# Chapter 2

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

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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 1992–2000. The results show regional reputations have become increasingly differentiated through time (although less so for New Zealand). In particular, cool-climate regions are becoming increasingly preferred over other regions 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.

## 1. Introduction

For more than a decade the wine industry has been booming in Australia and New Zealand. Both the area planted to vineyards and the volume of premium wine produced have grown at 7 + per cent per year on average since 1990, while the two countries' exports of wine have been growing at 15 + per cent per year (from a low base). Simultaneously, wine exports from California, South Africa and Chile have been soaring, such that the share of global wine production that is exported has risen from 15% to 30% in just a dozen years. Yet per capita wine consumption has grown little in

*This article originally appeared in *The Economic Record* (2003), 79(246), 357–369.

Australia and New Zealand and 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 U.K., the U.S., and (from a tiny base) East Asia (Anderson and Norman, 2003). In each of these markets, however, 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, 2003; Anderson *et al.*, 2003).

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 newly released 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 the 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 chapter addresses this question as it relates to Australian and New Zealand wines, using a hedonic pricing model. Our analysis extends previous studies in a number of ways. First, we simultaneously examine two very large data samples of quality ratings (Halliday, 2001; Winestate, 2001), each drawn from the same base population of wines and consumers, which enables us to make direct comparisons between them. Second, we are able to expose changes in reputations over the past decade when wine markets

[1]Thanks are due to the editor, referees and numerous colleagues for comments on earlier drafts presented at the AARES Conference in Adelaide in January 2001, the Enometrics VIII Conference in the Napa Valley in May 2001, and the CIES Workshop on Understanding Developments in the World's Wine Markets in Adelaide in October 2001; to Australia's Grape and Wine Research and Development Corporation, Rural Industries Research and Development Corporation, and the Australian Research Council as well as the German Academic Exchange Service (DAAD) for financial support; and to James Halliday and Peter Simic for kindly providing their very extensive tastings databases.

changed dramatically. Finally, we include indicators for sensory quality, producer reputation, variety, and regional origin for not only Australia but also New Zealand, which allows us to directly compare both countries on various grounds (e.g., regional and variety differentials).

This chapter 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 our empirical results for the markets in Australia and New Zealand separately over nine vintages. The final section summarizes what has been learnt and suggests areas for further research.

## 2. Previous Studies

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 when making a purchasing decision. The observed market price is the sum of implicit prices paid for each quality attribute.

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, consumers' perceptions of a wine's quality depends on producer reputation, the collective reputation of the wine region of production, and the grape variety (or varieties) used. 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

[2]This is to be distinguished from consumer perceptions over time of the changing quality of ultrapremium wines as they mature in bottle following the initial sale by the winery, as captured by time series of prices in the secondary auction markets. According to Ashenfelter (2000), Ashenfelter *et al.* (1995), Byron and Ashenfelter (1995) and Wood and Anderson (2002), key determinants of the vintage-to-vintage variation in the quality of maturing wines are a few straightforward weather variables in the growing season — information that consumers appear to have ignored in the past.

that may be interpreted as a return from producer investments in building reputation. On the demand side of the market, too, it is costly for consumers to improve their information about product quality. 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 become better informed. A favorable producer or winery rating assigned by a wine expert, for example, may serve as a way to reduce consumers' 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 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 in such cases can be regained. A favorable collective reputation of a particular wine region relative to other regions may provide another effective means of reducing consumers' decision-making costs.

Roberts and Reagans (2001) examine market experience, consumer attention, and price-quality relationships for New World wines in the United States market. They argue that the 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 United States 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). That 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 than red wine, but both regional reputation and individual quality indicators seem to be more important to red wine consumers in the United States. 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.

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 premia or discounts relative to a base region and variety. The present chapter analyzes such quality and reputation indicators for premium wines from Australia and New Zealand. For each country, we examine Halliday's (1999, 2001) data sets for nine vintages. Moreover, we analyze a second data set with more than 12,500 tasting scores for premium wines for the same two countries and up to eight vintages (Winestate, 2001). This enables us to compare hedonic pricing model results for two different data sets drawn from the same base population of wines and consumers and for the same vintages.

## 3. The Data and Hedonic Price Model

### 3.1. *The data*

In Table 1, we provide an overview of the data set from the well-known Australian wine critic James Halliday,[3] which we use to estimate the first set of hedonic price equations for each vintage from 1992 (1993 in the case of New Zealand) to 2000. The set includes 6866 observations from Australia and 1531 from New Zealand. For the Australian sample, the average quality rating is 87.2 points (range 70–97) and the average price is A$23.81 (range A$5–300). For New Zealand, the average quality rating is 88.6 points (range 73–97) and the average price is NZ$23.25 (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* (2.5–5 stars) 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

[3]Halliday data are made publicly available in annual books (see Halliday, 2001 and earlier editions). We were kindly provided with an integrated database for the whole period, however, which minimizes any inconsistencies from one yearbook to the next. There was of course some inflation over the 1990s (though much less than in earlier decades), but that is not a major problem in this study as we assess each vintage separately rather than pool the series.

Table 1. Description of James Halliday's (JH) Data Set

| Variable |
|---|
| Dependent Variable: Log(Price), Range A$5–300, NZ$7–90 |
| Vintage Rating: 100-Point Scale, Range 70–97 |
| Winery Rating: 5-Star Rating, Range 2.5–5 (NR = 2) |
| Classic Wine: 1 = Classic Rating; 2 = Not |
| Variety Dummies: Red |
| Cabernet Sauvignon |
| Cabernet Blends |
| Shiraz[a] (AUS) |
| Shiraz Blends (AUS) |
| Pinot Noir |
| Merlot (NZ) |
| Other Red |
| Variety Dummies: White |
| Chardonnay[b] |
| Riesling |
| Gewurztraminer (NZ) |
| Sauvignon Blanc |
| Semillon (AUS) |
| Sweet White |
| Other White |
| Regional Dummies: South Australia |
| Adelaide Hills |
| Barossa Valley[a] |
| Clare Valley |
| Coonawarra |
| Eden Valley |
| McLaren Vale |
| Other SA |
| Regional Dummies: ACT and NSW |
| Canberra |
| Hunter Valley |
| Mudgee |
| Riverina |
| Other NSW |
| Regional Dummies: Victoria |
| Bendigo |
| Goulburn Valley |
| Grampians |
| Macedon Ranges |
| Mornington Peninsula |
| Pyrenees |
| Yarra Valley |
| Other Vic. |

(*Continued*)

Table 1. (*Continued*)

| Variable |
|---|
| Regional Dummies: Western Australia |
| Great Southern |
| Perth |
| Margaret River |
| Other WA |
| Regional Dummies: Tasmania and Queensland |
| Northern Tasmania |
| Southern Tasmania |
| Queensland |
| Regional Dummies: New Zealand |
| Auckland |
| Canterbury |
| Hawke's Bay |
| Marlborough[b] |
| Wairarapa |
| Other NZ |

*Notes*: [a](AUS) and [b](NZ) indicate the reference dummies, which we dropped from the regressions.

variable (the tax inclusive recommended retail price) is expressed in local dollars per 750 mL bottle.

Table 2 provides an analogous overview of our second data source from Australia's popular wine magazine *Winestate*.[4] 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 (1994–1999 in the case of New Zealand), amounting to 11,251 observations from Australia and 1374 from 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

[4]As pointed out by Oczkowski (1994; footnote 4), *Winestate* uses a panel of judges that changes over time and so it provides a less consistent set of assessments than that provided by Halliday. It also includes a value-for-money consideration in its ratings. Even so, we thought it was worth doing the comparative analysis to see to what extent the *Winestate* data support the findings based on Halliday's data.

Table 2. Description of the Winestate (WS) Data Set

| Variable |
|---|
| Dependent Variable: Log(Price), Range A$5–385, NZ$9–90 |
| Star Rating: 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5 Stars (NR = $2\frac{1}{2}$) |
| Point Rating: Conversion of star rating to a 10-Point Scale, Range 5–10 |
| Variety Dummies: Red |
| Cabernet Sauvignon |
| Cabernet Blends |
| Shiraz[a] |
| Shiraz Blends (AUS) |
| Pinot Noir |
| Merlot |
| Other Red |
| Variety Dummies: White |
| Chardonnay[b] |
| Riesling |
| Sauvignon Blanc |
| Semillon |
| Sweet White (AUS) |
| Other White |
| Regional Dummies: South Australia |
| Adelaide Hills |
| Barossa Valley[a] |
| Clare Valley |
| Coonawarra |
| Eden Valley |
| McLaren Vale |
| Other Limestone Coast |
| Riverland |
| Langhorne Creek |
| Other SA |
| Regional Dummies: ACT and NSW |
| Canberra |
| Hunter Valley |
| Mudgee |
| Riverina |
| Other NSW |
| Regional Dummies: Victoria |
| Goulburn Valley |
| Mornington Peninsula |
| Rutherglen |
| King Valley |
| Yarra Valley |
| Central & West Vic. |
| Other Vic. |

(*Continued*)

Table 2. (*Continued*)

| Variable |
|---|
| Regional Dummies: Western Australia |
| Great Southern |
| Perth |
| Margaret River |
| Other WA |
| Regional Dummies: Tasmania and Queensland |
| Tasmania |
| Queensland |
| Regional Dummies: New Zealand |
| Auckland |
| Canterbury |
| Hawke's Bay |
| Marlborough[b] |
| Nelson |
| Other NZ |

*Notes*: [a](AUS) and [b](NZ) indicate the reference dummies, which we dropped from the regressions.

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.

### 3.2. *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, of each vintage and of the winery producing it (such ratings books are commonly available for perusal in wine shops), willingness to pay for a wine also reflects consumers' perception of the varietal reputation and the reputation of the producing region. An individual quality indicator such as a classic wine rating assigned by wine critics may also affect buying decisions.

Hedonic price analysis relates the price of a good to its utility-generating characteristics, and generates 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 of the wine producer as well as their own perception of varietal and regional reputations.[5]

The theoretical model described above limits the type of explanatory variables, but it does not restrict the functional form to be estimated. 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. The log-linear form has been applied in a number of published studies, including Oczkowski (1994, 2001), Nerlove (1995), and Combris *et al.* (1997). In our case, following Oczkowski, the results of applying a RESET-test to the linear, log-linear, and log-log functional forms lead us to prefer the loglinear specification, with log(Price) as the dependent variable (see Table 3). An examination of the correlation matrices for the coefficient estimates suggests that no serious degree of multicollinearity is present in the data. Moreover, we take note of the point stressed by Oczkowski (2001) that serious correlation between a single measure quality regressor and the error term would point to measurement errors and lead to inconsistent OLS (ordinary least squares) estimates. To test for that, we conducted a standard Hausman test using the average of the quality ratings for each producer label as an instrumental variables.[6] As is clear from Table 4, where more than 30 subsets of data are shown, only in five cases were the results significant at the 1% level and another five at the 5% level. We therefore conclude that in this study we do not have a serious problem of dependence between the quality ratings and the error term.

## 4. What Do the Results Show?

### 4.1. *Australia*

Tables 5 and 6 present the estimation results for Australia from the Halliday and *Winestate* samples, respectively. Shiraz and Barossa Valley are chosen as

[5]Previous studies have included other variables such as cellaring potential, year of marketing and producer size (see, e.g., Oczkowski, 1994). We did not have such variables available for our full time series, so cannot expect as high an adjusted $R^2$ value.

[6]There are 765 (923) different producers in the Halliday (*Winestate*) sample for Australia. For New Zealand, there are 203 (205) different producers in the Halliday (Winestate) data set.

Table 3. RESET F-test Statistics

| From | Sample | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|
| Log-linear | JH AUS | 6.14* | 6.65* | 29 | 22.9 | 62.4 | 52.4 | 26.3 | 18.2 | 6.68* |
| | JH NZ | 0.58** | 7.70 | 6.23* | 12.93 | 6.64* | 8.91 | 1.89** | 0.36** | — |
| | WS AUS | — | 0.16** | 0.30** | 4.73* | 19.6 | 0.04** | 6.17* | 4.99* | 0.09** |
| | WS NZ | — | 1.76** | 1.60** | 1.42** | 2.37** | 0.22** | 0.04** | — | — |
| Log-log | JH AUS | 7.41 | 11.0 | 29.8 | 22.4 | 53.2 | 54.0 | 29.9 | 19.6 | 7.50 |
| | JH NZ | 0.55** | 13.1 | 6.33* | 14.3 | 6.73* | 11.2 | 2.18** | 0.38** | — |
| | WS AUS | — | 0.08** | 0.38** | 5.02* | 20.4 | 0.002** | 5.46* | 5.22* | 0.18** |
| | WS NZ | — | 0.35** | 2.40** | 0.74** | 1.55** | 2.05** | 0.18** | 0.09** | — |
| Linear | JH AUS | 26.0 | 59.1 | 152.3 | 82.5 | 154.9 | 131.3 | 97.3 | 58.6 | 39.4 |
| | JH NZ | 0.09** | 23.2 | 34.1 | 70.6 | 52.2 | 72.7 | 12.6 | 1.50** | — |
| | WS AUS | — | 9.47 | 18.5 | 19.3 | 45.5 | 17.7 | 185.9 | 26.7 | 39.9 |
| | WS NZ | — | 2.05** | 7.24 | 11.7 | 0.05** | 1.05** | 0.14** | — | — |

*Notes*: **, *indicate significance at least at the 10% and 1% levels, respectively. JH, James Halliday; WS, *Winestate* magazine.

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Table 4. Hausman $\chi^2$-test Statistics

| From | Sample | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|
| Log-linear | JH AUS | 7.74 | $3.58^{**}$ | 15.4 | $5.81^{*}$ | $2.13^{***}$ | $2.42^{***}$ | $4.41^{*}$ | $0.28^{***}$ | $2.18^{***}$ |
| | JH NZ | $5.20^{*}$ | $1.35^{***}$ | $3.65^{**}$ | $6.61^{*}$ | $2.69^{***}$ | $0.54^{***}$ | $0.047^{***}$ | $2.60^{***}$ | — |
| | WS AUS | — | $0.52^{***}$ | 10.12 | 7.90 | $6.07^{*}$ | 29.4 | 16.7 | 8.72 | $0.51^{***}$ |
| | WS NZ | — | $3.18^{**}$ | $0.90^{**}$ | $0.002^{***}$ | $5.80^{*}$ | $0.08^{***}$ | $2.47^{***}$ | — | — |

*Notes*: $^{***}$, $^{**}$, $^{*}$indicate significance at least at the 10%, 5%, 1% levels, respectively. JH, James Halliday; WS, *Winestate* magazine.

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Table 5. Regression Results for Australia (Halliday Data Set)

| Parameter | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 |
|---|---|---|---|---|---|---|---|---|---|
| CONSTANT | 0.931* | −0.353 | −0.734* | 0.093 | 0.491** | 0.503** | 0.639** | 0.340 | −0.337 |
| Vintage Rating | 0.023* | 0.036* | 0.041* | 0.032* | 0.028* | 0.029* | 0.025* | 0.029* | 0.038* |
| Winery Rating | 0.021 | 0.046* | 0.051* | 0.055* | 0.093* | 0.069* | 0.093* | 0.075** | 0.082*** |
| Classic Wine | 0.066 | 0.055 | 0.159* | 0.271* | 0.235* | 0.259* | 0.281* | 0.361* | 0.275* |
| Cabernet Sauvignon | −0.243 | 0.034 | −0.045 | 0.003 | −0.059 | −0.118** | −0.036− | 0.104*** | −0.020 |
| Cabernet Blends | −0.444* | 0.012 | −0.070***− | 0.038 | −0.065 | 0.000 | 0.025 | 0.013 | 0.022 |
| Pinot Noir | −0.223** | 0.060 | 0.040 | −0.013 | −0.086 | −0.092 | −0.029 | 0.145 | 0.245 |
| Shiraz Blends | −0.099 | −0.111*** | −0.133** | −0.038 | −0.110 | −0.236* | −0.278* | −0.322* | −0.302** |
| Other Red | −0.347* | 0.073*** | −0.009 | 0.008 | −0.110** | −0.110*** | −0.136*** | −0.119 | 0.018 |
| Chardonnay | −0.288* | −0.070** | −0.160* | −0.174* | −0.250* | −0.219* | −0.176* | −0.103*** | −0.051 |
| Riesling | −0.420* | −0.339* | −0.531* | −0.471* | −0.597* | −0.581* | −0.537* | −0.379* | −0.505* |
| Sauvignon Blanc | −0.336* | −0.178* | −0.318* | −0.290* | −0.421* | −0.391* | −0.334* | −0.631*** | −0.406 |
| Semillon | −0.324* | −0.187* | −0.316* | −0.356* | −0.446* | −0.421* | −0.419* | −0.368* | −0.302 |
| Sweet White | −0.322** | −0.152** | −0.102 | −0.337* | −0.375* | −0.200* | −0.205 | −0.359* | −0.457** |
| Other White | −0.316* | −0.183* | −0.382* | −0.353* | −0.423* | −0.513* | −0.447* | −0.466* | −0.186 |
| Great Southern | 0.267* | 0.094 | 0.163* | 0.192* | 0.016 | −0.087 | −0.004 | −0.019 | −0.191 |
| Perth | 0.086 | −0.070 | −0.001 | 0.022 | −0.293* | −0.088 | −0.243** | −0.151 | −0.115 |
| Margaret River | 0.276* | 0.212 | 0.278* | 0.234* | 0.163* | 0.055 | 0.181** | 0.173*** | 0.040 |
| Other WA | 0.233** | 0.139** | 0.297* | 0.244** | 0.123 | 0.059 | 0.040 | 0.008 | −0.030 |
| Adelaide Hills | 0.301* | 0.183* | 0.183* | 0.342* | 0.136*** | 0.163*** | 0.164*** | −0.006 | −0.023 |
| Clare Valley | 0.234* | 0.008 | 0.109** | 0.073 | −0.099*** | −0.154** | −0.105 | −0.097 | −0.260** |
| Coonawarra | 0.177*** | 0.032 | 0.112** | 0.066 | −0.095*** | −0.067 | −0.029 | −0.065 | −0.155 |
| Eden Valley | 0.152*** | 0.080 | 0.248* | 0.288* | 0.202** | 0.185** | 0.205** | 0.006 | 0.287 |
| McLaren Vale | 0.056 | 0.063 | 0.171* | 0.023 | −0.099*** | −0.150** | 0.040 | −0.007 | −0.193*** |

(*Continued*)

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Table 5. (*Continued*)

| Parameter | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 |
|---|---|---|---|---|---|---|---|---|---|
| Other SA | $-0.194^{**}$ | $-0.126^{**}$ | $-0.126^{**}$ | $-0.084$ | $-0.281^{*}$ | $-0.259^{*}$ | $-0.132$ | $-0.119$ | $-0.439^{**}$ |
| Canberra | $0.253^{*}$ | $0.205^{**}$ | 0.123 | 0.060 | $-0.087$ | $-0.098$ | $-0.120$ | 0.055 | $-0.392^{**}$ |
| Hunter Valley | $0.163^{*}$ | $0.082^{***}$ | $0.086^{***}$ | 0.055 | $-0.119^{**}$ | $-0.166^{**}$ | $-0.165^{**}$ | $-0.231^{**}$ | $-0.407^{**}$ |
| Mudgee | 0.045 | 0.029 | 0.131 | $-0.085$ | $-0.115$ | $-0.346^{*}$ | $-0.323^{*}$ | $-0.483^{*}$ | $-0.523$ |
| Riverina | $-0.280^{**}$ | $-0.211^{*}$ | $-0.180^{***}$ | $-0.332^{*}$ | $-0.434^{*}$ | $-0.573^{*}$ | $-0.304^{***}$ | $-0.404^{*}$ | $-0.171$ |
| Other NSW | $0.252^{*}$ | 0.066 | $-0.008$ | 0.022 | $-0.239^{*}$ | $-0.245^{*}$ | $-0.170^{***}$ | $-0.200^{***}$ | $-0.382$ |
| Bendigo | $0.376^{*}$ | 0.073 | $0.148^{***}$ | 0.117 | $-0.141$ | $-0.004$ | 0.036 | 0.023 | $-0.265$ |
| Goulburn Valley | 0.009 | $-0.064$ | 0.074 | $-0.031$ | $-0.199^{**}$ | $-0.093$ | 0.083 | $-0.098$ | $-0.074$ |
| Grampians | $0.218^{**}$ | $0.206^{***}$ | $0.275^{*}$ | $0.188^{***}$ | $-0.020$ | 0.170 | 0.029 | $-0.015$ | 0.110 |
| Macedon Ranges | $0.322^{*}$ | $0.264^{*}$ | $0.388^{*}$ | $0.211^{**}$ | $0.214^{***}$ | 0.095 | 0.139 | 0.055 | $-0.190$ |
| Mornington Peninsula | $0.310^{*}$ | $0.233^{*}$ | $0.221^{*}$ | $0.236^{*}$ | $0.158^{***}$ | 0.107 | 0.126 | 0.018 | $-0.541$ |
| Pyrenees | $0.280^{**}$ | $0.262^{*}$ | 0.146 | $0.264^{*}$ | 0.056 | 0.141 | 0.151 | 0.168 | 0.071 |
| Yarra Valley | $0.212^{*}$ | $0.173^{*}$ | $0.200^{*}$ | $0.197^{*}$ | 0.056 | 0.051 | 0.075 | $-0.014$ | $-0.075$ |
| Other Victoria | $0.266^{*}$ | $0.087^{***}$ | 0.044 | $-0.006$ | $-0.077$ | $-0.033$ | $-0.068$ | $-0.065$ | $-0.151$ |
| Northern Tasmania | $0.259^{*}$ | 0.083 | $0.141^{***}$ | 0.120 | 0.085 | $-0.005$ | $-0.105$ | 0.142 | $-0.328$ |
| Southern Tasmania | $0.386^{*}$ | $0.158^{*}$ | $0.149^{**}$ | 0.122 | 0.064 | 0.018 | 0.067 | $-0.232$ | $-0.162$ |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Queensland | 0.105 | 0.147 | −0.054 | −0.073 | 0.089 | −0.130 | −0.249 | −0.232 | −0.015 |
| No. of Observations | 429 | 999 | 1281 | 1033 | 929 | 767 | 725 | 448 | 255 |
| Adjusted. $R^2$(%) | 29.4 | 39.4 | 38.5 | 44.8 | 44.4 | 43.6 | 42.7 | 43.7 | 37.5 |
| Average Retail Price (A$) | 18.01 | 21.57 | 24.39 | 24.03 | 24.45 | 24.50 | 24.75 | 25.24 | 28.90 |
| Average Vintage Rating (points) | 87.0 | 86.8 | 87.8 | 87.5 | 86.9 | 86.6 | 87.1 | 86.5 | 87.9 |
| Average Winery Rating (stars) | 3.83 | 3.89 | 3.96 | 4.03 | 4.08 | 4.08 | 4.07 | 4.08 | 4.15 |
| 1-point price effect (A$) | 0.41* | 0.79* | 1.01* | 0.77* | 0.68* | 0.71* | 0.62* | 0.74* | 1.10* |
| $\frac{1}{2}$-star price effect (A$) | 0.19 | 0.50* | 0.62* | 0.66* | 1.13* | 0.84* | 1.15* | 0.94** | 1.19*** |

*Notes*: ***, **, * indicate significance at least at the 10%, 5%, 1% levels, respectively.

Table 6. Regression Results for Australia (Winestate Data Set)

| Parameter | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 |
|---|---|---|---|---|---|---|---|---|
| CONSTANT | 2.550* | 2.641* | 2.767* | 2.699* | 2.634* | 2.419* | 2.432* | 2.183* |
| VintageRating | 0.041* | 0.045* | 0.044* | 0.060* | 0.073* | 0.092* | 0.107* | 0.156* |
| Cabernet Sauvignon | −0.003 | −0.019 | −0.062** | −0.054*** | −0.125* | −0.042 | −0.012 | −0.238* |
| Cabernet Blends | −0.149* | −0.094* | −0.141* | −0.161* | −0.199* | −0.112** | −0.103 | −0.315** |
| Shiraz Blend | −0.307* | −0.254* | −0.063 | −0.258* | −0.140*** | −0.012 | −0.322* | −0.240 |
| Pinot Noir | 0.105** | 0.087** | −0.022 | −0.111** | −0.138* | −0.077 | −0.011* | −0.357** |
| Merlot | −0.068 | 0.067** | −0.016 | 0.021 | −0.097 | 0.083 | 0.219 | 0.039 |
| Other Red | −0.115** | −0.076** | −0.254* | −0.187* | −0.282* | −0.155* | −0.239* | −0.215*** |
| Chardonnay | −0.143* | −0.167* | −0.247* | −0.258* | −0.249* | −0.124* | −0.136* | −0.530* |
| Riesling | −0.250* | −0.371* | −0.440* | −0.491* | −0.525* | −0.417* | −0.347* | −0.567* |
| Sauvignon Blanc | −0.121* | −0.253* | −0.396* | −0.418* | −0.401* | −0.250** | −0.088 | −0.504* |
| Semillon | −0.192* | −0.253* | −0.416* | −0.442* | −0.393* | −0.226* | −0.276* | −0.419* |
| Sweet White | −0.001 | −0.116 | −0.223** | −0.507* | −0.800* | −0.548* | — | — |
| Other White | −0.220* | −0.379* | −0.450* | −0.471* | −0.495* | −0.394* | −0.335* | −0.690* |
| Adelaide Hills | 0.248* | 0.231* | 0.173* | 0.121* | 0.083*** | 0.064 | −0.110 | 0.122 |
| Clare Valley | 0.103** | 0.047 | 0.010 | −0.043 | −0.052 | −0.082 | −0.300* | −0.125 |
| Coonawarra | 0.089 | 0.186* | 0.112* | 0.105* | 0.015 | 0.078*** | −0.053 | 0.068 |
| Eden Valley | 0.147** | 0.081 | 0.316* | 0.377* | 0.598* | 0.905* | −0.414 | 0.088 |
| McLaren Vale | 0.038 | 0.156* | 0.058*** | 0.007 | 0.008 | −0.152* | −0.318* | −0.159 |
| Other Limestone Coast | 0.127* | 0.146* | 0.067 | 0.025 | 0.345** | 0.070 | −0.667*** | — |
| Riverland | −0.254* | −0.312* | −0.288* | −0.454* | −0.626* | −0.609* | −0.644* | −0.429*** |
| Langhorne Creek | 0.059 | 0.039 | 0.090 | −0.118 | 0.073 | −0.193 | −0.129 | −0.253 |
| Other SA | 0.121 | −0.048 | −0.057 | −0.164* | −0.208* | −0.280* | −0.237* | −0.128 |
| Canberra | 0.313*** | 0.130 | 0.154 | 0.030 | −0.115 | −0.141 | −0.306*** | −0.294 |
| Hunter Valley | 0.179* | 0.123* | 0.058*** | 0.057 | 0.019 | 0.036 | −0.085 | 0.007 |
| Mudgee | 0.009 | 0.033 | 0.092*** | −0.201* | −0.264* | −0.427* | −0.754* | −0.252 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Riverina | $-0.407^{*}$ | $-0.321^{*}$ | $-0.328^{*}$ | $-0.222^{*}$ | $-0.351^{*}$ | $-0.239^{**}$ | $-0.230$ | $-0.018$ |
| Other NSW | $-0.011$ | $-0.003$ | $-0.011$ | $-0.099^{***}$ | $-0.073$ | $-0.015$ | $-0.225$ | — |
| Goulburn Valley | 0.063 | $-0.113$ | $-0.021$ | $-0.143^{**}$ | $-0.066$ | $-0.133^{***}$ | $-0.081$ | $-0.303^{***}$ |
| Mornington Peninsula | $0.300^{*}$ | $0.325^{*}$ | $0.231^{*}$ | $0.211^{***}$ | $0.249^{*}$ | 0.053 | $-0.259^{***}$ | 0.181 |
| Rutherglen | 0.051 | $-0.019$ | $-0.105^{***}$ | $-0.154^{**}$ | $-0.103$ | $-0.132^{***}$ | $-0.296^{***}$ | $-0.277^{**}$ |
| King Valley | 0.157 | 0.063 | $-0.069$ | 0.003 | 0.085 | 0.129 | $0.424^{***}$ | 0.226 |
| Yarra Valley | 0.068 | $0.253^{*}$ | $0.212^{*}$ | $0.128^{*}$ | $0.161^{*}$ | $0.167^{**}$ | 0.004 | 0.082 |
| Central & West Vic. | $0.187^{*}$ | $0.197^{*}$ | $0.161^{*}$ | $0.090^{***}$ | 0.068 | 0.060 | 0.000 | 0.129 |
| Other Victoria | 0.094 | 0.019 | $-0.069$ | $-0.024$ | $-0.192^{**}$ | $-0.204^{**}$ | $-0.302^{*}$ | $-0.073$ |
| Great Southern | $0.219^{*}$ | $0.159^{*}$ | $0.133^{**}$ | $0.112^{**}$ | $-0.031$ | $-0.084$ | $-0.020$ | 0.058 |
| Margaret River | $0.287^{*}$ | $0.270^{*}$ | $0.363^{*}$ | $0.347^{*}$ | $0.182^{*}$ | 0.084 | $0.131^{***}$ | 0.069 |
| Perth | $-0.013$ | 0.020 | 0.017 | $-0.022$ | $-0.072$ | $-0.170^{***}$ | — | $-0.103$ |
| Other WA | $0.186^{*}$ | $0.128^{**}$ | 0.035 | $-0.042$ | 0.071 | 0.048 | $-0.280^{*}$ | $-0.357$ |
| Tasmania | $0.292^{*}$ | $0.269^{*}$ | $0.208^{*}$ | $0.190^{**}$ | $0.199^{*}$ | 0.118 | $-0.162$ | 0.411 |
| Queensland | 0.080 | 0.013 | $-0.102$ | 0.047 | $-0.219$ | $-0.008$ | $-0.280$ | $-0.329$ |
| No.of Observations | 1345 | 2154 | 1993 | 2001 | 1551 | 1186 | 489 | 367 |
| Adj. $R^2$(%) | 34.2 | 30.9 | 29.7 | 29.7 | 30.5 | 26.3 | 30.4 | 40.8 |
| Average Retail Price (A$) | 15.87 | 19.29 | 20.22 | 20.31 | 20.03 | 20.75 | 21.33 | 19.98 |
| Average Vintage Rating (stars) | 2.96 | 3.20 | 3.29 | 3.34 | 3.32 | 3.35 | 3.35 | 3.11 |
| $\frac{1}{2}$-star price effect (A$) | $0.65^{*}$ | $0.86^{*}$ | $0.88^{*}$ | $1.21^{*}$ | $1.46^{*}$ | $1.92^{*}$ | $2.28^{*}$ | $3.12^{*}$ |

*Notes*: $^{***}$, $^{**}$, $^{*}$ indicates significance at least at the 10%, 5%, 1% levels, respectively.

the comparator variety and region (necessary to avoid the dummy variable trap). Thus, all coefficients are relative to what a Shiraz produced in the Barossa Valley would sell for. The columns show the estimation results for each of the eight or nine subsamples 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 $\frac{1}{2}$ a star rating increase.

Consider first the estimates using the Halliday data (Table 5). The parameters for vintage rating are all significant and fairly constant over time. The price premium is 3.1% on average and varies between 2.3% and 4.1% for a one-point increase in the vintage rating for the 1992–2000 vintages. That amounts to between a 40 and 110 cents increase on an average-priced bottle of wine for each vintage over that period (see second to last row in Table 5). The coefficients for producer reputation ("winery rating") are significant at the 5% level for all vintages except 1992 and 2000 (1992 is significant at 10%). The price premium for an average-priced bottle of wine worth ($23.80) ranges between 50 and 115 cents for another $\frac{1}{2}$ star in Halliday's winery rating and has been declining over the 1990s. Halliday's "classic wine" rating is significant for all vintages in Australia except the three most recent vintages (which were incomplete samples because many premium reds from those vintages were still to be released), and adds a price premium between 16% and 36%, other things equal. The downward trend in this coefficient reflects 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 (i.e., the price discount for them relative to Barossa Valley Shiraz decreases), implying that these varieties have become less unpopular over the latter 1990s. For the 2000 vintage, they attract about a one-third discount relative to Barossa Shiraz, other things equal. For Chardonnay, the discount is less whereas for Riesling it averaged almost 50%. In general the reds attracted similar prices relative to Shiraz,

and with few exceptions showed no significant difference for most individual vintages. Shiraz blends and other reds were sold at discounts of as much as 20% or more below the Barossa Shiraz price for the early vintages, but this difference has since become insignificant. White wines all sell at a discount relative to Barossa Shiraz and their parameters have become slightly more significant through time.

When examining the regional dummies, note that they clearly become more significant over time. For the 1992 vintage, only four regions are significantly different from the Barossa at the 5% level, while for the 1998 vintage, 10 of the 26 regions are significantly different at the 1% level and another four at the 5% level.[7] This pattern 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 1998 and then increase further as they became more popular with consumers relative to Barossa Valley wines. Strong upward trends are also evident for the newly developing ultra-premium cool-climate regions of the Adelaide Hills, Mornington Peninsula and Yarra Valley, with average premia up to 31 per cent. By way of contrast, the wines of the warm-climate irrigated region such as Other South Australia and Riverina become heavily discounted by the mid-1990s.

Turning to the estimates for the *Winestate* data (Table 6), the parameters for vintage rating are all significant but less constant over time compared to the Halliday coefficients. The price premium varies between 4 and 16 per cent for a $\frac{1}{2}$-star improvement in the sensory quality rating for the 1993–99 vintages. That is, a $\frac{1}{2}$-star increase in *Winestate's* rating would yield an increase in the price per bottle between 65 and 312 cents on an average-priced bottle of rated wine for the 1992–99 vintages (see last row in Table 6). Unfortunately, the rating schemes are too different to allow a direct comparison of the price premia in the two data sets, since *Winestate* only publishes ratings of three or more stars and the two data providers vary in the extent to which they focus on commercial, super- and ultra-premium wines (as reflected in their different average prices).

For the variety dummies, the *Winestate* data confirm that the Semillon and Sauvignon Blanc parameters become less unpopular relative to Barossa Valley Shiraz over the latter 1990s. On average, the *Winestate* data also

[7]Because the data sets for the 1999 and 2000 vintages exclude many super- and ultra-premium reds that were still awaiting release, less store can be put on the results for those last 2 years.

confirm that they attract about a one-third discount relative to Barossa Shiraz, other things equal, with both coefficients following the declining discount trends observed with the Halliday data. For Chardonnay the discounts are slightly higher in the *Winestate* sample whereas for Riesling they are slightly lower. Among the reds, Merlot attracted similar prices to Shiraz (less than 5% significance), but other red varieties including blends of Cabernet and Shiraz showed significant discounts below the Barossa Shiraz price, other things equal. Compared to the results from Halliday's data set, more of these parameters became significant as the decade proceeded.

When examining the regional dummies, notice again that they become increasingly significant over time, although the trend is more scattered and less clear than in the Halliday sample. In the sample the only region significantly different from the Barossa Valley for the '92 vintage at the 5% level was Rutherglen, while for the 1998 and 1999 vintages about half the regions are significantly different at the 1% level. Again, this pattern is an indication of an intensifying regional quality differentiation in Australia, with coefficients trending up or downward. Moreover, the *Winestate* data confirm the strong upward trends for the newly developing ultra-premium cool-climate regions (e.g., Adelaide Hills, Mornington Peninsula and Tasmania).

### 4.2. *New Zealand*

The results for New Zealand, shown in Tables 7 and 8, differentiate 10 varieties and five regions in each data set. (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 somewhat lower price premia for New Zealand as compared with Australia. The coefficients vary between 1.1% and 2.7%, which translate into price premia between 21 and 64 cents calculated at the average NZ price for each vintage. The parameters for "winery rating" also are mostly smaller and less significant for New Zealand than for Australia, while the "classic wine" parameter is equally significant with the premia ranging between 14% and 34%.

Varietal differences are less pronounced in New Zealand too. Note that Riesling is discounted by about one-third and Sauvignon Blanc between one-seventh and one-third relative to the base variety (Chardonnay), whereas the reds enjoy considerable premia, other things equal.

Table 7. Regression Results for New Zealand (Halliday Data Set)

| Parameter | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 |
|---|---|---|---|---|---|---|---|---|
| CONSTANT | 1.914* | 1.073* | 0.796** | 1.031* | 0.802** | 1.294* | 1.248* | 0.944 |
| Vintage Rating | 0.011** | 0.022* | 0.023* | 0.022* | 0.024* | 0.018* | 0.019* | 0.027** |
| Winery Rating | 0.030 | 0.036** | 0.061* | 0.049** | 0.039 | 0.042 | 0.048** | −0.057 |
| Classic Wine | 0.279 | 0.189*** | 0.343* | 0.320* | 0.185** | 0.315* | 0.171** | 0.140 |
| Cabernet Sauvignon | — | −0.099 | 0.131*** | 0.027 | 0.240*** | 0.157 | 0.170** | 0.242 |
| Cabernet Blends | — | 0.239* | 0.175* | 0.311* | 0.191** | 0.476* | −0.034 | — |
| Merlot | 0.096 | 0.073 | 0.064 | 0.158 | 0.089 | 0.508* | 0.110 | −0.168 |
| Pinot Noir | 0.278* | 0.254* | 0.184* | 0.112*** | 0.159** | 0.069 | 0.049 | 0.133 |
| Other Red | — | 0.142 | 0.296* | — | 0.363* | — | −0.155 | — |
| Riesling | −0.118** | −0.321* | −0.385* | −0.304* | −0.365* | −0.359* | −0.505* | −0.462* |
| Gewurztraminer | — | −0.002 | −0.229*** | −0.138 | −0.187 | −0.063 | −0.369* | −0.412 |
| Sauvignon Blanc | −0.143* | −0.248* | −0.279* | −0.346* | −0.261* | −0.257* | −0.334* | −0.303*** |
| Sweet White | 0.301* | 0.043 | 0.193 | 0.013 | 0.000 | 0.052 | −0.021 | −0.071 |
| Other White | 0.022 | −0.100*** | −0.184** | −0.187** | −0.193*** | −0.253* | −0.363* | −0.271 |
| Auckland | 0.053 | −0.081 | −0.005 | −0.042 | −0.006 | −0.056 | −0.017 | 0.038 |
| Canterbury | −0.005 | 0.014 | 0.114** | −0.023 | 0.096 | −0.105 | 0.148** | 0.086 |
| Hawke's Bay | 0.020 | 0.061 | 0.088** | −0.001 | 0.008 | −0.096 | −0.045 | −0.144 |
| Wairarapa | 0.098 | 0.165* | 0.083 | 0.100*** | 0.132*** | 0.080 | 0.088*** | 0.177 |
| Other NZ | −0.053 | 0.079*** | 0.103** | 0.011 | 0.101*** | 0.100 | −0.009 | 0.045 |
| No. of Observations | 176 | 328 | 289 | 196 | 216 | 117 | 143 | 53 |
| Adj. $R^2$(%) | 35.6 | 56.3 | 57.8 | 58.1 | 47.4 | 71.7 | 64.5 | 36.2 |
| Average Retail Price (NZ$) | 19.50 | 24.68 | 25.27 | 21.40 | 23.39 | 23.67 | 22.08 | 23.45 |
| Average Vintage Rating (points) | 89.5 | 89.0 | 89.3 | 88.7 | 87.3 | 86.7 | 89.0 | 88.2 |
| Average Winery Rating (stars) | 4.09 | 4.08 | 4.06 | 3.99 | 4.104 | 4.081 | 4.105 | 4.151 |
| 1-point price effect (NZ$) | 0.21** | 0.53* | 0.59* | 0.46* | 0.57* | 0.43* | 0.43* | 0.64** |
| $\frac{1}{2}$-star price effect (NZ$) | 0.29 | 0.45** | 0.77* | 0.53** | 0.46 | 0.50 | 0.53** | −0.67 |

*Notes*: ***, **, * indicates significance at least at the 10%, 5% and 1% levels, respectively.

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Table 8. Regression Results for New Zealand (Winestate Data Set)

| Parameter | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|
| CONSTANT | 2.530* | 2.963* | 2.782* | 2.608* | 2.760* | 2.804* |
| Vintage Rating | 0.048* | 0.014 | 0.042* | 0.065* | 0.041** | 0.046*** |
| Cabernet Sauvignon | — | 0.032 | 0.031 | 0.170*** | 0.000 | 0.038 |
| Cabernet Blends | — | −0.107 | 0.269* | 0.289* | 0.174** | −0.023 |
| Merlot | — | 0.032 | 0.150** | 0.047 | 0.184** | — |
| Pinot Noir | — | 0.352* | 0.291* | 0.218* | 0.090 | 0.134 |
| Shiraz | — | — | — | 0.156 | — | — |
| Othe Red | 0.115 | −0.179* | 0.014 | 0.145 | 0.178*** | 0.042 |
| Riesling | −0.037 | −0.212* | −0.256* | −0.220* | −0.282* | −0.343* |
| Sauvignon Blanc | −0.095*** | −0.223* | −0.258* | −0.255* | −0.304* | −0.027 |
| Semillon | — | −0.073 | −0.096 | −0.135 | −0.335** | — |
| Other White | 0.195* | −0.227* | −0.266* | −0.309* | −0.369* | −0.415*** |
| Auckland | −0.061 | −0.063 | −0.099* | −0.067*** | −0.089 | −0.052 |
| Canterbury | — | — | −0.157** | −0.041 | −0.002 | −0.138 |
| Hawke's Bay | −0.111 | 0.005 | 0.147* | 0.042 | 0.001 | 0.137 |
| Nelson | −0.088 | −0.118 | −0.105*** | −0.023 | −0.098 | — |
| Other NZ | 0.124 | −0.054 | 0.076 | 0.109** | 0.116 | 0.040 |
| No. of Observations | 126 | 248 | 344 | 362 | 194 | 90 |
| Adj. $R^2$(%) | 22.4 | 29.5 | 45.1 | 38.1 | 43.0 | 14.7 |
| Average Retail Price (NZ$) | 17.70 | 19.62 | 20.30 | 21.23 | 21.14 | 24.43 |
| Average Vintage Rating (stars) | 3.54 | 3.33 | 3.38 | 3.49 | 3.45 | 3.66 |
| $\frac{1}{2}$-star price effect (NZ$) | 0.85* | 0.27 | 0.84* | 1.37* | 0.87** | 1.12*** |

*Notes*: ***, **, * indicates significance at least at the 10%, 5% and 1% levels, respectively.

Most strikingly, however, are the differences in the degree of regional differentiation between the two countries. For New Zealand, only one out of a total of 40 regional dummy coefficients over eight vintages is significantly different from the base region (Marlborough) at the 1% level (plus just four others at the 5% level), and the degree of difference is not large. Nor are any trends in the size or significance of coefficients obvious over time, unlike for Australia.

Very similar findings emerge for New Zealand from the *Winestate* data (Table 8) as those from the Halliday data (Table 7): 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 subsamples the variation in prices explained by the model (adjusted $R^2$) is higher for New Zealand, despite the much smaller sample sizes. 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% 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, as well as his winery ratings and classic wine categorization) 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. This is equally true for Australia and New Zealand. It is consistent with the earlier study for Australia for 1991–1992 by Oczkowski (1994) and with Schamel's (2000) findings for the United States (based in that case on ratings published in the U.S. 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 toward greater regional and varietal differentiation, at least within Australia. This too suggests a greater proportion of consumers are becoming more discerning, which presumably is being reflected in vineyard land prices in the various regions. 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. 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, and being more heavily focused on non-premium wines).

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 ultra-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").[8] 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 have until very recently been downplayed.

[8]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 subnational 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 national promotion[9] 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.[10] This is especially crucial in light of Tirole's (1996) theoretical result, and the bitter experiences following wine scandals in Austria and Italy in the 1980s, showing that producers can suffer for a very long time from previous mistakes.

Second, how well could hedonic pricing models be applied to better understand the demand for wine grapes 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 grape growers. As quantitative measures improve for measuring in the vineyard and/or weighbridge those attributes winemakers are looking for, so will the scope for addressing this issue with hedonic price modeling. This would build on the work begun by Golan and Shalit (1993) with respect to Israeli grapes, and a recent paper by Oczkowski (2002). If indeed weather variables during the grape growing season are crucial, as the empirical results of Ashenfelter (2000) and Wood and Anderson (2002) suggest, those too would need to be included in addition to such variables as grape sugar level, color and acidity.

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[9]The Australian Wine and Brandy Corporation and the Wine Institute of New Zealand, respectively.

[10]Care is needed in any such empirical work to separate the influences of quality upgrading national research and development on the supply side and promotional efforts on the demand side (see Zhao *et al.*, 2003), as well as to distinguish corporate, regional and national generic promotion.

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