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How might climate changes and preference changes affect the competitiveness of the world's wine regions?☆

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Abstract

Winegrape production is generally considered riskier in cool-climate regions than in warmer ones, yet more producers are looking to invest in such regions. A commonly stated reason is to hedge against global warming, but is there more to it than that? This note reflects on some other supply-side drivers as well as some drivers from the demand side of global wine markets. It first defines what characterizes a cool-climate region; and it ends by drawing implications for the economic future of such cool regions as compared with the world's warmer wine regions.

Keywords: Climate change; Cool-climate wine; Competitiveness

1. What defines a cool climate wine region?

There is no consensus on what defines a cool climate wine region. Certainly average temperature over the growing season is important (October-April in Southern Hemisphere, April-October in Northern), but so too are such aspects as months of growing season, rainfall distribution, wind exposure, frost prevalence and sunlight hours. Jones and Schultz (2016) believe an average growing season temperature (GST) should be between 13 °C and 15 °C: below 13 °C means only non-vinifera (hybrid) varieties will prosper, and above 15 °C tends to result in wines that are significantly less acidic.

2. Why riskier?

Growing winegrapes in cool climates is both riskier and more costly than in warmer regions for several reasons. If cool regions also have higher rainfall because they are near the coast, disease pressure is greater; or if they are far inland they face a higher risk of spring or fall frosts that could kill the weakest vines. Also, the shorter growing season raises the risk that grapes won't ripen sufficiently in the coldest vintages. Yields will tend to be lower on average too, raising production costs per ton, and they tend to be more variable from vintage to vintage, adding to marketing challenges (especially when compared with those warmer regions that allow irrigation). If the prevalence to hand prune and pick is greater in cooler regions, that too would make them costlier. One of the few offsetting factors is that longer summer daylight hours in higher latitudes can contribute more to photosynthesis.

3. How significant are cool climate wine regions?

The share of cool climate regions in the world's vineyard area depends of course on which regions are classified as cool. The set listed in Table 1 has been compiled with the help of Peter Dry of the Australian Wine Research Institute. It may include some

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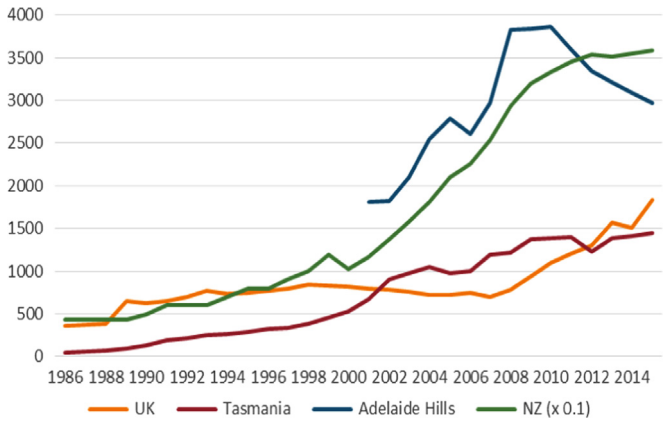

Fig. 1. Vine bearing area in a selection of cool climate regions,[a] 1986 to 2015 (hectares). [a]Note that New Zealand's area is ten times that shown on the above scale. *Source*: Author's compilation from national sources.

regions that are slightly warmer than what Jones and Schultz (2016) consider cool, but even so it suggests they account for just 13 percent of the world's winegrape bearing area in 2010.

These regions may be more important economically than just those area data suggest, however. This would be the case if average winegrape prices in cool climate regions are sufficiently higher than those of warmer regions to offset the lower yields per hectare. Their wines may have an even larger share of the global wine market if the wine price to grape price ratio is above the world average.

Are these regions expanding? Certainly they are in Australia and New Zealand, and famously also (albeit from a very low base) in England (see Fig. 1). But globally the area of the regions listed in Table 1 fell by one-sixth between 2000 and 2010, while the bearing area of warmer regions fell only one-tenth.

4. How different are cool climate winegrape varieties?

According to Jones (2006, Fig. 1), there is a clear ranking of premium quality winegrape varieties in terms of their potential to ripen in different climates,. That manifests itself in a quite different mix of varieties in cool as distinct from warmer climates: among the top ten varieties globally in those two subsets of regions, there are only three that are common, namely Chardonnay, Cabernet Sauvignon and Merlot (Fig. 2).

5. Supply-side determinants of the competitiveness of cool climate vignerons

Global warming is typically thought of as a major driver of new investment in cool climate wine regions, including from producers in warmer areas seeking to supplement supplies that can help them maintain their current styles of wines as well as add new ones (Ashenfelter and Storchmann, 2016). An opposite development took place between 1200 and 1600: the average temperature in Southern England fell about 1.3 °C over those four centuries, and the gradual disappearance of England's vineyards after 1200 is often attributed to that cooling (Lamb, 1982, Grove, 1988) – although the British takeover of the Bordeaux region of France may have been the main reason for their demise.

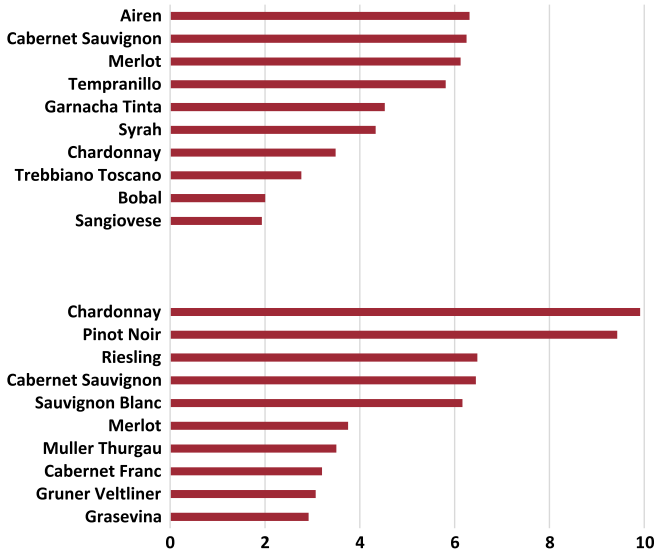

Fig. 2. Shares of the top ten varieties in the bearing area of the world's cool and warmer regions, 2010 (percent; bars for cool regions are shown below the set for warmer regions).
Source: Derived from Anderson (2013) using the regional classification in Table 1.

Over time with global warming, the warmest of cool regions would no longer be capable of producing cool climate wine styles. However, that would be more or less offset by new plantings in areas at higher altitudes or latitudes that were previously too cold to grow winegrapes profitably. Evidence to support this expectation is provided by Ashenfelter and Storchmann (2010a, 2010b). They examine economic data from the Mosel region of Germany and find that a 1 °C rise in GST increases gross earnings from Riesling by 30 percent.

Data compiled for Australia by Webb (2006), by contrast, suggest that in that country's hot winegrape regions, greater warming leads to lower prices and profits. This would add to a strengthening of the competitive edge of cool climate regions over hot ones.

Research and development can of course affect competitiveness. If cool climate regions have different R&D needs from warmer regions, it is a question of how R&D funding is allocated. Traditionally Australia has paid relatively little attention to cool climate viticultural research, in contrast to Germany and northern France (from whose research institutes more-northern European regions can borrow). Australia's cool climate regions may benefit from developing strategies to boost pertinent R&D investment collaboration with New Zealand.

Another supply-side influence on cool climate competitiveness is trade costs. Shipping small quantities of premium wine half-way around the world has been infeasible historically, which is a key reason why cool climate regions in the southern hemisphere had little presence in the main (i.e., northern hemisphere) markets for fine wine. Technological changes in ocean transportation of wine have helped to lower trade costs substantially over the past three decades however, and not only for commercial premium wines that are increasingly being shipped in bulk. That development is reducing the competitive disadvantage that southern hemisphere producers of fine wine, including from cool regions, have had to suffer until recently.

Table 1
Cool climate area by region and share of national winegrape area, 2010.
Source: Author's compilation based on consultations with Peter Dry of the Australian Wine Research Institute, using regional data assembled in Anderson (2013).

Region	Bearing area (hectares)	National share (%)	Region	Bearing area (hectares)	National share (%)
Argentina			Podunavlje	3206	15.45
Neuquen	1653	0.82	Pokuplje	41	0.20
Rio Negro	1643	0.82	Prigorje - Bilogora	791	3.81
Total Argentina	**3295**	**1.64**	Sjeverna Dalmacija	2333	11.24
Australia			Slavonija	3307	15.94
Adelaide Hills	3861	2.54	Srednja Juzna Dalm.	2972	14.32
Alpine Valleys	705	0.46	Zagorje-Medimurje	1266	6.10
Australian Capital Territory	4	0.00	Other HR	2263	10.90
Beechworth	57	0.04	**Total Croatia**	**20,754**	**100.00**
Bendigo	771	0.51	**Czech Republic**		
Canberra District (ACT)	105	0.07	Cechy	785	4.83
Canberra District (NSW)	378	0.25	Morava	15,457	95.17
Coonawarra	5985	3.94	**Total Czech Republic**	**16,242**	**100.00**
Grampians	506	0.33	**France**		
Heathcote	1245	0.82	Bas Rhin	6965	0.82
Henty	183	0.12	Cher	4027	0.48
Macedon Ranges	224	0.15	Cote d'Or	9665	1.14
Mornington Peninsula	752	0.50	Haut Rhin	9190	1.09
Mount Benson	233	0.15	Indre	424	0.05
Mount Lofty Ranges – other	468	0.31	Indre et Loire	10,443	1.23
Port Phillip – other	68	0.04	Nievre	1611	0.19
Robe	644	0.42	Saone et Loire	13,486	1.59
Southern Highlands	202	0.13	Savoie	1323	0.16
Tasmania	1251	0.82	Vendee	1318	0.16
Tumbarumba	254	0.17	Vienne	1091	0.13
Wrattonbully	2818	1.86	Yonne	7131	0.84
Yarra Valley	2440	1.61	**Total France**	**66,675**	**7.87**
Total Australia	**23,153**	**15.25**	**Germany**		
Austria			Ahr	550	0.54
Burgenland	13,842	30.40	Baden	15,830	15.51
Niederosterreich	27,184	59.70	Franken	6100	5.98
Steiermark	3867	8.49	Hessische Bergstra E	420	0.41
Wien and other Bundeslander	640	1.40	Mittelrhein	450	0.44
Total Austria	**45,533**	**100.00**	Mosel-Saar-Ruwer	8970	8.79
Canada			Nahe	4160	4.08
British Colombia	3995	39.56	Rheingau	3060	3.00
Ontario	6102	60.44	Rheinhessen	26,470	25.94
Total Canada	**10,096**	**100.00**	Rhein-Pfalz	23,460	22.99
Chile			Saale-Unstrut	700	0.69
Del Bio Bio	3420	3.07	Sachsen	460	0.45
Valparaiso	8522	7.64	Wurttemberg	11,430	11.20
Total Chile	**11,942**	**10.71**	**Total Germany**	**102,060**	**100.00**
China			**Hungary**		
Ningxia	11,152	37.74	Badacsony	1618	2.32
Total China	**11,152**	**37.74**	Balatonboglar	3305	4.74
Croatia			Balatonfelvidek	1025	1.47
Dalmatinska Zagora	602	2.90	Balatonfured-Csopak	2180	3.13
Hrvatsko Primorje	210	1.01	Bukk	1055	1.51
Istra	3083	14.85	Csongrad	1513	2.17
Moslavina	228	1.10	Eger	5509	7.90
Plesivica	452	2.18	Etyek-Budai	1717	2.46
Hajos-Bajai	1982	2.84	Jura	14	0.09
Kunsag	22,263	31.93	Lucerne	41	0.28
Matra	6294	9.03	Neuchytel	591	3.99
Mor	730	1.05	Schaffhausen	478	3.22
Nagy-Somlo	598	0.86	Schwyz	38	0.26
Neszmely	1587	2.28	St. Gallen	215	1.45
Pannonhalma	615	0.88	Thurgau	263	1.78
Pecs	777	1.11	Ticino	1069	7.21
Sopron	1919	2.75	Valais	5070	34.21
Szekszard	2333	3.35	Vaud	3819	25.77
Tokaj	5994	8.60	Zurich	614	4.14

Table 1 (*continued*)

Region	Bearing area (hectares)	National share (%)	Region	Bearing area (hectares)	National share (%)
Tolna	2526	3.62	Other Switzerland	25	0.17
Villany	2582	3.70	**Total Switzerland**	**14,820**	**100.00**
Zala	1592	2.28	**United Kingdom**	**1198**	**100.00**
Total Hungary	**69,715**	**100.00**	**United States**		
Japan			Marin	62	0.03
Hokkaido	835	22.47	Mendocino	6555	2.88
Nagano	754	20.30	Monterey	15,600	6.84
Yamagata	392	10.56	San Luis Obispo	11,484	5.04
Yamanashi	632	17.01	Santa Barbara	6512	2.86
Other Japan	1102	29.66	Santa Clara	609	0.27
Total Japan	**3715**	**100.00**	Santa Cruz	160	0.07
Luxembourg	**1304**	**100.00**	Sonoma	22,265	9.77
New Zealand			Columbia Gorge	159	0.07
Auckland	543	1.70	Columbia Valley	3023	1.33
Canterbury	320	1.00	Horse Heaven Hills	4283	1.88
Gisborne	2149	6.72	Lake Chelan	100	0.04
Hawkes Bay	4921	15.40	Puget Sound	72	0.03
Marlborough	18,401	57.57	Rattlesnake Hills	647	0.28
Nelson	813	2.54	Red Mountain	515	0.23
Otago	1532	4.79	Snipes Mountain	285	0.12
Waikato	147	0.46	Wahluke Slope	2689	1.18
Waipara	1442	4.51	Walla Walla Valley	528	0.23
Wairarapa	859	2.69	Yakima Valley	5444	2.39
Other NZ	836	2.62	Chautauqua-Erie	7561	3.32
Total New Zealand	**31,964**	**100.00**	Finger Lakes	3801	1.67
Slovakia			Other New York	1508	0.66
Juznoslovenska	4141	32.77	Benton Co.	155	0.07
Malokarpatska	3683	29.14	Columbia River	610	0.27
Nitrianska	2652	20.98	Douglas Co.	350	0.15
Stredoslovenska	1155	9.14	Jackson Co.	536	0.24
Tokajska	453	3.59	Josephine Co.	162	0.07
Vychodoslovenska	553	4.38	Lane Co.	341	0.15
Total Slovakia	**12,637**	**100.00**	Marion Co.	660	0.29
Slovenia			Other W. Valley	154	0.07
Bela Krajina	365	2.23	Polk Co.	928	0.41
Bizeljsko Sremic	907	5.54	Washington Co.	670	0.29
Dolenjska	1476	9.02	Yamhill Co.	2273	1.00
Prekmurje	564	3.45	Illinois	373	0.16
Stajerska Slovenija	6374	38.97	Indiana	263	0.12
Total Slovenia	**9686**	**59.22**	Iowa	194	0.09
Switzerland			Michigan	1072	0.47
Aargau	399	2.69	Minnesota	418	0.18
Basel-Landschaft	114	0.77	Ohio	436	0.19
Bern	242	1.63	Pennsylvania	1004	0.44
Fribourg	117	0.79	Virginia	1065	0.47
Geneva	1292	8.72	**Total United States**	**105,527**	**46.29**
Graubunden	421	2.84	**World in 2010**	**608,850**	**13.22**

Falling information and communication costs also have helped, by speeding the pace of technology transfer from the established centres of cool climate grape and wine research in Europe to the antipodes.

6. Demand-side determinants of the competitiveness of cool climate vignerons

Since it is relatively expensive to produce cool climate wines, they need to be able to command relatively high prices. The demand for them therefore depends on a rise in incomes of those wine consumers with a preference for that style of wine, or a preference shift toward that style. If both things happen simultaneously, prices of cool climate wines would rise even more than otherwise would have been the case. Regional marketing by cool climate producers may be able to reinforce such a preference switch, provided it is not more than offset by generic promotion by other regions.

Fine wines from cool regions have been produced since at least the 19th century, but only the elite could afford them. Unprecedented rises in per capita incomes since the 1980s, however, have boosted the demand for all luxury products, including wines. More specifically, higher incomes are raising the demand for higher-quality wines at the expense of low-quality wines, and for more styles and novel varieties. Also accompanying the higher incomes of such consumers is a greater tolerance – even a

desire – for vintage variation in still wines of the sort that is more common in cool climates. So even though there has been a halving in global consumption of wine per capita since the 1950s, the demand for finessed wines from cool regions can still grow. The challenge will be to be able to attract high-income customers in the wake of efforts by warmer regions to emulate the styles of cool-region wines, both still and sparkling.

7. Implications for southern hemisphere cool-climate regions

In addition to the above forces altering the competitiveness of cool climate wine regions in general, producers in cool regions of the Southern Hemisphere face the challenge of being relatively small both individually and collectively in each region. Smallness matters because it means the costs of focused R&D and of brand or regional promotion are subject to diseconomies of scale. It also means transport costs are relatively high. But as New Zealand has shown, these handicaps need not be insuperable. On the contrary, as producers in the relatively new cool regions gradually discover the varieties, clones and styles they can produce most profitably, so investments in their region could expand.

Conflicts of interest

The authors declare no conflict of interest.

Appendix A. Supporting material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.wep.2016.12.001.

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