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**Wine Quality and Varietal, Regional and
Winery Reputations:
Hedonic Prices for
Australia and New Zealand**

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Revised October 2001

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ABSTRACT

We estimate hedonic price functions for premium wine from Australia and New Zealand, differentiating implicit prices for sensory quality ratings, wine varieties, and regional as well as winery brand reputations over the vintages 1992 to 2000. For Australia, the results suggest regional reputations in general are becoming increasingly significant through time, indicating intensifying regional quality differentiation. In particular, some specific cool-climate regions are becoming increasingly preferred over other regions. Price premia based on brand reputation also are shown to be significant. For New Zealand also, regional quality differentiation is significant, although less so than in Australia. In each country, price premia associated with both James Halliday's and *Winestate* magazine's sensory quality ratings, and with Halliday's winery ratings and classic wine designations, are highly significant.

Key words: Wine quality, regional reputation, brand reputation, hedonic pricing

JEL codes: C50, D12, Q13

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1. Introduction

For more than a dozen years now the wine industry has been booming in Australia and New Zealand. Both the area planted to vineyards and the volume of wine produced have grown at 5+ per cent per year on average from 1988 to 1999, while the two countries' exports of wine have been growing at around 20 per cent per year (from a low base). Simultaneously, wine exports from California, South Africa and South America have been soaring, such that the volume share of global wine production that is exported has risen from 15 to 25 per cent. Yet per capita wine consumption in Australia and New Zealand has been static. Abroad, consumption has been falling steadily in the traditional wine-consuming countries of Europe and the southern cone of Latin America, more than offsetting demand growth in the UK, the US, and (from a tiny base) East Asia (Anderson and Norman 2001). In each of these markets, however, as in Australia and New Zealand, there has been a dramatic substitution of quality for quantity: premium (bottled) wine sales are growing steadily while non-premium (cask) sales are declining (Anderson, Norman and Wittwer 2001).

With global demand static and export supplies expanding rapidly, the average price of internationally traded wine is bound to come under pressure to decline in the coming years. In this more-competitive and more-globalized environment, the extent to which the price declines (or rises) for a particular group of producers will depend very much on the quality upgrading of its product, absolutely and relative to that of other producer groups, as perceived

by consumers at home and abroad. This raises the question of what determines consumers' perceptions of quality when they buy wine.¹ Many consumers, especially when they are new and inexperienced, are looking for guidance before purchasing wines. Often they are unsure about the quality of a wine they intend to purchase and turn to published ratings of wine experts for guidance. This begs the question as to how expert ratings, in addition to grape variety and regional reputations, affect the price of wine. What are consumers willing to pay for such things as the reputation of the producing region as distinct from corporate brand reputation, or grape variety reputation, or the published ratings of wine writers/judges/critics; and how has that willingness to pay evolved over time?

This paper addresses this question as it relates to Australian and New Zealand wines, using a hedonic pricing model. Our analysis is unique in a number of ways. First, in examining two very large samples of ratings, each drawn from the same base population of wines and consumers, we are able to make direct comparisons between the Halliday and *Winestate* ratings. Second, we are able to expose changes in reputations over the past decade when markets changed dramatically. And third, we include indicators for sensory quality, producer reputation, variety, and regional origin for not only Australia but also New Zealand (which has not been previously studied in this way).

The paper is structured as follows. In section 2, we briefly review the literature on hedonic pricing models and their application to wine. Section 3 presents the model and the two different data sets used in the analysis. Section 4 details the empirical results for the markets in Australia and New Zealand separately. The final section summarizes what has been learnt and suggests areas for further research.

¹ This is to be distinguished from the quality upgrading over time of super-premium wine as it matures in the bottle in the years following its initial sale by the winery, as captured by time series of prices in the secondary market. According to Ashenfelter (2000), Ashenfelter, Ashmore and Lalonde (1995), Byron and Ashenfelter (1995) and Wood (2001), key determinants of the vintage-to-vintage variation in the ultimate quality of mature wine are a few straightforward weather variables in the growing season - information that consumers appear to have been ignoring.

2. Literature review

A number of studies apply hedonic price analysis to estimate implicit prices for wine *quality* attributes.² They are based on the hypothesis that any product represents a bundle of characteristics that define quality. Their theoretical foundation is provided in the seminal paper by Rosen (1974), which posits that goods are valued for their utility-generating attributes. Rosen suggests there are competitive implicit markets that define implicit 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 purchasing decision. 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 price functions, 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 the identification problem is essentially a data issue that can be avoided by pooling cross-section and time-series data specific to a particular side of the market.

Since the quality of a particular bottle of wine cannot be known until it is de-corked and consumed, consumers' willingness to pay depends on reputations associated with that wine. In addition to quality ratings, individual producer reputation, the collective reputation of wine regions as well as the grape variety(-ies) used also affect wine quality and thus prices. Shapiro (1983) presents a theoretical framework to examine the effects of individual producer reputation on prices. He develops an equilibrium price-quality schedule for high-quality products, assuming competitive markets and imperfect consumer information, to demonstrate that reputation allows high-quality producers to sell their items at a premium that may be interpreted as revenue for producer investments in building reputation. On the demand side of

the market, it is costly for consumers to improve their information about product quality too. In such an environment of imperfect information, learning about the reputation of a product or of some of its attributes can be an effective way for consumers to reduce their decision-making costs. A favorable producer or winery rating assigned by a wine expert may serve as such an effective way to reduce the decision-making costs.

Tirole (1996) presents a model of collective reputation as an aggregate of individual reputations where current producer incentives are affected by their own actions as well as 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. A favorable collective reputation of a wine region relative to other regions may be another effective way to reduce consumer decision-making costs.

Oczkowski (1994) adopts a hedonic pricing model in one of the first empirical wine studies. He estimates a log-linear function for premium Australian wines, relating retail prices to six attribute groups and various interaction terms. In another paper, Oczkowski (2000) estimates hedonic price functions for Australian wine arguing 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.

Nerlove (1995) examines the Swedish wine market, which is characterized by no domestic production, a small share of global consumption, and government control of prices. This allows to assume exogenous prices (as opposed to assuming exogenous supply) and to estimate a reduced form hedonic price function, regressing quantities sold on various quality attributes and prices. Thus, Nerlove assumes that wine consumers in Sweden express their valuation of a particular quality attribute by varying the derived hedonic demand for it.

² This work builds on a long history of agricultural econometric research on product quality. An early example is

Golan and Shalit (1993) identify and evaluate quality characteristics for wine grapes produced in Israel relative to California wine. That is, they analyze hedonic grape pricing of the input supply side of the wine market. Their premise is that high-quality wines are produced only when growers are given a strong enough price incentive to supply better grapes. In a two-stage model, they first develop a quality index by evaluating the (relative) contributions of various physical grape attributes to wine quality. Second, they construct a quality-price function relating the price of Californian wine to the quality index developed in the first stage. Analogous to Nerlove, they also assume that prices are exogenous.

Combris, Lecocq and Visser (1997) estimate a hedonic price equation and what is referred to as a jury grade equation for Bordeaux wine to explain the variations in price and quality, respectively.³ Landon and Smith (1997, 1998) also present empirical analyses of Bordeaux wine, focusing on reputation indicators in addition to sensory quality attributes. In both papers, they study the impact of current quality as well as reputation indicators on consumer behavior using hedonic price functions. Lagged sensory quality ratings define individual product reputation. Regional reputation indicators are government and industry classifications. In addition, their 1997 paper analyzes five individual vintages over the period 1987 to 1991. Their main conclusions are: reputation indicators have a large impact on consumer willingness to pay; an established reputation is considerably more important than short-term quality improvements; and ignoring reputation indicators will overstate the impact of current quality on consumer behavior. Their estimated coefficients vary substantially across the five vintages examined.

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 the

Waugh (1928).

³ On its own, the jury grade equation has no economic meaning, and no theoretical or empirical reason is presented as to why it is estimated in addition to the hedonic price equation. In a review of the above four empirical wine studies, Unwin (1999) stresses the difficulties associated with identifying appropriate variables to include, the varying definitions of wine quality used, and the possible inconsistencies in their data.

attention paid to wine quality signals increases with the market experience of its producer and, because of spillover effects, with the experience of associated producers.

Schamel (2000) estimates a hedonic pricing model based on U.S. data for sensory quality ratings, individual wine quality and regional reputation indicators for two premium wine varieties: a white (Chardonnay) and a red (Cabernet Sauvignon). The paper examines seven regions (Napa and Sonoma Valley, Sonoma County, Oregon, Washington State, Australia, Chile, South Africa) and includes observations from a pool of eight vintages between 1988 and 1995. However, it does not estimate coefficients for individual vintages. The estimated price elasticity of sensory quality is larger for white wine, indicating that U.S. consumers were willing to pay a higher quality premium for white compared to red wine at that time. However, the results suggest both regional reputation and individual quality indicators seem to be more important to U.S. consumers of red wine. The results also suggest that the marketing of regional origin as a reputation attribute may have a higher payoff for regions primarily growing red wine. In other words, it seems that the public-good value of a regional appellation is higher for red wine regions and that individual producers in those regions may benefit more from collective marketing efforts.

Because wine consumers are uncertain about quality, we assume that, in addition to their own quality perceptions about grape varieties and growing regions, they use expert quality ratings for the wine and/or the winery in their buying decisions. Thus, consumer willingness to pay for a particular wine depends on a critic's quality rating of the wine and/or the producer, as well as their own reputation assessment for grape varieties and growing regions expressed through premiums or discounts relative to a base region and variety. The present paper analyzes such quality and reputation indicators for premium wines from Australia and New Zealand. For each country, we examine Halliday's (1999a,b and 2001) data set as a whole as well as data sets for recent vintages. Moreover, we analyze a second data set of more than 12,500 tasting scores for premium wines for the same two countries (Winestate

2001). This enabled us to compare for the first time hedonic pricing model results for two different data sets drawn from the same base population of wines and consumers.

3. The data and hedonic price model

The data

Table 1a provides an overview of the data set from well-known Australian wine critic James Halliday (2001 and earlier editions), which we have used to estimate a first set the hedonic price equations. This consistent set is available for each vintage from 1992 (1993 in the case of New Zealand) to 2000, amounting to 6,145 observations from Australia and 1,233 from New Zealand. In addition, we analyze the full data set for the '92-'00 vintages. For the Australian sample, the average quality rating is 87 points (range 65-97) and the average price is A\$23.91 (range A\$5-300). For New Zealand, the average quality rating is 88.5 points (range 73-97) and the average price is NZ\$23.37 (range NZ\$7-90). Halliday's value of sensory wine quality is defined by the variable *vintage rating* (100-point scale). He also provides a *winery rating* of the producer as a supplier of premium wine, and a *classic wine* classification in recognition of an outstanding wine. To evaluate differences in the willingness to pay for different grape varieties, we distinguish six different red and six white wine varieties or variety groupings, respectively. In order to assess the value of regional denominations in Halliday's sample, we distinguish wines from 27 different regions in Australia as well as six different regions in New Zealand. Separate equations are estimated for Australia and New Zealand. The endogenous variable (the tax-inclusive recommended retail price) is expressed in dollars per 750ml bottle.

Table 1b provides an analogous overview of our second data source from Australia's popular wine magazine *Winestate*. It provides wine ratings for 12,625 combined observations for Australia and New Zealand. In contrast to the 100-point scale for sensory wine quality adopted by Halliday, *Winestate* uses a 5-star rating scheme, assigning between 3 and 5 stars

but also using half-stars. (Some wines have no rating at all, which presumably implies less than 3 stars, so we assigned 2.5 stars for all non-rated wines.) For simplicity, we have given two points for every star, to avoid using decimals. From the *Winestate* tastings, a consistent set is available for each vintage from 1992 to 1999 (1994 to 1999 in the case of New Zealand), amounting to 11,251 observations from Australia and 1,374 from New Zealand. In addition, we analyze the full data set for all consistent observations (vintages '92-'00 for Australia and '92-'99 for New Zealand). For the Australian sample, the average quality rating is 3.25 stars and the average price is A\$19.56 (range A\$5-385). For New Zealand, the average quality rating is 3.44 stars and the average price is NZ\$20.59 (range NZ\$9-90). In order to assess regional denominations, the *Winestate* sample allows us to distinguish 28 different regions for Australia and six different regions for New Zealand.

The model

Following conventional hedonic models, we propose that a bundle of quality attributes defines any premium wine. Consumer willingness to pay is a function of that bundle of wine quality attributes. In addition to wine experts' sensory quality ratings of a particular wine each vintage and of the winery producing it (commonly available for perusal in wine shops), willingness to pay for a wine also reflects the varietal reputation and the reputation of the growing region. An individual quality indicator such as a classic wine rating assigned by wine critics may also affect buying decisions.

In general, suppose that a bundle of n different quality characteristics describe any bottle of premium wine: $\mathbf{Z} = z_1, \dots, z_n$ (e.g. sensory quality rating, regional origin, variety). Associated with this bundle is a unit price $P(\mathbf{Z})$. A hedonic price function describes the price of any particular wine i (P_{w_i}) as a function of its characteristics:

$$(1) \quad P_{w_i} = P_w(z_{i1}, \dots, z_{ij}, \dots, z_{in})$$

Following Rosen (1974), the utility maximization problem for a representative individual is

$$(2) \quad \text{Max } U = U(X, \mathbf{Z}) \quad \text{s.t. } M - P_{w_i} - X = 0$$

where X is a composite (numeraire) commodity. An implicit assumption of equation (2) is that each individual purchases only one bottle of wine i during the relevant time period. Thus, the model assumes that the quantity consumed is given and that consumers express their valuation of a particular quality attribute by varying their willingness to pay for it. The first order condition for the choice of characteristic z_j is given by

$$(3) \quad \frac{\partial U / \partial z_j}{\partial U / \partial X} = \frac{\partial P_w}{\partial z_j}.$$

Condition (3) simply states that the consumer's marginal willingness to pay for attribute z_j is equal to the marginal cost of purchasing more of z_j . $\partial P_w / \partial z_j$ is the marginal implicit price for characteristic z_j and corresponds to the regression coefficients to be estimated using equation (1). The utility function U can be rewritten as

$$(4) \quad U = U(M - P_{w_i}, z_{i1}, \dots, z_{ij}, \dots, z_{in})$$

Inverting (4), solving for P_{w_i} , and holding all but characteristic j constant yields a bid curve:

$$(5) \quad B_j = B_j(z_j, \mathbf{Z}^*, U^*)$$

Equation (5) describes the maximum amount that a representative individual would be willing to pay for one bottle of a particular wine as a function of z_j , holding other things constant. Note that U^* is the optimal utility level associated with maximization problem (2) and \mathbf{Z}^* is the vector of optimally chosen quantities for all other characteristics. A well-behaved bid curve exhibits a diminishing willingness to pay for z_j or a diminishing marginal rate of substitution between z_j and X . Because of differences in their preferences and/or incomes, consumers can have different bid curves.

Analogously, a hedonic pricing model can be developed for the supply side of the market. The inversion of the firm's cost function yields an offer curve for characteristic j , which describes the minimum price a firm would be willing to accept for one unit of a particular wine as a function of z_j , holding other things constant. In equilibrium, all bid and offer curves for each quality attribute and each market participant are tangent to the hedonic price function. However, we do not need to model the supply side of the wine market, because we assume that the market is in equilibrium. That is, consumers have made their utility-maximizing choices, given their knowledge of prices and characteristics of alternative wines and other goods. Moreover, all firms have made their profit-maximizing decisions, given their production costs and the costs of alternative wine qualities producible, and that the resulting prices and quantities clear implicit markets.

Hedonic price analysis relates the price of a good to its utility-generating characteristics and yields implicit prices for these characteristics. Thus, any quantitative or qualitative variable that affects consumer utility may be included in a hedonic price function. We formulate a model assuming that consumers, uncertain about the true sensory quality of a particular wine, adjust their willingness to pay using expert ratings of wine quality (vintage ratings) and wine producer as well as varietal and regional reputations as important criteria.

The theoretical model described so far does not restrict the functional form to be estimated, but it limits the type of explanatory variables. In the empirical literature on hedonic wine pricing, a variety of different functional forms have been explored and reported. For example, Landon and Smith (1997) examine five different functions choosing the reciprocal square root form, Oczkowski (1994) reports a log-linear form, and Nerlove (1995) compares log-linear, log-log and Box-Cox transformations. Heteroskedasticity is a potential problem given the nature of the data set. In our case, when we apply a simple Breusch-Pagan test to the linear, log-linear, and log-log functional forms and fix the level of significance for the critical χ^2 test statistic at 1%, we cannot reject the hypothesis of homoscedasticity for the

log-linear form (Breusch and Pagan 1979). Hence log-linear is the functional form we use, with $\log(\text{Price})$ as the dependent variable. An examination of the correlation matrices for the coefficient estimates suggests that no serious degree of multicollinearity is present in the data. Moreover, we observe no correlation between a single measure quality regressor and the error term which would point to measurement errors and lead to inconsistent OLS estimates as pointed out by Oczkowski (2000).

4. The results

Australia

Tables 2 and 3 present the estimation results for Australia from the Halliday and *Winestate* samples, respectively. Shiraz and Barossa Valley are chosen as the comparator variety and region (necessary to avoid the dummy variable trap). Thus, all coefficients can be thought of, as relative to what a Shiraz produced in Barossa Valley would sell for. The first column reports implicit prices for the complete pooled sample. The other columns show the estimation results for each of the eight or nine sub-samples of individual vintages. For the Halliday sample, the coefficients for “vintage rating” and “winery rating” measure the percentage price premia for a one-point increase in the 100-point scale, respectively. The dummy variable coefficients for variety and regional origin can be interpreted as a percentage price impact relative to a Barossa Valley Shiraz. The coefficient for “classic wine” reports the percentage price premium for a wine that obtained this special recognition. For the *Winestate* sample, the coefficients for “rating” measure the percentage price premia for a one-point increase (on a 10 point scale), which may in turn be interpreted as the percentage price premium for a $\frac{1}{2}$ star rating increase.

Consider first the estimates using the Halliday data (Table 2). The parameters for vintage rating are all significant and fairly constant over time. The price premium is 3.1% on average and varies between 2.4% and 4.5% for a one-point increase in the vintage rating for

the '92-'00 vintages. That is, a one point increase in Halliday's quality rating would yield an increase in the price per bottle between 43 cents and \$1.09 on an average-priced bottle of wine for each vintage over that period (see second to last row in Table 2). The coefficients for producer reputation ("winery rating") are significant for all vintages except for '92 and '00. The price premium for an average-priced bottle of wine worth \$23.91 is equivalent to 68 cents for another ½ star in Halliday's winery rating. However, it ranges between 16 cents and \$1.14 for individual vintages. Moreover, we observe a downward trend over the period analyzed which would indicate a decrease in brand reputation. Halliday's "classic wine" rating is significant for all vintages in Australia except the most recent three vintages (which are incomplete samples because many premium reds from those vintages are still to be released), and adds a price premium of about 25.1% (or A\$6.00) on average, all other things equal. Again a downward trend in this coefficient is evident reflecting a premium paid for older vintages.

Turning to the wine variety dummies, the changes over time in the parameter values for varieties reflect relative changes in consumer tastes and preferences for the various varieties. For example, Semillon and Sauvignon Blanc parameters become less negative, that is, the price discount for them relative to Barossa Valley Shiraz decreases, implying that these varieties have become less unpopular over the latter 1990s. On average they attract about a one-third discount relative to Barossa Shiraz, other things equal. For Chardonnay the discount was only half as large whereas for Riesling it averaged almost 50% (although less so in the late 1990s). Among the reds, Pinot Noir, Cabernet and Cabernet Blends attracted similar prices relative to Shiraz (less than 5% discount) not showing a significant difference for most individual vintages.⁴ However, Shiraz Blends and other reds were sold at discounts of as much as 20% or more below the Barossa Shiraz price, again all other things equal. Over time the variety parameters have become slightly more significant for the whites.

⁴ For Pinot Noir and Cabernet Blends the difference is also not significant for the whole sample.

When examining the regional dummies, note that they clearly become more significant over time. For the '92 vintage, only one region (Eden Valley) is significantly different from Barossa while for the '98 vintage, only 6 of the 26 regions are not significantly different.⁵ This pattern clearly indicates of an intensifying regional quality differentiation in Australia, with coefficients for some regions trending down while others are trending up. For example, the coefficients for wines from Tasmania first become significant in 1997 and then increase which means that they have become more popular with consumers relative to Barossa Valley wines. Strong upward trends are also evident for the newly developing super premium cool-climate regions of the Adelaide Hills, Mornington Peninsula and Yarra Valley with average premia up to 18%. By way of contrast, the wines of the warm-climate irrigated region of Riverina become heavily discounted by the mid-1990s and have remained so since then.

Now consider the estimates for the *Winestate* data (Table 3). The parameters for vintage rating are all significant but less constant over time compared to Halliday. The price premium is 6.9% on average and varies between 4.1% to 10.7% for a ½-star improvement in the sensory quality rating for the '93-'99 vintages. That is, a ½-star increase in *Winestate*'s rating would yield an increase in the price per bottle between 66 cents and A\$2.28 on an average-priced bottle of rated wine for the '93-'99 vintages (worth up to \$19.56 -- see last row in Table 3). For the '92 vintage, the percentage price premium for a ½-star rating increase is even higher at 15.6% which would yield an increase of A\$3.12 for the average priced bottle of that vintage. Unfortunately, the different rating schemes do not allow a direct comparison of the price premia for both data sets, since *Winestate* only publishes ratings of three or more stars. The two data providers also vary in the extent to which they focus on commercial, super- and ultra-premium wines (as reflected in their different average prices).

⁵ Because the data sets for the '99 and '00 vintages still exclude many super premium reds still awaiting release, less store can be put on the results for those two years.

For the variety dummies, the *Winestate* data confirms that the Semillon and Sauvignon Blanc parameters become less negative, implying that these varieties have become more popular relative to Barossa Valley Shiraz over the latter 1990s. On average, the *Winestate* data also confirms that they attract about a one-third discount relative to Barossa Shiraz, other things equal, with both coefficients almost identical to Halliday's. For Chardonnay the discount is slightly higher in the *Winestate* sample (22% compared with Halliday's 16%) whereas for Riesling it averaged 44% which is close to Halliday's 49%. Both samples confirm that the discount has declined over the 1990s. Among the reds, Pinot Noir and Merlot attracted similar prices to Shiraz (less than 5% discount), but other red varieties including Cabernet, Cabernet Blends and Shiraz Blends show discounts between 6% to 21% below the Barossa Shiraz price, again all other things equal. Compared to the results from Halliday's data set, more of these parameters have become significant as the past decade proceeded.

When examining the regional dummies, notice again that they become increasingly significant over time, although the trend is less clear than in the Halliday sample. In the sample the only region significantly different from the Barossa Valley for the '92 vintage was Rutherglen, while for the '98 and '99 vintages about half the regions are significantly different. Again, this pattern is an indication of an intensifying regional quality differentiation in Australia, with coefficients trending up or downward. Moreover, the *Winestate* data confirms the strong upward trends are evident for the newly developing super premium cool-climate regions (e.g. Adelaide Hills, Mornington Peninsula and Tasmania).

New Zealand

The results for New Zealand, shown in Tables 4 and 5, differentiate 10 varieties and 6 regions. (Absence of an entry means insufficient or no observations.) The Chardonnay variety and the region of Marlborough are chosen as the New Zealand bases. A number of interesting results, especially when compared with Australia's are worth highlighting. For

example, the parameters for Halliday's "vintage rating" are all significant and fairly constant over time, with almost the same price premium for New Zealand as for Australia (2.2% versus 3.1% for one additional quality point over the full sample period). For the individual vintages in Halliday's data set, the significant coefficients vary between 1.9% and 3.2% (which translate into price premia between 49 and 97 cents calculated at the average NZ price for each vintage). The "classic wine" parameter is almost equally significant with the premium averaging 22.6% or NZ\$5.28, not quite as much as for Australia (A\$6.00). The parameters for "winery rating" also are smaller and much less significant for New Zealand than for Australia. Variety differences are less pronounced in New Zealand too. Note that Riesling is discounted by one-third and other whites by 20-29% relative to the base variety (Chardonnay), whereas the reds enjoy considerable premia (between one-sixth and one-third), other things equal. Most strikingly, however, are the differences in the degree of regional differentiation between the two countries. For New Zealand, only five out of the 40 regional dummies (Table 4) are significantly different from the base region (Marlborough) over the full sample period (8 vintages), and the degree of difference is not large. Nor are any trends in the size or significance of coefficients obvious over time.

As was the case for Australia, very similar findings emerge for New Zealand from the *Winestate* data (Table 5) as those from the Halliday data (Table 4): vintage ratings are nearly all significant with no obvious trend over time, variety and regional differences are not pronounced, and nor are they becoming more significant over time.

Finally on the results, note that in all sub-samples the variation in prices explained by the model (R^2) is always higher for New Zealand, despite much smaller sample sizes and fewer explanatory variables. Moreover, note that the estimation results are fairly consistent across the two different data sets for each country, although the Halliday data set has the higher explanatory power. In addition, the size of the price premia that consumers are willing to pay for higher-rated wines is consistently less in New Zealand than in Australia (especially

bearing in mind that the NZ\$ was worth only 70-85 per cent of the value of the A\$ in the 1990s).

5. Implications and areas for further research

At least three clear lessons can be drawn from these results. One is that vintage ratings by independent writers/critics/judges (in this case those of *Winestate* magazine judges and for James Halliday also winery ratings and classic wine categorization) each appear to have a significant positive impact on the prices that consumers are willing to pay for premium wines, after taking into account their own reputation assessment for grape varieties and growing regions, expressed through premiums or discounts relative to a base region and variety. This is equally true for Australia and New Zealand. It is consistent with Schamel's (2000) findings for the United States, based in that case on ratings published in the US magazine *The Wine Spectator*, and suggests consumers value this information in their quest for greater knowledge about available wines.

Second, the premia consumers are willing to pay for higher-rated wines (both Halliday's and *Winestate*'s) appear to have trended downwards slightly over the 1990s. This is true also for Halliday's winery ratings. This is consistent with wine consumers in these two countries becoming more confident in their own ability to discern the quality of different wines, and hence less reliant on critics' ratings.

The third lesson is not unrelated to the second. It is that there is a clear trend towards greater regional and varietal differentiation, at least within Australia. This too suggests a greater proportion of consumers are becoming more discerning. Note, however, the weaker regional and varietal differentiation and the absence of any obvious price premia trend in New Zealand. The weaker varietal differentiation may reflect the relatively few varieties grown in New Zealand and (a point emphasized by Roberts and Reagans 2001) the newness of many of its premium wine-producing regions. And the lower price premia New Zealanders seem

willing to pay for higher-rated wines and wineries compared with Australians may simply reflect the lower per capita incomes in New Zealand and their weaker preference for wine (their per capita consumption being only 80% that of Australians).

The difference between the two markets in the degree of regional differentiation also may reflect the fact that Australia has more major premium regions that have been producing continuously for a long time than does New Zealand. The greater extent to which regional differentiation is increasing in Australia is partly a consequence of the rapid growth in the 1990s of new super-premium cool-climate regions, which are challenging the supremacy of the long-established regions. But another contributing factor is that, unlike New Zealand, Australia has introduced legislation (in 1993) to allow legal registration of regional names (technically, “geographical indications”).⁶ That legislation is providing stronger rights over the intellectual property value of regional names, thereby raising the rates of return on investments in regional promotion. Even though they cannot say anything about the profitability of such investments, the above results are not inconsistent with the view that price premia can be generated through such promotion. The European tradition of emphasizing region in addition to nation of origin would appear to be gradually taking hold in Australia. It remains to be seen whether regional reputation indicators become more or less important over time. On the one hand, regions are investing more in generic promotion of their regions; but on the other, globalization is causing individual wineries to agglomerate and put more emphasis on building their corporate brand reputation.

As for the signs and sizes of the premia/discounts attached to variety, they are consistent with common knowledge. But the fact that there are distinct premia for particular varieties, over and above a premium or discount for region of origin, distinguishes the Antipodes from Western Europe where varietal distinctions are downplayed.

⁶ This was to enable Australia to fulfill its agreement with the European Union on trade in wine, following the Uruguay Round of multilateral trade negotiations. For details see www.awbc.com.au/arms/a_regions.html. An analysis of its possible effects can be found in Kok (1999).

There is much scope for further empirical work of this sort. Two examples of other questions that might be addressed are mentioned by way of conclusion. First, to what extent are sub-national regions beginning to enjoy a price premium in markets abroad, or is it still only national recognition (“Brand Australia”) and corporate brands that matter in those export markets at this stage? An answer to this question would help to fine-tune the promotional efforts of wine companies and regional wine associations. If national generic promotion can be shown to pay abroad, the bodies responsible for that national promotion⁷ would find it easier to attract (i) funds for that generic promotion and (ii) support for regulation of wine exports to ensure the national reputation for quality exports is not tarnished.⁸ This is especially crucial in light of Tirole's (1996) theoretical result that producers may suffer a very long time from previous mistakes.

Second, how well could hedonic pricing models be applied to better understand the demand for winegrapes by wineries? Various technical features of grapes contribute to the quality of the wines made from them, but in ways that are not very transparent to grapegrowers. As quantitative measures improve for measuring those attributes winemakers are looking for, so will the scope for addressing this issue with hedonic price modeling, building on the work begun by Golan and Shalit (1993) with respect to Israeli grapes. If indeed weather variables during the grape growing season are crucial, as the empirical results of Ashenfelter (2000) and Wood (2001) suggest, those too would need to be included in addition to such variables and grape sugar level, color and acidity.

⁷ The Australian Wine and Brandy Corporation and the Wine Institute of New Zealand, respectively.

⁸ Care is needed in any such empirical work to separate the influences of quality upgrading national R&D on the supply side and promotional efforts on the demand side (see Zhao, Wittwer and Anderson 2001), as well as to distinguish corporate, regional and national generic promotion.

References

- Anderson, K. 2001. "Where in the World is the Wine Industry Going?" Plenary Paper presented at the AARES Annual Conference, Adelaide, 23-25 January. CIES Discussion Paper 0101, Centre for International Economic Studies, University of Adelaide (downloadable at <http://www.adelaide.edu.au/CIES/wine.htm#other>).
- Anderson, K. and Norman, D. 2001. *Global Wine Production, Consumption and Trade: A Statistical Compendium*, Adelaide: Centre for International Economic Studies.
- Anderson, K., D. Norman and G. Wittwer 2001. "Globalization and the World's Wine Markets: An Overview", Opening paper for the post-conference workshop (W90) of the Australian Wine Industry Technical Conference, on Understanding Developments in the World's Wine Markets, Adelaide, 11-12 October.
- Arguea, N. and C. Hsiao. 1993. "Econometric Issues of Estimating Hedonic Price Functions." *Journal of Econometrics* 56: 243-67.
- Ashenfelter, O. 2000. "Liquid Assets: The International Guide to Fine Wines." In *Optimus: The Magazine for the Private Investor*, Volume 2.
- Ashenfelter, O., D. Ashmore and R. Lalonde. 1995. "Bordeaux Wine Vintage Quality and the Weather." *Chance* 8(4): 7-14.
- Breusch T. and A. Pagan. 1979. "A Simple Test for Heteroskedasticity and Random Coefficients of Variation." *Econometrica* 47: 1287-94.
- Byron, R.P. and O. Ashenfelter. 1995. "Predicting the Quality of the Unborn Grange." *Economic Record* 71(212): 40-53, March.

- 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.
- Golan, A. and H. Shalit. 1993. "Wine Quality Differentials in Hedonic Grape Pricing." *Journal of Agricultural Economics* 44: 311 - 21.
- Halliday, J. 1999a. *Australia and New Zealand Wine Companion 2000*. Sydney: Harper Collins (and earlier issues of the book).
- Halliday, J. 1999b. *Australia and New Zealand Classic Wines*. Sydney: Harper Collins.
- Halliday, J. 2001. *Australia and New Zealand Wine Companion 2002*. Sydney: Harper Collins (and earlier issues of the book).
- Kok, S. 1999. *The Economics of Geographical Indications: A Case Study of the EU-Australia Wine Agreement*. Unpublished Honours thesis, School of Economics, University of Adelaide, November.
- 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. 2000. "Hedonic Wine Price Functions and Measurement Error." Working Paper No. 24. School of Management, Charles Stuart University, Wagga Wagga.

- Rachman, G. 1999. "The Globe in a Glass: Christmas Survey, Wine." *The Economist* 353(8150): 97-115, 18-30 December.
- Rosen, S. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy* 82: 34 - 55.
- Roberts P.W. and R. Reagans. 2001. "Market Experience, Consumer Attention and Price-Quality Relationships for New World Wines in the US Market, 1987-1999". GSIA Working Paper. Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, February.
- Schamel, G. 2000. "Individual and Collective Reputation Indicators of Wine Quality." CIES Discussion Paper 0009. Centre for International Economic Studies, University of Adelaide, March.
- Shapiro, C. 1983. "Premiums for High Quality Products as Returns to Reputations." *Quarterly Journal of Economics* 98(4): 659 - 79.
- 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
- Unwin, T. 1999. "Hedonic Price Indexes and the Qualities of Wine." *Journal of Wine Research* 10(2): 95-104.
- Waugh, F.V. 1928. "Quality Factors Influencing Vegetable Prices." *Journal of Farm Economics* 10: 185-96.
- Winestate. 2001. *Tasting Data File 2001*. Personal communication with *Winestate Magazine*, Adelaide.

Wood, D. 2001. *Predicting the Secondary Market Prices of Icon Red Wines*, unpublished Honours thesis, School of Economics, Adelaide University, November.

Zhao, X., G. Wittwer and K. Anderson. 2001. "Estimating the Distribution of Rewards from R&D and Promotion of Wine", Paper for the post-conference workshop (W90) of the Australian Wine Industry Technical Conference, on Understanding Developments in the World's Wine Markets, Adelaide, 11-12 October.

Table 1a: Description of the Halliday Data Set

Variable	Characteristic		
Log(Price)	Dependent Variable	Range: A\$5-300, NZ\$7-90	
Vintage Rating	Sensory Quality	100 Point Scale (Range 65 - 97)	
Winery Rating	Winery Ranking	5-Star Rating (2.5 – 5, NR = 2)	
Classic Wine	Special Rating	1 = Classic Rating; 0 = Not	
Cabernet Sauvignon	Red Varieties	Variety Dummies	
Cabernet Blends			
Shiraz # (AUS)			
Shiraz Blends (AUS)			
Pinot Noir			
Merlot (NZ)			
Other Red	White Varieties		
Chardonnay †			
Riesling			
Gewurztraminer (NZ)			
Sauvignon Blanc			
Semillon (AUS)			
Sweet White	South Australia	Regional Dummies for Australia	
Other White			
Adelaide Hills			
Barossa Valley #			
Clare Valley			
Coonawarra			
Eden Valley			
McLaren Vale			
Other SA			New South Wales
Canberra			
Hunter Valley			
Mudgee			
Riverina	Victoria		
Other NSW			
Bendigo			
Goulburn Valley			
Grampians			
Macedon Ranges			
Mornington Peninsula			
Pyrenees			
Yarra Valley	Western Australia		
Other VIC			
Great Southern			
Margaret River			
Perth	Tasmania		
Other WA			
Northern Tasmania	Queensland		
Southern Tasmania			
Queensland	New Zealand	Regional Dummies for New Zealand	
Auckland			
Canterbury			
Hawke's Bay			
Marlborough †			
Wairarapa			
Other NZ			

(Aus) and † (NZ) indicate the reference dummies, which we dropped from the regressions.

Table 1b: Description of the *Winestate* Data Set

Variable	Characteristic	
Log(Price)	Dependent Variable	Range: A\$5-385, NZ\$9-90
Star Rating	Sensory Quality	3, 3½, 4, 4½, 5-Stars (NR = 2½)
Point Rating	----- " -----	=> 10-Point Scale (Range 5-10)
Cabernet Sauvignon	Red Varieties	Variety Dummies
Cabernet Blends		
Shiraz #		
Shiraz Blends (AUS)		
Pinot Noir		
Merlot		
Other Red	White Varieties	Variety Dummies
Chardonnay †		
Riesling		
Sauvignon Blanc		
Semillon		
Sweet White (AUS)		
Other White	South Australia	Regional Dummies for Australia
Adelaide Hills		
Barossa Valley #		
Clare Valley		
Coonawarra		
Eden Valley		
McLaren Vale		
Other Limestone Coast		
Riverland		
Langhorne Creek		
Other SA		
Canberra	New South Wales	Regional Dummies for Australia
Hunter Valley		
Mudgee		
Riverina		
Other NSW		
Goulburn Valley	Victoria	Regional Dummies for Australia
Mornington Peninsula		
Rutherglen		
King Valley		
Yarra Valley		
Central & West VIC	Western Australia	Regional Dummies for Australia
Other VIC		
Great Southern		
Margaret River	Tasmania	Regional Dummies for Australia
Perth		
Other WA		
Tasmania	Queensland	Regional Dummies for Australia
Queensland		
Auckland	New Zealand	Regional Dummies for New Zealand
Canterbury		
Hawke's Bay		
Marlborough †		
Nelson		
Other NZ		

(Aus) and † (NZ) indicate the reference dummies, which we dropped from the regressions.

Table 2: Regression results for Australia [Halliday Data Set]

Parameter	'92-'00	2000	1999	1998	1997	1996	1995	1994	1993	1992
CONSTANT	0.184*	0.687	-0.468	-1.020*	0.116	0.478*	0.586*	0.599*	0.313	-0.347
Vintage Rating	0.031*	0.024*	0.037*	0.045*	0.031*	0.027*	0.027*	0.025*	0.028*	0.038*
Winery Rating	0.057*	0.018	0.070*	0.039*	0.047*	0.085*	0.065*	0.092*	0.081*	0.070
Classic Wine	0.251*	0.078	0.030	0.092	0.240*	0.245*	0.236*	0.269*	0.354*	0.303*
Cabernet Sauvignon	-0.047*	-0.119	0.021	-0.112*	-0.001	-0.039	-0.091	-0.035	-0.113*	-0.027
Cabernet Blends	-0.024	-0.332*	0.015	-0.126*	-0.033	-0.064	0.011	0.021	0.004	0.003
Pinot Noir	0.002	-0.049	0.103*	-0.008	-0.016	-0.054	-0.033	-0.030	-0.328*	-0.310*
Shiraz Blends	-0.179*	0.046	-0.145*	-0.225*	-0.076	-0.073	-0.202*	-0.290*	0.148	0.240
Other Red	-0.053*	-0.178	0.116*	-0.058	0.023	-0.112*	-0.094	-0.150*	-0.134	0.006
Chardonnay	-0.163*	-0.124	0.006	-0.212*	-0.159*	-0.222*	-0.187*	-0.179*	-0.108	-0.054
Riesling	-0.486*	-0.231*	-0.331*	-0.590*	-0.447*	-0.557*	-0.556*	-0.523*	-0.364*	-0.459*
Sauvignon Blanc	-0.318*	-0.164	-0.176*	-0.350*	-0.270*	-0.402*	-0.365*	-0.341*	-0.627	-0.418
Semillon	-0.339*	-0.148	-0.129	-0.345*	-0.328*	-0.421*	-0.421*	-0.424*	-0.355*	-0.316
Sweet White	-0.293*	-0.141	-0.141	-0.138	-0.322*	-0.373*	-0.178	-0.264*	-0.395*	-0.462*
Other White	-0.371*	-0.155	-0.137*	-0.416*	-0.341*	-0.397*	-0.496*	-0.454*	-0.487*	-0.231
Great Southern	0.089*	0.234*	0.019	0.248*	0.229*	0.082	-0.014	0.048	0.062	-0.118
Margaret River	0.218*	0.257*	0.186*	0.305*	0.269*	0.223*	0.131*	0.233*	0.257*	0.118
Perth	-0.081*	0.069	-0.057	0.005	0.014	-0.258*	-0.035	-0.153	-0.065	-0.019
Other WA	0.193*	0.216*	0.094	0.418*	0.275*	0.186	0.192*	0.108	0.129	0.043
Adelaide Hills	0.152*	0.263*	0.114	0.225*	0.302*	0.085	0.093	0.130	0.018	-0.221
Clare Valley	0.023	0.193*	-0.080	0.188*	0.129*	-0.003	-0.062	-0.026	0.007	-0.163
Coonawarra	0.060*	0.156	0.043	0.197*	0.111	-0.037	-0.009	0.048	0.061	-0.048
Eden Valley	0.373*	0.133	0.174	0.470*	0.441*	0.365*	0.387*	0.348*	0.275*	0.498*
McLaren Vale	0.051*	0.025	0.035	0.258*	0.078	-0.043	-0.084	0.088	0.083	-0.114
Other SA	-0.062*	0.063	0.038	0.014	0.055	-0.187*	-0.213*	-0.045	0.054	-0.290
Canberra	0.045	0.238*	0.118	0.307	0.105	-0.028	-0.040	-0.078	0.134	-0.325
Hunter Valley	-0.002	0.148*	0.017	0.151*	0.079	-0.043	-0.086	-0.101	-0.158	-0.335
Mudgee	-0.109*	0.024	-0.031	0.236*	0.006	-0.097	-0.356*	-0.380*	-0.402*	-0.452
Riverina	-0.297*	-0.214	-0.287*	-0.214*	-0.281*	-0.335*	-0.496*	-0.170	-0.246	-0.105
Other NSW	-0.045	0.209*	0.061	0.074	0.055	-0.179*	-0.147	-0.109	-0.098	-0.303
Bendigo	0.080*	0.362*	0.064	0.180	0.144	-0.075	0.059	0.079	0.098	-0.189
Goldburn Valley	0.005	-0.021	-0.189	0.170	-0.007	-0.135	-0.028	0.127	-0.019	-0.002
Grampians	0.143*	0.192	0.109	0.258*	0.187	0.024	0.257	0.077	0.061	0.191
Mcedon Ranges	0.192*	0.291*	0.149	0.355*	0.243*	0.245*	0.155	0.085	0.141	-0.134
Mornington Peninsula	0.178*	0.269*	0.151*	0.243*	0.282*	0.204*	0.135	0.167*	0.073	-0.449
Pyrenees	0.231*	0.267*	0.177*	0.331*	0.366*	0.115	0.192	0.196	0.248	0.151
Yarra Valley	0.127*	0.199*	0.123	0.182*	0.239*	0.100	0.096	0.121	0.074	0.004
Other Victoria	0.045*	0.243*	0.065	0.111*	0.046	-0.020	0.026	-0.013	0.018	-0.069
Northern Tasmania	0.092*	0.246*	-0.034	0.196*	0.183*	0.142	0.035	-0.060	-0.154	-0.078
Southern Tasmania	0.118*	0.359*	0.003	0.177*	0.167*	0.113	0.065	0.108	0.218	-0.251
Queensland	-0.037	0.136	0.198	-0.123	-0.051	0.135*	-0.085	-0.204	-0.150	0.044
# of observations	6145	424	655	1013	958	909	759	724	448	255
R ² (%)	41	30	38	41	46	46	46	46	49	47
Av. retail price (A\$)	23.91	17.98	23.63	24.28	23.50	24.04	23.99	24.78	25.30	28.92
Av. point rating	87.2	87.0	87.3	87.9	87.4	86.9	86.5	87.1	86.5	87.9
Av. winery rating (stars)	4.01	3.83	3.82	3.98	4.01	4.07	4.07	4.07	4.085	4.149
1-point price effect (A\$)	0.74	0.43	0.88	1.09	0.74	0.66	0.65	0.62	0.72	1.09
½-star price effect (A\$)	0.68	0.16*	0.82	0.47	0.56	1.02	0.79	1.14	1.03	1.01*

* = significant at the 5% level.

Table 3: Regression results for Australia [Winestate Data Set]

Parameter	'92-'99	1999	1998	1997	1996	1995	1994	1993	1992
CONSTANT	2.586*	2.550*	2.641*	2.767*	2.699*	2.634*	2.419*	2.432*	2.183*
Point Rating	0.069*	0.041*	0.045*	0.044*	0.060*	0.073*	0.092*	0.107*	0.156*
Cabernet Sauvignon	-0.063*	-0.003	-0.019	-0.062*	-0.054	-0.125*	-0.042	-0.012	-0.238*
Cabernet Blends	-0.141*	-0.149*	-0.094*	-0.141*	-0.161*	-0.199*	-0.112*	-0.103	-0.315*
Shiraz Blends	-0.212*	-0.307*	-0.254*	-0.063	-0.258*	-0.140	-0.012	-0.322*	-0.240
Pinot Noir	-0.041*	0.105*	0.087*	-0.022	-0.111*	-0.138*	-0.077	-0.011*	-0.357*
Merlot	-0.001	-0.068	0.067*	-0.016	0.021	-0.097	0.083	0.219	0.039
Other Red	-0.194*	-0.115*	-0.076*	-0.254*	-0.187*	-0.282*	-0.155*	-0.239*	-0.215
Chardonnay	-0.225*	-0.143*	-0.167*	-0.247*	-0.258*	-0.249*	-0.124*	-0.136*	-0.530*
Riesling	-0.439*	-0.250*	-0.371*	-0.440*	-0.491*	-0.525*	-0.417*	-0.347*	-0.567*
Sauvignon Blanc	-0.319*	-0.121*	-0.253*	-0.396*	-0.418*	-0.401*	-0.250*	-0.088	-0.504*
Semillon	-0.332*	-0.192*	-0.253*	-0.416*	-0.442*	-0.393*	-0.226*	-0.276*	-0.419*
Sweet White	-0.283*	-0.001	-0.116	-0.223*	-0.507*	-0.800*	-0.548*	---	---
Other White	-0.415*	-0.220*	-0.379*	-0.450*	-0.471*	-0.495*	-0.394*	-0.335*	-0.690*
Adelaide Hills	0.145*	0.248*	0.231*	0.173*	0.121*	0.083	0.064	-0.110	0.122
Clare Valley	-0.029	0.103*	0.047	0.010	-0.043	-0.052	-0.082	-0.300*	-0.125
Coonawarra	0.097*	0.089	0.186*	0.112*	0.105*	0.015	0.078	-0.053	0.068
Eden Valley	0.245*	0.147*	0.081	0.316*	0.377*	0.598*	0.905*	-0.414	0.088
McLaren Vale	0.012	0.038	0.156*	0.058	0.007	0.008	-0.152*	-0.318*	-0.159
Oth. Limestone Coast	0.062*	0.127*	0.146*	0.067	0.025	0.345*	0.070	-0.667	---
Riverland	-0.396*	-0.254*	-0.312*	-0.288*	-0.454*	-0.626*	-0.609*	-0.644*	-0.429
Langhorne Creek	-0.026	0.059	0.039	0.090	-0.118	0.073	-0.193	-0.129	-0.253
Other SA	-0.131*	0.121	-0.048	-0.057	-0.164*	-0.208*	-0.280*	-0.237*	-0.128
Canberra	-0.004	0.313	0.130	0.154	0.030	-0.115	-0.141	-0.306	-0.294
Hunter Valley	0.065*	0.179*	0.123*	0.058	0.057	0.019	0.036	-0.085	0.007
Mudgee	-0.113*	0.009	0.033	0.092	-0.201*	-0.264*	-0.427*	-0.754*	-0.252
Riverina	-0.341*	-0.407*	-0.321*	-0.328*	-0.222*	-0.351*	-0.239*	-0.230	-0.018
Other NSW	-0.049*	-0.011	-0.003	-0.011	-0.099	-0.073	-0.015	-0.225	---
Goulburn Valley	-0.096*	0.063	-0.113	-0.021	-0.143*	-0.066	-0.133	-0.081	-0.303
Mornington Peninsula	0.212*	0.300*	0.325*	0.231*	0.211	0.249*	0.053	-0.259	0.181
Rutherglen	-0.121*	0.051	-0.019	-0.105	-0.154*	-0.103	-0.132	-0.296	-0.277*
King Valley	0.058	0.157	0.063	-0.069	0.003	0.085	0.129	0.424	0.226
Yarra Valley	0.155*	0.068	0.253*	0.212*	0.128*	0.161*	0.167*	0.004	0.082
Central & West VIC	0.124*	0.187*	0.197*	0.161*	0.090	0.068	0.060	0.000	0.129
Other Victoria	-0.078*	0.094	0.019	-0.069	-0.024	-0.192*	-0.204*	-0.302*	-0.073
Great Southern	0.062*	0.219*	0.159*	0.133*	0.112*	-0.031	-0.084	-0.020	0.058
Margaret River	0.250*	0.287*	0.270*	0.363*	0.347*	0.182*	0.084	0.131	0.069
Perth	-0.047	-0.013	0.020	0.017	-0.022	-0.072	-0.170	---	-0.103
Other WA	0.040	0.186*	0.128*	0.035	-0.042	0.071	0.048	-0.280*	-0.357
Tasmania	0.205*	0.292*	0.269*	0.208*	0.190*	0.199*	0.118	-0.162	0.411
Queensland	-0.075*	0.080	0.013	-0.102	0.047	-0.219	-0.008	-0.280	-0.329
# of observations	11251	1345	2154	1993	2001	1551	1186	489	367
R ² (%)	29	36	32	31	31	32	29	36	47
Av. retail price (A\$)	19.56	15.87	19.29	20.22	20.31	20.03	20.75	21.33	19.98
Av. point rating	6.50	5.91	6.41	6.59	6.68	6.65	6.70	6.70	6.21
Av. star rating	3.25	2.96	3.20	3.29	3.34	3.32	3.35	3.35	3.11
½-star price effect (A\$)	1.36	0.65	0.86	0.88	1.21	1.456	1.92	2.28	3.12

* = significant at the 5% level.

Table 4: Regression results for New Zealand [Halliday Data Set]

Parameter	'93-'00	2000	1999	1998	1997	1996	1995	1994	1993
CONSTANT	1.006*	2.065*	0.286	1.110	0.976*	0.806*	1.255*	1.136*	0.751
Vintage Rating	0.022*	0.009	0.032*	0.020*	0.022*	0.025*	0.019*	0.020*	0.029*
Winery Rating	0.037*	0.028	0.027	0.058*	0.055*	0.035	0.037	0.056*	-0.054
Classic Wine	0.226*	0.132	0.128	0.380*	0.312*	0.190*	0.306*	0.165*	0.134
Cabernet Sauvignon	0.193*	---	-0.128	0.305*	0.004	0.234	0.161	0.179*	0.239
Cabernet Blends	0.263*	---	0.201*	0.163	0.334*	0.187*	0.476*	-0.038	---
Merlot	0.168*	0.121	0.087	0.251	0.157	0.127	0.509*	0.123	-0.134
Pinot Noir	0.187*	0.260*	0.177*	0.253*	0.036	0.156*	0.065	0.045	0.133
Other Red	0.330*	---	0.060	0.947*	---	0.368*	---	-0.156	---
Riesling	-0.341*	-0.122*	-0.113	-0.368*	-0.314*	-0.359*	-0.343*	-0.512*	-0.476*
Gewurztraminer	-0.244*	---	---	-0.262	-0.117	-0.194	-0.056	-0.363*	-0.587
Sauvignon Blanc	-0.293*	-0.145*	-0.068	-0.270*	-0.354*	-0.267*	-0.254*	-0.324*	-0.290
Sweet White	0.047	0.296*	0.121	0.165	0.001	-0.008	0.056	-0.020	-0.057
Other White	-0.202*	0.020	-0.172	-0.149	-0.198*	-0.186	-0.252*	-0.360*	-0.471
Auckland	-0.053*	-0.071	-0.064	-0.051	-0.099*	-0.043	-0.054	-0.013	0.057
Canterbury	0.032	-0.054	0.083	0.047	-0.007	0.073	-0.101	0.195*	0.116
Hawke's Bay	0.016	0.018	0.040	0.144	-0.004	0.005	-0.096	-0.036	0.058
Wairarapa	0.115*	0.096	0.202*	0.024	0.144*	0.122	0.091	0.107*	0.200
Other NZ	0.045*	-0.035	0.089	0.094	0.003	0.093	0.141	0.020	0.067
# of observations	1233	175	175	150	191	216	117	143	53
R ² (%)	58	40	43	70	64	52	76	70	56
Av. retail price (NZ\$)	23.37	19.46	30.31	23.03	21.30	23.39	23.70	22.09	23.45
Av. point rating	88.5	89.5	89.6	89.0	88.7	87.3	86.7	89.0	88.3
Av. winery rating (stars)	4.06	4.09	4.11	3.92	3.99	4.10	4.08	4.10	4.15
1-point price effect (NZ\$)	0.52	0.18*	0.96	0.46	0.48	0.57	0.45	0.44	0.68
½-star price effect (NZ\$)	0.44	0.27*	0.41*	0.67	0.58	0.41*	0.44*	0.62	-0.63*

* = significant at the 5% level.

Table 5: Regression results for New Zealand [Winestate Data Set]

Parameter	'94-'99	1999	1998	1997	1996	1995	1994
CONSTANT	2.761*	2.530*	2.963*	2.782*	2.608*	2.760*	2.800*
Point Rating	0.044*	0.048*	0.014	0.042*	0.065*	0.041*	0.047
Cabernet Sauvignon	0.063	---	0.032	0.031	0.170	0.000	0.038
Cabernet Blends	0.140*	---	-0.107	0.269*	0.289*	0.174*	-0.024
Merlot	0.078*	---	0.032	0.150*	0.047	0.184*	0.007
Pinot Noir	0.232*	---	0.352*	0.291*	0.218*	0.090	0.134
Shiraz	0.091	---	---	---	0.156	---	0.077
Other Red	0.031	0.115	-0.179*	0.014	0.145	0.178	---
Riesling	-0.239*	-0.037	-0.212*	-0.256*	-0.220*	-0.282*	-0.342*
Sauvignon Blanc	-0.255*	-0.095	-0.223*	-0.258*	-0.255*	-0.304*	-0.027
Semillon	-0.142*	---	-0.073	-0.096	-0.135	-0.335*	---
Other White	-0.256*	0.195*	-0.227*	-0.266*	-0.309*	-0.369*	-0.415
Auckland	-0.087*	-0.061	-0.063	-0.099*	-0.067	-0.089	-0.050
Canterbury	-0.091*	---	---	-0.157*	-0.041	-0.002	-0.137
Hawke's Bay	0.058*	-0.111	0.005	0.147*	0.042	0.001	0.139
Nelson	-0.103*	-0.088	-0.118	-0.105	-0.023	-0.098	---
Other NZ	0.064*	0.124	-0.054	0.076	0.109*	0.116	0.043
# of observations	1374	126	248	344	362	194	90
R ² (%)	37	28	33	48	41	47	26
Av. retail price (NZ\$)	20.59	17.70	19.62	20.30	21.23	21.14	24.43
Av. point rating	6.88	7.09	6.66	6.75	6.97	6.90	7.31
Av. star rating	3.44	3.54	3.33	3.38	3.49	3.45	3.66
½-star price effect (NZ\$)	0.90	0.85	0.27*	0.84	1.37	0.87	1.14*

* = significant at the 5% level.

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