

Determinants of Argentinean Wine Prices in the U.S.

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Abstract

A hedonic price function for Argentinean wines in the U.S market is estimated in order to evaluate the effect of the most important attributes of wine on price. Results show that labeling practices and the choice of the right wine quality attributes are far more influential on price than expert panel opinions or oenological wine improvements such as age. (JEL Classification: Q11, C21, D12)

I. Introduction

Argentina is the fifth largest wine producer of the world with an annual production of 15.4 million hectoliters. The country is placed after France (57.4 million hectoliters), Italy (53.0 million hectoliters), Spain (42.9 million hectoliters) and USA (20.1 million hectoliters) (OIV, 2004).

Argentinean wine exports have been growing steadily over the past decades. With a growth rate of 1,900% from 1990 to 2005, it even surpassed the wine export of the U.S., which amounted to \$300 million in 2005 (INV, 2006). During the same time span total trade grew at a significantly lower rate (251 %) (FAO, 2007), which allows to identify the wine industry as one of most thriving export sectors. In recognition of the strategic importance of the wine industry for trade, the Argentinean Government established in 2004 the “Plan Estratégico Vitivinícola 2020” (*Wine Strategic Plan 2020*), which is aimed at increasing the wine export value to the target of US\$ 2 billion by the year 2020. The industry is currently exporting to all five continents, but the most important markets for Argentinean wines are the United States of America (US\$66.5 million, in 2006), the United Kingdom (US\$30.4 million), Canada (US\$24.2 million), Brazil (US\$24.6 million) and Denmark (US\$15.5 million) (Diario del Vino, 2008).

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Despite the strategic position of wine in the globalization of the Argentinean economy, no local or international research has been carried out to assess the value attached to Argentinean wine quality attributes in international markets. Indeed, this assessment can significantly contribute to design a marketing strategy and secure their commercial success. This research is aimed at filling this gap for the most important market for Argentinean wines, the U.S. We estimate a hedonic price function for wine exports to the U.S. in order to gain insight into the implicit marginal valuation of each quality attribute. The selection of quality-relevant characteristics is based on the literature review presented in the subsequent section. The methodological framework and the data are explored in section III and the results are discussed in section IV. Finally, the last section presents the major conclusions and implications of our research.

II. Literature Review

The central idea in hedonic price theory, which goes back to Court (1939) and Griliches (1961), and was, in a different context applied by Rosen (1974), is that goods are valued in the markets for their utility-generating attributes. Hence, goods are thought of as composites from these attributes. The theory suggests that competitive markets for these attributes define implicit prices for the relevant embodied product characteristics, and consumers evaluate these traits upon purchase. The observed market price is then equal to the sum of the implicit prices given to each quality characteristic. The method used in most of the scientific literature is a practical derivation of what Rosen proposed, but not exactly the same. The selection of all relevant quality attributes depends on the composite good in question. The existing literature on wine prices in general suggests several attributes, which can be grouped into characteristics that are under the control of the winery, and those that are not, i.e., they are exogeneous factors for each winery.

Among the latter characteristics, the influence of weather as a determinant of wine prices was analyzed by Ashenfelter et al. (1995), Di Vittorio and Ginsburgh (1996), Wood and Anderson (2006), Haeger and Storchmann (2006) and others who concluded that growing season temperatures and harvest rainfall are crucial for wine quality and price. Another possibly important attribute at the group level is the geographic origin, although the existing literature does not convey a uniform picture about the impact of differentiation by origin on the price. On the one hand, Nerlove (1995) found that the origin of wine has no significant influence on price and Steiner (2004) found a low valuation of French wines with geographical appellation in United Kingdom. On the other hand, several authors found quite different results. Schamel (2000, 2004), Schamel and Anderson (2003) and Troncoso (2006) observed an important influence of the region of origin on price. Schamel and Anderson (2003) added that in Australia the regional reputations have become increasingly differentiated through time. In particular, cool climate regions are preferred to other regions. Steiner (2004) concluded that the low valuation of French wines with geographical appellation might help to explain the overall decline of French wines in the British wine market.

Since the sensory quality of the wine can only be experienced after purchase in the course of consumption (Schamel and Anderson, 2003), wine is a typical experience good¹. Hence, reputation is one of the most important channels to help overcoming the informational asymmetry associated with experience goods. Reputation could be affected in two different ways. First, and probably at least partially under the control of the winery, reputation might be conveyed directly through the producer and/or brand name to consumers. In the literature, Di Vittorio and Ginsburgh (1996), Schamel (2000), Oczkowski (2001) and Lecocq and Visser (2006) used this approach in the price regressions and found an important influence of this variable on price. Second, reputation rankings assigned by an expert are, at least in the short-run, exogenous to the winery. Lima (2006) working with observations from American tasting events found that the San Francisco Fair appears to be the best predictor of quality with the Dallas Morning News tasting second best. Schamel (2004) concluded that quality awards have a significant and positive price impact.

The positive influence of sensory qualities as judged by experts has been demonstrated by numerous authors, e.g., Nerlove (1995), Di Vittorio and Ginsburgh (1996), Combris et al. (1997), Schamel (2000 and 2004), Schamel and Anderson (2003), Haeger and Storchmann (2006), Lecocq and Visser (2006), and Troncoso and Aguirre (2006). The influence of some experts' ratings on the price is so important that it has inspired a new term: Wine Parkerization. Wine Parkerization refers to the stylization of wines by some wineries to please the taste of the influential wine critic Robert M. Parker Jr. However Combris et al. (1997), Lecocq and Visser (2001, 2006), Haeger and Storchmann (2006), and Troncoso and Aguirre (2006) have found that compared to the objective characteristics of wine the influence of sensory qualities is relatively less important. Oczkowski (2001) went further and concluded that reputation effects have a significant influence on price while the influence of quality is insignificant.

Among the variables under control of the winery, the quantity supplied is another attribute with potential explanatory power for the price. Consumers may use the quantity produced as a quality indicator. Analyzing auction prices, Di Vittorio and Ginsburgh (1996) concluded that the price of a wine is negatively related with quantity sold per lot. Referring to retail prices, Lima (2006) found a similar pattern for Californian wines.

The impact of aging on wine prices is twofold. On the one hand, many wines benefit from maturation and improve in quality. On the other hand, due to steady consumption, an increasing age of wine results in lower quantities supplied. Both effects work into the same direction, i.e., we assume aging to wine prices should increase with age. Accordingly, the literature confirms the positive price impact of the age variable (Di Vittorio and Ginsburgh, 1996; Wood and Anderson, 2006; Troncoso and Aguirre (2006). Di Vittorio and Ginsburgh (1996) estimated that age increased wine prices by about 3.7% per year of age, while Troncoso and Aguirre (2006) puts the number at 5.6%. In addition, Wood and Anderson (2006) found non-linear effects of aging and considered a quadratic and a cubic specification.

¹ Some quality attributes as organic production etc. could also be viewed as credence goods.

Finally, the impact of the chosen variety has found some attention in the literature. Troncoso and Aguirre (2006) estimated a positive impact of the grape variety on the purchase price while Steiner (2004) could not find a consistent pattern regarding the price impact of French varietal wines in the British market.

III. Data and Methodology

The data were obtained from the Wine Spectator Online Database, which contains ratings of thousands of wines from all over the world (Wine Spectator, 2006). The wines from Wine Spectator are blind-tasted by a panel of experts, following a strict procedure to eliminate any subjective influence. The data were processed using the program R for statistical computing (R Development Core Team, 2006).

Overall, there are 1,602 Argentinean wines listed in the database. After adjusting for outliers and observations with incomplete information, we yield our final sample of 1,102 wines. The sample includes wines from 1977 to 2005. For each observation, the database provides the following variables: retail price, sensory quality rating, quantity of cases made, vintage year, region of origin, producer name, special descriptors and grape variety. The score is provided as a sensory quality rating on a 100-point scale, according to the assessments made by the panel of experts of Wine Spectator. The variable 'special descriptors' refers to certain quality categories that appear on the label of a bottle of wine. These descriptors do not follow an internationally accepted classification system but each winery uses its own categories aiming at differentiating its wines from its competitors. Four descriptors were identified in the sample, which are, in an ascending order of quality: 'Selección' (Selection), 'Alta' (High), 'Reserva' (Reserve) and 'Gran Reserva' (Gran Reserve). The variable 'producer' was used to identify the 38 main Argentinean export wineries to capture a possible brand loyalty of consumers. The remaining variables are self-explanatory. Prices were all expressed in constant 2005 US dollars per bottle, using the American CPI for food and beverages as deflator (USA Department of Labor, 2007).

Six additional variables were defined based on the information in the database: age, consignment available on the label, membership to Wines of Argentina, level of regionalization, producer, instrumental 1 and instrumental 2.

The variable *age* was estimated as the difference between the date of releasing the wine to the market and the vintage year. Similar to Woods and Anderson (2006), we included a squared term (age^2), in order to allow for non-linear aging effects.

Some wine companies include information about the number of cases produced on the labels of their best wines. This information can have two different effects. On the one hand, the quantity of cases produced should be inversely related to quality, i.e., the more sophisticated wines are produced in reduced numbers. If quality is associated with price, then small quantities should imply higher prices and vice versa. On the other hand, only the best wines

carry this information on the label. Thus, the mere fact of its existence adds reputation to a particular wine, which is possibly reflected in the price. To capture these effects, two variables were employed: ‘consignment’, a continuous variable indicating the number of cases produced, and ‘consignment available’, a dummy variable, which indicates whether the information was included on the label or not. The first variable is intended to capture the quality effect while the second proxies for reputation.

Wines of Argentina is a private organization whose objective is the promotion of the generic brand “Wines of Argentina.” It is involved, jointly with the government, in carrying out the *Wine Strategic Plan 2020* that aims at increasing the presence of Argentinean wine in world markets. Membership in this organization might enhance the reputation of the companies involved, so we included a *membership* variable to capture this possible effect.

The region of origin is presented in various forms on the label of a bottle. In all cases, the label indicates the province of origin of the wine. In addition, some wineries also indicate valley, district or closest town in an effort for differentiation by emphasizing the local “terroir.” To allow for province reputation we included a *region* dummy variable. To assess the effect caused by the introduction of further location specifications on the label, a second dummy named *level* (short for “level of regionalization”) was used.

The variables and the notation employed in the equations are summarized in Table 1.

Table 1
Variables Employed in the Model

<i>Name</i>	<i>Notation used</i>	<i>Objective</i>	<i>Type of variable</i>
Vintage Year	Vintage	Instrumental variables for the auxiliary regression	Dummy
Instrumental 1			Continuous
Instrumental 2			
Sensory Quality Rating	Score	Determinants of the structural equation	Continuous
Quantity of Cases Made	Consignment		
Consignment Available	Consignment A		Dummy
Age			Continuous
Age ²			
Membership to Wines of Argentina	Club		Dummy
Region of Origin	Region		
Level of Regionalization	Level		
Producer Name	Producer		
Special Descriptors	Descriptor		
Varieties	Variety		

The hedonic price regression is shown in equation (1). The dependent variable is the natural logarithm of price per bottle; the regressors are defined as described above.

$$\ln P = \alpha_0 + \alpha_1 \text{Score} + \alpha_2 \text{Consignment} + \alpha_3 \text{ConsignmentA} + \alpha_4 \text{Age} + \alpha_5 \text{Age}^2 + \alpha_6 \text{Membership} + \alpha_7 \text{Region} + \alpha_8 \text{Level} + \alpha_9 \text{Producer} + \alpha_{10} \text{Descriptor} + \alpha_{11} \text{Variety} + \varepsilon \quad (1)$$

Although the panel of experts follows a strict procedure, attempting to be as objective as possible, subjective influences cannot be eliminated. Hence, the score variable may not be independent causing a possible endogeneity bias in equation (1). This suspicion could not be rejected when running a Hausman-type regression test² (Wooldridge, 2006). Oczkowski (2001) has shown that the existence of imprecisely measured hedonic attributes runs against the use of Ordinary Least Squares for estimation, as this would lead to (i) erroneously identifying statistically significant attributes, (ii) estimating substantially different marginal effects. To overcome this problem and following the procedure suggested by Oczkowski (2001), a 2-Stage-Least-Squares (2SLS) estimation procedure was employed using three additional variables: *vintage year*, *instrumental 1* and *instrumental 2* as instruments (equation 2). The *instrumental 1* variable was defined as the average score of all the wines of the same or older vintages that were tasted before the observation under consideration. The *instrumental 2* variable is defined as the average score of all wines that belong to the same region of the wine in consideration and were tasted before the observation under consideration in the Wine Spectator issues.

$$\begin{aligned} \text{Score} = & \alpha_0 + \alpha_1 \text{Vintage} + \alpha_2 \text{Instrumental1} + \alpha_3 \text{Instrumental2} + \alpha_4 \text{Consignment} \\ & + \alpha_5 \text{ConsignmentA} + \alpha_6 \text{Age} + \alpha_7 \text{Age}^2 + \alpha_8 \text{Club} + \alpha_9 \text{Region} + \alpha_{10} \text{Level} \\ & + \alpha_{11} \text{Producer} + \alpha_{12} \text{Descriptor} + \alpha_{13} \text{Variety} + \varepsilon \end{aligned} \quad (2)$$

We employed the Breusch-Pagan test to detect heteroskedasticity. To avoid perfect multicollinearity between the dummy variables, a variable had to be omitted in each group of dummy variables (see footnote table 2). The average price of the wines with these attributes was established as a reference price, and the marginal prices effects per average bottle estimated from the hedonic equation should be interpreted as deviations from this reference price.

In log-linear functions the estimated coefficient for an independent variable is roughly equal to the percentage change in y in response to a one unit change in x . (Halvorsen and Palmquist, 1980). In the case of dummy variables, their dichotomous nature impedes the interpretation of the coefficients as derivatives, but the impact can be estimated as proposed by Kennedy (1981). Thus:

² The regression test was carried out as follows. First, the independent and the instrumental variables, excepting the variables suspected of endogeneity, were regressed on score. Second, all the independent variables, including score, and the residuals from the first regression were regressed on the natural logarithm of the price. The residuals had a significant effect on price, confirming the endogenous nature of *score*. For more information, see Wooldridge (2006).

$$p_j = \begin{cases} 100\alpha_j & \text{for continuous } j \\ 100 \left[\exp(\alpha_j - 0.5\sigma_{\alpha_j}^2) - 1 \right] & \text{for dichotomous } j \end{cases} \quad (2)$$

where:

- p_j : is the percentage impact of the j -th variable on price, and
- α_j : is the estimated coefficient of the j -th variable
- $var(\alpha_j)$: is the variance of the estimated coefficient of the j -th dummy variable.

Expression (2) allows the estimation of the marginal price effects of each variable. Thus, the marginal price effects of the j -th continuous and dummy variables, m_j is $m_j = p_j * R$, where R is the price of the reference wine.

IV. Discussion

The sample includes wines priced from US\$ 5.13 to US\$ 150.05, with an average of US\$ 17.24 per 750 ml bottle. Age ranged from 0 to 24 years, with an average of 2.2 years, and quality scores, from 64 to 96 points, with an average of 83.6. The average consignment was of 12,363 cases, with a minimum of 18 cases and a maximum of 250,000 cases.

Table 2 shows the regression results based on the 2SLS estimates. Diagnostic testing of the assumptions regarding the residuals indicated heteroskedasticity, since the Breusch-Pagan statistic takes on a value of 493.6. Therefore, heteroskedasticity-consistent standard errors (HCSE) were calculated for Table 2. The coefficient of determination shows that the variation of the regressors explains the 67.8 % of the variability in logarithmic retail prices. For all coefficients that are statistically different from zero at the 5% level, both the percentage impact and the corresponding marginal price effects per average bottle are reported in the last two columns of Table 2.

Table 2
Hedonic Price Function for Argentinean Wines
 Percentage Impact and Marginal Price Effect per Average Bottle

Variables	Coefficient	Price effect per avg bottle (in US\$)	Variable	Coefficient	Price effect per avg bottle (in US\$)
Constant	-1.116** (-3.1)		Chardonnay	0.075** (2.2)	1.66
Score	0.045** (14.2)	0.97	Sauvignon Blanc	0.043 (0.6)	
Consignment	-0.000005** (-7.1)	-0.0001	Torrontés	-0.035 (-0.6)	
Consignment available	0.091** (3.2)	1.96	Viognier	0.018 (0.2)	
Age	0.152** (7.6)	7.6	Other White Varietals	-0.216** (-3.3)	-4.21
Age2	-0.004** (-2.0)	-2.0	Only Malbec, CabSauv and Merlot	0.289** (2.9)	7.06
Valley's name	0.093 (1.2)		Only Malbec and Cabernet Sauvignon	0.277** (2.2)	6.64
District's name	0.124 (2.4)		Only Malbec and Syrah	-0.115 (-1.4)	
Town's name	0.059 (0.7)		Only Cabernet Sauvignon and Syrah	-0.026 (-0.2)	
Vineyard's name	0.235** (4.0)	4.0	Malbec, CabSauv, Merlot, others	0.672** (3.2)	19.68
Membership	-0.151** (-2.3)	-2.3	Malbec, CabSauv, others (not Merlot)	0.583** (5.6)	16.80
Salta	0.043 (0.5)		Malbec and others (not CabSauv, Merlot, Syrah)	0.211 (1.3)	
San Juan	-0.138 (-1.6)		CabSauv and others (not Malbec, Merlot and Syrah)	0.631** (2.4)	17.57
Malbec	0.004 (0.13)		Blends with Chardonnay (main variety)	-0.048 (-0.6)	
Merlot	0.053 (1.2)		Blends with Sauvignon Blanc (main variety)	0.027 (0.2)	
Syrah	-0.076** (-2.0)	-1.59	Blends with Torrontés (main variety)	-0.035 (-0.3)	
Bonarda	-0.333** (-3.5)	-6.16	Alta	0.339** (3.5)	8.53
Tempranillo	0.198** (2.2)	4.60	Reserva	0.027 (0.7)	
Sangiovese	-0.128** (-1.9)	-2.62	Gran Reserva	0.324** (2.6)	7.99
Pinot Noir	0.118 (1.3)		Selection	-0.076 (-0.8)	
Other Red Varietals	-0.331** (-3.7)	-6.12			
$R^2 = 0.678$					
$RSE = 0.3344$					

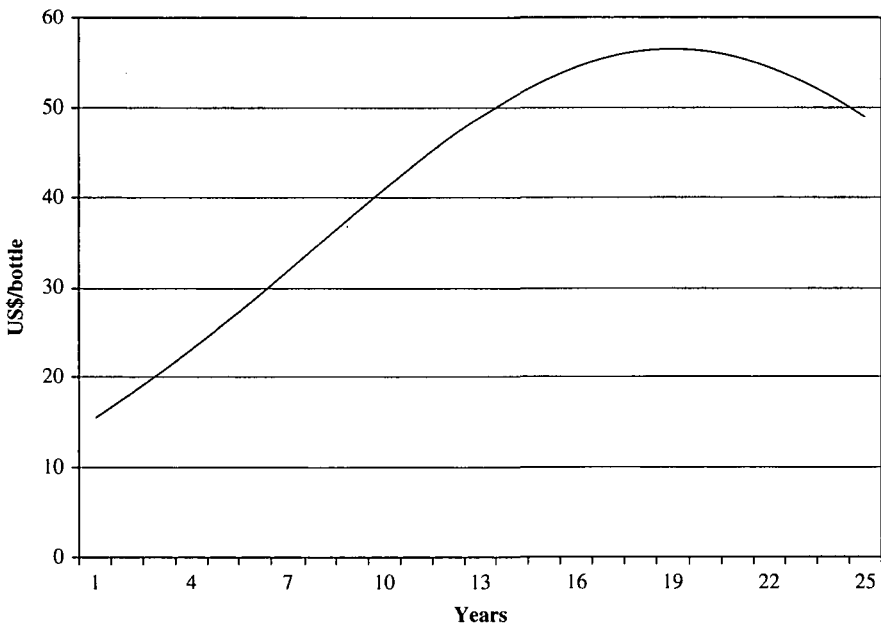
(*) Calculated as $p_j(RP)$, where RP stands for the reference price. The reference price corresponds to a bottle of Cabernet Sauvignon from Mendoza, with no special descriptors and produced by a member of *Wines of Argentina* (Winery Catena Zapata), which commands US\$21.49 per bottle, is scored with 86.8 points and has been aged for 2.2 years. The average consignment is of 26,100 cases.

The model was estimated with producer-fixed effects.

The variables with the most important (positive or negative) impact on price are: *grape variety*, *level* (of regionalization), *producer*, *age* and *special descriptors*. *Quality score*, *age*², *consignment* and *consignment available*, although statistically significant, have a relatively minor effect on price. *Consignment* shows, as expected, a negative relationship with price, suggesting that bigger shipments of wines are associated with less quality, which reflects on smaller prices. Thus, one additional case placed in the market should depress price by 0.0005%, i.e. an increase by 2,000 cases is required to reduce price by 1%. On the other hand, the simple fact of reporting the number of cases produced (*Consignment A*) in the label has a positive effect as it increases price by 9.1%.

Figure 1 shows that age has a positive but marginally declining effect on price. The reference wine reaches its maximum price (US\$ 57.1/bottle) at the age of 19 years, suggesting that no additional gain follows from exceeding this threshold. It is unlikely, however, that a winery will accept to go that far in time, as probably the marginal cost (variable and financial) of keeping wine in oak barrels will exceed the marginal gain of adding one additional year (about US\$ $3.27 - 0.09 * \text{Age}^2$).

Figure 1
Bottle Price of Reference Wine and Age



With regard to the identification on the label of the region of origin, our results suggest that the American consumer prefers detailed and specific information rather than a more general one. Thus, the vineyard's name and the district have statistically significant coefficients while the coefficients of more general geographical denominations as town, valley and province are statistically not different from zero. Note that the marginal effect of indicating the vineyard on prices is higher than 25%.

Surprisingly, membership to *Wines of Argentina* is negatively associated with prices. This result is contrary to a-priori expectations. However, data collection for this study began in 2005, only a year after the generic promotion of Argentinean wines was launched. This might simply be too early to capture the desired improvements in retail prices. Also, this result might reflect the effort being made by *Wines of Argentina's* associates to penetrate the American market, where reduced prices for wines of the association's members might serve as an investment into future market opportunities. The negative coefficient would be indicative that such price reductions are not shared by non-members of the organization. Nevertheless, the lack of positive price effects of belonging to *Wines of Argentina* should be analyzed further, after allowing time for the promotion campaign to yield effects.

Table 2 shows that the retail price is quite sensitive to the variety, as practically all varieties exhibit two-digit positive or negative impacts. With the exception of Tempranillo, for red wines, and Chardonnay, for whites, varietal wines have negative coefficients; all blends have substantial positive price coefficients. These results are as expected since blending is a process of identifying and combining single varieties in terms of uniqueness and exquisiteness, traits that are presumably appreciated in the sophisticated wine market. It is noteworthy, however, that although Malbec blends receive substantial price premia, the highest price differentials are attained by blends of Cabernet Sauvignon with Malbec or other varieties. Although Malbec is the emblematic variety of Argentina, in the view of American consumers Argentinean oenologists do a better job when they include Cabernet Sauvignon in their blends.

Finally, price is also sensitive to special quality descriptors. *Alta* and *Gran Reserva* receive a price premia of 39.7% and 37.2%, respectively. However, while these descriptors have an important impact on price, the other two descriptors (*Reserva* and *Selección*) are insignificant. This indicates that the American consumer is sensitive with regard to quality and is prepared to pay a price premia only for the best-quality levels. Note also that this variable is correlated to variety, as it is unlikely that a varietal wine will deserve a high-quality descriptor, and a blend a low-quality descriptor.

Table 2 reports the marginal price effects per average bottle for each characteristic. The major lesson to be drawn from the results is that labeling practices and the choice of the right wine quality attribute are far more influential on price than expert panel opinions. Thus, a good label indicating the consignment (US\$1.96), the vineyard of origin (US\$5.65) and description of the quality (US\$7.99 for a *Gran Reserva*) of the wine can add as much as US\$ 15.6 to the retail price to the reference price of US\$21.49 a bottle. On the other

hand, producing a good blend can increase the retail price in the range of US\$6.64 to 19.68 a bottle, as well as going for varietals can *decrease* price in as much as US\$6.16. This contrasts with the US\$ 1 to be gained by each additional score point or the US\$3.27 for each additional year of age, over the 86.8 points and the 2.2 years of the reference wine, results difficult (and costly) to achieve.

V. Conclusions

In this study, the responsiveness of retail prices for Argentinean wines in the US market was analyzed employing a hedonic regression analysis. Our quantitative analysis indicated several possibilities to achieve higher market prices. Using a dataset compiled from the Wine Spectator, we found that criteria like labeling, and choosing specific product characteristics which are immediately visible to the potential buyer, are key variables in the price determination. The impact of special descriptors on the label, however, accounts only for half of the descriptors. Revision of the other descriptors should be considered since their use by the Argentinean wine industry seems not very well aligned with the internationally accepted descriptors. The retail price is also strongly affected by blends. The analysis suggests that the industry should prefer blends to single varietal wine, especially those that include Malbec and Cabernet Sauvignon.

The finding of a negative impact of being a member in *Wines of Argentina* was one of the most surprising results. The negative price differential is mainly connected to the fact that the generic advertisement campaign was only implemented in 2005 so that it is maybe too early to observe a distinct impact in the target market. Future research will have to show whether this marketing program is helpful.

Overall, the results of our analysis confirm that objective characteristics have a relatively stronger impact than subjective characteristics. The price of the experience good 'wine from Argentina' seems to be determined much more by the reputation, which is conveyed through location, variety, and labeling, than by the score obtained from expert tastings.

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