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# Varietal Distinctiveness of World's Wine Regions: An Updated Empirical Picture

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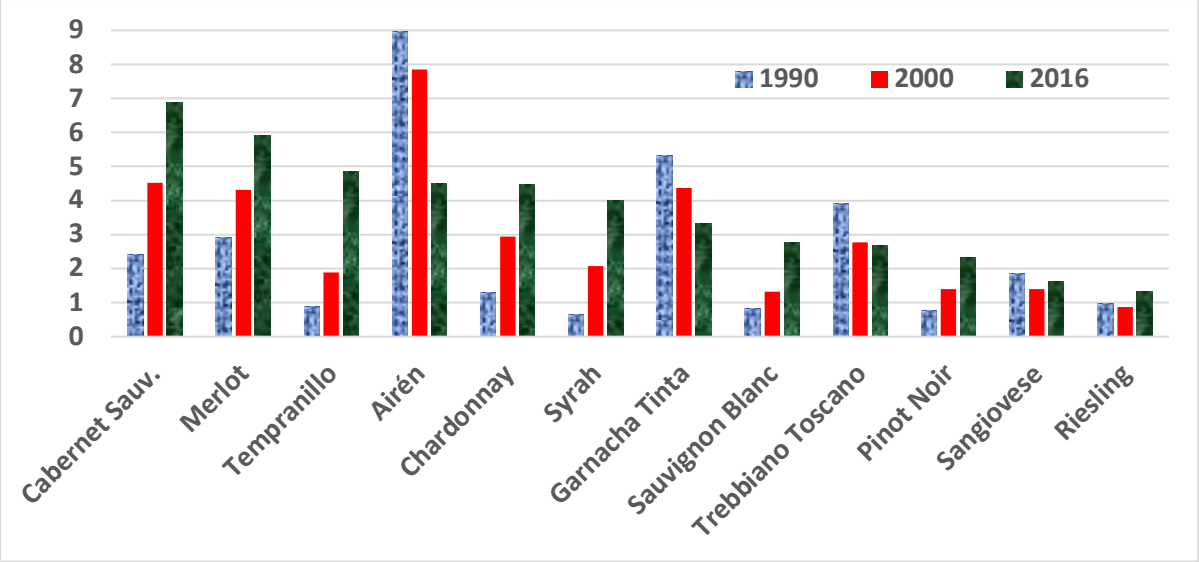
This summarizes and updates an article originally published as Anderson and Nelgen (2021) which is based on a freely available revised global database and ebook (Anderson and Nelgen (2020a,b).

Over the past three decades there have been dramatic changes to global wine markets. They include the continuing rapid decline in wine consumption in the world's traditional wine-producing countries of Western Europe, the explosive growth in wine exports from temperate regions of New World countries, and the growth in wine demand in traditionally beer- and spirits-focused countries of northwest Europe and East Asia (Anderson and Pinilla 2018, 2022). Those plus climate changes have prompted winegrowers to alter the mix of winegrape varieties in their vineyards, and also the locations of vineyards. To assist vignerons make future planting decisions, a global database showing which varieties are grown in the world's various wine regions has been assembled and twice updated and expanded. The latest version (Anderson and Nelgen 2020a,b) provides regional snapshots for 2000, 2010 and 2016 for more than 800 wine-growing regions in 53 countries that account for 99% of the world's winegrape area, as well as a national snapshot for 1990. It has a number of improved features.

First, we have moved to the precise spelling of varieties according to their country of origin, and listed transliterated spellings among our synonyms, following Robinson, Harding and Vouillamoz (2012) or otherwise www.vivc.org. Second, we have homogenized the spelling across the years of names of within-country winegrape-growing regions. Where the degree of regional disaggregation varied through time, we now provide a table to show the regions within each super-region so that trends in the latter are more-easily discernible. We also provide a concordance between the names of regions as listed in the original national data source and the (sometimes more common) names of regions adopted in the Johnson and Robinson (2019) 8th *World Atlas of Wine*. Third, we have introduced two new indexes of internationalization of varieties. One shows the extent to which various countries' native winegrape varieties have been adopted abroad; the other shows the extent to which each nation's varietal choice is focused on exotic (non-native) varieties.

One core finding is that the share of red varieties in the global bearing area rose from 46% in 1990 to 56% in 2016. As part of that, Cabernet Sauvignon's global rank rose from 8th to 1st, and its global share plus that of Merlot and Syrah rose from 5% to 17% (Figure 1). Ironically, consumers have moved more toward white wines this century (OIV 2023), leading to a glut of red wine on global markets by 2023-24.

Figure 1: Shares of global bearing area of the top dozen varieties in 2016 compared with 1990 and 2000 (%)



Importantly, this latest version of the global database has a new set of tables focused on key climate variables of each of the world's 800+ winegrape-growing regions. Based on the location (latitude and longitude) of the region's main town, nine climate variables have been extracted by Gregory Jones from the 1958-2019 records of its nearest weather station. Jones' research over the past quarter-century has found that growing season average temperature (GST) is the best single indicator of viticultural relevance. His analysis determined that the world's winegrape regions can be usefully divided into four climate classifications: 'cold', 'temperate', 'warm' and 'hot'. After allocating each region to one of those four classifications, we have been able to determine the weighted average GST for each super-region (e.g. Bourgogne, made up of Cote-d'Or, Nievre, Saone-et-Loire and Yonne). We did so by using regional winegrape bearing areas as weights. Those same weights have allowed us to estimate the national and global shares of bearing area in each of our four climate classifications, with almost four-fifths of the bearing area corresponding to 'warm' and 'hot' climates (Table 1). Anderson and Nelgen (2020a,b) also report that information by winegrape variety.

Table 1: Shares of 2016 bearing areas under 'cool' (<15°C), 'temperate' (15-19°C), 'warm' (17-19°C), and 'hot' (>19°C) climates, area-weighted average growing season temperature (GST) for the top 20 countries, the New and Old Worlds, and the world as a whole

| Country | Cool | Temp. | Warm | Hot | GST (°C) | Area ('000 ha) |
|---|---|---|---|---|---|---|
| Spain | 0 | 12 | 8 | 80 | 19.5 | 884 |
| France | 5 | 42 | 42 | 12 | 17.6 | 815 |
| Italy | 1 | 2 | 20 | 77 | 19.6 | 605 |
| United States | 0 | 23 | 33 | 44 | 19.1 | 240 |
| Argentina | 0 | 0 | 21 | 79 | 20.6 | 206 |
| Romania | 0 | 0 | 100 | 0 | 17.7 | 183 |
| Portugal | 0 | 0 | 41 | 59 | 18.8 | 183 |
| China | 0 | 0 | 100 | 0 | 18.1 | 178 |
| Chile | 0 | 8 | 83 | 9 | 17.9 | 146 |
| Australia | 1 | 10 | 40 | 49 | 19.4 | 132 |
| South Africa | 0 | 0 | 3 | 97 | 21.0 | 96 |
| Germany | 51 | 49 | 0 | 0 | 15.0 | 95 |
| Moldova | 0 | 0 | 100 | 0 | 17.2 | 83 |
| Hungary | 0 | 85 | 15 | 0 | 16.7 | 64 |
| Bulgaria | 0 | 0 | 100 | 0 | 18.3 | 53 |
| Greece | 0 | 0 | 4 | 96 | 21.2 | 51 |
| Russia | 0 | 0 | 100 | 0 | 17.6 | 51 |
| Georgia | 0 | 100 | 0 | 0 | 16.6 | 48 |
| Austria | 13 | 87 | 0 | 0 | 15.5 | 45 |
| New Zealand | 10 | 89 | 1 | 0 | 15.7 | 35 |
| New World | 1 | 11 | 43 | 45 | 19.2 | 3373 |
| Old World | 3 | 21 | 32 | 44 | 18.5 | 1110 |
| World | 3 | 18 | 35 | 44 | 18.6 | 4483 |

In a follow-up study (Puga et al. 2022), we employ principal component analysis (PCA) for data reduction of climate variables, and cluster analysis for grouping similar regions. This results in three clusters defining wine regions globally. The results show premium wine regions are found across each of the climate types. They also show that the climate has already changed across clusters. This suggests future climate change may threaten high-quality winegrape production in many regions.

Several other indicators capture changes over the first 16 years of this century. They include the varietal intensity index, which captures the degree of specialization of each region or nation in each variety; a varietal-

based regional similarity index, which captures the degree of similarity of each region's varietal mix with that of any other region (or of the nation or the world); and a varietal concentration index. Puga and Anderson (2023) summarize the extent of similarities and concentrations in the mixes of winegrape varieties across countries. We show by how much these mixes are becoming more or less similar and more or less concentrated. In doing so we develop a hierarchical clustering method based on the similarity index, which reveals considerable heterogeneity in the extent of similarities across countries. The concentration index suggests that if two different winegrape blocks are randomly chosen anywhere in the world, the probability of those winegrape blocks having the same variety is just 2.2%. European countries do not seem to exhibit a larger degree of concentration than non-European countries, despite being subject to more planting regulations. We use these indexes to compare changes between 2000 and 2016, and conclude that the mix of winegrape varieties has become more similar across countries and more concentrated globally over that period. In doing so, many national mixes have become more concentrated on the most-popular French varieties. That has also made those mixes become more similar (Anderson and Nelgen 2021). This does not, however, preclude the possibility that the mix of varieties could become less similar as between regions *within* any country – as indeed has been happening within Australia (Anderson and Puga 2023a,b).

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