology, taking into account the multiple intrinsic characteristics that provide consumers with a large range of wines (Oczkowski & Doucouliagos, 2015). The method has, nevertheless, received some criticism because of the difficulty of selecting the appropriate

variables or the need to assume that the quality attributes of wines are unrelated to their price (Unwin, 1999). The selection of the attributes included as determinant of the wine price was based on the review of the literature and the information provided by several sources.

The planning and implementation of long-term investment strategies could benefit from having information about the attributes more valued by consumers. The results can help in assessing the need to include specific attributes in the final product, by enabling comparison between their implicit prices and their marginal cost. This explains the widespread use of hedonic price models to determine the relative importance of the intrinsic characteristics of wine[1]. Some studies are focused on traditional markets, such as France (Landon & Smith, 1997; Lecocq & Visser, 2006; Ali & Nauges, 2007; Cardebat & Figuet, 2009; Carew & Florkowski, 2010), Italy (Brentari *et al*., 2011 and 2015; Caracciolo *et al*., 2013; Roma *et al*., 2013; Levaggi & Brentari, 2014; Cacchiarelli *et al*., 2014) or Germany (Schamel, 2003), as well as new producers, such as Australia (Oczkowski, 1994, 2015; Steiner, 2004; Davis & Ahmadi-Esfahani, 2005), New Zealand (Bicknell *et al*., 2005; Bicknell & MacDonald, 2012), US (Yang *et al*., 2012; Cuellar & Claps, 2013; Delmas & Grant, 2014), Chile (Melo *et al*., 2005; Troncoso & Aguirre, 2006; Ortuzar & Alfranca, 2010) or Argentina (San Martin *et al*., 2008; Estrella, 2014).

The domestic market for Spanish wines has been analyzed from different perspectives. Angulo *et al*. (2000) estimate a hedonic price function for red wines, Morilla & Martínez (2002) for Spanish wines with *Designation of Origin*, Rodríguez & Castillo (2009) for red wines from *Castilla La Mancha*, and Perza (2010) for Catalan wines. The acceptance of Spanish wines has also been assessed in foreign markets such as the United Kingdom (UK) (Steiner, 2009), France (Cardebat & Figuet, 2014) and, jointly with wines from other origins, in the US (Schamel, 2006).

It is interesting to point out that Spain is currently the country with largest vineyeard area in the world and the top wine exporter but its wine is sold for its low price (Parga-Dans & Alonso González, 2017). Considering the evolution of the US wine market, it is important to have some knowledge about which wine characteristics can contribute to achieve higher prices in that market. So far, no study offers a specific valuation of prices in wine's US markets with respect to Spanish wines, despite the importance of exports for the Spanish wine industry and the relevance of the US market. This research aimed to meet this gap, by trying to determine which features of quality

Spanish wines were most valued by US consumers. Our analysis took a representative sample of Spanish wine exports to identify the attributes influencing consumer willingness-to-pay in each segment. Our hypothesis was that there are some specific attributes that can influence wine's prices. These attributes has been clustered in six groups of attributes are shown to influence wine's prices: vintage, aging, quality rating, appellation, type of wine and size of winery. Any business decision involving one of these attributes was relevant for the positioning of a wine in the US market.

Material and methods

Hedonic price theory enables product differentiation analysis based on the utilities provided by product characteristics or attributes, through the estimation of an implicit price or hedonic price function. Pioneer studies in the literature on the hedonic price theory include Waugh (1928) and Court (1939), but it was not until the 60s that it came into more extensive use in research conducted by Griliches (1961), Chow (1967) and Muth (1969), and the study by Rosen (1974), founded on the work of Lancaster (1971), which estimates a perfect competition model optimizing hedonic price theory.

A hedonic price function is a mathematical function relating the price of a good to its characteristics or attributes. Any variable influencing the consumer decision or production cost can be considered in the function and, if proved significant, it can be assumed to have consumer value or relevance in the production process. Two key parameters need to be specified: the functional form and the product characteristics to be included as explanatory variables.

Equation [1] describes a general hedonic function model

$$p = f(X_1, X_2, \ldots X_j, \ldots X_m) \qquad [1]$$

where p denotes the price of the i-th bottle of wine and the j-th attribute. The market is assumed to be in equilibrium and consumers and producers are assumed to maximize their objective functions.

Linear, log-linear, double logarithmic or logarithmic functional forms can be adopted (Brachinger, 2002). As usual in hedonic price models, the attributes of interest were represented exclusively by dummy variables (Morilla & Martínez, 2002; Steiner, 2004; Rodríguez & Castillo, 2009), which reduces the risk of impacts from measurement errors in variables and prevents from

---

[1] Fogarty (2003), Estrella *et al*. (2012), Estrella (2014) and Oczkowski & Doucouliagos (2015) offer a complete literature review of the application of the methodology to wine industry

heteroscedasticity. This option also restricts the choice of functional form to linear or log-linear models. Most studies opt to estimate the log-linear model (Steiner, 2004; Melo *et al.*, 2005; Luppe *et al.*, 2009 or Carew & Florkowski, 2010), for the variance-stabilizing properties derived from the logarithmic transformation. Equation [2] describes the log-linear model estimated by ordinary least squares[2]

$$\ln p = \ln \beta_0 + \sum \beta_j X_j \qquad [2]$$

where *βj* is the marginal variation in price associated with a marginal change in attribute X_j. Estimated coefficients represent the percent variation in price for a unit change in attribute *X*.

Since the problem involves a large number of independent variables, a closer-fitting function was constructed by using Stata software to estimate a forward stepwise regression, with a threshold of 10% significance level for a variable's inclusion in the model (Lecocq & Visser, 2006; Brentari *et al.*, 2015).

The inclusion of dummies as endogenous variables meant that for each one there must be a control group, which must be excluded from the estimation. However, following the proposals of Suits (1984) and Kennedy (1986), it was possible to adjust the estimated coefficients and include each category of the binary variables in the estimation, without affecting any other estimation properties. These adjusted coefficients were interpreted directly in relation to the sample mean price, thus making the results easier to interpret. According to Oczkowski (1994), and to illustrate the method, suppose a hedonic model $p_t = \beta_0 + \beta_1 D_{1t} + \beta_2 D_{2t} + \varepsilon_t$ with the two dummy variables that $\sum_{j=1}^{2} D_j = 1$. To avoid the problem of multicollinearity, imposing the constraint that $\sum_{j=1}^{2} \beta_j \omega_j = 0$, where ω_j represents the proportion of non zero dummy observations, leads to the result that $\widehat{\beta_0} = \bar{p}$,and $\widehat{\beta_1}$ and $\widehat{\beta_2}$ are now interpreted as deviations from the average price in the sample. To estimate the function by ordinary least square, the constraint is expressed as $-\beta_1 = -\beta_2 \left(\frac{\omega_2}{\omega_1} \right)$.

Since the model considers only binary variables, the partial derivatives are not defined and the estimated coefficients do not represent the implicit price of each characteristic. To ease interpretation of the results, the relative percentage effect of the dummy variable on the price was included. The transformation procedure proposed by Halvorsen & Palmquist (1980) with

the modifications suggested by Kennedy (1981) was followed to avoid biased results. Thus, the percentage difference on the price associated to every dummy variable was estimated according to the expression

$$\hat{g} = 100 . \left[exp^{(\hat{c} - 0.5 . var(\hat{c}))} - 1 \right] \qquad [3]$$

where ĝ is the percentage impact, $\hat{c}$ is the estimated coefficient for each dummy variable and $var(\hat{c})$ is an estimate of the variance of $\hat{c}$.

The data were obtained from the magazine *Wine Spectator* (2012), which offers a database that has been widely used in other studies (Troncoso & Aguirre, 2006; Miller *et al.*, 2007; San Martín *et al.*, 2008; Cuellar & Claps, 2013; Lee & Sumner, 2013). The digital edition of *Wine Spectator* includes more than 290,000 wine ratings covering all the main wine-producing countries, and including 12,500 Spanish wines. The sample (September, 2012), which included 9,260 references[3], has been segmented by price[4] as some authors suggest (Angulo *et al.*, 2000; Costanigro *et al.*, 2007) and to determine if the different market share of Spanish wines in each category (ICEX, 2014) could affect the consumer valuation. Premium segments provide more possibilities for market penetration than lower price segments (Cholette & Castaldi, 2005; Thach & Cuellar, 2007). Three price categories were considered: popular premium (between US$ 3 and US$ 7 per bottle), super premium (between US$ 7 and US$ 14 per bottle) and ultra premium (over US$ 14 per bottle). Table 1 shows the sample distribution and the descriptive statistics for each category. The average retail price was US$ 28 per bottle, although there was a high degree of dispersion. The average price in the popular premium category was US$ 6.25 per bottle, which was close to the upper bound, while, in the super premium category, it was US$ 10.84 per bottle, which was mid-range for the category, and, in the ultra premium category, it was US$ 40 per bottle, and the dispersion was higher.

Different hedonic models have been estimated for each price category and for the whole sample with the aim of evaluating the differentiated influence of the attributes in the wine's prices in the US market.

Besides retail price, and according to the literature review, the *Wine Spectator* database variables considered in the estimation were aging, type or color, quality rating, geographical origin (appellation) and vintage year. A

---

[2]Box-Cox transformation has been applied to check the suitability of the chosen model to the log-linear specification, with no conclusive results.
[3]The sample covered only still wines to avoid the potential problems in comparing different areas of production and to homogenize the sample. In general, non-appellation wines were excluded, with the exception of two bearing an *Indicación Geográfica Protegida* (Protected Geographical Indication) label: *Vino de la Tierra de Castilla* and *Vino de la Tierra de Castilla y León*, due to the significant number of observations in the sample.
[4]The US market retail price data are initial release prices, revised, where necessary, by the prices achieved at auction. These prices are collected prior to tasting, so the endogeneity problems that are common with this type of study are not a concern (Costanigro *et al.*, 2010).

Table 1. Descriptive statistics of the data.

Variable	Popular Premium		Super Premium		Ultra Premium		Total	
No. observations	653		3,185		5,422		9,260	
Price ($): retail price in US market								
Mean	6.25		10.84		40.66		27.96	
Standard deviation	0.86		1.91		45.70		38.08	
	Number	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Aging: according to the established classifications of Spanish regulation[1]								
Joven	553	85.08	2,350	73.78	2,583	47.63	5,488	59.27
Crianza	72	11.08	535	16.80	621	11.45	1,228	13.26
Reserva	24	3.69	271	8.51	1,028	18.96	1,324	14.30
Gran reserva	1	0.15	29	0.91	383	7.06	412	4.45
Boutique	0	0.00	0	0.00	808	14.90	808	8.73
Size of the firm: according to the number of employees and the annual turnover								
Micro	101	15.54	868	27.25	2,675	49.33	3,645	39.36
Small	251	38.62	1,256	39.43	1,569	28.93	3,077	33.23
Medium	209	32.15	773	24.27	950	17.52	1,932	20.86
Big	89	13.69	288	9.04	229	4.22	606	6.54
Type of wine: classified regarding the colour of the wine								
Red	462	71.08	2,184	68.57	4,586	84.57	7,234	78.12
White	134	20.62	782	24.55	809	14.92	1,725	18.63
Rosé	54	8.31	219	6.88	28	0.52	301	3.25
Quality rating: assigned to every wine by the experts of the magazine Wine Spectator								
Classic	0	0.00	0	0.00	52	0.96	52	0.56
Outstanding	0	0.00	26	0.82	1,196	22.05	1,222	13.20
Very good	86	13.23	1,024	32.15	2,783	51.32	3,893	42.04
Good	355	54.62	1,650	51.81	1,143	21.08	3,148	34.00
Mediocre	168	25.85	436	13.69	226	4.17	832	8.98
Not recommended	41	6.31	49	1.54	23	0.42	113	1.22
Appellation: legally protected geographical indication (or group of them) identifying where wine is produced								
Bierzo	2	0.31	30	0.94	147	2.71	179	1.93
Calatayud	18	2.77	43	1.35	27	0.50	88	0.95
Campo de Borja	35	5.38	75	2.35	39	0.72	149	1.61
Cariñena	9	1.38	60	1.88	16	0.30	85	0.92
Castilla y León region	2	0.31	27	0.85	54	1.00	83	0.90
Catalunya	0	0.00	47	1.48	19	0.35	66	0.71
Catalunya region	18	2.77	96	3.01	113	2.08	227	2.45
Centro region	7	1.08	24	0.75	46	0.85	77	0.83
Galicia region	1	0.15	25	0.78	46	0.85	72	0.78
Jumilla	18	2.77	133	4.18	93	1.71	244	2.63
La Mancha	25	3.85	95	2.98	27	0.50	147	1.59
Levante region	14	2.15	73	2.29	55	1.01	142	1.53
Montsant	0	0.00	27	0.85	134	2.47	161	1.74
Navarra	74	11.38	301	9.45	145	2.67	520	5.62
Penedès	63	9.69	235	7.38	236	4.35	535	5.78
Priorat	2	0.31	19	0.60	579	10.68	600	6.48
Rías Baixas	0	0.00	80	2.51	312	5.75	392	4.23
Ribera de Duero	16	2.46	183	5.75	1,030	18.99	1,229	13.27
Ribera del Guadiana	3	0.46	18	0.57	9	0.17	30	0.32
Rioja	176	27.08	878	27.57	1,606	29.61	2,660	28.73
Rueda	18	2.77	236	7.41	120	2.21	374	4.04
Sierras de Málaga	0	0.00	0	0.00	5	0.09	5	0.05
Somontano	19	2.92	71	2.23	25	0.46	115	1.24

Table 1. Descriptive statistics of the data (continuation).

Variable	Popular Premium		Super Premium		Ultra Premium		Total	
Toro	15	2.31	79	2.48	243	4.48	338	3.65
Txakoli	0	0.00	2	0.06	21	0.39	23	0.25
Utiel-Requena	27	4.15	27	0.85	30	0.55	84	0.91
Valdeorras	0	0.00	10	0.31	44	0.81	54	0.58
Valdepeñas	15	2.31	39	1.22	9	0.17	63	0.68
VT Castilla	63	9.69	136	4.27	56	1.03	255	2.75
VT Castilla y León	10	1.54	77	2.42	124	2.29	211	2.28
Yecla	0	0.00	39	1.22	13	0.24	52	0.56
Vintage year: the year in which wine was produced								
1980	5	0.77	4	0.13	6	0.11	15	0.16
1981	8	1.23	9	0.28	20	0.37	37	0.40
1982	13	2.00	14	0.44	31	0.57	59	0.64
1983	9	1.38	19	0.60	9	0.17	37	0.40
1984	15	2.31	15	0.47	5	0.09	35	0.38
1985	25	3.85	38	1.19	42	0.77	105	1.13
1986	19	2.92	35	1.10	22	0.41	76	0.82
1987	21	3.23	42	1.32	32	0.59	95	1.03
1988	17	2.62	39	1.22	24	0.44	80	0.86
1989	19	2.92	65	2.04	47	0.87	131	1.41
1990	24	3.69	53	1.66	47	0.87	124	1.34
1991	27	4.15	50	1.57	67	1.24	144	1.56
1992	25	3.85	37	1.16	29	0.53	91	0.98
1993	42	6.46	33	1.04	35	0.65	110	1.19
1994	17	2.62	82	2.57	129	2.38	228	2.46
1995	26	4.00	89	2.79	151	2.78	266	2.87
1996	44	6.77	129	4.05	197	3.63	370	4.00
1997	43	6.62	97	3.05	111	2.05	251	2.71
1998	22	3.38	156	4.90	177	3.26	355	3.83
1999	19	2.92	142	4.46	222	4.09	383	4.14
2000	20	3.08	131	4.11	269	4.96	420	4.54
2001	25	3.85	148	4.65	404	7.45	578	6.24
2002	29	4.46	171	5.37	274	5.05	474	5.12
2003	29	4.46	193	6.06	398	7.34	620	6.70
2004	28	4.31	198	6.22	569	10.49	795	8.59
2005	27	4.15	214	6.72	530	9.77	771	8.33
2006	13	2.00	214	6.72	481	8.87	708	7.65
2007	9	1.38	213	6.69	395	7.29	617	6.66
2008	14	2.15	189	5.93	335	6.18	539	5.82
2009	9	1.38	187	5.87	229	4.22	425	4.59
2010	6	0.92	119	3.74	99	1.83	224	2.42
2011	1	0.15	60	1.88	36	0.66	97	1.05

[1] One additional category has been included to consider the boutique wines.

winery size variable was also included but the data were obtained from other sources.

Aging is included in many studies with significant results (Morilla & Martínez, 2002; Melo *et al*., 2005; Lecocq & Visser, 2006; Troncoso & Aguirre, 2006; San Martín *et al*., 2008; Rodríguez & Castillo, 2009; Perza, 2010; Kwong *et al*., 2011, 2017). Spanish regulations establish only four wine classifications based on aging: *joven, crianza, reserva* and *gran reserva*[5] . However, analysis of the sample led us to

set up a new classification, *boutique*, in the upper price category. These wines do not follow aging regulations, so they are usually included in the *joven* classification. However, their special high-quality features command higher prices. Table 1 shows that almost 60% of the sample classified as *joven*, and belong mainly to the popular and super premium price categories.

With respect to the type or color of the wine, the sample was split into three types: red, white and rosé. The reds were expected to achieve significantly higher consumer value than the whites (Panzone & Simões, 2009) or rosés. Red wines made up the majority of the sample, especially in the ultra premium category, and their prices almost doubled those of the whites and triple those of the rosés.

Quality ratings are typically included as a variable in hedonic price models but results and conclusions regarding their impact on consumer choice are ambiguous. Some works find them significant explaining the consumer behavior (Morilla & Martínez, 2002; Bicknell *et al.*, 2005; San Martin *et al.*, 2008; Caracciolo *et al.*, 2013, Cacchiarelli *et al.*, 2014, or Cousido Cores, 2017), but other studies report a null effect on the purchase decision (Combris *et al.*, 1997; Panzone, 2011). If their effect is significant, the wines with highest ratings can be expected to get market rewards (Schamel, 2006). *Wine Spectator* assigns

quality ratings based on a blind tasting of an expert panel not on a quality/price assessment, which could cause correlation problems. Tasting panels rate the wines on a 50-point qualitative scale, ranging from 50 (lowest score) to 100 (top score) (Shanken, 1996). The ranks are: not recommended (50-74 points), mediocre (75-79), good (80-84), very good (85-89), outstanding (90-94) and classic (95-100). The most frequent ratings in the sample overall were very good and good (42% and 34% respectively). Most of the wines in the popular and super premium categories were rated as good, while in the ultra premium price category the majority received ratings of very good, followed by outstanding and good.

Appellation as an attribute is generally included in wine hedonic price models, because it is accepted that it adds value to wines by certifying the presence of a differentiated quality product (Parga-Dans & Alonso González, 2017). It may refer to a country (Yoo *et al.*, 2011) or a region (Panzone & Simões, 2009; Yang *et al.*, 2012; Cacchiarelli *et al.*, 2016b) and the significance of its role influencing price's wines has been tested in many studies (Nerlove, 1995; Morilla & Martínez, 2002; Steiner, 2004; Rodríguez & Castillo, 2009; Brentari *et al.*, 2011; Roma *et al.*, 2013). We analyzed US consumer willingness to purchase Spanish quality wines of different
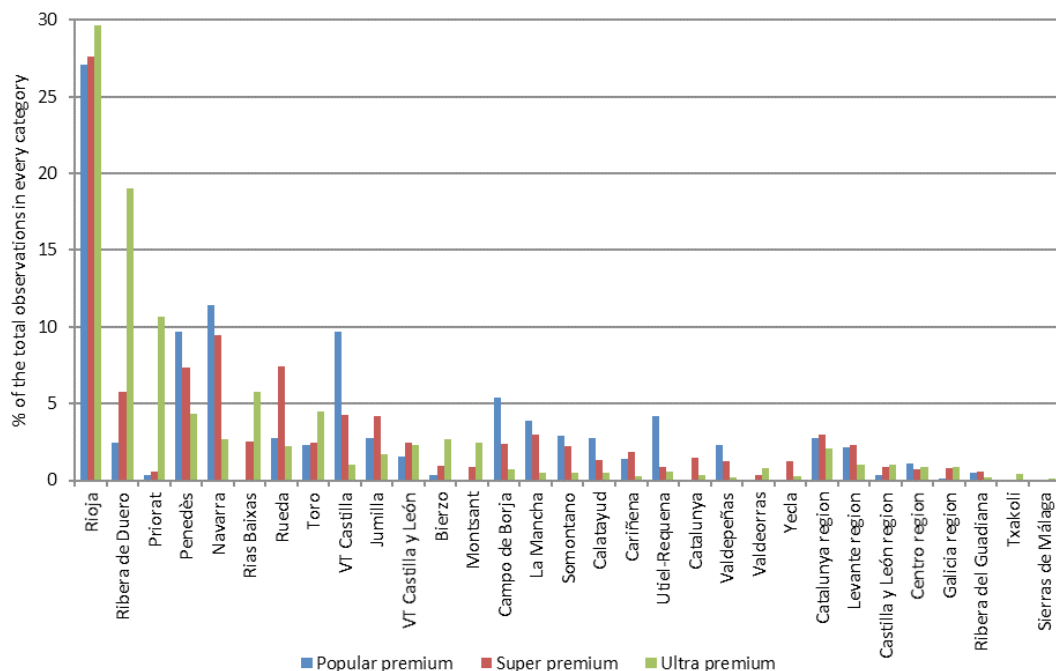

Figure 1. Distribution of the relative weight of every appellation in the categories of prices.

---

[5]*Joven* wine requires no aging in wooden barrels; *crianza* red wines are aged for 2 years with at least 6 months in oak. *Crianza* whites and rosés must be aged for at least 18 months with at least 6 months in oak. *Reserva* red wines are aged for at least 3 years with at least 1 year in oak. *Reserva* whites and rosés must be aged for at least 2 years with at least 6 months in oak. *Gran reserva* red wines require at least 5 years' aging, with at least 18 months in oak. *Gran reserva* whites and rosés must be aged for at least 4 years with at least 6 months in oak.

Table 2. Estimated hedonic prices models

Variable	Popular premium			Super premium			Ultra premium		
	Cor.Coef.[1]	t-ratio	Impact	Cor.Coef.[1]	t-ratio	Impact	Cor.Coef.[1]	t-ratio	Impact
Constant	1.900	14.51	561.36	2.409	66.88	1,011.91	3.438	42.4	3,002.13
Aging									
Joven	-0.069	-3.16	-7.61	-0.089	-7.15	-8.56	-0.113	-59.04	-10.66
Crianza	-0.001	-2.69	-1.17	-0.005	-4.63	-0.59	-0.310	-53.96	-26.67
Reserva	0.070	-2.18	6.10	0.094	-1.66	9.83	0.039	-42.12	3.92
Gran reserva	0.389		47.57	0.150		16.15	0.384	-19.02	46.73
Boutique	—	—	—		—	—	0.941		156.32
Size of the firm									
Micro	0.002	1.87	0.15	0.027	8.76	2.74	0.026	3.14	2.62
Small	NS	NS	NS	-0.027	2.21	-2.67	-0.016	1.72	-1.65
Medium	-0.002	2.12	-0.17	NS	NS	NS	-0.010	1.84	-1.06
Big	-0.029		-2.90	-0.042		-4.14	-0.069		-6.66
Type of wine									
Red	NS	NS	NS	0.004	5.57	0.37	-0.002	3.54	-0.50
White	NS	NS	NS	-0.004	4.4	-0.39	0.002	3.53	-0.10
Rosé	NS	NS	NS	-0.062		-6.01	-0.273		-23.88
Year									
1980	-0.349	-2.96	-29.61	-0.201	-4.15	-18.49	-0.362	-3.18	-31.28
1981	NS	NS	NS	-0.187	-5.77	-17.20	-0.126	-3.1	-12.20
1982	NS	NS	NS	-0.068	-4.32	-6.67	-0.020	-2.41	-2.29
1983	-0.243	-1.98	-21.66	-0.052	-4.78	-5.18	-0.368	-3.95	-31.42
1984	NS	NS	NS	NS	NS	NS	-0.164	-1.81	-16.47
1985	NS	NS	NS	-0.090	-7.98	-8.65	-0.108	-4.19	-10.43
1986	NS	NS	NS	-0.027	-5.49	-2.66	-0.171	-3.81	-15.99
1987	-0.076	2.44	-7.37	-0.028	-6.03	-2.77	-0.121	-3.85	-11.59
1988	-0.054	2.86	-5.35	-0.038	-6.23	-3.72	-0.067	-2.73	-6.78
1989	0.010	4.93	0.94	-0.056	-8.75	-5.44	-0.061	-3.65	-6.06
1990	0.002	5.17	0.14	-0.058	-8.14	-5.65	0.002	-2.63	0.00
1991	-0.027	4.47	-2.69	0.002	-5.27	0.13	-0.026	-3.65	-2.72
1992	NS	NS	NS	0.047	-2.93	4.81	-0.029	-2.49	-3.12
1993	-0.057	3.92	-5.55	-0.025	-5.43	-2.55	-0.003	-2.36	-0.58
1994	-0.010	4.06	-1.03	-0.021	-7.91	-2.05	NS	NS	NS
1995	-0.015	4.58	-1.56	-0.006	-7.38	-0.62	NS	NS	NS
1996	-0.018	5.38	-1.79	0.016	-7.33	1.59	NS	NS	NS
1997	0.016	6.71	1.57	0.033	-5.48	3.33	0.067	-2.29	6.89
1998	-0.013	4.32	-1.37	0.047	-5.75	4.79	NS	NS	NS
1999	0.079	6.9	8.19	0.052	-5.18	5.31	0.212	1.94	23.54
2000	0.060	6.49	6.15	0.052	-4.97	5.38	0.211	2.1	23.50
2001	0.101	8.33	10.62	0.101	-1.74	10.65	0.201	2.04	22.28
2002	0.065	7.65	6.71	NS	NS	NS	0.207	1.96	23.00
2003	0.099	8.29	10.33	0.093	-2.62	9.74	0.206	2.25	22.88
2004	0.054	6.8	5.46	0.104	-1.75	10.95	0.219	3.28	24.52
2005	0.087	7.75	8.99	NS	NS	NS	0.190	1.71	20.94
2006	0.054	5.02	5.41	NS	NS	NS	NS	NS	NS
2007	-0.015	2.91	-1.56	0.156	2.62	16.90	NS	NS	NS
2008	0.036	4.71	3.62	0.153	2.27	16.57	NS	NS	NS
2009	0.086	4.98	8.90	NS	NS	NS	0.086	-2.52	8.92
2010	0.128	4.88	13.43	NS	NS	NS	0.024	-3.2	2.29
2011	-0.153		-14.15	0.125		13.35	0.157		16.98

Table 2. Estimated hedonic prices models[1] (continuation).

Variable	Popular premium			Superpremium			Ultra premium		
	Cor.Coef.[2]	t-ratio	Impact	Cor.Coef.[2]	t-ratio	Impact	Cor.Coef.[2]	t-ratio	Impact
Appellation									
Castilla y León region	NS	NS	NS	0.032	2.88	3.17	0.003	1.88	0.1
Catalunya region	0.049	-1.99	4.99	-0.019	2.23	-1.91	0.089	4.76	9.21
Centro region	NS	NS	NS	NS	NS	NS	0.004	1.77	0.24
Galicia region	NS	NS	NS	0.062	3.71	6.37	NS	NS	NS
Levante region	-0.081	-4.9	-7.85	-0.095	-1.78	-9.12	0.059	2.91	5.94
Bierzo	0.128		13.71	0.055	3.82	5.59	NS	NS	NS
Calatayud	0.005	-3.1	0.39	-0.122	-2.45	-11.47	NS	NS	NS
Campo de Borja	-0.034	-4.64	-3.37	-0.149	-4.47	-13.86	0.093	2.99	9.51
Cariñena	-0.071	-3.99	-7.01	NS	NS	NS	NS	NS	NS
Catalunya	—	—	—	0.035	3.88	3.54	NS	NS	NS
Jumilla	0.005	-3.13	0.41	-0.127	-4.21	-11.98	NS	NS	NS
La Mancha	0.005	-3.42	0.45	-0.102	-2.33	-9.7	NS	NS	NS
Montsant	—	—	—	0.038	3.11	3.79	-0.024	2.11	-2.4
Navarra	0.024	-3.71	2.35	-0.006	4.28	-0.57	NS	NS	NS
Penedès	0.059	-2.42	6.01	0.035	6.89	3.53	0.037	4.42	3.76
Priorat	NS	NS	NS	NS	NS	NS	0.090	8.43	9.37
Rías Baixas	—	—	—	0.113	8.27	11.99	-0.213	-3.66	-19.18
Ribera del Duero	NS	NS	NS	0.091	10.38	9.56	0.217	15.82	24.22
Ribera del Guadiana	NS	NS	NS	NS	NS	NS	NS	NS	NS
Rioja	0.053	-2.86	5.45	0.012	6.76	1.16	0.008	5.84	0.83
Rueda	0.039	-2.27	3.86	0.001	4.01	0.07	NS	NS	NS
Sierras de Málaga	—	—	—	NS	NS	NS	NS	NS	NS
Somontano	0.033	-2.47	3.28	NS	NS	NS	NS	NS	NS
Toro	0.051	-1.84	5.18	0.003	3.18	0.25	0.041	4.84	4.14
Txakolí	—	—	—	0.263	2.92	29.26	NS	NS	NS
Utiel-Requena	-0.079	-5.83	-7.69	NS	NS	NS	NS	NS	NS
Valdeorras	-	-	-	0.146	4.06	15.61	NS	NS	NS
Valdepeñas	-0.001	-3.08	-0.21	-0.150	-3.26	-13.95	-0.516	-3.08	-40.87
VT Castilla	-0.043	-5.77	-4.27	-0.116	-3.52	-10.94	NS	NS	NS
VT Castilla y León	-0.013	-2.9	-1.44	NS	NS	NS	0.111	5.49	11.65
Yecla	—	—	—	-0.059		-5.77	-0.103		-9.76
Quality rating									
Classic	—	—	—	—	—	—	0.353	13.61	42.06
Outstanding	—	—	—	0.039	3.14	3.89	-0.039	23.02	-3.80
Very good	0.031	4.78	3.08	0.000	6.84	-0.02	-0.314	8.98	-26.97
Good	-0.012	3.56	-1.26	-0.038	2.71	-3.78	NS	NS	NS
Mediocre	-0.018	3.17	-1.84	NS	NS	NS	NS	NS	NS
Not recommended	-0.092		-8.80	-0.061		-5.88	-0.435		-35.26
Number observations	653			3,185			5,422		
R^2	0.329			0.256			0.626		
Adjusted R^2	0.272			0.243			0.622		
F	5.87			18.88			179.45		
Prob>F =	0.000			0.000			0.000		

[1]Cor.Coef.: corrected coefficient. —: there is not any observation in this segment for this variable. NS: not significant

appellations. Distinct preferences within the price categories considered could support the usefulness of customer segment-based promotion strategies (Cuellar & Claps, 2013). The *Wine Spectator* database contained data from various Spanish wine-producing regions. In our analysis, appellations with fewer than 50 references were grouped into clusters based on similar geographical, soil and climate characteristics. Based on these criteria, our model considered 31 different appellations (Figure 1). Most of the references belonged to the *Rioja, Ribera del Duero*, *Penedés* and *Navarra* appellations. It is worth noting that, as the price of the wine increases, the *Priorat, Bierzo* and *Ribera del Duero* appellations gained prominence, whereas *Penedés, Navarra, Vinos de la Tierra de Castilla, Campo de Borja, La Mancha, Somontano* and *Calatayud* lost it.

The vintage year is easily identifiable by the consumer, because it features on the label. Its use in research about its role as determinant of wine's prices has produced mixed results. For some authors it has little or no influence (Schamel & Anderson, 2003; Schamel, 2006; Luppe *et al.*, 2009), and for others it is a determining factor (Angulo *et al.*, 2000; Lecocq & Visser, 2006; Schroeter *et al.*, 2011). The *Wine Spectator* database contained references from vintage years 1980 to 2011, with a higher concentration of vintage years 2004 and 2005. The distribution of vintage years was more balanced in the popular premium than in the super premium and ultra premium price categories.

Finally, the inclusion of the winery size variable enables assessment of the impact of the scale factor on wine prices, as well as quantification of the exclusiveness that consumers can award to wines. Winery size is expected to be inversely related to price (Rodríguez & Castillo, 2009; Kwong *et al.*, 2011; or Delmas & Grant, 2014). Size classification was in accordance with the European Commission (EC) recommendation[6]. As the *Wine Spectator* database did not include this variable, other data sources, such as *Sistema de Análisis* de *Balances Ibéricos* (SABI), *Informa D&B*, or direct consultation with wineries were necessary. Most of the reference wines (72.6%) were produced by micro and small businesses, which were the commonest sizes of firms producing wines in the higher price categories, while most lower priced wines were produced by medium-sized and large firms.

Results

The results of the estimated models are presented in Table 2. Except for appellation, the observed pattern for each attribute was similar across price categories, although the magnitudes varied.

Aging was the most influential attribute. A positive relationship was found between aging and wine's prices in all price categories, except, importantly, the ultra premium category, where *crianzas* had more negative impact than *joven* wines. In the popular premium and super premium categories, *gran reserva* wines had more impact on prices, increasing the mean price in the category by 47.6% and 16.2% respectively. In the ultra premium category, *boutique* wines had the greatest impact on prices, raising them to 156% of the average price. It is worth noting that aging had less relative influence in the lower price categories and that the highest willingness-to-pay values were for *boutique wines*.

A similar result was obtained for the quality rating attribute, which played a bigger role in the ultra premium category than in the others. However, the effect had the same sign in all price categories: impact on price was less positive, or becomes negative, as the quality rating decreased. It is worth noting that the quality ratings of the wines in the super premium category showed very little variation (only 9.77 points between the significant variables). This suggested that potential efforts to improve quality ratings would not significantly influence the demand for these wines. In the ultra premium category, there was a linear relationship between the quality rating and the price impact, which was positive only for wines that qualify as classic. These results highlighted the importance of an excellent quality rating (outstanding or classic), given that lower ratings had a negative or zero price impact.

The results also revealed an inverse relationship between winery size and wine price. The impact of the exclusiveness factor was eroded in the lower price category, while it was stronger in the super premium category, where large firm size had a negative impact 4.14 percentage points higher than that of small firm size (-2.7%), while micro-firm size had a positive impact of 2.7%. In the ultra premium category, although large firm size was penalized (-6.7%), micro-wineries did not obtain higher positive impact than they did in the super premium category (2.6%) and, in fact, small wineries had more negative impact than medium-sized ones. A possible explanation for this is that the

[6]Commission recommendation 2003/361/CE of 6 of May 2003 concerning the definition of micro, small and medium-sized enterprises.The size classes considered are microenterprise (employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million), small (10 to 49 employees and EUR 2 to 10 million), medium (50 to 249 employees and EUR 10 to 50 million) and big (more than 250 employees and more than EUR 50 million).

exclusiveness factor was captured, not by firm size, but by the *boutique* variable, which was the most influential variable in this price category.

The type of wine was not significant in the popular premium category, while, in the super premium and ultra premium categories, the most negative impact was for rosés (-6% and -23.9% respectively) and reds had more positive impact than whites.

Impacts on prices of the most recent vintages were more positive than the older ones in all three price categories. In the super and ultra premium categories, a linear relationship could be observed. However, in the popular premium category, three different behaviors could be identified. 80s vintages had the most negative impacts, while most of the 90s vintages were below the average price and their effect, while significant, was not very strong. The more recent vintages had a positive influence on sale price. Thus, as vintages approach the current year, impact on prices improved from negative scores to the top score which was assigned to vintage 2010 which had an impact of 13.4%[7].

With regard to appellation, in the popular premium category, the most positive impacts on prices were *Bierzo, Penedès, Rioja, Toro, Catalunya* region, *Rueda, Somontano, Navarra, La Mancha, Jumilla* and *Calatayud*, that is, a wide spread across the whole country. The most favorable impact labels among the super premium wines, however, were those from north and northwest Spain, while the majority of those with negative impacts were from the south, although there were also some from northern regions (*Aragón, Navarra* and *Catalunya*). In the ultra premium category, most appellations (73%) had positive impact, the top going to wines from *Ribera del Duero* (+24.2%). The appellation with the greatest negative impact was *Valdepeñas* (-40.9%). It is worth noting that some appellations (*Yecla, Utiel-Requena, Cariñena, Vinos de la Tierra de Castilla* or *Valdepeñas*) had no positive impact in any price category. Furthermore, the impacts for *Valdepeñas* wines decreased as their retail price increased, reflecting poor consumer-perceived quality, whereas some appellations, such as *Rioja, Ribera del Duero, Priorat, Penedès, Rueda* and *Toro,* had positive impact in all price categories where they were significant.

It is also important to mention some of the results obtained for the two best-known Spanish appellations, *Rioja* and *Ribera del Duero*, which were also the two most represented in the sample. While the positive impact for the Rioja appellation diminished as the sale price increased, *Ribera del Duero* obtained its highest positive impact in the ultra premium price category, where most of the wines with this appellation were concentrated (84% of wines with this appellation class as ultra premium and 1.3% as popular premium). This concentration was a prestige factor that promoted willingness to purchase a *Ribera del Duero* in the upper price categories.

Rías Baixas, Calatayud, Navarra or *Montsant* had negative impact in the higher price categories but positively in lower price categories. This appeared to suggest disinclination to purchase beyond a certain price threshold. Positive impact on prices of some appellations, such as *Campo de Borja* or *Vinos de la Tierra de Castilla y León*, on the other hand, increased with the price of the wine. The influence of other appellations was erratic and the price effect could be positive or negative.

Discussion

The first conclusion arising from the results of this research was that all the wine attributes considered in the hedonic function were valued by US consumers and had an impact on the sale price. So any business and marketing strategy directed at any of these characteristics is relevant to the positioning of a specific wine on the US market. The super premium category is a more complex decision-making environment, because the number of attributes influencing demand was greater. In other words, there are various potential product-positioning options. Special care must be taken with decision-making in the top and bottom price categories, however, because there were fewer attributes to enable market success, and therefore fewer factors on which to work.

US consumers set great store by the aging of wine, which was, overall, the factor with most influence on the sale price (a similar result is obtained by Morilla & Martínez, 2002; Melo *et al*., 2005; and Perza, 2010), except in the super premium category, where other attributes, particularly vintage year and appellation, were more highly valued. Significantly, the US consumer valued length of aging and high-end price placement which reflects specific characteristics, as in the case of *boutique* wines, especially in the ultra premium price category. In this respect, it would be appropriate to analyze the associated costs of aging wines for longer periods, or producing a *boutique* wine targeted to this market, in order to determine whether it would increase profits. It is surprising to note, however, that *crianzas* were valued similarly or even lower than *joven* wines, so there may be no profit from aging wine to qualify as *crianza*, as suggested by Rodríguez & Castillo (2009).

---

[7]The negative coefficient for 2011 was due to there being only one observation for that year at a significantly lower price than the category average.

On the other hand, it can be observed that the US consumer appreciated the chance to buy a quality wine for less than expected in the two lowest price categories, which suggests that marketing strategies based on discounts or special promotions might enable product positioning in these markets. This, combined with factors such as the good value for money that Spanish wine offers the average consumer (ICEX, 2014), the high and increasing willingness of the US consumer to discover new wines (Del Rey, 2014b), and the growing interest of young consumers in imported wines (Wine Market Council, 2012), constitutes an incentive to design customer-attracting promotions and establish distributor/retailer agreements.

The exclusiveness factor, measured by firm size, can serve as a market differentiation tool in the US because it represents added value for US consumers, who, according to results reported in the literature (Morilla & Martínez, 2002; Rodríguez & Castillo, 2009; Kwong *et al*., 2011; Delmas & Grant, 2014), attach greater value to wines produced by micro-enterprises than to those produced by large wineries. Wine price decreased with size of winery in all price categories, but the effect was more marked in the super premium category. High-end wine market consumers showed greater appreciation of micro-wineries and greater rejection of large wineries than was the case with the consumers of less expensive wines.

With regard to the type of wine, reds were more highly valued than whites or rosés, which were negatively valued by US consumers, which confirms the results obtained by Steiner (2009) for Spanish wines in the British market. This picture appears to mirror Spanish export volume and market share trends for the different types of wine in the US, where red wine exports have gained ground in recent years at the expense of rosés, which have shrunk significantly. In any event, this emerged as the least relevant attribute for consumers making a purchase decision, and it had no significance whatever in the lowest price category, despite having been reported as a relevant factor in other studies (Panzone & Simões, 2009; Yoo *et al*., 2011).

US consumers were found to attach very high value to expert quality ratings, especially at the high end of the market, where the importance of other factors decreases (Schroeter *et al*., 2011; Cuellar & Claps, 2013). This justifies efforts to improve classifications, especially in the ultra premium category. Our results showed a proportional relationship between quality rating and consumer valuation, as reported in past studies (Schamel & Anderson, 2003; Cacchiarelli *et al*., 2014). However, it is worth noting that only quality scores above 90 were significantly effective when it came to compensating the investment effort they

required. Furthermore, strategies needed to be directed not only at achieving high quality scores but also at making them known to the public in order to stimulate demand and support higher prices (Hilger *et al*., 2011; Cardebat & Figuet, 2014).

Vintage year was generally considered a factor of medium relevance in decision-making, and thought to have less importance at the high end than at the middle and low end of the wine market. Our analysis showed the most recent vintages to be the most highly valued, possibly due in part to the increased availability and familiarity of Spanish wines in the US market in the last few years. In any case, there would be little to be gained from exporting older vintages, especially from the cheaper end of the market, since the costs could outweigh the profits.

Appellation and soil and climate conditions played a relevant role in consumer choices, confirming the findings of other authors (Brentari *et al*., 2011; Amrusch & Wirl, 2013; Caracciolo *et al*., 2013; Roma *et al*., 2013). The location of a winery can therefore either help or hinder its positioning in the US market. Potential investment in new wineries should therefore be carefully assessed, as the disadvantages of an erroneous location could not be reversed by enological treatments or short-term investment (Troncoso & Aguirre, 2006) or by brand strengthening tactics (Boatto *et al*., 2011).

It is remarkable that, the various appellations in the upper price category received mostly positive ratings, supporting the idea of a certain prestige factor and a positive overall image in association with Spanish wines. However, there were few significant appellations in this category, so further promotion and positioning efforts are needed to increase awareness and acceptance by US consumers and thus improve that prestige factor.

Overall, the highest ratings went to wines from northern Spain, while those from the southern, surrounding regions and *Aragón* received negative ratings. According to these findings, certain appellations, such as Y*ecla, Utiel-Requena, Cariñena, Vinos de la Tierra de Castilla* and, particularly, *Valdepeñas*, need to modify their promotional strategies, and work intensively to improve their positioning.

Higher market penetration was found to enhance consumers' wine knowledge and raise their "liking" assessment, which is consistent with the findings of Steiner (2009) for Spanish wines in the British market. Wines from *Rioja, Ribera del Duero, Priorat, Penedès, Rueda* and *Toro*, all with strong presence in the sample, received positive ratings. The exceptions to this pattern, *Navarra* and *Rías Baixas*, need to intensify their promotion efforts and adjust their marketing strategies, as consumers showed no willingness to pay high prices for these wines. The ratings for wines from *Campo de*

Borja or *Vino de la Tierra de Castilla y León*, on the other hand, increased with higher prices, which seems to suggest that they enjoy better positioning, especially in the upper price categories.

In relation to this, there are public programs to promote firms exporting to foreign markets available to wineries and wine producers and a growing role is played by EU promotion programs in third countries (MAGRAMA, 2012).

Our results suggested that strategies for the Spanish wineries to obtain higher prices in the US wine market were dependent on the wine price category. In the popular premium category, the most influential attribute was aging. In the middle category (super premium), moreover of aging, the exclusivity factor measured through the size of the firm could play an important role. Marketing tools could be used in this area by wineries trying to improve their relative position. Additionally, wineries could take some advantage of the region of origin in this category, because this attribute had more influence in this segment. Finally, in the ultra premium category aging wines for longer periods or producing a *boutique* wine and try to obtain a good quality rating are the two main objectives to reach by wineries.

Future studies might consider regional climate variables and their evolution over time, with a view to revealing possible influences and changes in buyer behavior. Further research could explore US consumer behavior and factors influencing willingness to purchase each of the appellations considered in this work.

References

Albisu LM, Zeballos G, 2014. Consumo de vino en España. Tendencias y comportamiento del consumidor. In: La economía del vino en España y en el mundo; Compés R, Castillo JS (coord.). pp: 99-140. Cajamar Caja Rural.

Ali HH, Nauges C, 2007. The pricing of experience goods: the example of en primeur wine. Am J Agr Econ 89 (1): 91-103. https://doi.org/10.1111/j.1467-8276.2007.00965.x

Amrusch P, Wirl F, 2013. Does the environment matter on the wine market: an analysis of the wine market in Austria. In: Ecosystems and Sustainable Development IX; Marinov A & Brebbia C (eds), pp: 211-218. WIT Press. https://doi.org/10.2495/ECO130181

Anderson K, Norman D, Wittwer G, 2001. Globalization and the world's wine markets: overview. Discussion Paper Nº 0143, Centre for International Economic Studies, Adelaide University.

Angulo AM, Gil JM, Gracia A, Sánchez M, 2000. Hedonic prices for Spanish red quality red wine. Brit Food J 102 (7): 481-493. https://doi.org/10.1108/00070700010336445

Bicknell K, Friesen L, MacDonald I, 2005. A hedonic price analysis for the New Zealand wine industry: preliminary results. New Zeal Agr Resour Econ Soc, 2005 Conf, Aug 26-27, Nelson, New Zealand.

Bicknell K, MacDonald I, 2012. Regional reputation and expert opinion in the domestic market for New Zealand wine. J Wine Res 23 (2): 172-184. https://doi.org/10.1080/09571264.2012.676541

Boatto V, Defrancesco E, Trestini S, 2011. The price premium for wine quality signals: Does retailers' information provision matter? Brit Food J 113 (5): 669-679. https://doi.org/10.1108/00070701111131764

Brachinger HW, 2002. Statistical theory of hedonic price indices.Working Paper from Dept of Quantitative Economics, Univ of Freiburg/Fribourg Switzerland.

Brentari E, Levaggi R, Zuccolotto P, 2011. Pricing strategies for Italian red wine. Food Qual Prefer 22: 725-732. https://doi.org/10.1016/j.foodqual.2011.06.001

Brentari E, Levaggi R, Zuccolotto P, 2015. A hedonic price analysis for the Italian wine in the domestic market. Qual Quant 49: 999-1012. https://doi.org/10.1007/s11135-014-0102-z

Cacchiarelli L, Carbone A, Laureti T, Sorrentino A, 2014. The value of quality clues in the wine market: evidences from Lazio, Italy. J Wine Res 25 (4): 281-297. https://doi.org/10.1080/09571264.2014.959659

Cacchiarelli L, Carbone A, Esti M, Laureti T, Sorrentino A, 2016a. Assessing Italian wine quality and prices: de gustibus non disputandum est. Brit Food J 118 (5): 1006-1024. https://doi.org/10.1108/BFJ-03-2015-0108

Cacchiarelli L, Carbone A, Laureti T, Sorrentino A, 2016b. The value of the certifications of origin: A comparison between the Italian olive oil and wine markets. Brit Food J 118 (4): 824-839. https://doi.org/10.1108/BFJ-05-2015-0180

Caracciolo F, Cembalo L, Pomarici E, 2013. The hedonic price for an Italian grape variety. Ital J Food Sci 25 (3): 289-294.

Cardebat JM, Figuet JM, 2009. Estimation of a hedonic price equation for Alsace, Beaujolais and Provence wines. Appl Econ Lett 16 (9): 921-927. https://doi.org/10.1080/13504850701222145

Cardebat JM, Figuet JM, 2014. Expert opinions and Bordeaux wine prices: an attempt to correct the bias in subjective judgements. J Wine Econ 9 (3): 282-303. https://doi.org/10.1017/jwe.2014.23

Carew R, Florkowski WJ, 2010. The importance of geographic wine appellations: hedonic pricing of burgundy wines in the British Columbia wine market. Can J Agr Econ 58: 93-108. https://doi.org/10.1111/j.1744-7976.2009.01160.x

Cholette S, Castaldi RM, 2005. Analyzing the US retail wine market using price and consumer segmentation models. 2nd Int Wine Marketing Symp Proc, Sonoma, CA, USA.

Chow GC, 1967. Technological change and the demand for computers. Am Econ Rev 57: 1117-1130.

Combris P, Lecocq S, Visser M, 1997. Estimation of a hedonic price equation for Bordeaux wine: does quality matter? Econ J 107: 390-402. https://doi.org/10.1111/j.0013-0133.1997.165.x

Costanigro M, McCluskey JJ, Mittelhammer RC, 2007. Segmenting the wine market based on price: hedonic regression when different prices mean different products. J Agric Econ 58 (3): 454-466. https://doi.org/10.1111/j.1477-9552.2007.00118.x

Costanigro M, McCluskey J, Goemans C, 2010. The economics of nested names: name specificity, reputations, and price premia. Am J Agric Econ 92 (5): 1339-1350. https://doi.org/10.1093/ajae/aaq065

Court AT, 1939. Hedonic price indexes with automotive examples, dynamics of automobile demands. General Motors Corp., NY. pp: 99-117.

Cousido Cores C, 2017. Empirical evidence of factors affecting fine wine prices using hedonic price model. The case of Spain, France and Italy. Master thesis. Agric & Resour Econ, University of Arizona, USA.

Cuellar SS, Claps M, 2013. Differential effects of brand, ratings and region on willingness to pay: A hedonic price approach. J Wine Res 2: 138-155. https://doi.org/10.1080/09571264.2013.766160

Davis T, Ahmadi-Esfahani F, 2005. Hedonic modelling for Australian wine. 49 Ann. Conf., Aust Agr Resour Econ Soc, Feb 9-11, 19. Coffs Harbour, Australia.

Del Rey R, 2014a. Retos de futuro del sector vitivinícola en España. In: La economía del vino en España y en el mundo; Compés R, Castillo JS (coord.). pp: 667-710. Cajamar Caja Rural.

Del Rey R, 2014b. L'Espagne: une coexistence gagnante des marques d'entreprises et des indications géographiques. Paper presented at the Observatoire Viticole de l'Hérault. Béziers (France).

Delmas M, Grant L, 2014. Eco-labeling strategies and price-premium: the wine industry puzzle. Bus Soc 53 (1): 6-44. https://doi.org/10.1177/0007650310362254

Dinis I, Simoes O Moreira J, 2011.Using sensory experiments to determine consumers' willingness to pay for traditional apple varieties. Span J Agric Res 9 (2): 351-362. https://doi.org/10.5424/sjar/20110902-133-10

Estrella MJ, 2014. The role of geographical attributes in consumers' willingness to pay for Argentinean Malbec. Insights for international protection. Tesis doctoral, Università degli Studi di Padova.

Estrella MJ, Defrancesco E, Gennari A, 2012.The wine hedonic price models in the "Old and New World": state of the art. Rev Fac Cienc Agrar 44 (1): 205-220.

Fogarty J, 2003. Australian premium wine prices: do quality ratings matter? West Aust Quart Bull Econ Trends 4 (3): 41-64.

Griliches Z, 1961. Hedonic prices indexes for automobiles: an econometric analysis of quality change. The price statistics of the federal government. Columbia Univ Press, NY.

Halvorsen R, Palmquist R, 1980. The interpretation of dummy variables in semilogarithmic equations. The Am Econ Rev 70: 474-475.

Hilger J, Rafert G, Villas-Boas S, 2011. Expert opinion and the demand for experience goods: an experimental approach in the retail wine market. Rev Econ Stat 93 (4): 1289-1296. https://doi.org/10.1162/REST_a_00117

ICEX, 2014. El mercado del vino en Estados Unidos. Economic and Trade Office. NY Spanish Embassy.

Kennedy PE, 1981. Estimation with correctly interpreted dummy variables in semilogarithmic equations. Am Econ Rev 71: 801.

Kennedy PE, 1986. Interpreting dummy variables. Rev Econ Stat 68: 174-175. https://doi.org/10.2307/1924943

Kwong LMK, Cyr D, Kushner J, Ogwang T, 2011. A semiparametric hedonic pricing model of Ontario wines. Can J Agr Econ 59: 361-381. https://doi.org/10.1111/j.1744-7976.2010.01209.x

Kwong LMK, Ogwang T, Sun L, 2017. Semiparametric versus parametric hedonic wine price models: an empirical investigation. Appl Econ Lett 24: 897-901. https://doi.org/10.1080/13504851.2016.1240330

Lancaster K, 1971. Consumer demand: A new approach. Columbia Univ Press, NY.

Landon S, Smith CE, 1997. The use of quality and reputation indicators by consumers: The case of Bordeaux wine. J Consum Policy 20: 289-323. https://doi.org/10.1023/A:1006830218392

Lecocq S, Visser M, 2006. What determines wine prices: Objective vs. sensory characteristics. J Wine Econ 1: 42-56. https://doi.org/10.1017/S1931436100000080

Lee H, Sumner D, 2013. The economic value of wine names that reference place in the US market: Analysis of champagne and sparkling wine. In: Wine economics: Quantitative studies and empirical applications; Giraud-Héraud E, Pichery MC (eds.). Palgrave Macmillan, UK, pp: 73-87. https://doi.org/10.1057/9781137289520_5

Levaggi R, Brentari E, 2014. The hedonic price for Italian red wine: do chemical and sensory characteristics matter? Agribusiness 30: 385-397. https://doi.org/10.1002/agr.21377

Luppe MR, Lopes Fávero L, Prado Belfiore P, 2009. Hedonic pricing models and the evaluation of attributes: the case of wines from Brazil, Argentina and Chile. Esic-Market 134: 27-47.

MAGRAMA, 2012. Medida de promoción vino en terceros países. Seminario Opciones de Internalización para los Vinos Españoles del Observatorio Español del Mercado del Vino, 27 junio, Madrid.

Melo O, Buzeta JE, Marshall MB, 2005. Determinantes del precio del vino en el mercado chileno: Un estudio de precios hedónicos. Econ Agr 9: 58-73.

Miller JR, Genc I, Driscoll A, 2007. Wine price and quality: in search of a signaling equilibrium in 2011 California Cabernet Sauvignon. J Wine Res 18 (1): 35-46. https://doi.org/10.1080/09571260701526899

Morilla J, Martínez A, 2002. Una función de precios hedónicos para el vino español de calidad en el año 2000. Rev Esp Est Agrosoc Pesq 196: 173-193.

Muth RF, 1969. Cities and housing. University Press, Chicago.

Nerlove M, 1995. Hedonic price functions and the measurement of preferences: The case of Swedish wine consumers. Eur Econ Rev 39: 1697-1716. https://doi.org/10.1016/0014-2921(95)00013-5

Oczkowski E, 1994. A hedonic wine price functions for Australian premium table wine. Aust J Agric Econ 38 (1): 93-110. https://doi.org/10.1111/j.1467-8489.1994.tb00721.x

Oczkowski E, 2015. Hedonic wine prices functions with different prices. Aust J Agric Resour Econ 59: 1-17.

Oczkowski E, Doucouliagos H, 2015. Wine prices and quality ratings: A meta-regression analysis. Am J Agric Econ 97 (1): 103-121. https://doi.org/10.1093/ajae/aau057

Ortuzar JC, Alfranca O, 2010. Current and regular prices hedonic models for the wine industry. Span J Agric Res 8 (4): 873-886. https://doi.org/10.5424/sjar/2010084-1381

Panzone LA, 2011. The lost scent of Eastern European wines in Western Europe: A hedonic model applied to the UK market. Brit Food J 113 (8): 1060-1078. https://doi.org/10.1108/00070701111153797

Panzone LA, Simões OM, 2009. The importance of regional and local origin in the choice of wine: Hedonic models of Portuguese wines in Portugal. J Wine Res 20 (1): 27-44. https://doi.org/10.1080/09571260902978527

Parga-Dans E, Alonso González P, 2017. 'Marketing quality' in the food sector: Towards a critical engagement with the 'quality turn' in wine. Geoforum 85: 5-8. https://doi.org/10.1016/j.geoforum.2017.07.005

Perza G, 2010. Una primera aplicación de un modelo de precios hedónicos al vino catalán. Tesina de Máster. Univ Autónoma de Barcelona.

Rodríguez M, Castillo JS, 2009. El vino tinto de denominación de origen en Castilla-La Mancha: Un análisis de precios hedónicos. Rev Esp Est Agrosoc Pesq 222: 103-123.

Roma P, Di Martino G, Perrone G, 2013. What to show on the wine labels: A hedonic analysis of price drivers of Sicilian wines. Appl Econ 45 (19): 2765-2778. https://doi.org/10.1080/00036846.2012.678983

Rosen S, 1974. Hedonic prices and implicit markets: product differentiation in pure competition. J Political Econ 82 (1): 34-55. https://doi.org/10.1086/260169

San Martín GJ, Troncoso JL, Brümmer B, 2008. Determinants of Argentinean wine prices in the US. J Wine Econ 3 (1): 72-84. https://doi.org/10.1017/S1931436100000560

Sanjuán-López AI, Resano-Ezcaray H, Camarena-Gómez DM, 2009. Developing marketing strategies for Jiloca saffron: A price hedonic model. Span J Agric Res 7 (2): 305-314. https://doi.org/10.5424/sjar/2009072-421

Schamel G, 2003. A hedonic pricing model for German wine. Agrarwirtschaft 52 (5): 247-254.

Schamel G, 2006. Geography versus brands in a global wine market. Agribusiness 22 (3): 363-374. https://doi.org/10.1002/agr.20091

Schamel G, Anderson K, 2003. Wine quality and varietal, regional and winery reputations: hedonic prices for Australia and New Zealand. Econ Rec 79: 357-369. https://doi.org/10.1111/1475-4932.00109

Schroeter C, Ritchie JL, Rickard BJ, 2011. Factors that influence prices for cool-climate wines: A hedonic analysis of the market for Riesling. J Agribusiness 29 (1): 105-126.

Shanken M, 1996. The Wine Spectator's ultimate guide to buying wine. Wine Spectator Press, NY.

Steiner B, 2004. Australian wines in the British wine market: A hedonic price analysis. Agribusiness 20 (3): 287-307. https://doi.org/10.1002/agr.20012

Steiner B. 2009. Old World wines revisited: consumers' valuation of Spanish and German wines in the UK wine market. University of Alberta, Dept of Rural Economy. Staff paper, 09-03.

Suits DB, 1984. Dummy variables: mechanisms v. interpretation. Rev Econ Stat 66 (1): 177-180. https://doi.org/10.2307/1924713

Thach E, Cuellar S, 2007. Trends and implications for Spanish wine sales in the US market. Int J Wine Bus Res 19 (1): 63-78. https://doi.org/10.1108/17511060710740352

Troncoso JL, Aguirre M, 2006. Factores que influyen en los precios del vino chileno en el mercado de Estados Unidos: análisis de precios hedónicos. Agr Téc (Chile) 66 (3): 295-305. https://doi.org/10.4067/S0365-28072006000300008

Troncoso JL, Engler A, Manriquez P, Valdivia A, 2012. Factors that influence the price of cattle in livestock auctions: The case of the stockyard of Melipilla (Chile). Cienc Investig Agrar 39 (1): 37-45. https://doi.org/10.4067/S0718-16202012000100003

Unwin T, 1999. Hedonic price indexes and the qualities of wines. J Wine Res 10: 95-104. https://doi.org/10.1080/09571269908718165

Waugh FV, 1928. Quality factors influencing vegetable prices. J Farm Econ 10: 185-196. https://doi.org/10.2307/1230278

Wine Market Council, 2012. The U.S. wine market consumer trends & analysis. 7th Annual Wine Market Council Res Conf, 31st Jan, NY.

Wine Spectator, 2012. Wine ratings database. www.winespectator.com [September, 2012].

Wittwer G, Berger N, Anderson K, 2003. A model of the world's wine markets. Econ Model 20: 487-506. https://doi.org/10.1016/S0264-9993(01)00095-5

Yang N, McCluskey JJ, Brady MP, 2012. The value of good neighbors: A spatial analysis of the California and Washington State wine industries. Land Econ 88 (4): 674-684. https://doi.org/10.3368/le.88.4.674

Yoo V, Florkowski WJ, Carew R, 2011. Pricing attributes of wines from emerging suppliers on the British Columbia market. Agric Appl Econ Assoc 2011 Ann Meet, 24-26 July, Pittsburgh, PA, USA.