International Wine Trade:
Analyzing the Value of Reputation and Quality Signals

Günter Schamel
Dept of Ag Economics and Social Sciences
Humboldt University at Berlin
Berlin, Germany 10099
g.schamel@rz.hu-berlin.de

May 2003

Abstract:
This research examines the factors behind price differentials based on regional origin. For this purpose, we estimate a hedonic pricing model of premium wines sold in the U.S. We hypothesize that numerous quality signals affect wine prices including expert opinions about sensory quality, maturing potential, and special selections as well as derived indicators that signal a high or low quality producer. After correcting for variety, regional origin, and age, the data confirms that a wine's price is related to producer quality signals, which may even negate regional effects. We conclude that it is problematic to interpret regional premiums as brand value (as opposed to quality premiums) without adjusting them for producer quality signals. Estimated brand values may then be biased. Moreover, a strong positive producer quality signal receives a larger percentage price premium than a comparable negative signal which warrants important marketing implications for producers and entire regions.

Key words: hedonic pricing, international trade, reputation, quality signals
JEL codes: F13, L11, L15, Q17

Selected paper submission prepared for the 2003 AAEA Annual Meeting to be held in Montreal Canada, July 27-30.

International Wine Trade:
Analyzing the Value of Reputation and Quality Signals

Introduction

Driving issue for this research is to shed light on the factors behind price differentials seemingly based on the origin of a product. Conventional approaches in international trade analysis stress the importance of production cost, product quality, and strategic behavior and associate product origin with a reputation or quality measure. However, this may neglect the impact of subjective consumer preferences based on marketing, advertising, brands or product loyalty. Advertising campaigns for export promotion, such as those for American beef or Colombian coffee, reflect the recognition of policy-makers that establishing regional brands is an important way to boost exports. In this paper, we apply a hedonic model to estimate the potential impact of regional origin on wine prices controlling for blind-tasted sensory quality, variety, *and* producer quality signals in order to assess their significance with respect to New World wine traded and sold in the US.[1] The theories explaining the correlation between prices and regional origin include production costs approaches with monopolistic competition (e.g. Helpman and Krugman, 1985), spatial models (e.g. Fujita et al., 1999), quality differentiated product markets (e.g. Tirole, 1988), and reputation signaling (e.g. Shapiro, 1983). Other empirical approaches with specific applications to wine include Schamel (2000) modeling product scarcity and Brooks (2001) modeling brand value and correcting for cost differences that transcend borders.

Quality signals are important price determinants for an experience good such as premium wine, which is a highly differentiated good with numerous quality aspects. An objective quality measure is very difficult to define. Many of the *sensory* indicators that determine expert quality ratings are subjective. Additional indicators, such as labeling, bottle design, or the reputation of producers and regions may also advance or hinder the sale of a particular wine. Frequently, it is observed that wine prices may vary substantially despite very similar sensory quality attributes. For

[1] New World wine dominates the US market: about 77% of consumption is either from California or imported from Australia, New Zealand, Argentina, Chile, or South Africa. Recently, their market share increased steadily (Anderson and Norman). Only 15% are from Europe and 8% from sources outside of California (Sumner et al.). We choose to neglect other sources because of their different classification schemes (e.g. France by origin and not by variety).

instance, wine from California's Napa Valley typically sells at a higher price than wine of comparable sensory quality from another region.

We attempt to explain such observations by positing that reputation indicators, variety, and regional origin affect wine purchase decisions. Because consumers are uncertain or do not have sufficient information about quality, they are prepared to pay a much higher price for a reputable wine from a well-known producer and/or region. Moreover, given the limited attention that consumers can expend, not all quality signals receive equal attention. We assume that the level of attention that consumers pay to positive (negative) quality signals is higher for producers well above (below) their average peer performance. Therefore, for a consumer, an unusually high/low quality demonstration forms a lasting signal about a producer quality.

Main objective of the paper is to estimate a hedonic model evaluating the impact of positive and negative producer quality signals as well as expert evaluations, regional origin, wine variety, judging age on wine prices. From this, we are able to derive interesting marketing implications for New World wine producers. We also draw some conclusions on interpreting the correlation between prices and regional origin as brand value as opposed to a quality premium. Hedonic models posit that the observed market price is the sum of implicit prices paid for quality attributes and wine is an experience good with many defining quality attributes. Data source for this analysis are published expert evaluation in the "Wine Spectator" magazine from 10/01 through 10/02 available online at www.winespectator.com. Wine experts assign sensory quality ratings on a 100-point scale. From these quality scores we derive an indicator of positive and negative producer quality demonstrations based on the deviation from the average quality performance of producers within a region. Modeling a unique indicator for a producer quality signal is a distinct feature of this empirical application.

Literature Review

A number of studies have applied hedonic models to estimate implicit prices for wine quality and reputation attributes. They are based on the notion that any product represents a bundle of characteristics that define quality. Theoretical foundation is the seminal paper by Rosen (1974), which posits that goods are valued for their utility-generating attributes. Rosen suggests that competitive implicit markets define prices for embodied product attributes, and that consumers evaluate product

attributes (e.g. features of a car, indicators of air or water quality) when making a purchase. The observed market price is the sum of implicit prices paid for each quality attribute. Rosen also recognizes an identification problem for supply and demand functions derived from hedonic models, because implicit prices are equilibrium prices jointly determined by supply and demand conditions. Hence, implicit prices may reflect not only consumer preferences but also factors that determine production. In order to solve the identification problem it is necessary to separate supply and demand conditions. Arguea and Hsiao (1993) argue that identification is essentially a data issue which can be avoided by pooling cross-section and time-series data specific to a particular side of the market.

Reputation indicators affects consumer willingness to pay since the quality of a bottle of wine is not known until it is opened. In addition to sensory quality and variety, producer and collective regional reputation indicators may also affect prices. Shapiro (1983) presents a theoretical framework to examine the effects of individual producer reputation on prices. He develops an equilibrium price-quality schedule, assuming competitive markets and imperfect consumer information. For consumers, it is costly to improve their information about product quality. He demonstrates that reputation allows high-quality producers to sell their items at a premium that may be interpreted as return on investments in reputation building. In such an environment of imperfect information, learning about the reputation of a product can be an effective way for consumers to reduce their decision-making costs. Expert evaluations may be an effective way for consumers to learn about reputation of producers and/or regions. Tirole (1996) presents a model of collective reputation as an aggregate of individual reputations where current producer incentives are affected by their own actions and collective actions of the past. He derives the existence of stereotype producers from history dependence, shows that new producers may suffer from past mistakes of older producers for a long time after the latter disappear, and derives conditions under which the collective reputation can be regained.

Nerlove (1995) studies the Swedish wine market with government-controlled prices, no domestic production, and a small share of global consumption. He estimates a reduced form hedonic model with exogenous prices (as opposed to supply assuming that Swedes reveal their valuation of a particular wine quality attribute by varying the derived hedonic demand for it), regressing sold

quantities on various quality attributes and prices. Combris, Lecocq and Visser (1997) estimate a hedonic price equation and what is referred to as a jury grade equation to explain variations in price and quality for Bordeaux wine. Landon and Smith (1997, 1998) also analyze Bordeaux wine, focusing on a lagged reputation indicator in addition to sensory quality. In both papers, they use a hedonic model to study the impact of current quality and reputation based on past quality demonstrations. Government and industry classifications define regional effects. Their main findings are: reputation indicators have large price impacts; an established reputation is much more important than short-term quality improvements; and ignoring reputation indicators will overstate the impact of current quality on consumer behavior. In their 1997 paper, estimated coefficients vary substantially across the vintages.

Roberts and Reagans (2001) examine market experience, consumer attention, and price-quality relationships for New World wines in the U.S. market. They argue that producer or regional quality signals improve with the duration of market exposure and evaluation by consumers. Oczkowski (1994) estimates hedonic price function for premium Australian wines, examining six attribute groups and various interaction terms. In another paper, he argues that single indicators of wine quality and reputation are imperfect measures because tasters' evaluations differ and thus contain measurement errors. Employing factor analysis and 2SLS, he finds significant reputation effects but insignificant quality effects (Oczkowski, 2001).

Brooks (2001) argues that traditional views of international competitiveness emphasize product quality and production cost and neglect the potential impact of marketing and brand development on export demand. Applying hedonic regression analysis, she controls for vintage, blind-tasted quality, variety and also cost differences. Cross-country comparisons that suggest that neither cost nor quality differences, but country “brands” affect a wine bottle’s price in excess of fifty percent. Crucial for this conclusion is to interpret the premiums on regional dummies as a marketing premium as opposed to a quality premium.

Schamel (2000) estimates a model including blind-tasted quality, variety, scarcity, and special designations. The paper examines seven regions and two varieties (Cabernet Sauvignon and Chardonnay). The estimated price elasticity of sensory quality is larger for Chardonnay, indicating

that consumers are willing to pay a higher quality premium compared to Cabernet Sauvignon. However, the other indicators including regional origin and scarcity seem to be more important to red wine consumers. The results suggest that the public-good value of a regional appellation is higher for red wine regions and that producers there may benefit more from collective marketing efforts. In another paper, Schamel and Anderson (2001) evaluate wine quality and regional indicators for wines from Australia and New Zealand.

In this paper, the focus is on regional and producer quality signals. Consumers willing to buy wine but still uncertain about its quality despite expert opinions, have an idea about a producer's ability to deliver a quality wine based on average quality relative to regional peers. Their willingness to pay also depends on maturing potential, age and relative scarcity of the wine. In addition, they have quality perceptions about grape varieties and growing regions when forming their buying decisions. To assess the significance of such subjective perceptions on New World wine trade, we apply a hedonic model to estimate the impact of regional origin on prices controlling for blind-tasted sensory quality, variety, *and* producer quality signals. Comparisons across regions and countries will identify how origin affects wine prices. At least part of the estimated price premiums or discount due to regional origin may be interpreted as a marketing premium as opposed to a quality premium or discount if the variation in regional effects does not correspond with the regions having a better average quality.

Data and Analysis

Building on the seminal work by Rosen (1974), we propose a hedonic model where the price of a particular wine (P_w) is a function of its attributes z_j: $P_w = P_w(z_1, ..., z_j, ..., z_n)$.[2] We obtained a detailed data set of New World wine sold in the U.S. that discerns wine quality assessments, regional origin as well as producer quality signals.[3] In each issue, *Wine Spectator* magazine publishes prices and ratings for sensory wine quality (*Sq*) and maturing potential (*Pot*) as well as special expert

[2] We neglect an exposition of hedonic pricing models, which are well documented in the literature (Nerlove 1995).

[3] New World wines (California, Oregon, Chile, Australia, etc.) are labeled primarily by variety, while Old World wines (France, Italy, Spain, etc.) are labeled primarily by their region of origin. Thus, the data set does not classify a "Cabernet Sauvignon" from "Bordeaux", even though Bordeaux reds are made primarily from Cabernet. We would need to either manually edit the data or to define a separate category for "Bordeaux styles." For this reason, we chose to neglect Old World wines from the analysis which are about 15% of total U.S. consumption with a declining trend.

selections (*SS, BB*). Dependent variable is the logarithm of a wine's release price (*P*) in US$.[4] Using the sensory wine quality ratings, we derive an indicator for high-end (*He*) and low-end (*Le*) quality producers by calculating the deviation of a producer's average quality rating from their respective regional average. We then define dummy variables identifying high-end and low-end quality producers, which deviate by more than two points from their respective peer average.[5]

Further control variables in the model are availability (*A*), age (*Age*) and a categorical dummy for wine variety (*Va*). The full data set, which we analyzed, includes the judging years 1990 through 2001 and consisted of more than 3,800 observations. The sample size used for the estimation was reduced due to missing information about prices, varieties, availability or vintage data, but still amounts to a total of 3,055 observations. We analyze separate models for red and white varieties in order to see differential impacts due to the basic wine color.

Tables 1 and 2 (including notes) provide some key information and sample statistics for the data. For the estimation, we differentiate eleven regions in six countries and ten varieties as well as red and white wines in general. Napa was chosen as the base region and Cabernet Sauvignon as the base variety (Chardonnay in the white wine sample). For the whole sample, the average score is 86.2 points, ranging from 61 to 97. The average nominal price is $29.19 ranging from $5 to $195. The average age of a wine when judged is 2.45 years and the expert opinion on the maturing potential of wines is 2.8 years on average. About 2/3 of the wines are red varieties and about 1/3 white varieties.

The paper addresses producer reputation effects and their potential impact of regional origin on consumer willingness to pay for premium wine. This may help to assess the significance of subjective preferences in international markets. In markets for experience goods, such expert evaluations direct consumers to a particular product or producer association. Although we employ producer reputation effects via dummy variables derived from producer and regional averages, we also explored other avenues. We ran each model directly using producer averages or their deviations from the regional averages. We note that these variables are highly correlated and thus yield similar re-

[4] The reported price is a suggested retail price on *release* and prior to tasting. This price may differ from actual consumer transaction prices due to retail mark-ups and government taxes differ.

[5] Note that the estimated regional effects (measured on the regional dummy variables) will be mitigated through the producer quality signal derived from the regional averages.

sults. Moreover, assuming uncertain consumers, it seems more reasonable to use a less precise measure when modeling producer quality signals. We include a set of indicator variables for grape variety as well as the age and maturing potential at the time of judging as we expect that aged wines (especially reds and/or those with a high potential to mature) will achieve higher prices.

Although we use a mixed log-linear functional form, the results are robust to model specification.[6] The core model estimated in this paper is:

$$(2) \qquad \log(P) = \alpha + \beta_1 \log(Sq) + \beta_2 \log(A) + \gamma_1 He + \gamma_2 Le + \gamma_3 BB + \gamma_4 SS + \delta_1 Age + \delta_2 Pot + \eta_j Va + \theta_k Reg + \varepsilon$$

where log(P) is the logarithm of the suggested release price in US$. Given the functional form this equation, β_1 measures the price elasticity of the quality rating, β_2 the price elasticity of the availability (scarcity) indicator. The γ coefficients measure the premiums/discounts for high/ low-end quality producers and for the two special expert designations. The δ coefficients for *Age* and *Pot* indicate the percentage premium paid for older and maturing wines while η and θ measure price premiums/discounts for regional origin and variety, respectively. *Reg* and *Va* denote dummy variable matrices for regional origin and variety. Estimating equation (2) results in a vector of coefficients relative to the contribution of the base control.

Estimation Results

Table 3 lists the regression results for the three hedonic models. Most estimates are highly significant (except for one variety), and F-tests show that adding these variables will significantly improves the model fit. With respect to sensory expert evaluations of both red and white wine, prices are highly elastic (about 2.44% or 71¢ at the average price). Producer quality signal also affect prices significantly. However, it is interesting to see that high-quality producers receive much higher premium (22%) compared to the discount for low-quality producers (6.5%). Moreover, note that the estimated premium for high-end producers is 4% larger for white wines while the discount for low-end producers is 2.5% smaller for red wine. Thus, red (white) wine producers are to gain less (more) from consistently producing higher qualities, but would also loose less (more) form consistent underperformance.

[6] A RESET F-test does not reject this functional formulation but the others including linear and log-linear.

As expected, we estimate that wine prices increase with age (+15%) and maturing potential (+3.7%), and that the premium for both of these variables is much larger for reds. Special selections (*SS*) control an average 10% premium while best buy designations (*BB*) carry a 20% discount. The "availability" coefficients are negative and highly significant in all three samples. This suggests that a small scarcity effect may be present which is somewhat larger for red wines, where a 1% increase in the number of cases made results in a 0.13% decrease in price. A more detailed look at variety effects suggests that prices for Cabernet blends are not significantly different from the base variety, a pure Cabernet Sauvignon. Only the low yielding Pinot Noirs sell at a premium (+7.5%). The other estimated variety discounts vary up to –25% for a Zinfandel.

Comparing the three models, the most interesting results come from the relative contribution of regional origin to prices. The price discounts for regional origin are quite large, varying between 16% and almost 60% (relative to the Napa base appellation). Apart from the residual "Other California" region, the domestic regions command higher prices than wines imported form other New World sources. We argue that the regional origin estimates reflect both brand values and reputation, because the data is at least in part consistent with models of quality-price signaling. In particular, the ranking of the estimated premiums for the domestic regions corresponds exactly to the regional quality ranking in Table 2. However, including the foreign regions, this correspondence brakes down. For example, the average New Zealand wine rates 87 points second only to the Napa base, but the estimated discount of 30% is almost twice as high as for Sonoma wine rating only 86.5 points on average. Part of this may be explained by a consumer home bias, which warrants some further investigation below.

Let us turn to the mitigating effects of quality producer signals on the estimated regional effects. Producers within a region may benefit or suffer from each other's quality performance due to spillover effects. As consumers pay closer attention to differences among producers and their products, the price-quality relationship within a region becomes less complementary and more competitive. A high regional quality performance facilitates quality-based competition among producers and may diminish the importance of collective regional indicators. Figure 1 depicts the estimated regional effects superimposing the adjustments due to high and low quality producer signals. Although

these adjustments preserve the regional rankings, they reveal some interesting results. No foreign wine, even from high-end producers, exceeds their counterparts from average Napa producers. Only white wines from top New Zealand producers almost reach parity (-0.6%). White wines from top South African producers carry less than half of their average discount and fetch slightly higher prices than white wines from average North Coast producers. Red wines from top Australian producers secure higher prices than reds from average Sonoma producers, but still sell below reds from a low-end Napa source. In general, we conclude that it is problematic to interpret regional premiums as brand value (as opposed to a quality premium) without making adjustments for producer quality. For this reason, we argue that the estimated brand values of up to 50% in Brooks (2001) may be biased. Moreover, similar to individual producers, entire regions have a track record of quality evaluations, which in the eyes of consumer marks them as a high or low quality-producing region. In order to fully disentangle brand values and estimated regional premiums, an additional indicator correcting for regional quality should be incorporated in the analysis.

Discussion and Conclusion

At least three lessons can be drawn from these results. A first lesson is that expert quality assessments and producer quality signals appear to have a significant positive impact on the prices that consumers are willing to pay for premium wines, even after correcting for grape varieties and regional origin. This general finding is consistent with other studies and suggests consumer's value this information in their quest for greater knowledge about available wines. Moreover, as consumers become more confident in their one ability to discern quality, they become less reliant on imperfect signals, including generic regional quality indicators (Tirole, 1996). Producer quality indicators are large and may negate an estimated regional discount as in the case of high-end South Coast producers. Moreover, strong positive producer quality signals carry a larger percentage premium than comparable negative signals.

A second lesson is a clear trend towards greater regional differentiation (see Figure 1). A contributing factor to this trend may be the registration of geographical indications providing for stronger property rights and value in regional names, thereby raising the rates of return on investments in regional promotion. We estimate significant relative differences between growing regions,

warranting important marketing implications for individual producers as well as entire wine growing regions. Because regional reputation is a public good, it may be useful to engage in activities to enhance the reputation of particular wine growing areas or of varieties from a region. Our results suggest that for regions trading primarily red wine such as Australia, marketing regional origin as a quality attribute may be quite rewarding. Australia's sensory quality rating for reds is second only to Napa but it carries an estimated regional discount of 40%. Moreover, for regions primarily growing white wine it seems that a marketing strategy emphasizing regional origin is less rewarding and their producers would benefit more from individual marketing efforts (e.g. New Zealand's top producers almost reach parity with Napa). This finding is also consistent with Schamel (2000). However, it remains to be seen whether regional indicators become more or less important over time. On the one hand, regions are investing more in generic promotion. On the other, globalization is causing individual wineries to agglomerate and put more emphasis on building a corporate brand reputation. Our analysis raises the question whether the estimated regional premiums are to be interpreted as a quality premium, a brand value or both. We conclude that they are both and that they need to be adjusted for producer as well as regional quality signals to get an idea of regional brand values. This paper is a first step and includes an adjustment for producer quality signals. The second step requires a larger data set in order to define regional quality signals and will be accomplished in a future paper.

The third lesson relates to Tirole (1996). He suggests that consumers forming their buying decisions may rely on approximate quality signals when access to more proximate signals is difficult or costly. Not all consumers may have access to individual wine quality evaluations but may have an idea about high and low quality producers within a region or may be exposed to regional marketing or brand promotion. In the current context, this would help to explain part of the home bias as proximity may imply a more complete consumer knowledge about high and low quality producers and/or a greater exposure to regional marketing and brand promotion. U.S. consumers might miss the more accurate quality signals from foreign sources and more of the foreign price variation is then captured by their regional dummy variable. The fact that price differentials and significance levels on the foreign regions are much larger points in this direction.

Finally, we ought to mention some characteristic features of the wine industry studied in this paper. It is probably save to say that wine quality evaluations receive a high level of consumer attention, with several major publications providing wine quality ratings on a regular basis, not to mention the regional or variety ‘fashion’ trends in wine consumption that these publications may determine. Moreover, the quality of each vintage is affected by many factors beyond producer control.

Table 1: Description of the Data †

Variable		Short description	Ø	Min.	Max.
Price [1]	*P*	Suggested retail price on *release*	29.19	5	195
Sensory quality [2]	*Sq*	Point score from blind tasting (max.100 pts.)	86.2	61	97
Availability [3]	*A*	Approx. # of cases made with particular label	12,437	38	1.1M
Potential [4]	*Pot*	Potential to improve with age (years)	2.83	0	14
Age	*Age*	Judging year minus Vintage (in years)	2.45	0	9
High-end [5]	*He*	High-end quality producer (dummy variable)			
Low-end [5]	*Le*	Low-end quality producer (dummy variable)			
Best Buy [6]	*BB*	Outstanding value at modest price (dummy)			
Special Selection [7]	*SS*	Selected, highly recommended wines (dummy)			
Variety [8]	*Va*	Wine variety (categorical dummy)			
Region [9]	*Reg*	Regional origin (categorical dummy)			

Table 2: Regional Statistics

	All Wines			Red Wine			White Wine		
Regions [9]	**Count**	**Ø Price**	**Ø Score**	**Count**	**Ø Price**	**Ø Score**	**Count**	**Ø Price**	**Ø Score**
Napa	741	44.69	87.5	551	50.62	87.6	190	27.52	87.1
Sonoma	567	31.12	86.5	386	32.60	86.3	181	27.96	87.1
South Coast	208	29.05	85.9	145	30.72	85.7	63	25.21	86.5
Central Coast	144	28.29	85.6	90	32.92	85.7	54	20.57	85.3
North Coast	121	23.17	85.1	81	25.62	85.4	40	18.23	84.6
Other California	236	16.30	84.0	167	17.69	84.3	69	12.94	83.4
All California	2,017	33.48	86.4	1,420	37.27	86.4	597	24.47	86.3
NEW ZEALAND	123	19.13	87.0	31	25.68	86.3	92	16.92	87.3
AUSTRALIA	535	23.84	86.5	380	26.82	87.0	155	16.54	85.3
SOUTH AFRICA	124	17.77	84.9	81	19.95	85.1	43	13.65	84.5
CHILE	157	16.65	84.4	112	18.92	84.9	45	11.00	83.0
ARGENTINA	99	17.45	83.8	79	18.94	83.6	20	11.60	84.5
All Regions	**3,055**	**29.19**	**86.2**	**2,103**	**32.87**	**86.3**	**952**	**21.06**	**85.9**

Notes: (data source: Wine Spectator Online at www.winespectator.com).

[1] Release prices as published in the Wine Spectator magazine as well as online.

[2] Scale: 95-100 (classic; a great wine)
90-94 (outstanding; superior character and style)
80-89 (good to very good; with special qualities)
70-79 (average; drinkable, may have minor flaws)
60-69 (below average; drinkable, not recommended)
50-59 (poor; undrinkable, not recommended).

[3] Availability estimates stated in the tasting notes.

[4] Maximum storage potential in years based on the expert opinion at the time of tasting (e.g. drink now = 0).

[5] The average quality of high-end (low-end) producers deviates by more than 2 points from the regional average.

[6] Value for money designation awarded after blind tasting procedure (incl. best buy, smart buy, and best value).

[7] Includes highly recommended (selected highest-scoring wines in an issue), cellar selections (will improve most with aging), and spectator selections (not necessarily highest scoring, but make a most out-standing purchase).

[8] Variety (#, ∅ price, ∅ score): Cabernet Sauvignon (520, $43.51, 86.8), Cabernet Blends (116, $34.59, 86.4), Merlot (262, $27.58, 85.7), Pinot Noir (337, $35.34, 85.8), Shiraz (329, $28.70, 87.1), Zinfandel (260, $25.02, 85.6), Other Red (279, $26.57, 86.0), Chardonnay (580, $24.16, 86.4), Sauvignon Blanc (219, $15.40, 85.5), Other White (153, $17.39, 84.9). Cabernet Sauvignon (Chardonnay in white sample) are base varieties.

[9] California regions are defined as follows:

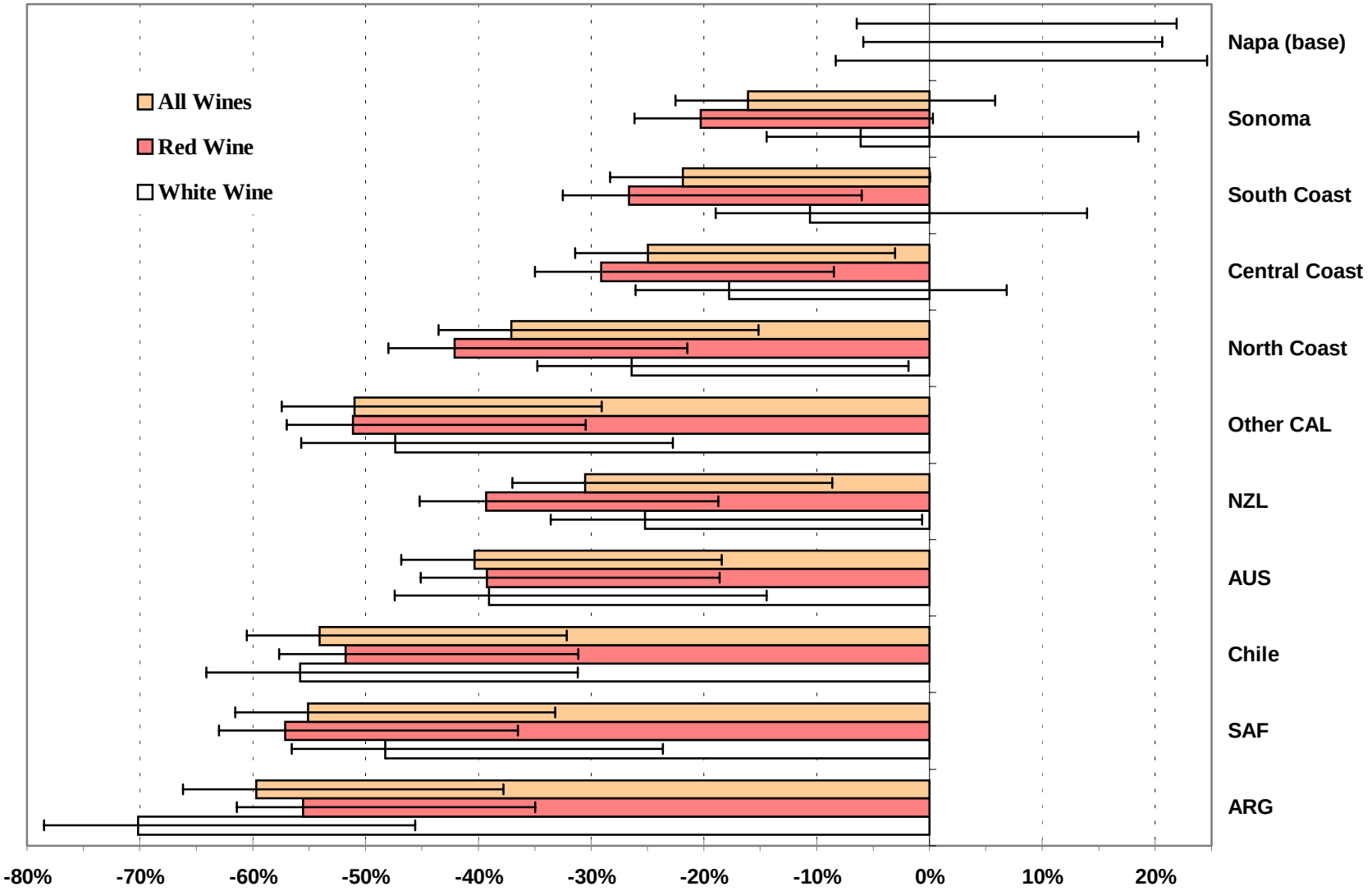
Napa	incl. Napa Vly. and Carneros (chosen as base region)
Sonoma	incl. Sonoma Vly./Co.
Central Coast	incl. Bay Area, Central Coast, and Monterey Co.
North Coast	incl. Mendocino, Lake, and Solano Co.
South Coast	incl. Santa Barbara Co., Paso Robles, Santa Maria, Santa Ynez, and Edna Vlys.
Other California	incl. all other California wine and non-specified blends from above.

Table 3: Regression Results [dep. variable = log(Price)]

	All Wines		Red Wine		White Wine	
Parameter	Estimate	(t-statistic)	Estimate	(t-statistic)	Estimate	(t-statistic)
CONSTANT	-6.908	(-6.44)*	-6.818	(-4.87)*	-7.065	(-4.41)*
Log(Score)	2.439	(10.13)*	2.425	(7.70)*	2.440	(6.80)*
Log(Cases)	-0.118	(-28.57)*	-0.127	(-23.87)*	-0.105	(-17.15)*
Potential	0.037	(10.20)*	0.040	(8.71)*	0.020	(2.81)*
Age	0.150	(17.51)*	0.163	(15.70)*	0.106	(7.09)*
High-end	0.219	(12.41)*	0.206	(9.18)*	0.246	(9.06)*
Low-end	-0.065	(-3.42)*	-0.059	(-2.47)**	-0.083	(-2.85)*
Best Buy	-0.202	(-5.25)*	-0.246	(-4.92)*	-0.112	(-2.03)**
Special Selection	0.104	(2.62)*	0.122	(2.42)**	0.090	(1.49)
Sonoma	-0.161	(-8.53)*	-0.203	(-8.41)*	-0.061	(-2.17)**
South Coast	-0.219	(-8.20)*	-0.266	(-7.76)*	-0.106	(-2.71)*
Central Coast	-0.250	(-8.25)*	-0.291	(-7.25)*	-0.177	(-4.22)*
North Coast	-0.371	(-11.44)*	-0.421	(-10.09)*	-0.264	(-5.58)*
Other California	-0.510	(-18.78)*	-0.511	(-14.82)*	-0.474	(-11.48)*
NEW ZEALAND	-0.305	(-9.15)*	-0.393	(-6.09)*	-0.252	(-7.06)*
AUSTRALIA	-0.404	(-19.30)*	-0.392	(-14.23)*	-0.391	(-12.83)*
CHILE	-0.541	(-16.81)*	-0.518	(-12.49)*	-0.558	(-11.47)*
SOUTH AFRICA	-0.551	(-16.27)*	-0.571	(-12.57)*	-0.482	(-10.30)*
ARGENTINA	-0.597	(-15.54)*	-0.555	(-11.77)*	-0.702	(-10.80)*
Cabernet Blends	0.040	(1.17)	0.043	(1.18)		
Merlot	-0.171	(-6.90)*	-0.155	(-5.92)*		
Pinot Noir	0.075	(2.87)*	0.110	(3.81)*		
Shiraz	-0.157	(-6.26)*	-0.150	(-5.46)*		
Zinfandel	-0.257	(-9.72)*	-0.234	(-8.13)*		
Other Reds	-0.154	(-5.98)*	-0.149	(-5.37)*		
Chardonnay	-0.125	(-5.30)*				
Sauvignon Blanc	-0.239	(-7.20)*			-0.179	(-6.88)*
Other Whites	-0.235	(-6.86)*			-0.141	(-5.33)*
N	3055		2103		952	
R^2 [%]	74.20		71.82		74.64	
adj. R^2 [%]	73.97		71.50		74.10	
RESET F-statistic	1.667		1.018		2.250	

* and ** indicates significance at the 1% and 5% level, respectively.

Figure 1: Regional Discounts and Adjustments for High and Low-end Producers



References

Anderson K, and D. Norman. 2003. “Global Wine Production, Consumption, and Trade, 1961 to 2001: A Statistical Compendium. CIES. Adelaide University, Australia.

Arguea, N. and C. Hsiao. 1993. “Econometric Issues of Estimating Hedonic Price Functions.” *Journal of Econometrics* 56: 243-67.

Brooks, E. 2001. “Countries as Brands: International Trade in Wine.” Harvard University Working Paper presented at the VDQS 2001 in Napa Valley, CA.

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

Fujita, M., P. Krugman, and A. Venables. 1999. *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press.

Helpman, E. and P. Krugman. 1985. *Market Structure and Foreign Trade*. Cambridge, MA: MIT Press.

Landon, S. and C. E. Smith. 1997. “The Use of Quality and Reputation Indicators by Consumers: The Case of Bordeaux Wine.” *Journal of Consumer Policy* 20: 289 - 323.

Landon, S. and C. E. Smith. 1998. “Quality Expectations, Reputation and Price.” *Southern Economic Journal* 64(3): 628 - 47.

Nerlove, M. 1995. “Hedonic Price Functions and the Measurement of Preferences: The Case of Swedish Wine Consumers.” *European Economic Review* 39: 1697 - 716.

Oczkowski, E. 1994. “A Hedonic Price Function for Australian Premium Table Wine.” *Australian Journal of Agricultural Economics* 38: 93-110.

Oczkowski, E. 2001. “Hedonic Wine Price Functions and Measurement Error.” *The Economic Record*: Vol. 77 No. 239, 374-82.

Roberts P. and R. Reagans. 2001. “Market Experience, Consumer Attention and Price-Quality Relationships for New World Wines in the US Market”. GSIA Working Paper. Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, February.

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

Schamel, G. 2000. “Individual and Collective Reputation Indicators of Wine Quality.” CIES Discussion Paper 0009. Centre for International Economic Studies, Adelaide University.

Schamel, G. and K. Anderson. 2003. "Wine Quality and Varietal, Regional and Winery Reputations: Hedonic Prices for Australia and New Zealand" *The Economic Record*: Vol. 79 No. 246 (forthcoming)

Shapiro, C. 1983 "Premiums for high quality products as Returns to reputations." *Quarterly Journal of Economics*, 98: 659-679.

Sumner D. et al. 2001. The wine and winegrape industry in North America. Workshop Paper No. 2 presented at the CIES Wine Economics Workshop in Adelaide, October 2001.

Tirole, J. 1996. "A theory of collective reputations (with applications to the persistence of corruption and to firm quality)." *Review of Economic Studies*, 63: 1-22.

Tirole, J. 1988. *The Theory of Industrial Organization*. Cambrigde, MA: MIT Press.

Wine Spectator. 2002. "Wine Spectator Magazine" Issues Oct. 15, 2001 through Oct. 15, 2002. Wine Spectator Press, New York. (online: www.wine-spectator.com)