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Can we explain variations in winery ratings in Victoria?

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Abstract

The scoring of wines and the ratings of wineries is the source of much debate. In this paper we attempt to explain variations in winery ratings in Victoria by examining two winery rating systems, the winery 5-star ratings system of Halliday and the WineBoss version that modifies the Halliday system, to obtain a consensus industry rating from a variety of sources; in conjunction with a limited number of other data about the wineries that are rated. We use ordered logit models and odds ratios on a sample of rated Victorian wineries (291 in the Halliday sample and 331 in the WineBoss sample) to see which predictor variables increase the odds of a winery being in a higher-rated category.

Wineries that are older, use a consultant winemaker and/or produce predominantly red wines are more likely to be in a higher-rated category than those wineries that do not; conversely, wineries that use a contract winemaker and/or are located in a number of particular regions of Victoria are more likely to be in a lower-rated category than those wineries that do not. All of these results are as expected and confirm previous research. However, neither the size of the winery in terms of output nor whether the winery has other revenue sources, such as a restaurant, has any significant correlation with winery rating. The paper concludes with some suggestions for further research.

Introduction

Anderson and Wittwer (2013, Table 4) have demonstrated that real producer price changes for Australian wine declined most dramatically for non-premium wines over the period 2009 to 2011. Consequently, and notwithstanding the imprecision, inconsistency and prejudice involved in the determination of wine prices (see, for example, Derbyshire 2013; Grant, Dollery and Hearfield 2011; Garcia-Parpet 2008; Trubek 2008) many winemakers in Australia have recognised the need to attach a perception of premium quality to their products in order to maintain profits in the face of intensified competition at lower price points, both domestically and globally.

Alongside reinforcing claims to excellence attached to particular regions within Australia's geographically diverse wine industry (see, for example, Banks and Sharpe, 2006), a recent development has seen the formation of a consortium of Australian producers under the banner 'Australian First Families of Wine', which has sought to highlight ideas of tradition and quality in the Australian industry on the global stage (AFFW, 2013). However, a more longstanding method for achieving the much sought-after cachet is to earn high ratings from wine rating experts. In Australia, as elsewhere, these points-based ratings systems are awarded to both specific wines (see, for example, Wine Selector, 2013; Geddes, 2013) as well as particular wineries. Arguably, the best-known expert who rates both wines and wineries is James Halliday (Halliday 2013a).

[1] We are grateful for the comments made by a reviewer, and have made liberal use of the material included in these comments in revising the paper. Any errors made, however, remain the responsibility of the authors.

There is empirical evidence to support a positive correlation between wine ratings and wine prices in Australasia. Oczkowski (1994) estimated a hedonic model for table wine price in Australia, including among the explanatory variables Halliday's (2013b) five-point scale (see Appendix 1). He found that wine prices increased with the rating level. Ling and Lockshin (2003) also estimated a hedonic model of wine prices in Australia that included Halliday's rating system and concluded that winery and brand reputation have major effects on the wine price. Schamel and Anderson (2003) estimated hedonic price functions for premium wine in Australia and New Zealand and discovered highly significant price premia associated with Halliday's (2013b) scale. Bicknell, Friesen and MacDonald (2005) estimated a similar hedonic model for New Zealand premium wines, using Cooper's (2003) quality rating scale, and concluded that a significant premium existed.

If high ratings from wine experts do lead to wineries being able to increase their prices, how can lower rated wineries or new wineries gain a higher rating? One problem is that ratings of individual wines is highly subjective (and contentious, see Derbyshire 2013), even among experts, and the winery ratings systems are to a large extent based on measures of "quality" that are determined by ratings on specific wines (see Appendix 1).

The experts who rate wineries also provide a limited range of other data about the wineries they rate. The question we address here is whether there are any statistical relationships between winery ratings and these other data? Or alternatively, are there any common characteristics among highly rated wineries that aspiring wineries could adopt? We use ratings of Victorian wineries from two rating systems: the winery 5-star ratings system of Halliday (2013b), referred to above, and the WineBoss version that modifies the Halliday system to obtain a consensus industry rating from a variety of sources[2], alongside the potential explanatory variables made available by these experts (Halliday 2013a, and WineBoss 2013).Victoria is chosen for the analysis because it has the largest number of wineries of any state in Australia, with many wine-producing regions with distinctive attributes over a relatively small area. We recognise that the absence of specific data on *terroir*, individual wines and winemaking ability is likely to substantially reduce the ability of the estimated model to explain variations in wine ratings.

Method

The method used to explain ratings achieved by Victorian wineries is to estimate an ordered logit model. We use the five groups of wineries with ratings of 3, 3.5, 4, 4.5 and 5 stars specified by WineBoss (2013) and the six groups of wineries of 3, 3.5, 4, 4.5, 5 and 5-red stars specified by Halliday (2013b). Because an ordinal dependent variable violates the assumptions of a linear regression model, we estimate the logit version of an ordinal regression model (ORM) (Long and Freese 2006, p. 183). The ORM statistical modelis a latent variable model of the form:

$$r_i^* = \mathbf{x}_i\boldsymbol{\beta} + e_i \qquad (1)$$

where r_i is the rating of winery i, $\mathbf{x}$ is a vector of explanatory variables and e is the error term.

Following Long and Freese (2006, p. 184), equation (1) is expanded for the measurement model by dividing r^* into five or six ordinal categories, one for each winery rating category specified above:

$$r_i = m \text{ if } \tau_{m-1} \leq r_i^* < \tau_m \text{ for } m = 1 \text{ to } 5 \text{ for WineBoss and 1 to 6 for James Halliday} \qquad (2)$$

where the cut points $\tau_{m-1}$to τ_m (four in the WineBoss model and five in the Halliday model) are estimated. Again following Long and Freese (2006, p. 184), we assume that τ_0 = minus infinity and $\tau_{m+1}$is plus infinity. The observed ratings category changes when r^* traverses a cut point. The probability of observing $r = m$ for given values of the explanatory variables 'corresponds to the region of distribution' where r^* falls between τ_{m-1} and τ_m (Long and Freese 2006, p. 184).

[2]A comparison of the two rating systems in Figures 1 and 2 shows reasonably similar distributions but with higher proportions at the extremes in the Halliday system: 45 per cent to 37 per cent for non-rated observations and 27 per cent to 24 per cent for 5-star rating.

For ease of interpreting the model results, we focus on the odds ratios. Odds ratios are used to compare 'the people who are in groups greater than *k* versus those who are in groups less than or equal to *k* where *k* is the level of the response variable' (IDRE 2013).They are interpreted as follows: 'for a one unit change in the predictor variable, the odds for cases in a group that is greater than *k* versus less than or equal to k are the proportional odds times larger' (IDRE 2013). Cut points are estimated in the model to differentiate between the groups when the values of all explanatory variables are evaluated at zero.

Data

WineBoss (2011) reported on the ratings of 529 Victorian wineries. A sample of 331 wineries was used for the WineBoss model after excluding two wineries for which a full set of data was unavailable and 196 wineries that were not rated. Correspondingly, a sample of 291 wineries was used for the Halliday model after excluding two wineries for which a full set of data was unavailable and 236 wineries that were not rated. Halliday (2013b) explained non-ratings as follows: 'The rating is given in a range of circumstances: where there have been no tastings in the 12-month period; where there have been tastings, but with no wines scoring more than 86 points; or where the tastings have, for one reason or another, proved not to fairly reflect the reputation of a winery with a track record of success'. The dependent variables are shown in Figures 1 and 2, while the potential explanatory variables are shown in Table 1.

Potential Explanatory Variables

As noted, Victoria was chosen as it has many wine-producing regions with distinctive attributes over a relatively small area, and many different types of winery businesses and wine styles–irrigated and rainfed; hot temperate and cool climate; small (almost hobby) family farms and extensive corporate structures; etc. This makes forming prior expectations about directions of effect quite difficult.

However, on balance, we expect a positive correlation between the age of a winery and its rating, for three main reasons. First, an established winery ought to have access to wine grapes from well-established vines that are of consistently superior quality to those obtained from young vines. We acknowledge that this proposition is controversial as it could be argued that the appropriate standard of grapes for a desired wine label is determined on the vine and has more to do with *terroir*, clonal selection and vine balance and management than the age of the vine. Furthermore, many wineries also purchase supplementary fruit for their labels. Second, a more established winery should be further along the learning curve in producing premium wines as winemakers take time to establish an understanding of how fruit from particular vineyards behave. This is offset to some extent by the mobility of good winemakers who are able to move to different employers within a region or commence their own operation in a region with which they are familiar. Third, longer-established wineries should be better able to forge a reputation for the production of high-quality wines, which would make it easier to attract talented winemakers.

The correlation between the size of a winery[3] and its rating is uncertain. On one hand, the size of the winery is expected to have a positive influence on its rating on the basis that larger wineries are better able to afford the services of the top winemakers. On the surface, it appears that the existing empirical evidence would favour small and medium wineries, given that Ling and Lockshin (2003) found that wine prices were higher for small and medium wineries. But this result was obtained after controlling for quality and reputation, suggesting that other factors are at play in varying the prices received by wineries of different size. On the other hand, there are very talented winemakers who prefer to work in small wineries with greater control and oversight of their wines.

The contract variable is a dummy variable according to whether the winery contracts a winemaker or not (taking the value of one if using a contractor, zero otherwise). These wineries are expected to rate lower than wineries making their own wine because of the smaller incentive to a contractor than to a winery to produce premium wines and achieve a high quality rating.

[3]The size of the winery was measured by the number of cases sold annually. These data were unavailable for a few wineries but, where vineyard area was available, an estimate for this variable was obtained by multiplying the area of grapevines by an estimated mean yield of 55 hectolitres per hectare.

On the contrary, use of a consultant may provide scope for a winery to improve the quality of its products. The consultants chosen are typically people with a long experience in producing and judging premium wines. The consultant variable is also a dummy variable according to whether the winery uses a consultant or not, taking the value of one if using a consultant, zero otherwise.

A dummy variable for wineries with other profit-making centres (primarily hospitality businesses) was expected to have a negative sign on its coefficient because of the need to spread labour and capital resources across a wider range of productive activities. This is likely to result in a trade-off between wine quality and the exploitation of economies of scope from complementary activities (for example, achieving higher mark-ups from wines sold in a winery restaurant than from selling them in other markets). In other words, these wineries would be expected to specialise less in producing premium wines than would specialist wineries.

Three dummy variables were included in the model to capture wine type effects, with mixed wine production as the base. They are for wineries producing predominantly (at least 75 per cent) still red wines, still white wines and sparkling wines (taking the value of one in each case); however, there are very few observations for the latter two variables. Wineries producing predominantly still red wines were expected to have greater scope to impress wine experts with the quality of their wine than wineries producing a mix of wine types or predominantly still white wines or sparkling wines. Previous evidence from Ling and Lockshin (2003) and Schamel and Anderson (2003) has indicated a premium for red wines over white wines after controlling for predicted quality and reputation.[4] However this is related to regional suitability. For example, most red varieties need heat whereas grapes used for the super premium whites and sparkling wines can only be grown in cool and/or elevated regions.

Twenty-seven regional dummy variables are included in the model. Yarra Valley is used as the base on the grounds that it is the most distinguished Victorian wine region and probably has the widest range of winery size and variety. It is expected that wineries in other regions would have an overall lower or equal quality rating with wineries in this region given the reputation of Yarra Valley for producing premium wines. Regions expected to have wineries with at least an equal rating include Rutherglen with its world-class quality of fortified wines, Beechworth with its wineries producing chardonnay, and Geelong with its wineries producing pinot noir.

We also estimated an alternative model in which the regional dummy variables were replaced by a single variable representing the number of wineries in a region. This variable is expected to pick up two effects: as a measure of any 'cluster' effects (see, for example, Porter 1998); and as a proxy for attracting wineries to regions with greater agro-biological potential to produce premium wines.

Summary statistics for the data on variables used in the analysis are presented in Table 1.

Table 1: Summary statistics of variables

Variable	Mean	Std deviation	Minimum	Maximum
WineBoss rating	3.29	2.07	1	6
Halliday rating	3.35	2.40	1	7
Age of winery	25.99	23.82	5	160
Use of contract winemaker	0.22	0.41	0	1
Output (kcases)	36.57	383.29	0	8000
Use of consultant	0.02	0.14	0	1
Other revenue source	0.33	0.47	0	1
Red wine dominant	0.22	0.41	0	1
White wine dominant	0.01	0.10	0	1
Sparkling wine dominant	0.01	0.10	0	1

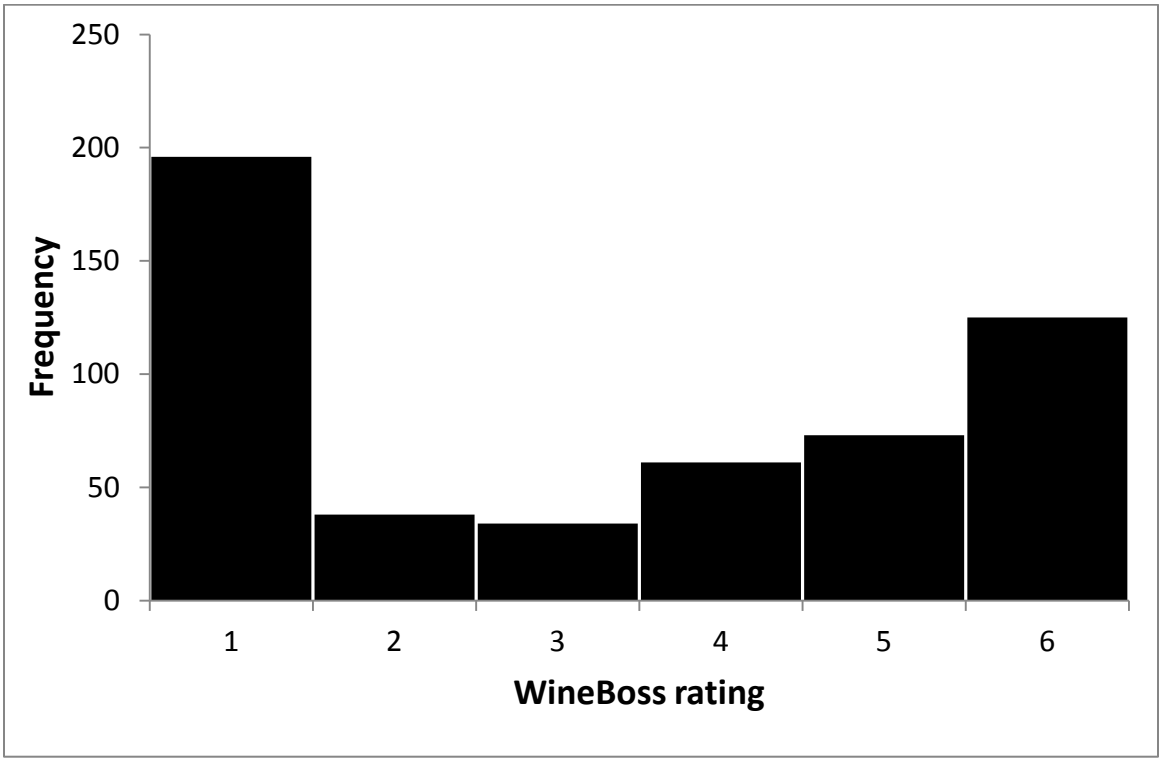
[4] Red wines are regarded as a product that can be safely stored and traded for higher prices in the future, but this is a very small part of the wine market.

Results

Choice of estimated models

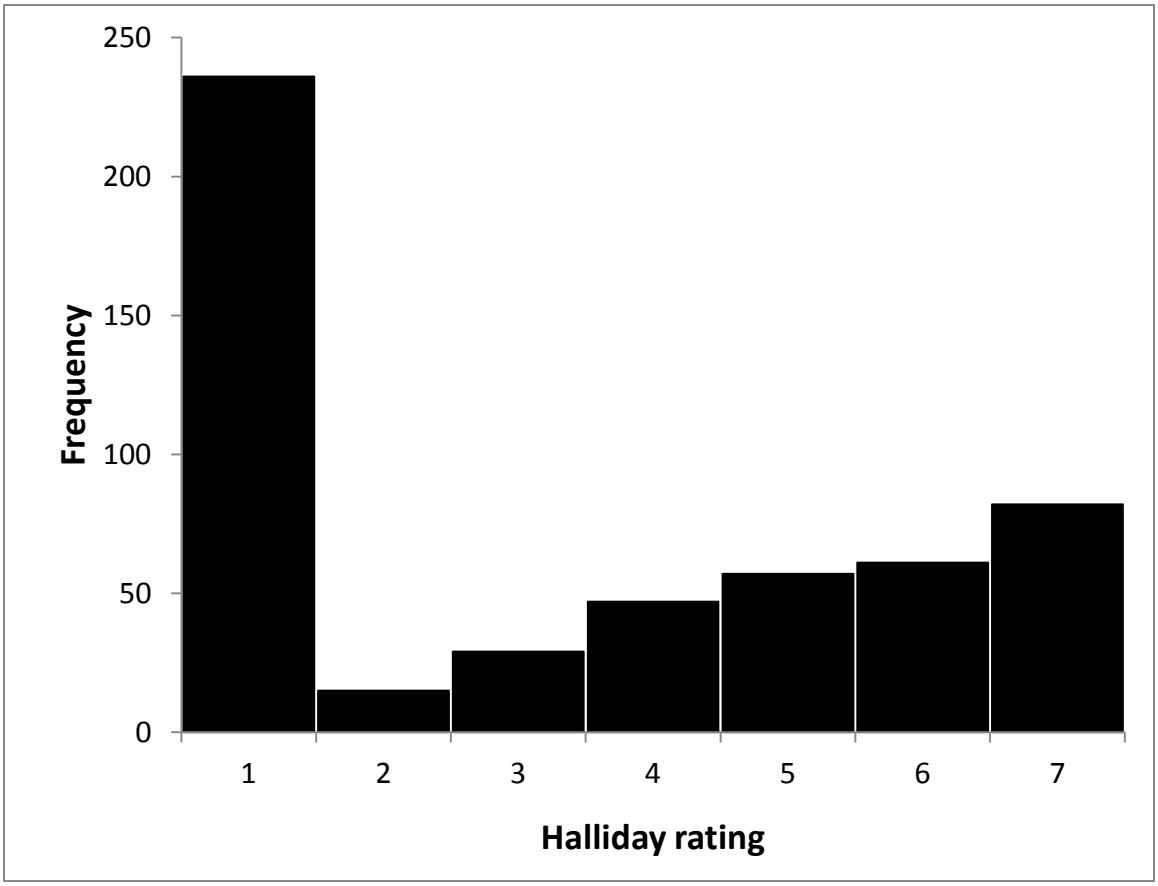
Ordered logit estimates are reported only for the models excluding the non-rated observations given the unusual distributions of the dependent variables when the non-rated observations are included (see Figures 1 and 2). Also, a variety of reasons could explain why wineries were not rated that need not correspond to the quality of wine produced. While there are no major divergences in estimates and significance levels between the models including and excluding these observations, the latter models provide a better explanation of variations in winery ratings.

Figure 1 : Distribution of WineBoss ratings.



Note: 1 = not rated; 2 = 3 stars; 3 = 3.5 stars; 4 = 4 stars; 5 = 4.5 stars; 6 = 5 stars.

Figure 2 : Distribution of Halliday ratings



Note: 1 = not rated; 2 = 3 stars; 3 = 3.5 stars; 4 = 4 stars; 5 = 4.5 stars; 6 = 5 stars; 7 = 5 stars (red).

Ordered logit models

Estimated coefficients of variables expected to influence winery ratings in the ordered logit models excluding non-rated observations are reported in Table 2 for the WineBoss model and Table 3 for the Halliday model. In comparing the two sets of estimates, it is evident that there is no Yarra Valley bias in the Halliday estimates. The likelihood ratio χ^2 tests for the WineBoss model (99.63, prob> χ^2 =0.000) and the Halliday model (100.21, prob> χ^2 =0.000) indicate strongly that at least one of the coefficients on the explanatory variables is not equal to zero in each model. Coefficient estimates could not be obtained for the Swan Hill and North-East Victoria regional dummy variables in the WineBoss model because there are no observations once non-rated observations are removed, and these variables were consequently omitted from Table 2. The McFadden pseudo R^2 statistic for both the estimated models is 0.10, keeping in mind that a low value is not uncommon for a pseudo R^2, which cannot be compared to the R^2 value in an ordinary least squares regression. IDRG (2013) warns that this statistic should be treated with caution.

Estimates of logit models for binary outcomes

Prior to estimating the ordered logit models, simple logit models for binary outcomes were estimated using the same set of explanatory variables as for the ordered logit models to attempt to explain why

wineries may not have a rating. Few explanatory variables have significant coefficients, with very few significant regional dummy variables at the 10 per cent significance level or better. But significant coefficients of note in both models are the positive signs on the coefficients of the contract variable, implying wineries using a contractor to make their wines are more likely not to have a rating, and negative signs on the cluster variable (number of wineries per region), implying wineries in regions with a large number of wineries are less likely not to have a rating. A significantly negative sign on the coefficient of the winery size variable in the Halliday model suggests that small wineries are more likely not to have a rating although the corresponding coefficient estimate in the WineBoss model was insignificant even though the sign was also negative.

Table 2: Model results for factors influencing WineBoss winery ratings in Victoria

Explanatory variable	Odds ratio	Coefficient	Std error	z	P>|z|	
Age of winery	1.025	0.024	0.007	3.29	0.001	***
Output volume	1.000	-0.155	0.283	-0.55	0.585	
Use of contractor	0.327	-1.116	0.293	-3.81	0.000	***
Use of consultant	7.275	1.984	1.129	1.76	0.079	*
Other revenue source	0.943	-0.059	0.241	-0.25	0.806	
Red wine dummy	2.036	0.711	0.309	2.30	0.021	**
White wine dummy	0.272	-1.301	1.523	-0.85	0.393	
Sparkling wine dummy	0.558	-0.584	1.078	-0.54	0.588	
Rutherglen	0.467	-0.762	0.692	-1.10	0.271	
Mornington Peninsula	0.844	-0.170	0.371	-0.46	0.646	
Pyrenees	0.560	-0.581	0.597	-0.97	0.331	
Geelong	1.635	0.491	0.477	1.03	0.303	
Beechworth	0.317	-1.148	0.897	-1.28	0.201	
Sunbury	0.175	-1.744	0.816	-2.14	0.033	**
Alpine Valleys	0.073	-2.612	0.861	-3.03	0.002	***
Glenrowan	0.117	-2.145	1.502	-1.43	0.153	
King Valley	0.181	-1.894	0.539	-3.51	0.000	***
Bendigo	0.439	-0.866	0.597	-1.45	0.147	
Strathbogie Ranges	0.906	-0.532	0.902	-0.59	0.555	
Heathcote	0.796	-0.276	0.477	-0.58	0.563	
South East Australia	0.071	-2.669	1.352	-1.97	0.048	**
Henty	1.600	0.449	1.236	0.36	0.716	
Upper Goulburn	0.546	-0.633	0.616	-1.03	0.304	
Gippsland	0.364	-1.049	0.504	-2.08	0.037	**
Ballarat	0.383	-0.999	0.728	-1.37	0.170	
Grampians	0.515	-0.691	0.632	-1.09	0.275	
Macedon Ranges	0.523	-0.678	0.513	-1.32	0.187	
Goulburn Valley	0.035	-3.390	0.959	-3.54	0.000	***
Murray Darling	0.044	-3.151	1.069	-2.95	0.003	***
Port Phillip Zone	0.110	-2.010	0.891	-2.26	0.024	**
Nagambie Lakes	0.472	-0.772	0.975	-0.79	0.428	
Western Victoria Zone	0.376	-1.050	1.536	-0.68	0.494	
Central Victoria Zone	0.131	-2.068	1.118	-1.85	0.064	*
Cut point 1		-2.507	0.384	-6.53		
Cut point 2		-1.608	0.359	-4.48		
Cut point 3		-0.524	0.346	-1.51		
Cut point 4		0.578	0.347	1.67		

Note: *** significant at 1 per cent; significant at 5 per cent; significant at 10 per cent

Table 3: Model results for factors influencing James Halliday winery ratings in Victoria

Explanatory variable	Odds ratio	Coefficient	Std error	z	P>|z|	
Age of winery	1.024	0.024	0.007	3.55	0.000	***
Output volume	1.000	-0.013	0.258	-0.05	0.960	
Use of contractor	0.233	-1.455	0.347	-4.19	0.000	***
Use of consultant	1.161	0.149	0.724	0.21	0.836	
Other revenue source	1.196	0.179	0.245	0.73	0.465	
Red wine dummy	1.996	0.691	0.323	2.14	0.032	**
White wine dummy	1.046	0.045	1.552	0.03	0.977	
Sparkling wine dummy	1.997	0.691	0.973	0.71	0.477	
Rutherglen	0.371	-0.991	0.686	-1.45	0.148	
Mornington Peninsula	0.706	-0.348	0.376	-0.93	0.354	
Pyrenees	0.517	-0.659	0.539	-1.22	0.221	
Geelong	0.971	-0.029	0.469	-0.06	0.951	
Beechworth	0.346	-1.060	1.132	-0.94	0.349	
Sunbury	0.375	-0.980	0.968	-1.01	0.311	
Swan Hill	0.031	-3.469	1.569	-2.21	0.027	**
Alpine Valleys	0.229	-1.475	0.880	-1.68	0.094	*
Glenrowan	0.082	-2.504	1.448	-1.73	0.084	*
King Valley	0.124	-2.084	0.610	-3.42	0.001	***
Bendigo	0.225	-1.493	0.629	-2.37	0.018	**
Strathbogie Ranges	0.260	-1.347	0.779	-1.73	0.084	*
Heathcote	0.691	-0.370	0.481	-0.77	0.443	
South East Australia	0.027	-3.594	1.451	-2.48	0.013	**
Henty	1.179	0.165	0.844	0.20	0.845	
Upper Goulburn	0.377	-0.974	0.639	-1.52	0.127	
Gippsland	0.379	-0.969	0.570	-1.70	0.089	*
Ballarat	0.235	-1.450	0.912	-1.59	0.112	
Grampians	0.704	-0.351	0.640	-0.55	0.584	
Macedon Ranges	0.451	-0.797	0.514	-1.55	0.121	
Goulburn Valley	0.020	-3.896	0.892	-4.37	0.000	***
Murray Darling	0.009	-4.733	1.075	-4.40	0.003	***
Port Phillip Zone	0.047	-3.053	1.329	-2.30	0.022	**
Nagambie Lakes	0.227	-1.485	1.083	-1.37	0.170	
Western Victoria Zone	2.529	-0.928	1.541	0.60	0.547	
Central Victoria Zone	0.253	-1.375	1.619	-0.85	0.396	
Cut point 1		-3.832	0.451	-8.50		
Cut point 2		-2.266	0.353	-6.42		
Cut point 3		-1.012	0.321	-3.15		
Cut point 4		0.015	0.312	0.05		
Cut point5		1.067	0.319	3.34		

Note: *** significant at 1 per cent; significant at 5 per cent; significant at 10 per cent

For the WineBoss model, cut points were highly significant between the lower three rating categories and moderately significant between the upper three categories. For the Halliday model, all cut points except cut point 4 were highly significant. That is, in both cases there is a lack of precision in determining between 4-star and 5-star wines. However, the Halliday model is able to distinguish clearly between 5-star and 5-red-star wineries.

The coefficient on the age of winery variable is positive and significant at the 1 per cent significance level in both estimated models. The estimated odds ratios for this variable (1.024 and 1.025 in the estimated WineBoss and Halliday models, respectively) are interpreted in the following manner: a one year increase in the age of a winery would increase the probability that the winery would be in a higher rating category

by 2.4 to 2.5 per cent. This result is consistent with the expected impact of winery age on the quality rating. Examples of longstanding wineries currently achieving 5-red-star rating by Halliday (2013a) are All Saints Estate, Campbells and Chambers Rosewood in Rutherglen, Baileys in Glenrowan and Brown Brothers in King Valley. Nevertheless, the relationship is not generalisable as we acknowledge that some 'old' wineries such as St Leonards winery in Rutherglen, Tisdall winery in Goulburn Valley and The Gap winery in the Grampians have only a 3-star rating.

The coefficient on the volume of wine output variable is highly insignificant in both models, indicating that the size of the winery bears no relationship to its quality rating. This result suggests that small wineries are as capable of achieving a high rating as large wineries, and vice versa. While numerous large wineries are regularly achieving high scores for their wines, a number of small wineries are also doing so.

The coefficient on the contract variable is significant in both models at the 1 per cent significance level and the estimated odds ratios for this variable (0.33, 0.23)are less than unity, as expected. The ratios are interpreted as follows: using a contract winemaker would reduce the probability that a winery would be in a higher rating category by 67 per cent and 77 per cent, respectively, for the WineBoss and Halliday models. This result indicates that using a contractor to make wine has a strong adverse effect on the probability of a winery obtaining a higher quality rating. But note that using a contract winemaker need not be accompanied by a low rating. There is now a group of good winemakers using contracting for smaller producers as a way to fund their own label activities.

As expected, there is a positive relationship between the use of a consultant on the probability of achieving a higher quality rating, but the odds ratio varies between models being much higher in the WineBoss model (7.28) than in the Halliday model (1.16). The latter estimate is not significantly greater than unity whereas the former is significantly greater than unity at the 10 per cent significance level. The extremely high value of the odds ratio should be treated with caution however as there were few observations for this variable.

The assumption that wineries with other revenue sources would rate worse than specialist wineries proved not to be so. While the estimated odds ratio is less than one in the WineBoss model, the coefficient is highly insignificant. It is greater than one in the Halliday model but, again, is highly insignificant. About one third of all rated wineries have another revenue source, and there are numerous examples of both diseconomies and the ability of a winery to combine the production of premium wines while operating a restaurant (in particular in the Yarra Valley (Anon. 2013)).

Of the coefficients on the red-dominant, white-dominant and sparkling wine-dominant dummy variables, only the coefficient on the red-dominant variable is significant, at the 5 per cent significance level in both models. This result is expected, suggesting that a predisposition to rely solely or mainly on red wine production will substantially increase the probability of a higher quality rating. It would approximately double the probability that the winery would be in a higher rating category. Downing Estate Vineyard, for example, operates with 10 hectares planted solely to Shiraz, Cabernet Sauvignon and Merlot winegrapes and achieves a 5-red-star rating from Halliday (2013a). But high premium red-dominant wineries need not be exclusively red wine producers. An example of a winery with 5-red-star rating that produces predominantly Pinot Noir wines while also producing some white wines (Chardonnay and Gewurztraminer) is Bass Phillip. Its reputation is based primarily on its sustained ability to produce top-rating Pinot wines.

The coefficients on nine of the regional dummy variables are significant at least at the 10 per cent significance level for the WineBoss model, all in the expected negative direction (odds ratios less than one). The estimated odds ratios for these variables vary substantially. Using one region that was expected to rate badly against the base as an example, a winery located in the warm-climate Murray Darling region would decrease its probability of being in a higher rating category by 96 per cent. Other regions in this category in ascending order of odds ratios are: Goulburn Valley (odds ratio of 0.04, significant at 1 per cent); Alpine Valleys (odds ratio of 0.07, significant at 1 per cent); South-East Australia (odds ratio of 0.07, significant at 5 per cent); Port Phillip Zone (odds ratio of 0.11, significant at 5 per cent); Central Victoria Zone (odds ratio of 0.13, significant at 10 per cent); King Valley (odds ratio of 0.18, significant at 1 per cent); Sunbury (odds ratio of 0.18, significant at 5 per cent); and Gippsland (odds ratio of 0.36, significant at 5 per cent). An additional three regional dummy variables had significant negative coefficients in the Halliday model, namely: Swan Hill (odds ratio of 0.03, significant at 5 per cent);

Glenrowan (odds ratio of 0.08, significant at 10 per cent); and Strathbogie Ranges (odds ratio of 0.26, significant at 10 per cent). The coefficient on the Central Victoria dummy variable is not significantly less than zero, in contrast to the situation in the WineBoss model.

Given the wide variations in grape-growing conditions across regions, it is a little surprising that wineries in so few regions were predicted to rate as inferior in quality to wineries in Yarra Valley and other major producing regions such as Mornington Peninsula and Geelong. Possible explanations are that in most regions there is potential for most wineries to apply scientific methods in wine production that limit the adverse effects of agroclimatic factors, and producers select *terroirs* suitable for growing winegrapes. It may be the case that particular wine varieties that are better suited to the specific regions are selected. Newer wineries may have access to better clones, modern equipment and an innovative winemaking technique, and would be expected to rate more highly than on older neighbouring winery.

Another possible explanation relates to wine experts finding it more difficult to discern between good wines than to identify ordinary or poor ones, or even expecting 'plonk' from regions with a poor reputation to be wine of low quality (see, e.g., Derbyshire 2013).Regardless of the reason for the low probability, it would be a bold move for wineries in poorly rating regions to attempt to increase prices on the basis of expert ratings.

The coefficient on the cluster variable replacing the regional dummy variables took the expected positive sign and was significant at the 1 per cent level of significance. The variable can be interpreted as follows: an additional winery in a region is associated with about a 1.5 per cent probability of being in a higher quality rating category. This result suggests that a cluster benefit arises from having good access to information and advice on winemaking, and from additional wineries locating to a particular region to add to the region's brand, tradition and reputation.

Conclusion

In this paper we attempt to explain variations in winery ratings in Victoria by examining two winery rating systems: the 5-star ratings system of Halliday and the WineBoss version that modifies the Halliday system to obtain a consensus industry rating from a variety of sources; in conjunction with a limited range of other data about the wineries they have rated. We use ordered logit models and odds ratios on a sample of rated Victorian wineries (291 in the Halliday sample and 331 in the WineBoss sample) to test which predictor variables increase the odds of a winery being in a higher-rated category.

Wineries that are older, use a consultant winemaker and/or produce predominantly red wines are more likely to be in a higher-rated category than those wineries that do not; conversely, wineries that use a contract winemaker and/or are located in a number of particular regions of Victoria (with Yarra Valley as the base) have greater odds of being in a lower-rated category than those wineries that do not. All of these results are as expected and confirm previous research. However, there are two results that do not accord with our prior expectations. The coefficient on the volume of wine output variable is highly insignificant in both models, which says that small and large wineries are equally likely to achieve a high rating. The second unexpected result is that wineries with other revenue sources, such as a restaurant, did not rate worse than specialist wineries.

These results suggest some areas for further investigation. First, the level of explanation of the estimated model is low and there are more than 200 wineries in these samples that are not rated. Many of these wineries have chosen to be non-rated. It would be interesting to look at other measures of success apart from winery rating, such as the personal attitudes and objectives of the key decision makers across the whole sample, and whether these vary in line with success. Examples of this sort of approach are Grant (2011) and Wright and Grant (2011).

Second, apart from the red star rating, Halliday's rating of an individual winery is based on tastings within the past year. It would be interesting to look at how winery ratings changed over time and what factors explained these changes.

A third area for research is to attempt to take account of the heterogeneity of wines sold by a winery. The notion of 'premium quality' varies within wineries, and the primary range may sell for high prices while the secondary label sells for relatively low prices. It would be useful to examine specific wine labels rather

than wineries given that medium and larger wineries usually have different labels over a range of price points.

Finally, a lack of significant effect of multiple profit centres on winery ratings is just one dimension of the relationships between winemaking and other economic activities. It would be interesting to test for the presence of scope economies between them. When Australian export markets contracted, many small-to-medium-sized wineries turned to cellar door outlets and varying types of food outlets to boost their turnover and profit margins. Many succeeded yet many did not, with issues being over-capitalisation, wines not matching the food offering and the difficulty of obtaining and keeping good service staff in rural areas.

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Appendix 1 James Halliday winery ratings

.  Outstanding winery regularly producing wines of exemplary quality and typicity. Will have at least two wines rated at 94 points or above, and had a five-star rating for the previous two years. 4.9%. Where the winery name is itself is printed in red, it is a winery generally acknowledged to have a long track record of excellence – truly the best of the best. 3.8%

 Outstanding winery capable of producing wines of very high quality, and did so this year. Also will usually have at least two wines rated at 94 points or above.

 Excellent winery able to produce wines of high to very high quality, knocking on the door of a 5-star rating. Will normally have one wine rated at 94 points or above, and two (or more) at 90 and above, others 87-89.

 Very good producer of wines with class and character. Will have two (or more) wines rated at 90 points and above (or possibly one at 94 and above).

 A solid, usually reliable, maker of good, sometimes very good wines. Will have one wine at 90 points and above, others 87-89.

 A typically good winery, but often has a few lesser wines. Will have wines at 87-89 points.

NR The rating is given in a range of circumstances: where there have been no tastings in the 12-month period; where there have been tastings, but with no wines scoring more than 86 points; or where the tastings have, for one reason or another, proved not to fairly reflect the reputation of a winery with a track record of success.

Source:http://www.winecompanion.com.au/wineries/understanding-winery-ratings.