Winery reputation in explaining wine clusters: A spatial analysis of Hunter Valley wine producers

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Outline

- Motivation for the study
- Research questions
- Background on wine clusters
- Methods of analysis
- Winery rating system and data
- Results
- Findings
- Further work

Motivation for the study

- The Australian wine industry faces increased competition in export and domestic markets, subdued global demand, and decreasing prices for low-quality bulk wines
- We consider whether a cluster of wineries exists producing high-quality wine, so that the Australian wine industry can improve domestic and export returns through cluster benefits

Motivation for the study

- Cluster benefits include:
  - access to superior physical resources
  - economies of scale
  - agglomeration economies
  - regional knowledge and skills
  - industry leadership
  - innovation

Research questions

- Do Hunter Valley wine producers exhibit clustering behaviour?
- More specifically, do high-rating Hunter Valley wine producers exhibit clustering behaviour?
- What are the factors influencing this clustering behaviour?
- What are the factors influencing winery ratings and is clustering one of them?

Background on wine clusters

Cluster: ‘geographically proximate group of interconnected companies, suppliers, service providers and associated institutions in a particular field, linked by local public goods and externalities of various types’ (Porter 2003, p. 562)

Source: Porter, M. (2003), ‘The economic performance of regions’, *Regional Studies* 27, 549-578, amended by the insertion of ‘local public goods’.

Background on wine clusters

- Extreme viewpoints on location influencing the quality of wines produced by a winery:
  - 'Old World': wine quality rigidly defined by location – *terroir* and the 'cultural interposition of man concerning tradition, environmental orientation, and information and social exchange within regions in enhancing *terroir*' (Caple and Thyne 2014)
  - 'New World': science- and marketing-based approach to achieving high quality of any wine anywhere in a designated wine region

Background on wine clusters

- Preferred middle position: *terroir* and regional varietals are still important in defining wine quality in a region even if climate is not as restricting on quality of winegrapes in Australia as for Old World producers
- Wine Australia's (2013) strategy is 'to build a stronger perception of the quality of Australian wine' based on the 'quality, diversity and regionality of wines'
- Diversity and regionality can enhance wine quality by exploiting the physical environment of a wine region, and variations within it

Background on wine clusters

- Key issue:

Are clustering contributions to high wine quality in the Hunter Valley wine region negated by factors* that relax the locational constraints on producing high-quality wine?

* Examples: few environmental constraints (particularly warm climate), diverse varietal opportunities, widespread knowledge of suitable grape-growing and winemaking requirements, ready access to skilled labour

Methods of analysis

- Spatial autocorrelation as a measure of clustering (Moran's I statistic) for all 200 wineries and for the 45 high-rating wineries in the Hunter Valley wine region
- Ordered logistic regression to analyse determinants of winery rating, including cluster variables as proxies for unobserved factors existing in clusters that positively influence winery ratings

Methods of analysis

- Use of rating system as a measure of winery reputation for quality rather than wine prices
- Whose rating system?
- Ordered or continuous variable?

James Halliday Winery Rating System

★★★★★ Will have at least two wines rated at 94 points or above, and had a five-star rating for the previous two years

★★★★★ Capable of producing wines of very high quality, and did so this year; will usually have at least two wines rated at 94 points or above

★★★★☆ Will normally have one wine rated at 94 points or above, and two (or more) at 90 and above, others 87-89

★★★★ Will have two (or more) wines rated at 90 points and above (or possibly one at 94 and above)

★★★☆ Will have one wine at 90 points and above, others 87-89

★★★ Will have wines at 87-89 points

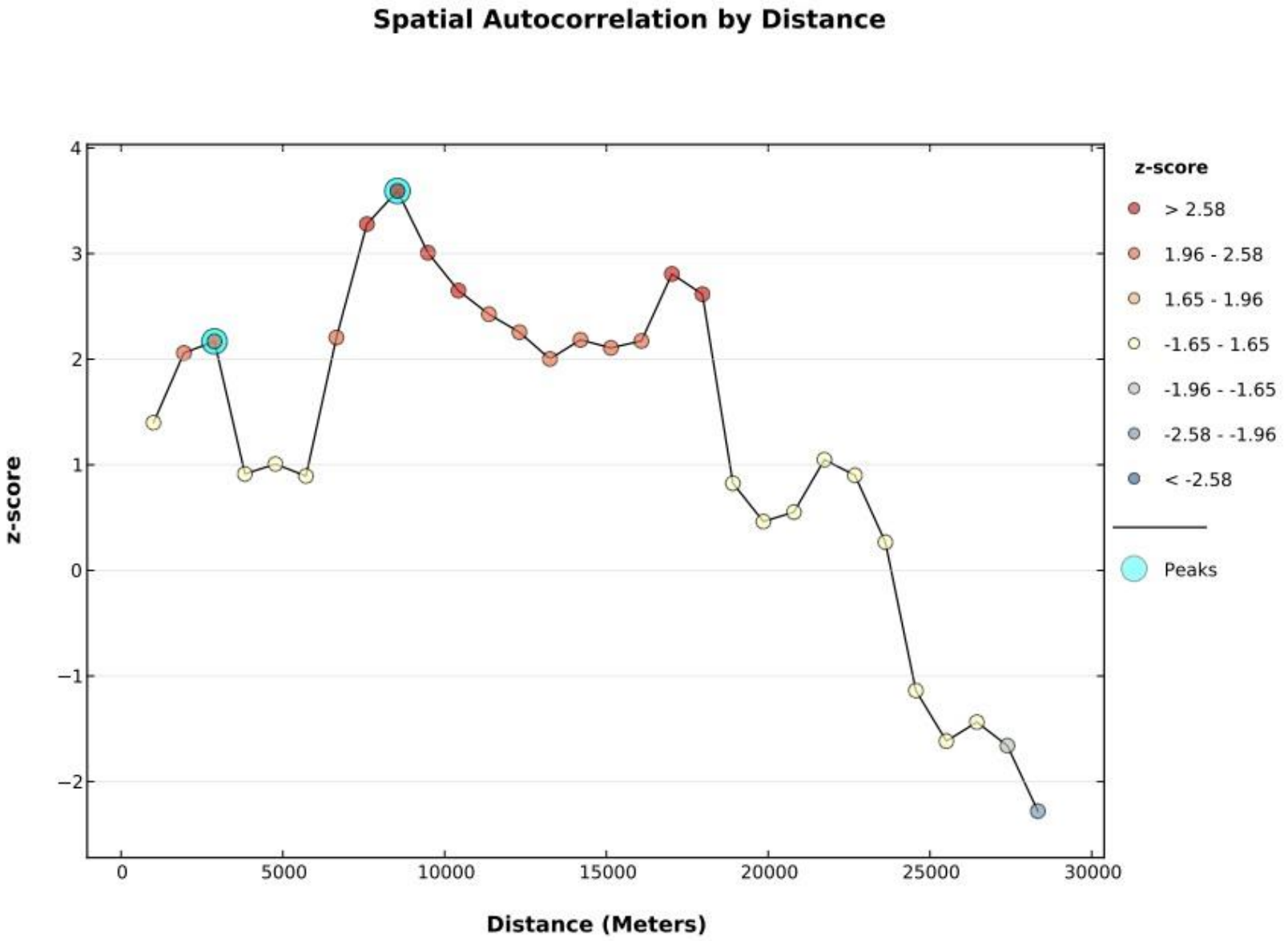
NR No tastings in 12-month period; tastings, but with no wines scoring more than 86 points; or tastings have not fairly reflected the reputation of a winery with a track record of success

Sample dataset

Evidence of clustering

- Positive spatial autocorrelation is when similar values cluster together in a map
- The global Moran's I test measures the spatial autocorrelation present between all data points and determines whether the dataset experiences clustering behaviour
- The local Moran's I test measures the clustering behaviour exhibited by individual data points
- Moran's I coefficient is in the range +1 (clustering) to -1 (dispersing)

Evidence of clustering: all wineries



Evidence of clustering: all wineries

- Global Moran's I test result for all HV wineries:

Variable	I-statistic	Std dev(I)	z-score
Rating	+0.147*	0.084	1.817

*p<0.05

- Local Moran's I statistics: 84 of all 200 wineries demonstrated a statistically significant spatial autocorrelation with their neighbours
- 54 clustering pattern (positive spatial autocorrelation) and 30 dispersal pattern (negative spatial autocorrelation)

Evidence of clustering: high-rated wineries

- Test result for highly rated (5-star) HV wineries:

Variable	I-statistic	Std dev(I)	z-score
Rating	-0.026	0.045	-0.065

- 6 of 45 high-rating wineries exhibit clustering or dispersing behaviour
- 4 exhibit clustering behaviour
- 2 exhibit dispersing behaviour, indicating that these wineries tend to be located a greater geographical distance from their peers

Evidence of clustering: rated wineries

- Test result for highly rated (5-star) HV wineries:

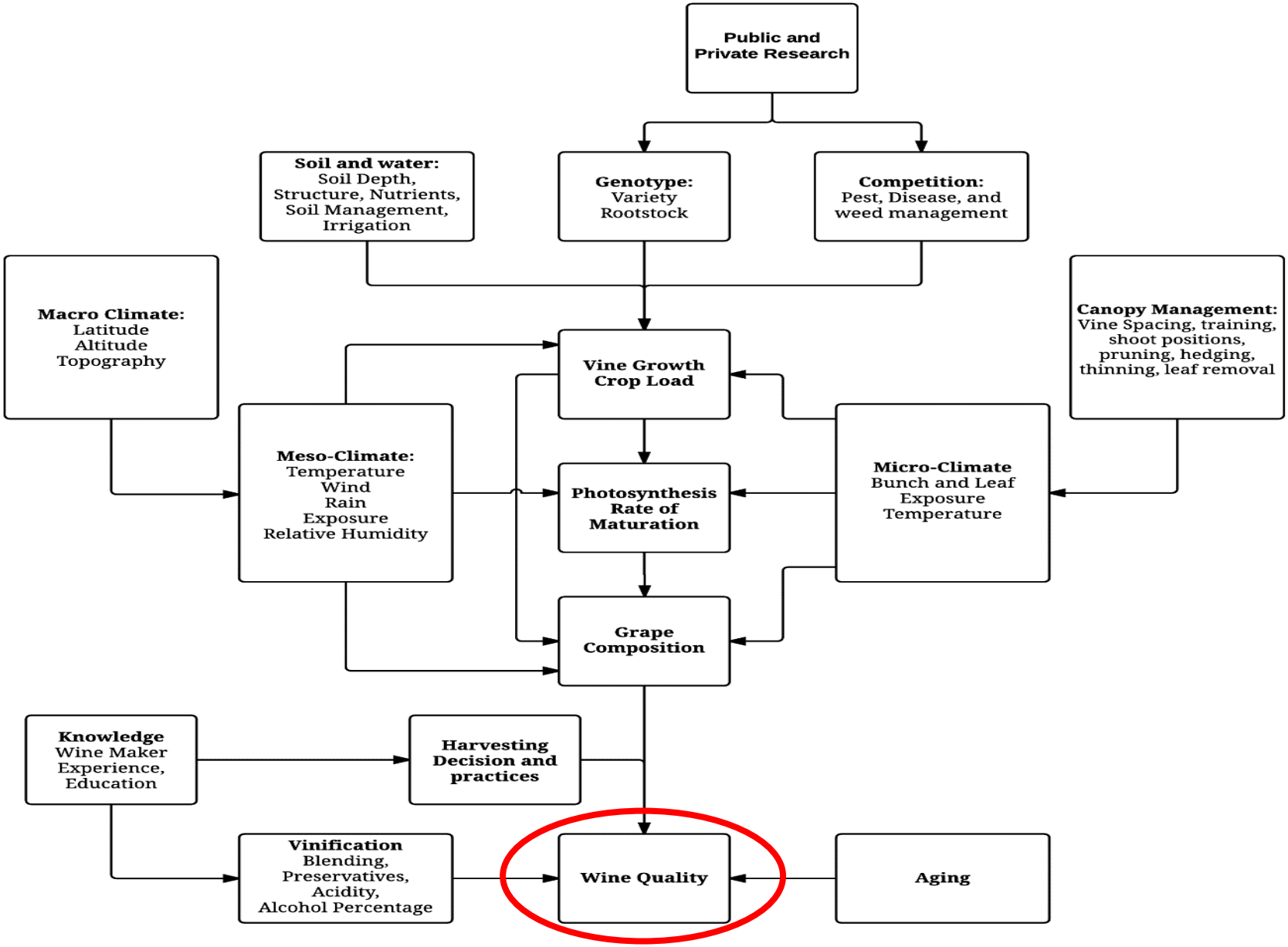
Variable	I-statistic	Std dev(I)	z-score
Rating	0.066	0.192	0.396

- Suggests no spatial autocorrelation among rated wineries
- Unnecessary to estimate a spatial lag model

Ordered logistic regression

- Unrated wineries were excluded
- For the 72 rated wineries, the neighbouring wineries within the 8.5 km buffer were counted according to their rating on the Halliday rating scale
- Ordered logit models were estimated using *Stata* where the dependent variable was the Halliday winery rating

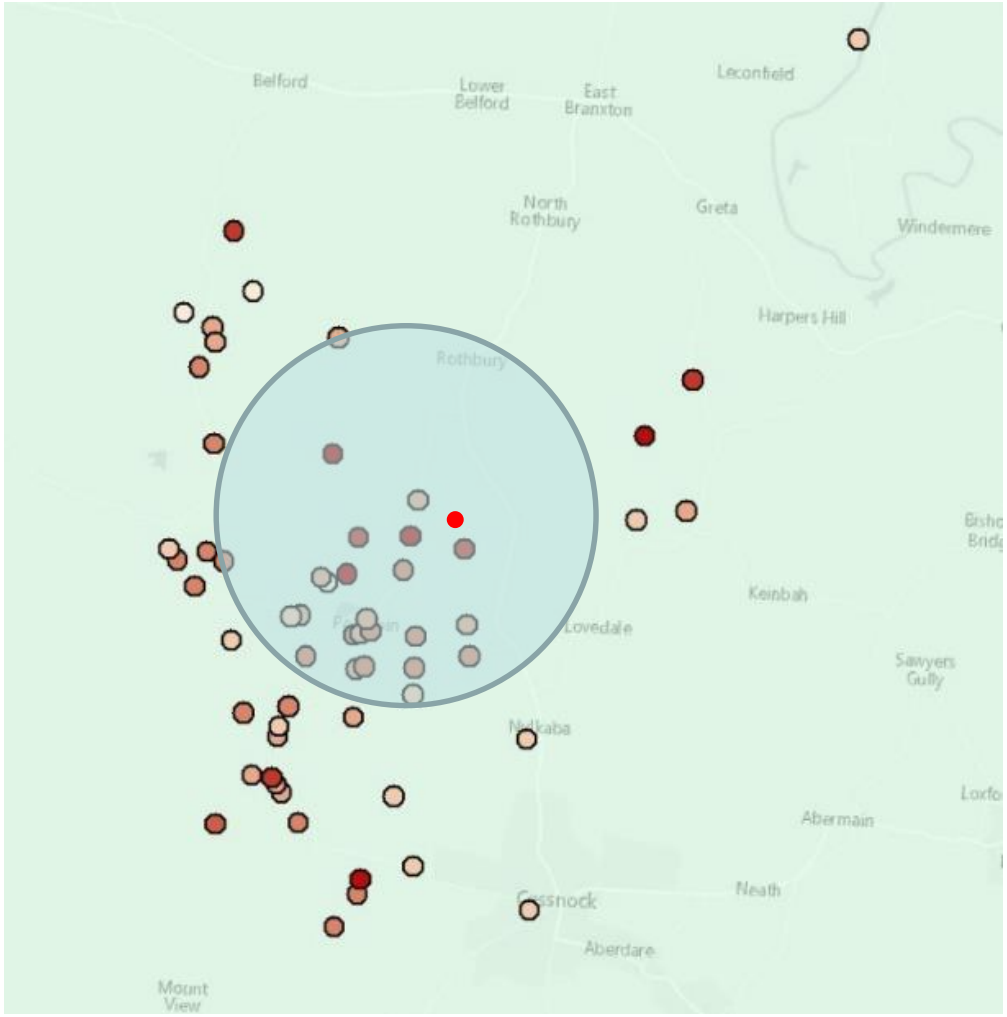
Conceptual model



Adapted from Jackson and Lombard (1993)

Ordered logistic regression

- Buffers were drawn around each winery at the optimal spatial autocorrelation band (8.5 km)



Ordered logistic regression

- Explanatory variables included:
  - Soil characteristics
  - Clustering (number of wineries for each of the rating categories within the 8.5 km band)
  - Winemaking practices
  - Winegrape growing practices
- Missing variables because of data deficiencies

Ologit results: cluster variables

Regressor	Odds ratio	z	p
Unrated wines	1.021	0.22	0.825
3-star wines	1.658	1.12	0.264
3.5-star wines	0.647	-0.84	0.403
4-star wines	0.683	-0.81	0.420
4.5-star wines	1.119	0.42	0.672
5-star wines	1.074	0.63	0.531

Test for parameters jointly equal to zero:

chi2(5) = 4.76
Prob > chi2 = 0.4454

Findings

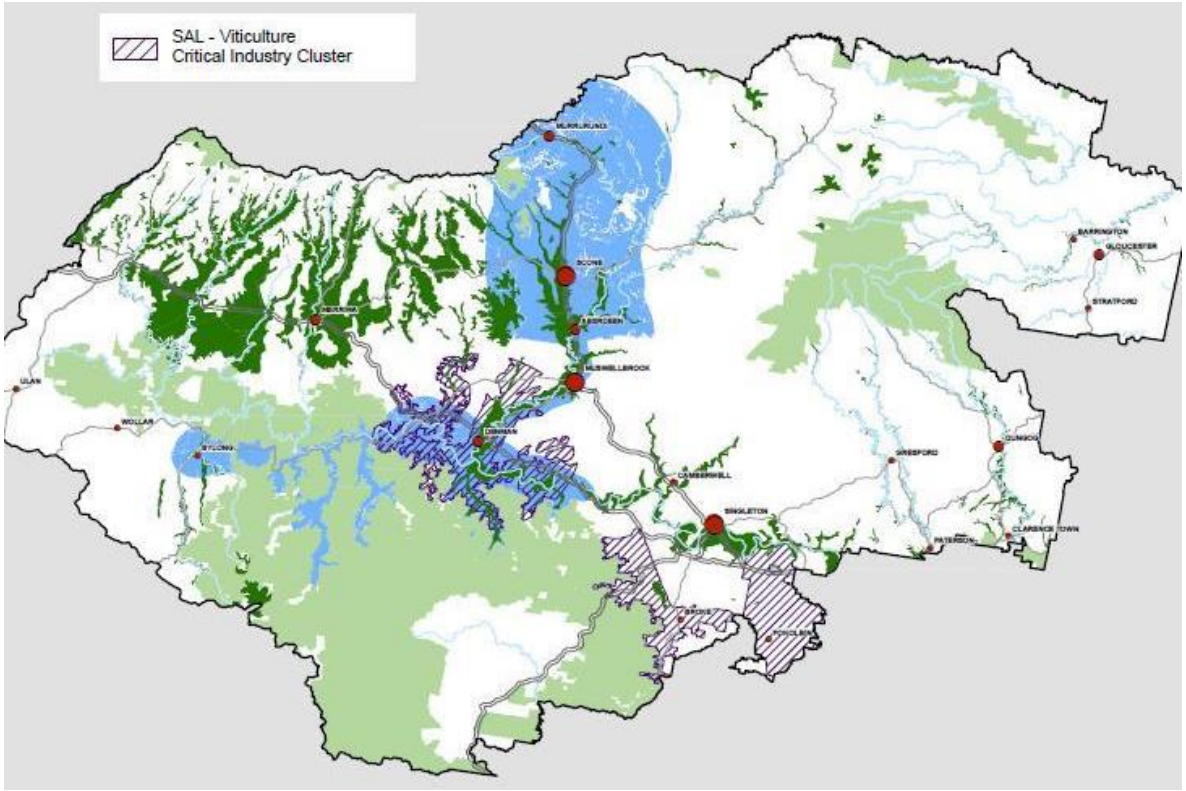
- Evidence of clustering of wineries in the Hunter Valley wine region
- But no evidence of clustering of high-rating wineries
- Results are consistent with Wine Australia's strategy of diversity, and observations that there are fewer environmental constraints on producing high-quality wines in Australia than in Europe
- Semillon varietal a major factor in winery ratings, but not 'a one-trick pony'

Further work

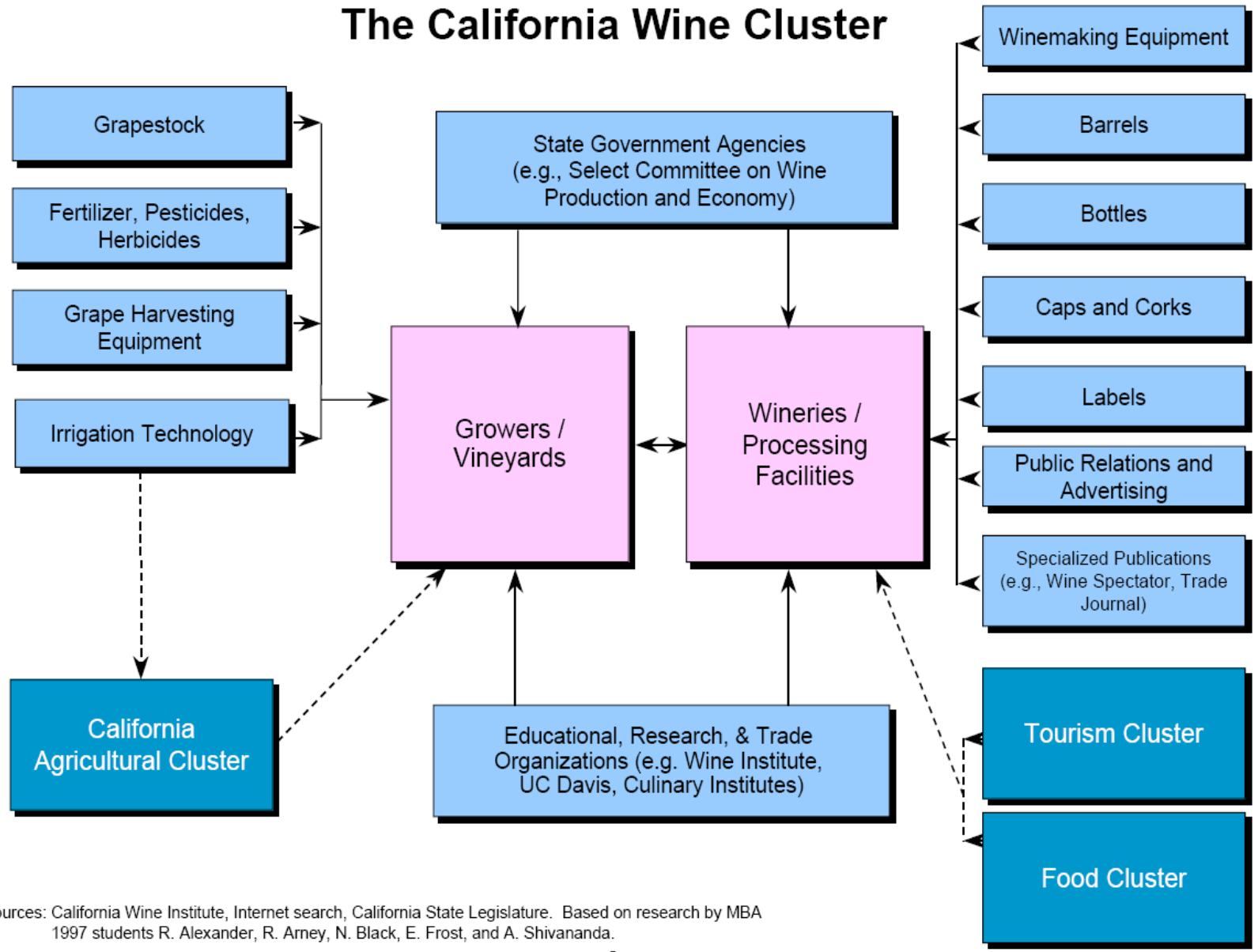
- Scope for improving the data set and spatial econometric analysis method
- Would be helpful to distinguish types of unrated wineries for ordered logit modelling
- Develop panel data sets
- Test for clustering across as well as within wine regions
- Use other wine expert ratings
- Use different buffer zones to define a cluster
- Study wineries exhibiting local clustering/dispersing behaviour

Research questions

- This study builds on earlier work by the authors and the work by the NSW Departments of Primary Industries and Environment and Planning, which identified a critical viticulture cluster in the Hunter Valley

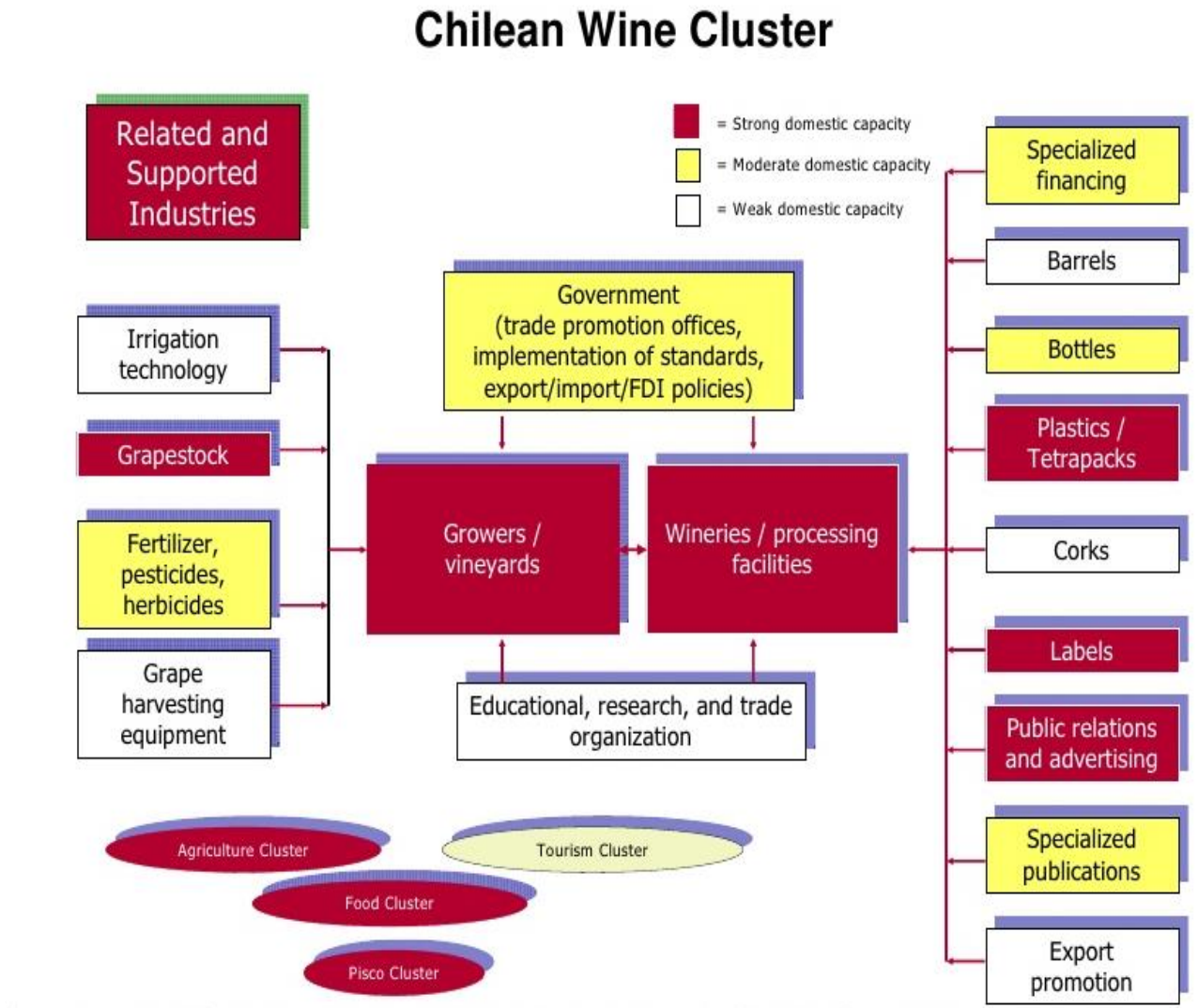


Background on wine clusters



Sources: California Wine Institute, Internet search, California State Legislature. Based on research by MBA 1997 students R. Alexander, R. Arney, N. Black, E. Frost, and A. Shivananda.

Background on wine clusters



Source: Research by HBS student team (Asier Alea, Judd Belstock, Don Lambert, Jacqueline O'Neill, Noah Sawyer), 2005

Background on wine clusters

- Huon Hooke (2016):

‘Some years ago, a distinguished Bordeaux winemaking academic and writer was quoted as saying semillon was not one of the noble grape varieties. Perhaps he had never tasted a classic Hunter Valley semillon by Tyrrell's or McWilliam's Mount Pleasant. For such wines are among the greatest and most distinctive in Australia – if not the world.’

Background on wine clusters

- Jancis Robinson (2004):

‘Hunter Valley Semillon is one of Australia's great gifts to the world of wine.’

- Jancis Robinson (2016):

‘In Australia’s Hunter Valley [semillon] is responsible for one of the most idiosyncratic and historic wine types exclusive to the New World. … [It] is one of the unsung heroes of white wine production.’

Background on wine clusters

- Huon Hooke again:

‘… the Hunter has an abundance of sandy soils, which semillon loves – especially old river beds such as those that run through the Hermitage Road/Casuarina area where Tyrrells' HVD and other famous semillon vineyards are sited.’

‘All [Tyrrell’s semillons] come from subtly different soil types and taste slightly different. The thing they have in common is that they all win show trophies hand over fist.’

Background on wine clusters

- Huon Hooke (continued):

‘If ever it can be glibly said that the red soils produce the best red wines and the white produce the best whites, it's in the Lower Hunter Valley's pivotal district, Pokolbin. The top exponents of the style have their semillon vines on poor, white to grey sand or sandy loam soils.’

Background on wine clusters

- James Halliday (2015):

‘The ability of many high-quality, estate-based, Australian wineries to produce between three and five varietal wines of similar quality is a source of mystery to visitors from overseas, particularly France. The answer is that the varietal/regional choice in Europe has been historically determined by the amount of warmth in the growing season, just sufficient for the permitted varieties to achieve full ripeness.’

Background on wine clusters

- James Halliday (continued):

'… Turning the proposition upside down in the southern hemisphere-Australian context, most regions have ample warmth to ripen multiple varieties, particularly given the massive size of our official GI regions compared with the tiny areas of appellations in France.'

Methods of analysis

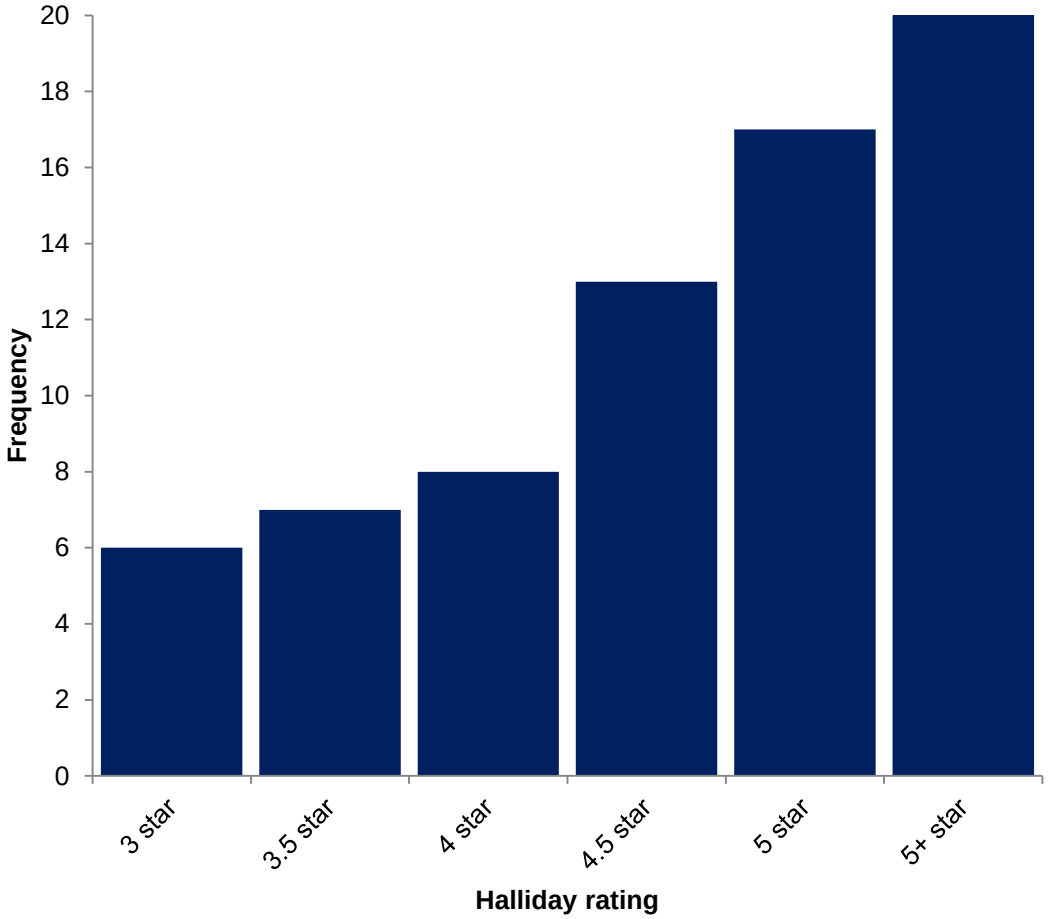
- A similar study in USA to the regression analysis:

  Yang, N., McCluskey, J.J. & Brady, M.P. (2012), 'The value of good neighbors: A spatial analysis of the California and Washington wine industries', *Land Economics* 88(4), 674-684

- Clusters of high-quality wineries found to be present

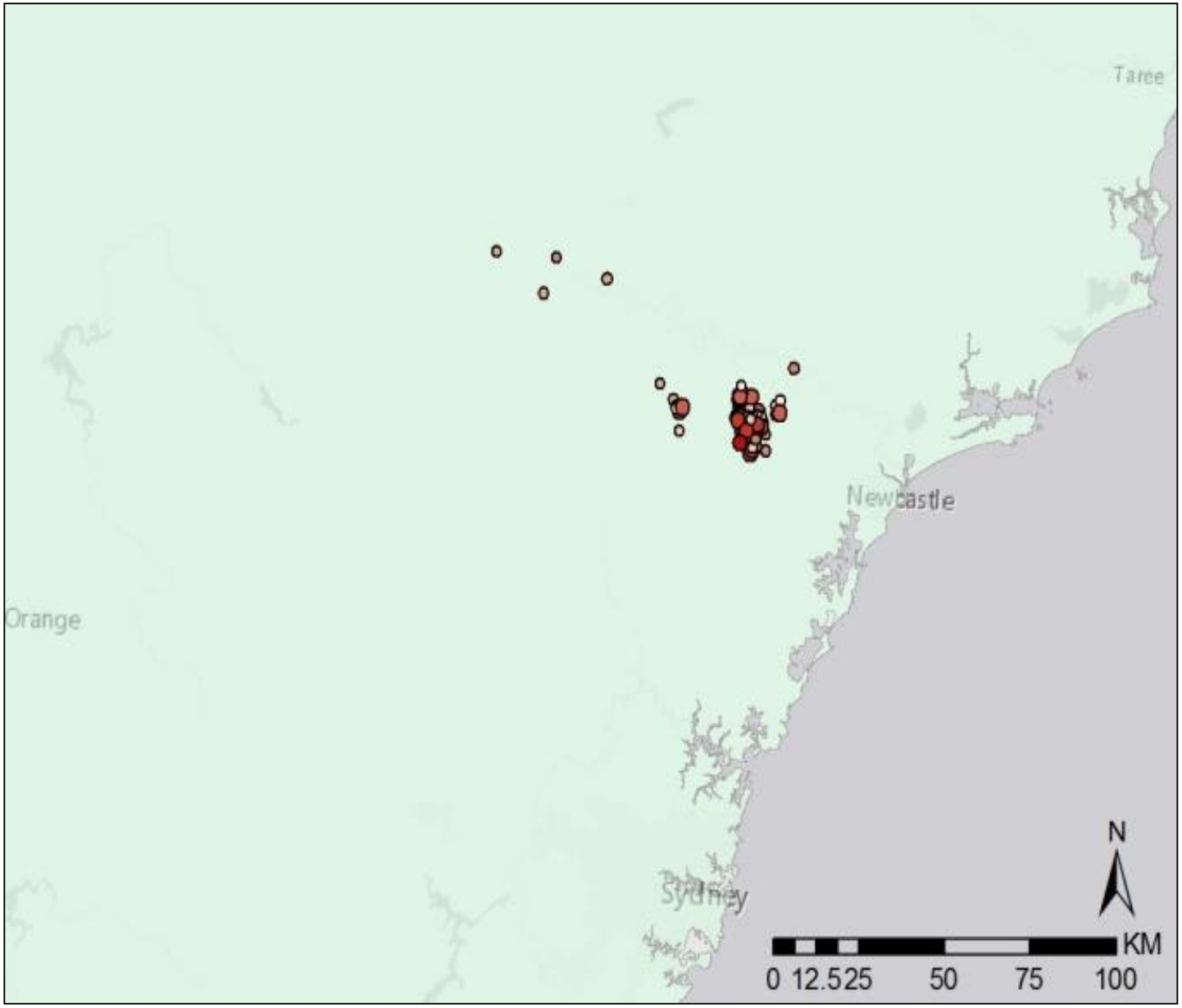
Sample dataset

- 72 rated wineries
- Mean distance of 3.4 km (SD 7.3 km) to the nearest neighbouring winery



Distribution of ratings

Study area



Ordered logistic regression

- The underlying process to determine the rating of any individual winery used the following latent variable model:

$$r_i^* = \mathbf{x}_i\beta + e_i$$

where:

r_i is the rating of winery i,

x is a vector of independent variables

β is a vector of regression coefficients which are estimated

e is the error term

Ordered logistic regression

- Observe the categories of response by dividing r^* into the six ordinal categories:

$$r = \begin{cases} 1 & \text{if } r^* \leq 1, \\ 2 & \text{if } 1 < r^* < \mu_1, \\ 3 & \text{if } \mu_1 < r^* < \mu_2, \\ \vdots & \\ 5 & \text{if } \mu_4 < r^* \end{cases}$$

  where the cut points μ_0 to μ_5 are estimated and assume $\mu_0 = -\infty$ and $\mu_5 = \infty$
- The category for observed ratings changes when r^* crosses a cut point
- The probability of a rating for a given set of explanatory variables corresponds to the region of the cumulative distribution curve where r^* falls

Results: grape and winemaking variables

Regressor	Odds ratio	z	p
Average age of wine	1.441	1.21	0.225
Volume of wine produced	1.000	-1.40	0.162
Age of winery	1.018	1.97	0.049
Sourcing of grapes	1.555	0.62	0.538
Closest ‘first family’	1.000	1.05	0.292
Semillon	48.25	4.49	0.000
Whites other than verdelho	3.017	1.65	0.100
Reds other than shiraz	0.703	-0.51	0.608
Blending	0.660	-0.49	0.633

LR chi2(24) = 70.83
Prob > chi2 = 0.0000
Log likelihood = -73.48597
Pseudo R2 = 0.3252

Results: soil variables

Regressor	Odds ratio	z	p
Soil pH	1.542	0.18	0.860
Effective cation exchange capacity	1.700	1.93	0.054
Silt	0.524	-1.95	0.052
Phosphorus	2.138	0.48	0.630
Available water capacity	0.297	-1.91	0.056
Bulk density – whole earth	0.000	-1.66	0.097
Clay	1.418	2.24	0.025
Nitrogen	0.000	-2.85	0.004
Sand	1.294	1.34	0.180

Results: cluster variables

Regressor	Odds ratio	z	p
Unrated wines	1.021	0.22	0.825
3-star wines	1.658	1.12	0.264
3.5-star wines	0.647	-0.84	0.403
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Test for parameters jointly equal to zero:

chi2(5) = 4.76
Prob > chi2 = 0.4454

Evidence of clustering by area

- Test result for highly rated (5-star) HV wineries:

Variable	p-value all	p-value 5-star
Southeast Australia	-	0.286
NSW	**0.017**	0.476
Victoria	**0.002**	0.393
South Australia	**0.032**	**0.045**
Western Australia	0.259	**0.056**
Tasmania	**0.006**	**0.057**
Queensland	**0.000**	0.290
Hunter Valley	**0.031**	0.476
Yarra Valley	0.149	**0.091**
Barossa Valley	0.357	**0.001**