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WHERE IN THE WORLD IS THE WINE INDUSTRY GOING?

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Abstract

This paper addresses three questions: how well does Australia's wine industry performance since the late 1980s compare with previously and with the recent performance of its competitors abroad; what are the prospects ahead for Australian producers, given that global wine consumption per capita has not been growing yet premium wine production is expanding in many countries; and what can be done to improve those prospects? In absolute terms, and relative to other Australian industries, the wine industry has done extremely well since the late 1980s in terms of export-led growth. It is now the world's second largest exporter of wine after the European Union. Relative to other New World wine export suppliers, however, Australia's trade performance is not outstanding. Exports from the United States and several other Southern Hemisphere producers also have grown rapidly in quantity and in quality, albeit from smaller bases. Given that competition from other New World suppliers, and the quality upgrading of several large wine regions in Europe, the continued prosperity of the Australian industry depends on it meeting numerous challenges. The way it is positioning itself to do that may well provide an example to other industries of how to sustain export-led growth.

Key words: wine, grapes, global wine modelling

JEL codes: C53, F10, O30, Q13

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For those already or prospectively in the wine industry, the title of this paper poses a \$64 billion question, given the massive expansion in New World winegrape plantings in the past decade – or more accurately, just over US\$100 billion, when global wine consumption is measured at the retail level including taxes in 1999. To economists that makes wine a fairly small industry, accounting for just 0.5 per cent of global private consumption. Even to agricultural economists it may seem small, because barely 0.5 per cent of the world's cropland is devoted to grapes and only a portion of those vineyards produce winegrapes. But to millions of investors and hundreds of millions of consumers, this industry provides a far more fascinating product than its shares of expenditure or GDP might suggest. It also provides economists with a wonderfully rich case study to test their latest theories and empirical methodologies, because it is and always has been a turbulent industry with plenty of government intervention and industry regulation. More than that, it involves all three sectors of the economy¹ and all key aspects of globalization.

More than 100 years ago it was claimed that “Many of the leading wine merchants of London and other important commercial centres admit that Australia promises to become a powerful rival in the world's markets with the old-established vineyards of Europe” (Irvine 1892, p. 6).² The first *Yearbook of Australia* made a similar claim in 1908, but by the 1922 edition it added some comments on why that had not happened: “The production of wine in Australia has not increased as rapidly as the suitability of soil and climate would appear to warrant. The cause of this is probably twofold ... Australians are not a wine-drinking people and consequently do not provide a local market for the product, and ... the new and comparatively unknown wines of Australia find it difficult to establish a footing in the markets of the old world, owing to the competition of well-known brands. Active steps are being taken in various ways to bring the Australian wines under notice, and it may be confidently expected that when their qualities are duly recognised the wine production of this country will exhibit a rapid development.”

To what extent is the Australian wine industry at last fulfilling that earlier promise? In particular, how well has the industry performed over the past decade, how does that compare with the performance of its competitors abroad, and what are the opportunities and challenges ahead for Australian producers, given that national and global wine consumption per capita has not been growing yet premium wine production is expanding in many countries? These

¹ The average cost globally of a bottle of wine is shared roughly as follows: 10% to the grapegrower, 30% to the winery, 37% to wholesalers and retailers, 16% to excise or wholesale sales tax, 6% to VAT/GST, and 1% to import tariff revenue, according to the assumptions in a recently developed World Multisector Wine Model (Wittwer, Berger and Anderson 2001). That is also the source of the \$102 billion estimate of the value of global wine sales in 1999.

² Such an admission was not forthcoming from the French, however. At the international wine competition of the Vienna Exhibition of 1873, for example, the French judges, on hearing of the identity of the wines they had judged blind, are reported to have resigned when they learnt a prize-winning shiraz was not French but from the Colony of Victoria (Beeston 1994, p. 62).

questions are addressed in turn. More difficult to answer are such questions as: why has it taken more than 100 years to fulfil the promise seen for the industry in the late 19th century, and has there been too much planting in the late 20th century?

How well has the Australian wine industry performed over the past decade?³

Australian wine exports rose from less than A\$20 million per year (less than 5 per cent of sales) up to the mid-1980s to A\$1.5 billion in 2000. As a consequence of huge increases in production relative to domestic consumption, export sales for the first time will exceed domestic sales of Australian wine in 2001. Australia is now the world's largest wine exporter after the European Union bloc (or fourth after France, Italy and Spain).

While Australia's wine exports have boomed several times in the past, in each case those booms subsequently plateaued and the expanded acreage meant grapegrowers went back to receiving low returns. Indeed in the latter 1970s/early 1980s wine exports were so low that Australia became a net importer of wine, and the industry's prospects were sufficiently dire as recently as 1985 as to induce the government to fund a vine-pull compensation scheme to encourage grapegrowers to move to alternative crops. Yet, like a phoenix, the industry has risen again and grown with renewed vigour during the past decade: the acreage planted to vines has nearly trebled (Figure 1) and the real value of both winegrape and wine production has grown at more than 10 per cent per annum over the past dozen years.

The long history of fluctuating fortunes raises the obvious question of whether Australia's current wine boom is to be followed by yet another crash, at least in winegrape prices if not in wine production and export volumes. The wine industry is still bullish, having in 1995 set itself targets of doubling annual exports to A\$1 billion by the turn of the century (since achieved) and of trebling the real value of wine production within 30 years. Others, aware of the boom-bust cycles of the past, still need to be convinced that this time the expanded demand is here to stay – at least long enough for growers to recoup a return from new plantings (which have nearly trebled Australia's area of winegrape vineyards). To help resolve this difference in views, consider the features of Australia's previous wine booms.

On the one hand, it is difficult not to be sobered by the past. This is because, as is clear from Figure 1, each of the first four booms in the Australian wine industry finished with a plateau in vineyard area (and winery output) growth. These were periods when returns to grapegrowers and often also winemakers were depressed for years because of the extent of new plantings during the boom. Nor is this phenomenon unique to Australia. On the contrary, it has periodically been the case in grape and wine markets elsewhere in the world for at least two millennia.⁴

Yet, on the other hand, our past history also is encouraging, because it shows the current boom to have several positive features that contrast with those of earlier booms. Some of these features are summarized in Table 1. The first boom, from the mid-1850s, was mainly

³ This and the next section draw liberally from Anderson (2000a) and Anderson and Berger (1999).

⁴ Johnson (1989, p. 66-67) points to the example of the eruption of Mt. Vesuvius in 79AD. Pompeii at the time was the Bordeaux of the world wine market. The burying of its vineyards and cellars caused a huge hike in the price of wine, which stimulated plantings elsewhere. So great were the new plantings that a wine glut soon emerged, prompting Emperor Domitian in 92AD to ban new plantings in Italy and to order the grubbing up of half of the vineyards in Rome's overseas provinces.

driven by domestic demand growth following the gold-rush induced trebling in Australia's population in the 1850s. However, the wine produced from that excessive expansion was unable to be exported profitably, largely because of high duties on inter-colonial trade plus poor marketing and high transport costs in exporting the rather crude product of that time to the Old World. Hence returns slumped quite quickly in that first cycle.

The second boom, from the 1880s, was due to a mixture of domestic and export demand growth, the latter involving better marketing and lower transport costs for what were higher quality but still mostly generic bulk (rather than winery bottled and branded) dry red wines. The relatively open British market absorbed one-sixth of Australia's production early in the 20th century, before the first world war intervened. That boom was part of a general internationalization of world commodity markets at that time – something that returned but in much-diminished form after that war.

The acreage boom induced by soldier settlement after World War I provided the basis for the third boom, from the mid-1920s. That third boom was helped by irrigation and land development subsidies, a huge fortified wine export subsidy, and a 50 per cent imperial tariff preference in the British market for fortified wines. The decline in domestic consumption, induced by the export subsidy and the Depression, added to wine exports in the 1930s – which by then accounted for more than one-fifth of production (Osmond and Anderson 1998, Figure 4). The subsequent removal of the export subsidy, and the huge hike in UK tariffs on fortified wine in the latter 1940s, then caused a severe decline in export orientation. As well, the return to normal beer consumption after war-induced grain rationing kept down domestic wine sales growth.

The fourth boom, following two post-war decades of slow growth in the industry, was entirely domestic. It emerged as Australian consumer tastes became more European, as licensing and trade practice laws changed with income growth, as corporatization of wineries led to more-sophisticated domestic marketing and new innovations (including wine-in-a-box), and as Britain's wine import barriers rose again with its accession to the EC. Initially domestic demand grew for red wine. Then the cask attracted a new clientele of white wine drinkers, causing Australia's per capita wine consumption to treble during the fourth cycle. Then the economy-wide recession of the early 1980s slowed demand growth and caused wine prices to slump to the point that the Federal and South Australian governments intervened with vine-pull subsidies in the mid-1980s.

How does the fifth and latest boom, which began in the late 1980s, differ from the earlier booms? One difference is that the current boom is overwhelmingly export-oriented, since Australia's per capita wine consumption has been static over the 1990s. This contrasts with the first and fourth booms at least which were primarily domestic. It also differs from the inter-war boom, when exports were more a way of disposing of soldier-settlement induced surplus low-quality fortified wine production than as a pre-planned growth strategy.

Secondly, the current boom is mainly market-driven, which is not unlike the first two booms but contrasts markedly with the third (inter-war) boom that evaporated once government assistance measures (the export subsidy and the preferential UK tariff) were withdrawn.⁵ What triggered the growth in export demand for Australian wine was the change

⁵ In the present boom the only form of assistance offered and hence able to be withdrawn is the tax incentive to expand plantings via the tax-reducing accelerated depreciation allowance for some establishment costs (as applies to investment in many other industries).

in liquor licensing laws in the United Kingdom in the 1970s, allowing supermarkets to retail wine to the post-war baby boomers (by then adults). By the mid-1980s supermarkets, dominated by Sainsbury's, Marks and Spencer, Waitrose and Tesco, accounted for more than half of all retail wine sales in the United Kingdom (Unwin 1991, p. 341). Given also Australia's close historical ties with Britain, it is not surprising that Australian companies recognised and responded to this new market opportunity.⁶ They were able to do so faster than EU suppliers because the latter have been hamstrung by myriad regulations and insulated from market forces by price supports.⁷ To exploit this rapidly growing market required large volumes of consistent, low-priced premium wine. Land- and capital-abundant Australia had the right factor endowments to supply precisely that. High labour costs were overcome for larger firms by adapting and adopting new techniques for mechanical pruning and harvesting, thereby generating economies of size. That stimulated a number of mergers and acquisitions among Australia's wine firms that resulted in several large and four very large wine companies.⁸ This has provided the opportunity to reap large economies of scale not only in grape growing and wine making but also in viticultural and oenological R&D, in brand promotion and related marketing investments, and in distribution systems including through establishing their own sales offices abroad rather than relying on distributors.⁹ The volumes of grapes grown and purchased from numerous regions by these large firms enable them to

⁶ The timing of the initial export surge was helped by the devaluation of the Australian dollar in the mid-1980s, which was due to a sharp fall in international prices of Australia's coal, grain and other major primary export products. That devaluation, together with low domestic prices for premium red grapes at the time (due to a domestic fashion swing to whites from the mid-1970s), increased substantially the incentive for investing in developing overseas markets for Australian wine. Other factors expanding foreign demand for Australian wine at the time were food-safety scares associated with Chernobyl in April 1986 and scandals involving additives in Austrian and Italian wines (Rankine 1996). Meanwhile, competition was minimal from South Africa because of anti-apartheid sentiment and from Argentina and Chile because their domestic and trade policies for a long time had discriminated against exportable agricultural products (and the wine style produced for their domestic market was heavier than that sought in the northern hemisphere – see Thompson 2000).

⁷ Australia's share of the value of the UK's wine imports between 1988 and 1997 grew from 2 to 10 per cent, while the share of the four traditional West European exporters in UK imports fell from 78 to 65 per cent and that of Central and Eastern Europe remained flat at less than 2 per cent (Berger, Spahni and Anderson 1999, p. 90). It is understandable that exports from the economies in transition from communism have yet to be dramatic, given the myriad adjustment difficulties producers face in those countries. As for the European Union producers, they have been slow to respond because the Common Agricultural Policy has insulated EU producers from market forces, making it less profitable for them to respond to changes in consumer preferences. Specifically, the CAP has provided such high prices for non-premium EU wine (largely destined for distillation, as its direct demand has slumped) that they did not find it worthwhile to make the considerable investments necessary to upgrade their product and to market it abroad.

⁸ On the one hand, there has been a huge increase in the number of Australian wine producers (currently more than 1200, compared with fewer than 200 in the early 1970s and 300 in the early 1980s – see Winetitles (2000 and earlier issues)), but most of them are very small. On the other hand, there have been numerous mergers and takeovers by larger firms to form even larger conglomerates (see Halliday (1994, p. 59) for a chronology of ownership changes since the early 1980s). The net result has been a substantial increase in firm concentration. Whereas in 1978 those crushing more than 1000 tonnes accounted for 17 per cent of wine firms, now they account for just 4 per cent of all wine firms. The top three producers now account for about 50 per cent of the annual vintage, of the number of bottles of wine sold, and of the value of domestic sales, and for 70 per cent of wine exports; for the top nine producers those shares are about 75 and 95 per cent, respectively (Osmond and Anderson (1998, Tables 11 and 12)).

⁹ The corporatization of firms has helped in raising the enormous amounts of capital required for rapid expansion. In Australia the capital intensity of winegrape growing is about 50 per cent above that of other agriculture and that of winemaking is more than one-fifth higher than that of other manufacturing.

Australia's four biggest wine firms are listed in the world's top 20 producers of wine, but as of the late 1990s they were ranked 13th (Southcorp), 16th (BRL Hardy), 18th (Mildara Blass) and 20th (Pernod Ricard, strictly a French company but whose main wine holding is Orlando Wyndham). Southcorp has only one-quarter the sales of each of the world's top two wine firms (LVMH of France and E&J Gallo of the United States). See Rachman (1999).

provide massive shipments of consistent, popular wines, with little variation from year to year, for the UK and now also North American supermarkets.¹⁰

Another major difference between now and the past is that the quality of wine output has improved hugely during the past decade or so, relative to the cost of production. Moreover, for the first time, the industry is in a position to build brand, regional, and varietal images abroad to capitalize on those improvements in the quality of its grapes and wines. That image building has been partly generic, with the help of the Australian Wine Export Council's activities in Europe and elsewhere. It has come also from the promotional activities of individual corporations and their local representatives abroad as those firms became ever-larger and more multinational via mergers and takeovers during the past dozen or so years. That promotion has been helped by being able to point to the legislated wine quality standards in the Australian Food Standards Code, and to the fact that Australian wines are still exceptionally good value for money in Northern Hemisphere markets, despite the real price increases of the 1990s. The depreciation of the Australian dollar during 1997-98 and again in 2000 has allowed overseas consumers and Australian producers to share the benefits: the unit value of Australia's wine exports rose from A\$2.80 in 1993 to A\$4.80 in 2000, a period when inflation averaged just 2 per cent per year.¹¹

And a fourth feature distinguishing the current situation is the health factor. An ever-wider appreciation of the desirability of moderate over heavy drinking, and in particular of the possible health benefits of a moderate intake of red wine,¹² are ensuring that the consumer trend towards spending on quality rather than quantity of wine (and on wine in preference to beer and spirits) will continue for the foreseeable future to boost wine demand both in Australia and abroad. The health factor has attracted many new consumers to red wine in particular, for whom Australia's relatively fruity, easy-drinking reds are especially attractive.

Australia's export-oriented wine growth in international perspective¹³

How does growth of Australia's wine production and exports compare with growth of global wine consumption and expansions by other New World wine producers? How well is Australia penetrating traditional and new wine markets abroad, both absolutely and relative to other exporters? And to what extent is Australia upgrading the quality of its exports to different markets, again not just absolutely but relative to other exporters?

¹⁰ Indeed some types (eg, Lindemans Bin 65 Chardonnay) were specifically developed for and only sold in those markets initially, being released in Australia several years later only after sufficient expansion in production of the required grapes.

¹¹ Those Australian consumers finding it difficult to adjust to the recent surge in domestic wine prices are nonetheless grateful for the very low prices they enjoyed for so long prior to the recent export take-off. Even the relatively high current prices are low by the standards of the Roman Empire: according to Unwin (1991, pp. 123-26) and Johnson (1989, p. 83), in the first century B.C. the price of a (roughly 22 litre) jar of standard wine exported from Italy to France was one Gaul slave!

¹² Following the broadcast on US television in November 1991 of a *60 minutes* segment on possible reasons for 'the French paradox' (concerning their superior health despite high levels of wine consumption), red wine sales in the US shot up 61 per cent that month and have remained higher ever since (Heien and Sims 2000).

¹³ The data referred to in this section have been compiled by the author and his previous co-authors from a combination of United Nations Statistical Office bilateral trade statistics and OIV production and consumption statistics. Information on obtaining copies of our statistical compendia are detailed at our website (www.adelaide.edu.au/CIES/wine.htm). At the time the latest data available for all series and countries was 1997, hence several of the tables and figures do not go beyond that year.

Background to the global wine market

For many centuries wine has been very much a European product (Johnson 1989),¹⁴ and still is. More than three-quarters of the volume of world wine production, consumption and trade involve Europe, and most of the rest involves just a handful of New World countries settled by Europeans. In the late 1980s Europe accounted in value terms for all but 5 per cent of wine exports and three-quarters of wine imports globally.

However, Europe's dominance is beginning to weaken, particularly in international markets. In the ten years to 1997, the rest of the world's share of wine export dollars rose ten percentage points, with virtually all of it coming from California and six Southern Hemisphere countries (column 3 of Table 2). When intra-European Union (EU) trade is excluded, the decline in Europe's share of global exports is even greater over that decade: a fall from 88 per cent to 70 per cent (column 5 of Table 2).

The rapid growth in wine exports from the New World over the past decade is ironic, in that it coincides with a decline in world wine production and consumption. Over the decade to 1997, global wine production fell at 0.8 per cent per year, and yet global wine trade rose by 4.1 per cent per year in volume terms and 6.5 per cent in value terms -- or 9.7 per cent if intra-EU trade is excluded (final row of Table 2).

Traditionally the countries producing wine were also the countries consuming it, with only about one-tenth of global sales being across national borders, and most of that was with near neighbours. The proportion traded rose a little over the 1980s but has since risen much more, so that now about one-quarter of the volume of sales is international (Table 3). That is, despite a slight decrease in the per capita volume of consumption globally, wine is becoming much more of an internationally traded product.

How well is Australia doing relative to other wine producers?

In terms of global wine production, Australia has always been a small player. Prior to the 1970s it accounted for less than 1 per cent of world production, and as recently as 1987 its share had barely risen to 1.2 per cent. During the following ten years the share doubled, to 2.3 per cent, but on its own that statistic still makes Australia look rather insignificant.

In terms of exports, Australia was even less significant until the 1990s. As recently as the first half of the 1980s the country accounted, in volume terms, for only 0.2 per cent of global wine exports, the same as its share of global wine imports. The import share has changed little, but the export share has shot up to 3 per cent in volume terms and 5 per cent in value terms. In fact Australia's wine exports grew more than three times faster than the global average: at annual rates of 16 per cent in volume terms and 21 per cent in value terms over that period (Table 4). That was sufficient to ensure the industry exceeded by 50 per cent its target of A\$1 billion of wine exports by 2000, helped by the strengthened US dollar that year.

¹⁴ This is despite the fact that vines were first cultivated for wine in the Middle East. The drinking of wine in that part of the world went into decline, however, with Mohammed's decree against it in the 7th century AD (Johnson 1989, pp.98-101).

Rapid though Australia's export growth has been, it has not been as fast as that for other Southern Hemisphere wine exporters, who as a group enjoyed a growth rate about ten percentage points faster (27 per cent p.a. for volume and 30 per cent for value in the decade to 1997). Nor was it much faster than that for North America or Europe's transition economies. It is simply faster than that for Western Europe, which is still the dominant exporter group (Table 4). Certainly Australia's comparative advantage in wine has strengthened as Western Europe's has weakened somewhat, as has that of other New World wine exporters. The final column of Table 3 indicates the extent of those changes. The final row shows that wine's share of merchandise exports has fallen for the EU from 2.1 to 2.0 times the global average, whereas for Australia that index has risen from 1.3 to 4.5 over the decade to 1997 and to close to 10 by 2000. The latter increase raises Australia's index to more than that of the European Exporters.

What is striking from the right hand columns of Table 4 is the different reasons for these high rates of New World export growth. Australia's exports grew rapidly because its production growth was much faster than its consumption growth. By contrast, in North America much slower production growth accompanied no growth in the aggregate volume of consumption. Meanwhile, in the other New World countries production actually declined, but much less so than domestic consumption, allowing exports to boom. Volumes of consumption per capita have become somewhat more equal across regions as a result but, as column 2 of Table 3 shows, there is still a wide variance.

The world's top ten wine exporters account for 90 per cent of the value of international wine trade, with Europe's economies in transition from socialism accounting for most of the rest (left-hand column of Table 5). Of those top ten, half are in Western Europe and the other half are New World suppliers, led by Australia. Australia is the world's fourth largest exporter of wine in value terms, after France (alone accounting in 1997 for more than 40 per cent), Italy (17 per cent) and Spain (9 per cent). The share of France has dropped ten percentage points since the late 1980s, which with smaller drops for Italy and Germany have ensured that the shares of Australia and other New World suppliers have risen substantially.

If the European Union is treated as a single trader and so intra-EU trade is excluded from the EU and world trade data, the EU's share of world exports shows a much bigger fall, from 82 per cent to 59 per cent in the decade to 1997. With that adjustment, Australia moves to number two in the world. Its share of global exports rises from less than 5 per cent to more than 9 per cent. It is this fact, in spite of Australia's small share of global production, which has made Australia suddenly a much more significant player in the world wine market. Meanwhile, the share of the other main New World exporters in Table 5 (Argentina, Chile, New Zealand, South Africa, and the US) rose even faster, from 6 per cent to 19 per cent. That is, while Australia has done very well as an expanding wine exporter, it is not alone: the world wine market as a whole is becoming more internationalized and far more competitive, and most key New World suppliers are expanding their export sales (albeit from a lower base) nearly as fast or even faster than Australia, as is clear from Figure 2.

How well is Australia penetrating wine markets abroad?

Just as wine exports are highly concentrated, so too are imports. The ten top importing countries accounted for all but 15 per cent of the value of global imports in the late 1980s. That 15 per cent residual had risen to 20 per cent by 1997, due mainly to Germany's reduced

import share, indicating some growth of new markets. But in 1997, half the value of all imports continued to be bought by the three biggest importers: the UK (with 21 per cent), the US and Germany (each with about 14 per cent -- see Figure 3). In volume terms, Germany is the largest importer of wine (19 per cent of the world total), followed by the United Kingdom (17 per cent), France (10 per cent) and the United States (8 per cent).

Despite that concentration, the ten top exporters are quite different in their penetration of those and other import markets. This is evident from Table 5. In Australia's case, it has concentrated on four English-speaking rich countries: the United Kingdom, the United States, Canada and New Zealand. When depicted as shares of Australia's total wine exports, it appears Australia has not diversified its exports much over the past decade: since 1993 those four countries have accounted for between 75 per cent and 85 per cent of Australian sales abroad. Certainly Australia has gradually increased its dominance as an importer in all four of those markets, especially the UK and US. But it has done so only by not boosting greatly its shares in continental Western Europe (most notably Germany, the world's biggest importer of red wine) and in the emerging markets of East Asia (Figure 4) – although sales to Germany in trebled between 1998 and 2000.

How well is Australia doing in upgrading wine export quality?

A crude index of the quality of a country's wine exports is the average export price, shown in the final column of Table 3. To see how different exporting countries are faring relatively, Figure 5 shows each exporter's average price as a percentage of the global average, minus 100, at the beginning and end of the decade to 1997. While France's strong position has changed little, Australia and New Zealand have improved their positions hugely to rival the quality dominance of France's exports. New Zealand's average export price is well ahead of France's now, and Australia is just a few cents per litre behind France. Meanwhile, the price of exports from other Southern Hemisphere suppliers in 1997 was only half the Australian average.

However, even though the Australian average unit export price rose 52 per cent over the decade to 1997 when the global average rose only 20 per cent, complacency is not called for. The rise for Australia was exceeded by Chile (55 per cent), Italy (59 per cent), New Zealand (61 per cent), and Argentina (63 per cent), and not far behind were the United States (44 per cent), South Africa (39 per cent) and even Europe's transition economies (31 per cent). Clearly, other new exporters are striving to raise the quality of their exports just as much as Australia, albeit from different bases. The global average increase was as low as 20 per cent mainly because the average price of exports from France and Spain rose little and, in Portugal's case, fell over the decade.

Note, however, that the quality of wine exports varies markedly across different markets. In 2000 two-thirds of Australia's export sales to the US were at prices above \$5 a litre, whereas the proportion of sales in that category was only one-quarter for the UK, one-fifth for New Zealand, and one-sixth for Germany (Table 6).

What are the prospects ahead for the wine industry in Australia and globally?

Australia's grape and wine production is being increasingly oriented towards higher-quality products in response to the demand for premium wine growing rapidly at the expense of non-premium wine. However, other New World producers are also upgrading the quality of their product, as are previously low-quality regions of traditional supplying countries (the south of France, La Mancha in Spain, northern Italy, Southeastern Europe). This is showing up in the rise in the average price of wine exports (final column of Table 3). It raises the question: are there physical (physiological/climatic, agronomic, water) limits on the expansion of premium winegrape production in the various regions of the world? The greatest influence on wine quality is the climate for grape growing. Virtually all winegrapes are the sub-species *Vinus vinifera* which, ten plus millennia ago, grew wild in much of Europe, North Africa and the Middle East (but not in the Americas or the southern hemisphere). They can be grown successfully only between 30° and 50° north and south of the equator where their distinctive annual cycle can be accommodated.¹⁵ That cycle involves winter dormancy when temperatures can be below freezing, but the mean daily temperature has to reach 10°C in spring before shoots grow and 20°C in summer for flower clusters to bloom. Frosts in spring can cause severe damage, as can rain prior to the autumn harvest (Unwin 1991, p. 33-35). Hence the idealness of a winter-rain Mediterranean climate, with the addition of local or meso-climatic features that include the right combination of access to sunlight, shelter from wind, freedom from spring frosts, sufficient irrigable water in case of a summer drought,¹⁶ etc. The next most important influence is what the French call *terroir*: the soils should preferably be gravelly and well-drained, and not overly fertile. (Beyond those features, the skills of the viticulturalist and winemaker are what matter.) Given that, it is not surprising that the world's top 30 wine-producing countries are in the temperate zone. But as Table 7 shows, there is a huge variance in the vine intensity of cropping in those countries.

At one extreme are the traditional producing countries of France, Italy, Spain and Portugal with 5, 6, 8 and 10 per cent of their cropped area under vines, respectively. Nearly as extreme are the Balkan states of Southeastern Europe. Having had the opportunity there to cultivate grapes for more than two millennia, and given the financial supports provided by the EU in recent decades, it is likely that virtually all suitable land in Western Europe is already under vines. Hence their only hope for growth is in terms of quality improvement, that is, expanding premium wine at the expense of non-premium. Normally that means lowering vine yields, so such quality upgrading will lower the aggregate volume of wine produced.

At the other extreme are the New World wine producers, with the United States, Australia and New Zealand each having only 0.2 per cent of their crop area under vines – barely above the ratio for China.¹⁷ And Argentina, Uruguay and South Africa also have vines accounting for less than 1 per cent of their crop area. Hence in those countries, which have

¹⁵ In the tropics the vine is evergreen (no dormancy), but it yields only a small crop of low-quality grapes. The only exceptions are in high-altitude areas where temperatures are more moderate.

¹⁶ Vines need relatively little water per year once they are established; yet having that water is essential for producing quality winegrapes every year over the long term in a drought-prone environment. That means Australia's wine industry has been able to afford to pay much more than many other rural users for water rights (e.g., four times as much as graziers wishing to irrigate pasture -- see Smith 1998, Table 3.6). Wineries use significant quantities of water too. Partly as a consequence of demands from the booming wine industry, major improvements to water property rights and water policies have been introduced in Australia over the past fifteen years, which have made it easier for vineyard and winery investors to obtain the necessary water.

¹⁷ Even with the massive planting of vineyards in recent years this bearing area number for Australia will still be less than 0.3 per cent in 2005.

ample land with suitable climates for expansion, the main influence on vineyard area is the expected long-term profitability of grapes relative to that of alternative uses for the land.¹⁸ Without going into the sophisticated econometrics of investment and dis-investment behaviour under uncertainty, but taking into account the option value of waiting for more information on real price trends (Dixit 1992; Dixit and Pindyck 1994), the fact that Australia's vineyard area expanded only after the mid-1990s and despite little growth in real producer prices since then makes economic sense – as does the slowdown in plantings that began in 1999-2000 (Table 8).

With both sets of regions in mind, what might be the net effect on global wine markets of recent and prospective trends in grape and wine supply and demand? The trend towards premium and away from non-premium wine production and consumption, together with the data on new plantings (the most recent of which will take until 2005 to produce significant crops), provide enough information to attempt to project wine markets a few years into the present decade. That has been done recently using a 10-region global model of grape and wine markets that differentiates not only according to region of origin (Armington 1969)¹⁹ but also as between premium and non-premium segments of each market and each bilateral trade flow (Wittwer, Berger and Anderson 2001).²⁰

The Wittwer et al. (2001) projection has the world market for premium wine (40 per cent of global wine output) growing by 38 per cent over the six vintages to 2005 while that of non-premium wine growing very little. It has premium production more than doubling for Australia, while it increases by a bit over 50 per cent for the US and nearly doubles for other Southern Hemisphere wine-exporting countries. However, it grows by only one-fifth in Western Europe. That growth in premium output is projected to outstrip the expanding demand because of income and adult population growth and preference changes, causing premium producer prices to fall. In the model's base case they fall most for Australia, by 12 per cent for premium grapes and 15 per cent for premium wine, reflecting the very large premium acreage expansion in this country over the past few years. Meanwhile non-premium prices change little because the assumed slowdown in its demand is matched by a slowdown in supply. This base projection has Australia exporting nearly three-quarters of its premium wine by 2005, compared with a bit under three-fifths in 1999.²¹

The usefulness of that base case projection is less in providing a market forecast (improvements in such things as the premium/non-premium data split are needed first), than in providing a basis for comparison with alternative scenarios over which participants may or may not have control. Several have been analysed quantitatively by Wittwer et al. (2001) and are explored in the following sections. Those sections examine ways in which the Australian

¹⁸ And the associated water, although it happens that premium grapes need very little water except in semi-desert locations, and even there they need less than the likely alternative crops.

¹⁹ Ideally one would also like to differentiate between regions within a country and even between firms when dealing with a differentiable product such as wine (Spence 1976, Dixit and Stiglitz 1977). However, data limitations effectively preclude global modeling at a more disaggregated level than the nation.

²⁰ The only other recent projections exercises for Australia to the author's knowledge are less comprehensive ones by Wittwer and Anderson (2000a) to 2003 using just a national CGE model (although it does separate out three type of grapes and wines), by Shepherd (2000) again to 2003 using an ABARE model just for Australian winegrapes, and by the key industry bodies (WFA and AWEC) to 2010 using a more informal approach just for premium wine (although it does separate red and white wine).

²¹ Much of the new plantings of grapes in Australia are on large holdings that have the flexibility to produce either high yields per hectare of lower-quality grapes or low yields per hectare through more labour-intensive methods to get higher-quality grapes from the same vines. This will allow them to respond to trends in the prices of premium relative to non-premium wines.

industry is attempting to improve its future competitiveness and reduce the prospects of a decline in profitability. All involve more investment in knowledge creation and dissemination, which means there is a role for collaboration both among firms and at an industry-wide level. Of particular importance are investments in research, education and training, in marketing, and in lobbying for tax reform.

How can collaboration improve prospects for Australia's wine industry?

Standard neo-classical trade theory stresses the importance of resource endowments as the key determinant of comparative advantage (including in this case climate, land with the appropriate *terroir*, sufficient water, and skilled viticulturalists and oenologists). For differentiated products such as wine, where purchase decisions are to some extent driven by fashion (as determined by advertising, the writings of wine critics/judges, food scares, etc.), a resource that is crucially important is information/knowledge (and the skills to use it profitably).²² Its generation, as well as its productive use, is to a considerable extent under the control of the industry's producers.

While acquiring and using information can be costly, it is gradually becoming less so - and it is becoming available more quickly, thanks to the digital revolution. To keep one's competitive edge in this new economic environment, strategies are needed to obtain and make good use of available information faster and at a lower cost than one's competitors, to generate new information, and to cost-effectively disseminate information about one's products to consumers and to governments wishing to tax it. The information required relates not just to consumer demands but also to appropriate new technologies as they affect all aspects of grapegrowing, winemaking and wine marketing.

Much of that information has a public-good nature. That, together with the spillovers that can occur from private-firm generation of information through such activities as promotion and technical research, means collaboration between firms within the industry can have a high payoff. Hence critical determinants of future competitiveness include improvements in efficiency not only of individual firms (including through mergers and/or acquisitions and better grower/winemaker liaison) but also via collaboration at the industry-wide level. With that improved collaboration can come higher-payoff investments in generic marketing, in research and training and in lobbying governments. Consider each of these in turn.

Collaboration and firm-level efficiency

Two levels of collaboration between wine firms are important: vertical (that is, between the grapegrower, other input supplier, wine maker, and wine marketer), and horizontal. The various channels through which it can occur include mergers, acquisitions, and a range of other alliances.

As with so many horticultural products, processing of winegrapes and then marketing/distributing the wine is necessary before the product reaches the final consumer. Many winegrape producers have chosen to also do some or all of those manufacturing and

²² For a recent survey of trade theories in a growth context as applied to both standard and differentiable rural products, see van Berkum and van Meijl (2000).

service activities themselves. But there are far more winegrape growers than there are wineries, with the former depend heavily on the latter to process their highly perishable and virtually non-internationally tradable product. That dependence has not been a problem during the past dozen years when winegrape demand has grown much faster than supply. Indeed the shortage period has led to the widespread signing of long-term (often ten-year) contracts, providing wineries with security of supply in the 1990s and growers with greater security of demand into the next decade. Should supply grow faster than demand in the next few years, the vulnerability of the non-winemaking grapegrower could return. However, the increasing emphasis on producing and promoting consistent high-quality wine, and the fact that much of that quality is determined in the vineyard, has led Australia's wineries to improve their two-way relationships with contract grapegrowers.²³

Another form of vertical integration is occurring between wine making and wine marketing. An example is e-commerce, which is lowering the cost, especially for smaller wineries, of using email and the internet to market their wines directly. One Australian firm even experimented in 2000 with selling their entire release by tender over the internet. The exemption of small wineries from the Australian Government's wine sales tax for own-marketed wines has added to the incentive to explore these new options. Another example is wineries getting involved in tourism, going beyond standard cellar-door activities to restaurant and entertainment services.

Turning to horizontal collaboration, New World wineries are beginning to diversify their markets abroad as their production grows. Knowledge about the various niches and the distributional networks in those foreign markets is expensive to acquire, however. Hence new alliances between Australian and overseas wine companies are being explored with a view to capitalizing on their complementarities in such knowledge. The purchase by the owner of Mildara Blass (Fosters Brewing Group) of Napa Valley-based Beringer, the alliance between two family-owned firms, Rosemount and California's Mondavi, Petaluma's alliance with a Washington State-based distributor (Stimson Lane), and the purchase by New Zealand's biggest wine firm (Montana) of the second largest (Corbans) were all cases in point during 2000. These may achieve the desired result much quicker than direct foreign investment, although that has been happening increasingly too (not least from the US because of the strong US dollar in 2000). As well, in this era of floating exchange rates, cross-border operations can be a form of currency hedge; and it can also serve as insurance against a major disease outbreak (e.g., Phylloxera, Pierce's Disease) in the home country.

Horizontal mergers and acquisitions are also taking place domestically. A key objective is to get economies of scale not only in marketing but also in producing. This is especially important if firms wish to move beyond the boutique size and penetrate the large-scale (particularly supermarket) distribution networks. The most recent in Australia is the merger of St Hallett and Tatchilla to list a new firm, Banksia Wines, towards the end of 2000.

²³ See Hoole (1997) for the Orlando Wyndham experience and Steiman (1999) for Southcorp's approach. Southcorp rates the grapes from every plot of land and the wine that results on a sophisticated 30-point scale, and contract growers are paid accordingly. In turn, the wine point scores are used to determine under which label (and hence price bracket) a particular batch will be sold (Steiman 1999, page 130). Ways of measuring the quality of grapes delivered for crushing are improving too, so there will be less uncertainty about the appropriate bonus or discount that should be applied to the indicator price per tonne, and hence more incentive for growers to aspire to higher-quality production.

This trend – which is occurring in many industries as part of globalization (UNCTAD 2000) – may increase concentration in the wine industry. That should do little to reduce competition among winemakers however, including in their purchase of grapes.²⁴ While it may be that a few left-behind wineries will be disadvantaged by the new alliances among more-progressive firms (as suggested by a model developed by Cassella and Rauch 1999), an alternative outcome is that even they could benefit as those merging ones improve their export performance. That could happen either by getting in the slipstream of the progressive firms' success abroad in promoting 'Brand Australia', or in supplying a less-crowded domestic market while the merging firms focus on markets abroad.

More worried are Australia's specialist grapegrowers. They are aware that the big wine corporations have valuable so-called 'knowledge capital' that is internationally mobile and hence tends to relocate to places where it can earn the highest rewards (Carr, Markusen and Maskus 2000). During recent years Australia's grapegrowers have enjoyed an exceptionally high proportion of the benefits of the growth in demand for premium wine, in the form of high prices for their grapes. Were those high prices to continue, large wine firms (which source three-quarters of their grapes from independent growers) may find it more profitable to expand their crushing capacity in lower-priced countries rather than in Australia in the years ahead -- thereby causing winegrape prices to tend to equalize across countries, even though the grapes themselves are not traded internationally. Such developments help to keep profits of Australian-based multinational wine companies higher than they otherwise would be, while lowering profits to grapegrowers. However, there is also the possibility that multinational wine corporations from abroad will invest in Australia, which would have an offsetting, positive effect on grapegrowers. Some of that happened in 2000 in response to the fall in the US price of the Australian dollar, and more still could occur as such firms seek a hedge against the possible spread of Pierce's Disease in California.

Horizontal collaboration stimulated by the digital revolution is also occurring at the retail level. A recent example is the new alliance, to begin March 2001, between the supermarket giant Sainsbury's and the discount liquor chain Oddbins in the United Kingdom. While each will continue their traditional mode of selling, the combined venture is to sell wine exclusively via the internet, TV and email.

How are the savings from increased marketing efficiencies via supermarketing and e-commerce likely to be distributed between the consumer, marketer, winemaker and grapegrower? Wittwer et al. (2001) explore this question with their global wine model. They suggest that in the short run the innovative distributors will gain most but that, over time as competition among distributors drives down consumer prices, the gains will be shared among consumers and producers. Given even further time, the benefits to producers would encourage increased plantings and winemaking capacity and so consumers end up with the lion's share of the benefits (all but one-eighth in the empirical simulation experiment they report).

Collaboration at the industry-wide level

²⁴ On a global scale, wine is the least concentrated of the beverage industries. According to SBC Warburg as quoted by Bruce Kemp at the Wine Industry Outlook Conference in Adelaide on 11 November 1999, the world market share of the top four firms is just 7 per cent in the wine industry compared with 20 per cent for beer, 44 per cent for spirits, 60 per cent for tobacco, and 78 per cent for soft drinks. Concentration has been higher in the past though: at the time of Nero, soon after the birth of Christ, there were only six proprietors operating in the whole of Roman North Africa (Johnson 1989, p. 59).

In addition to collaboration to improve the efficiency of grape growing, wine making and wine marketing at the firm level, the Australian wine industry during the past decade has enjoyed a high and envied degree of collaboration also at the industry level. The key motivations for that collaboration are to internalize externalities and to overcome the free-rider problem of collective action. Efforts traditionally have been directed in three key areas: the generic promotion of Australian wine domestically and especially overseas; investments in research, education and training (and now also statistical information); and lobbying governments (most notably for lower taxes on wine consumption at home and lower barriers to imports overseas). Maintaining and expanding those activities requires a non-stop flow of deliberate and skilful leadership, something that the Australian wine industry has been fortunate to have in relative abundance compared with both other Australian industries and the wine industry abroad. Nowhere was that entrepreneurial leadership more noticeable than during the development through the Winemakers' Federation of Australia of a shared vision for the industry called *Strategy 2025* (AWF 1995). It was developed with nothing more in mind than providing a 30-year vision for the future so as to stimulate a steady flow of investment. At the time the targets in that document were considered by many observers as rather optimistic, since they involved a three-fold increase in the real value of wine production, 55 per cent of it for the export market. Getting half way to those targets requires having a crush of 1100 kt to produce 750 million litres of wine at a wholesale pre-tax value of A\$3 billion (A\$4/litre). Yet so convincing was that document, and so intense has been the subsequent investment (see Figure 1 above), that the industry is virtually half-way towards its 30-year targets -- that is, in just six vintages.

Long-run strategic planning by firms and the industry is made easier with an active system of producer organizations. The Australian wine industry has an excellent system involving more than 80 organizations at the national, state and regional levels, with a well-developed hierarchy of interaction between them.²⁵ Among them is the Australian Wine and Brandy Corporation (AWBC). One of its tasks is to ensure that exported wine meets the product standards of the importing country, so that the reputation of the industry as a whole is not jeopardised by any sub-standard shipments. Another is to supervise the Label Integrity Program. A third is to establish the regional boundaries for the purpose of registering Geographical Indications. A fourth is to lobby directly and via Australia's Department of Foreign Affairs and Trade for greater market access abroad through a lowering of tariff and non-tariff import barriers. And very important has been its role, via its Australian Wine Export Council, to invest in generic promotion of 'Brand Australia'.

A further task for AWBC that has been expanded significantly of late is the systematic provision of strategic information on market developments at home and abroad. The smaller an industry, the less likely such data will be available at low cost. Yet for capital-intensive industries such as wine with long lead times and large up-front costs, information on planting intentions of others in one's own country and elsewhere is especially pertinent for those contemplating investing, given that full bearing may not occur until 5+ years after beginning to invest. The grape and wine industry recognised this and spent some of its R&D funds on commissioning (a) the Australian Bureau of Statistics to collect more information including on growers' planting intentions in the coming year (ABS 2000), and (b) Australian Bureau of Agricultural and Resource Economics to use that information to project supplies several years ahead (see, e.g., Shepherd 2000). In addition, each year the Winemakers' Federation of Australia organises a Wine Industry Outlook Conference and the Winegrape Growers'

²⁵ For this and all key aspects of the Australian Wine industry, see <http://www.wineaustralia.com.au>.

Council of Australia organises a National Winegrape Outlook Conference, so such projections information can be shared and discussed. As well, the Australian Wine Industry Technical Conference held every third year keeps producers up to date on new technologies, as is the National Wine Industry Environment Conference (first held in 2000); and the WFA's Wine Australia exhibition every second year is aimed at getting more wine information to consumers.

More investment in research, education and training

Australia has had a long history of investing in formal grape and wine research, education and training, dating from the establishment of Roseworthy Agricultural College (now part of the University of Adelaide) in 1883 and of its Diploma in Oenology in 1934, plus the creation of the Australian Wine Research Institute adjacent to the University of Adelaide's Waite agricultural research campus in 1955 (Halliday 1994 pp. 109-11). In that same Waite precinct, but involving several interstate participants as well, is a Cooperative Research Centre for Viticulture. And the industry since 1988 has had its own Grape and Wine Research and Development Corporation (called a Council until 1991). The GWRDC's current budget is over \$10 million per year, and growing rapidly not only because output is expanding but also because in 1999 growers and wineries agreed to raise the research levy by more than one-third. The Federal Government matches producer levies dollar-for-dollar up to a maximum of 0.5 per cent of the gross value of output (a limit yet to be reached).

Rankine (1996) claims that even though Australia has supplied less than 2 per cent of the world's wine until very recently, it contributes as much as 20 per cent of the global flow of research papers on viticulture and oenology. A more recent study of 1995 data suggested a somewhat smaller but still disproportionately large contribution (Hoj and Hayes (1998, Figure 3). That latter study also showed that research as a percentage of gross product was considerably smaller for grapes and wine than for Australia's larger rural industries and for that of major manufacturers. That is not sufficient justification for boosting R&D spending, but it does suggest the need for an empirical study of the likely rate of return from raising the producer levies at least to the level of attracting the maximum dollar-for-dollar contribution from the government.

Formal education in viticulture and oenology spread from the University of Adelaide first to Charles Sturt University and since to others. Also, the University of South Australia and several other universities are adding to the pool of wine marketing courses. As well, numerous Technical and Further Education (TAFE) campuses are offering viticultural training both for employees and for boutique vineyard/winery proprietors and hobby farmers. And high schools in wine areas are offering grape and wine oriented material in their agricultural science courses. Notwithstanding all these programs, the peak industry bodies believe much more effective programs are possible. They have just completed a strategic review of the issue (Andrews 2000) which recommends they establish an education and training steering committee to fine-tune the programs to better meet the changing needs of the industry.

The payoff from investments in R&D is higher the more readily and rapidly new information is disseminated, trialed and adopted. That requires not only education and training but also – for on-going lifetime learning -- active journal, magazine and website publications, specialized publishers/distributors, and regional, state and national associations

of producers whose culture is to share new information, ideas, and results of field experimentation.²⁶ The role of grower liaison officers employed by the wineries to interact with contract growers, in disseminating new information and helping to appraise grape quality, has been considerable. Those officers now insist on the use of diaries to record irrigation, spraying and fertilizing activities, they encourage lower yields so as to intensify grape colour and flavours, and they help monitor baume (sugar) levels in the grapes. In short, 'precision viticulture' is being adopted as producers strive for quality improvements (Polkinghorne 1999).

While Australia has been a leader in wine R&D investments and in the rapid adoption of new technologies, Southern Hemisphere and Southern and Eastern European suppliers are catching up rapidly, including through international technology transfer. Australia is contributing to and benefiting from that in at least two ways. One is via Australian viticulturalists and winemakers exporting their services through spending time abroad as consultants (Williams 1995; Smart 1999). Another is via foreign investment by Australia's bigger wine companies in grape production, wine making, and/or wine marketing and distribution in other countries.²⁷ Such international technology transfers are not peculiar to the wine industry of course -- it is part of the general contribution by multi-national corporations (MNCs) to globalization. That in turn has been aided by reforms to restrictions on foreign investment and by the fall in communication costs thanks to the digital/information revolution. Smaller grapegrower/winemaker firms might be affected adversely in so far as the spreading abroad of Australian expertise in viticulture, winemaking and wine marketing eventually reduces the distinctiveness of 'Australian' wine in the global marketplace. However, there is the offsetting prospect that internationally engaged Australians will bring back new ideas that can be exploited to good effect in Australia.

Finally on research, one of the more difficult priority setting issues is to decide how much of the R&D budget to spend on GMO, organic, and biodynamic technologies. Food consumers, especially in Europe, have become far more sensitised in recent years to food safety issues, making it awkward to anticipate their -- and their governments' -- possible reactions to new products that might be generated using these different technologies. As recent work on GM feed crops has shown (Nielsen and Anderson 2001), vastly different outcomes are possibly depending on the nature of those consumer and/or government reactions abroad. Given the international nature of these concerns, there may be a higher payoff than usual from collaborating with grape and wine researchers focused on these issues in the US and other New World countries.

More investment in marketing

The other classic ways to try to boost profitability is to promote one's product as being different from and superior to what others produce.²⁸ For Australian wine this has been done in two key ways, particularly since the 1980s. One is generic promotion abroad by the

²⁶ For a comprehensive listing of participants in the industry, and of the wide array of journals and magazines dedicated to grape and wine producer (not to mention consumer) information, see Winetitles (2000) and the websites www.winetitles.com.au and www.wineaustralia.com.au.

²⁷ For example, Mildara Blass has planted more than 120 hectares to red wine grapes in the Napa Valley in California, Southcorp has its own vines and a joint venture on California's Central Coast, and BRL Hardy have a major winery (La Baume) in the south of France and a big joint venture in Sicily.

²⁸ Promoting wine by its characteristics, including its location of production, has been going on for at least five millennia (Unwin 1991, P. 68).

Australian Wine Export Council, particularly through its London-based Australian Wine Bureau. The other is corporate brand promotion. Both are becoming more cost-effective with the huge increase in the quantity and quality of Australia's exportable wine, and together they have greatly enhanced the reputation of the Australian industry as a producer of high-quality, value-for-money wines.

Marketing is something the industry may not have done well during its first 150 years which, as the earlier quotation from the *Yearbook of Australia 1922* (p. 279) suggested, may partly explain why it had not revealed a strong comparative advantage in exporting premium wine in the past. But that is changing rapidly. For example, being acutely aware of the prospect of premium prices falling during the next few years from their historically very high 1990s levels -- due in part to the spectacular success of its *Strategy 2025* -- the Australian industry is turning its attention to the next steps in its strategy. One of them was launched at the Wine Industry Outlook Conference in November 2000: the *Australian Wine Marketing Agenda 2000-2010* (WFA and AWEC 2000). That calls on firms to boost not only their own brand promotional efforts but also to support spending on 'Brand Australia' generic promotion.²⁹ Recent empirical research suggests there may well be scope for Australia to gain from generic promotion in the United States at least, as its wines continue to attract lower prices than wines from Napa Valley that receive similar sensory ratings in magazines such as the *Wine Spectator* (Schamel 2000).

National generic and brand promotion can be complemented by regional generic promotion. This is a more viable option now that the definition of boundaries for the various regions and sub-regions ('geographical indications') are being finalized. Thanks to the WTO's trade-related intellectual property rights agreement ('TRIPs'), Australia is now able to legally register and get its own geographical indications recognised globally. The payoff from exploiting that piece of intellectual property may be non-trivial: a new study by Schamel and Anderson (2001) finds that equally rated wines in sensory terms attract significantly different prices according to their regional origin within Australia, and similarly for New Zealand. Corporate brand advertising will still remain the dominant form of promotion, but regional branding will add to 'Brand Australia' as an additional and more-specific means of generic promotion of the nation's wines. Domestically, too, the better definition of regions is leading to more information-sharing among producers within regions, and to better coordination with regional wine (and food) tourism activities.

An additional marketing tool is quality assurance. This strategy is as old as the ancient Greeks.³⁰ In Australia it takes the form of a Label Integrity Program to ensure the Australian wine and brandy quality standards in the Australian Food Standards Code are adhered to. That Code is partly as a consequence of the Australia-European Union international wine agreement and partly because they were requested by the industry to assist the marketing of Australian wine abroad. The quality standards currently in place also apply to wine imported into Australia. These standards are not dissimilar to those in the EU or US (where more than two-thirds of the world's wine is produced, consumed and traded), and most wine-producing countries have seen virtue in legislating wine quality standards to regulate their domestic

²⁹ In addition to wineries, supporting industries are being asked to contribute. Nine key suppliers of inputs (ranging from corks and barrels to transport and label printers) became the inaugural Australian Wine Export Partners in late 2000.

³⁰ Robinson (1994, p. 465) cites the case of the Greek island of Thasos which, as early as the second millennium B.C., standardized the size of the amphorae and allowed exports only of wine sealed with the name of the magistrate as a guarantee of authenticity (a seal that was also used by other Greek states).

production and international trade in wine. Preventing consumer fraud has been one of the objectives of such regulation, since the damage to a national industry that follows exposure of fraudulent behaviour can be severe.³¹

A further marketing strategy involves diversifying the destinations for Australia's exports as more exportable production comes on stream. The current narrowness of that distribution is clear from Figure 4, and in particular from the fact that more than three-quarters of Australia's wine export earnings still come from just four English-speaking countries. Of course there are good reasons for low shares in some other markets. One is that the types and qualities of wine Australia exports may be not well matched with the types/qualities currently imported by some of the major importing countries. For example, France imports mainly low-quality wine (priced at one-quarter Australia's average export price), and the same is true for Europe's transition economies and, to a lesser extent, for the Netherlands and Sweden (Anderson and Berger 1999, Table 8). That is not the case in Japan though, yet Australia sells a very small proportion of its premium wine to Japan (while contributing a relatively high proportion of Japan's imports of other goods). This is probably due to Australia not being perceived by the Japanese as a super-premium supplier, having exported relatively low quality wine there in the early 1990s. Nor had Australia until very recently made much of an inroad into Germany, despite it being the world's biggest red wine importer. To date that has been because of insufficient premium red wine being available for export. As supplies expand over the next few years, the scope for high returns from further efforts in marketing and trade diplomacy in such countries will grow commensurately. Since its red imports are more than ten times Australia's current premium red wine export volume, there is ample scope for that market alone to absorb all of Australia's expected output increase without reducing very much German imports from other countries (mostly France and Italy).

What about sales prospects in Asia? The claim that Asian food does not lend itself to wine as much as European food is difficult to sustain in the face of both contemporary and historical evidence. Recent efforts to match such foods with wine have been highly successful. And there is evidence that the elites of both China and India consumed wine centuries ago. China, for example, produced, consumed and traded grapevine with Persia as early as the first century BC, and Marco Polo noted that excellent wines were produced in Shansi Province for exporting all over Cathay (Johnson 1989, pp. 20-21). And the Mogul empire in 16th century India was supplied with wine from the High Indus Valley and Afghanistan (Johnson 1989, pp. 106-108). It seems reasonable to expect then as incomes rise, and with it access to refrigeration and air conditioning, that a gradual expansion in wine promotion in this food-revering region will yield a high payoff over the long term – vindicating the view of Stigler and Becker (1977) that prices and incomes together with product knowledge/information are the key factors affecting demand, not ‘differences in tastes’. The speech in China by Premier Deng in 1997, affirming the health virtues of red wine consumption, like the *60 Minutes* TV program in the US in 1991 concerning the so-called French paradox, are stark reminders of how well-targeted information can alter consumption patterns overnight. The mind boggles at the potential impact on world wine markets of an easing in the negative attitude of Islamic clerics towards alcohol, given the long history of grapegrowing in the Middle East and North Africa.

³¹ For example, following the scandal in 1985 involving Austrian wine being found to have been sweetened by a harmless but illegal additive, Austria's exports plummeted by four-fifths the next year (Robinson 1994, p. 73).

More lobbying for lower wine consumer taxation in Australia

The consumer tax on wine is higher in Australia than in almost any other significant wine-producing country (Berger and Anderson 1999). The introduction by the Federal Government of its so-called 'wine equalization tax' (WET) of 29 per cent, which came into force on 1 July 2000 is, together with the 10 per cent GST on wine, generating even more tax revenue from the industry than prior to the GST tax reform. The wine industry is lobbying during election year 2001 for the phase-out of the WET. To get a feel for what impact that might have, Wittwer and Anderson (2000b) analyse the impact of cutting Australia's tax on premium wine to just double the OECD average (leaving the non-premium rate unchanged so that, in volumetric terms, the latter tax is about the same as for premium wine). With such a tax cut consumer prices drop significantly for premium wine, by over \$1.50 per litre, and domestic consumption of premium wine increases from 95 MI to 107 MI for red wine, and from 90 MI to 102 MI for white wine.³² The impact on industry output is small, with the premium segment expanding by less than 0.5 per cent relative to the base case. This small change is due to the assumption that land in the winegrape industries and capital in all the winegrape and wine industries is the same in this as in the base scenario, leaving labour as the only variable factor within these industries. Importantly for producers, however, the volume of premium exports required to maintain the same total volume of sales as in the base case is significantly less in this scenario. That is, the amount of investment in promotion abroad over the next few years would not need to be as great if the imminent output growth coincided with a reduction in domestic wine taxation.

More lobbying for lower wine consumer taxation in other countries

In early days it was wine production that was taxed in order to subsidize consumption, as for example in Rome in 250AD (Johnson 1989, p. 74). Indeed this was true of most agricultural intervention of agrarian economies (Anderson 1995). Wine export trade was also taxed, which had the same impact of subsidizing domestic consumers while hurting producers.³³ Wine imports too were often restricted, but not always to protect domestic producers so much as to wage economic wars to match the military ones of the time.³⁴

Turning to more recent times, import restrictions are more commonly used to protect domestic producers of either wine or, as in East Asia, wine substitutes (beer and spirits). Import tariffs themselves are not very large except in East Asia (Berger and Anderson 1999).

³² In per capita terms, in the 2003 base case, premium consumption is 4.8 litres for red premium wine and 4.5 litres for white premium wine. These levels increase to 5.4 litres and 5.2 litres, respectively, in the wine tax cut scenario.

³³ The Greek island of Thasos in the second millennium B.C. allowed exports only of wine sealed with the name of the magistrate not only as a guarantee of authenticity but also in order to tax exports (Robinson 1994, p. 465). Taxes on Bordeaux exports were so high that when lowered in 1203, tax revenue actually increased (and allowed consumption by 1308 to rise to 4.5 litres of claret per capita in Britain (Johnson 1989, p. 142) -- the same as in the early 1970s). Along the Rhine River in the 14th century, there were no less than 62 customs points. With such implicit subsidizing of local consumption (and because drinking water was unsafe), the volume consumed per capita by the 15th century in Germany is estimated to have exceeded 120litres (Johnson 1989, p. 120).

³⁴ The long history of wine trade policy's influence on Europe's bilateral trade patterns is well documented. For example, Bordeaux exports fluctuated from an annual average of 79 MI during 1303-37 to 14 in 1337-56 to 29 in 1356-69 and back to 11 for 1440-53. And French exports to Britain fell from around 10MI in 17th century to just 1MI from 1690 to 1850 when Portugese exports grew from 0 to 12 MI and Spain's from 4 to 6 MI p.a. (Francis 1972, Appendix).

However, Old World fears of growing competition in the European and East Asian wine markets from New World suppliers could lead to the provision of more subsidies and protection via non-tariff import restrictions by the European Commission. Already recent subsidies to producers in the EU to help upgrade their wine industry are reputed to be of the order of US\$2.3 billion.

There is also the possibility that technical measures are used to provide hidden forms of protection to the EU industry (as happened in Canada after the signing of the Canada-US free trade agreement -- Heien and Sims 2000). The EU's recent effort to have so-called "industrial wine" distinguished from "agricultural wine" (the former presumably referring to North America and Australia/New Zealand, the latter to European) would, if successful, provide a possible opening for another technical barrier to trade. Using their model of the global wine market, Wittwer et al. (2001) explore the impacts of a rise in technical barriers to EU imports of premium wine from the New World; the results have the usual effects of such protection in the EU and elsewhere.

To avoid such outcomes, New World wine exporters need to develop ways to make the most of the opportunity to become active participants, for the first time as a group, in the recently launched WTO round of multilateral trade negotiations. While each of those suppliers alone is not a very big player in the world wine market, their combined share of the value of global wine exports (excluding intra-EU trade) is 29 per cent, which is a sizeable counterweight to the EU's share of 55 per cent (column 5 of Table 2). It thus makes sense for them to form a coalition for the purpose of dealing with the EU, including in multilateral negotiations. That was done recently, in the form of the New World Wine Producers' Forum that involves officials and wine industry representatives meeting twice a year (Battaglene 1999). Building up that new informal institution, by drawing on the huge success during the Uruguay Round of the Cairns Group of like-minded agricultural-exporting countries, is likely to have a high payoff during and beyond the next round of WTO trade talks. Care is needed in fine-tuning their requests for trade policy reforms abroad, however. Wittwer et al. (2001) note that their modelling of a reduction in the EU wine import tariff generated some counter-intuitive results. In particular, since the EU tariff is volumetric rather than ad valorem, its reduction encourages the consumption and importation of non-premium relative to premium wines and so leads to less rather than more sales from premium wine exporters such as Australia and New Zealand.³⁵

Conclusion

What should one answer to the person in the street who asks: has Australia invested too much in vineyards in the past few years? As is true for all such economic questions, the answer is: it depends. The average price of our exports is still rising, but will it soon fall? The above analysis suggests it would if the industry did nothing more in response to the growing supplies of premium wine at home and abroad. But the industry *is* doing a great deal to reduce the risk of a slump in profits, and it has scope to do even more. So long as its producers also remain attuned to the market and flexible enough to respond to exogenous shocks such as

³⁵ Another concern for trade negotiators is the prospect of an Eastern enlargement of the EU. At present twelve countries are negotiating their accession to the EU, and no less than seven of them are among the 30 top wine-producing countries listed in Table 7. Hopefully such an enlargement would, for budgetary reasons, encourage the EU to lower its assistance to wine producers. But even that need not guarantee that the overall assistance to Europe's wine industry would fall. A first attempt at modeling this scenario appears in Berger (2000).

currency re-alignments, changes in consumer fashions, or disease outbreaks, its prospects for continued prosperity look good. But, as anybody who has studied the history of the wine industry knows, the only thing that is really certain is that this is an industry characterized by great uncertainty and ever-fluctuating fortunes.

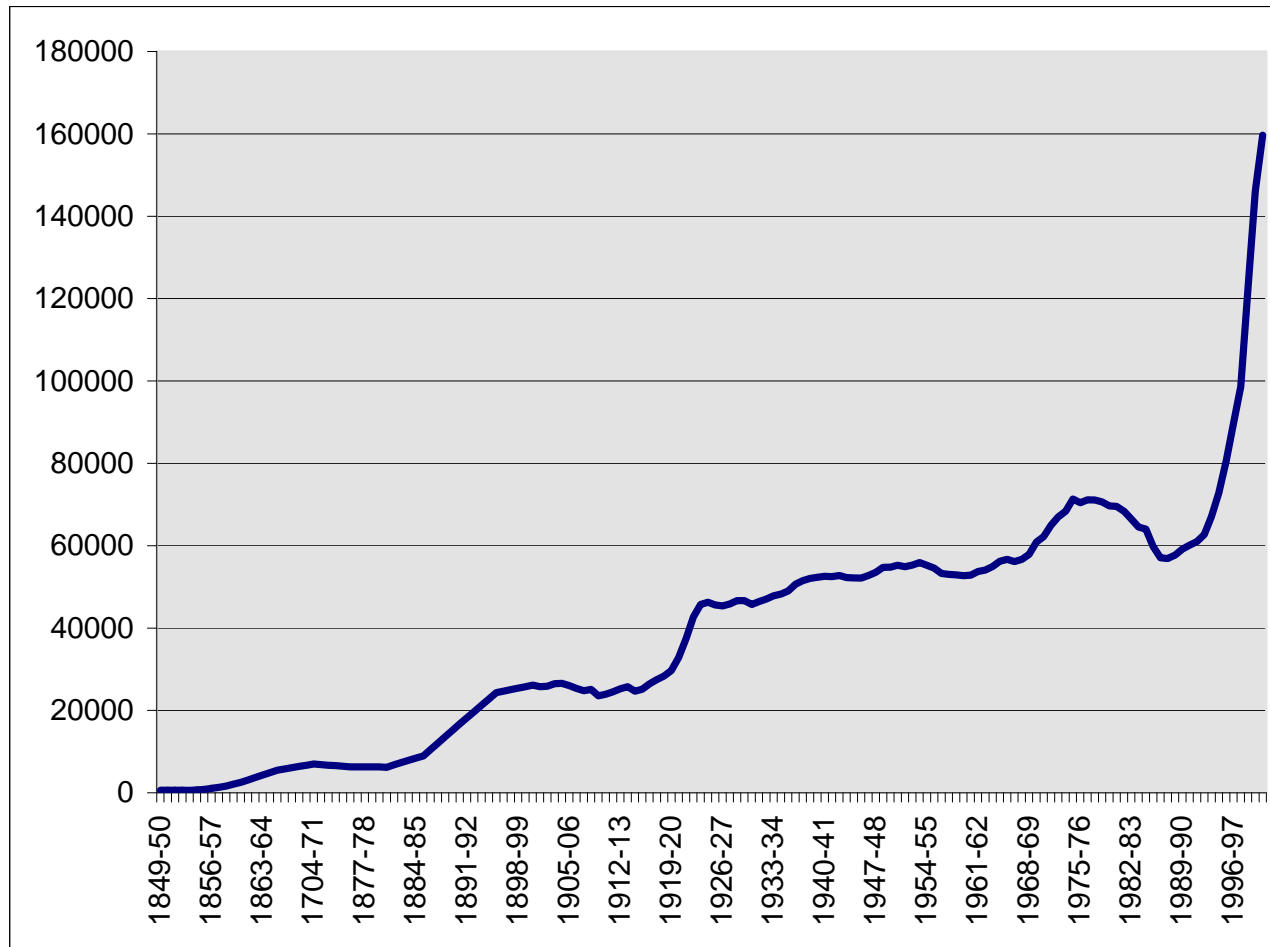
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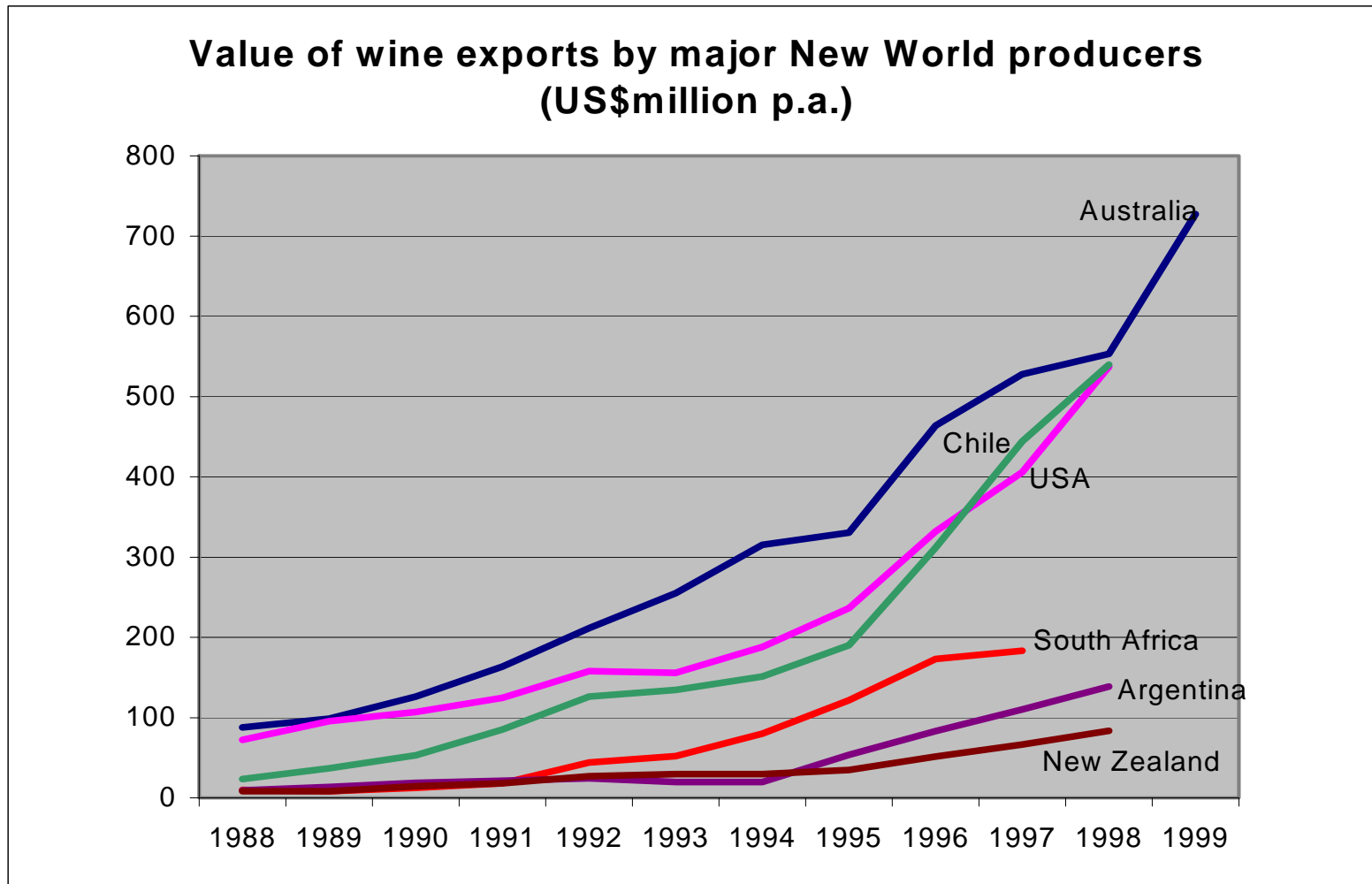
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Figure 1: Area of vineyards (hectares), Australia, 1849-50 to 2000-01



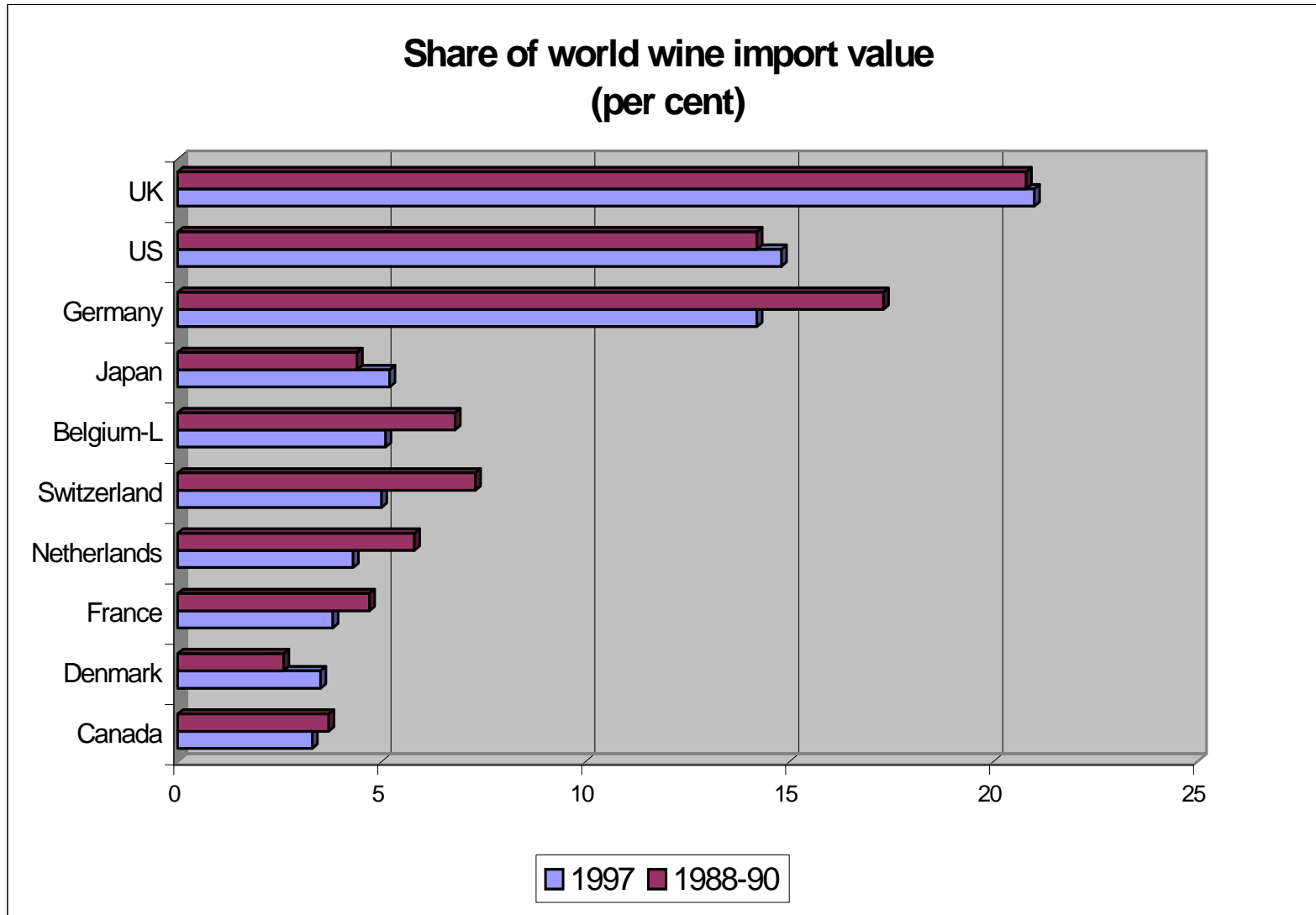
Source: Updated from Osmond and Anderson (1998, Table 2).

Figure 2



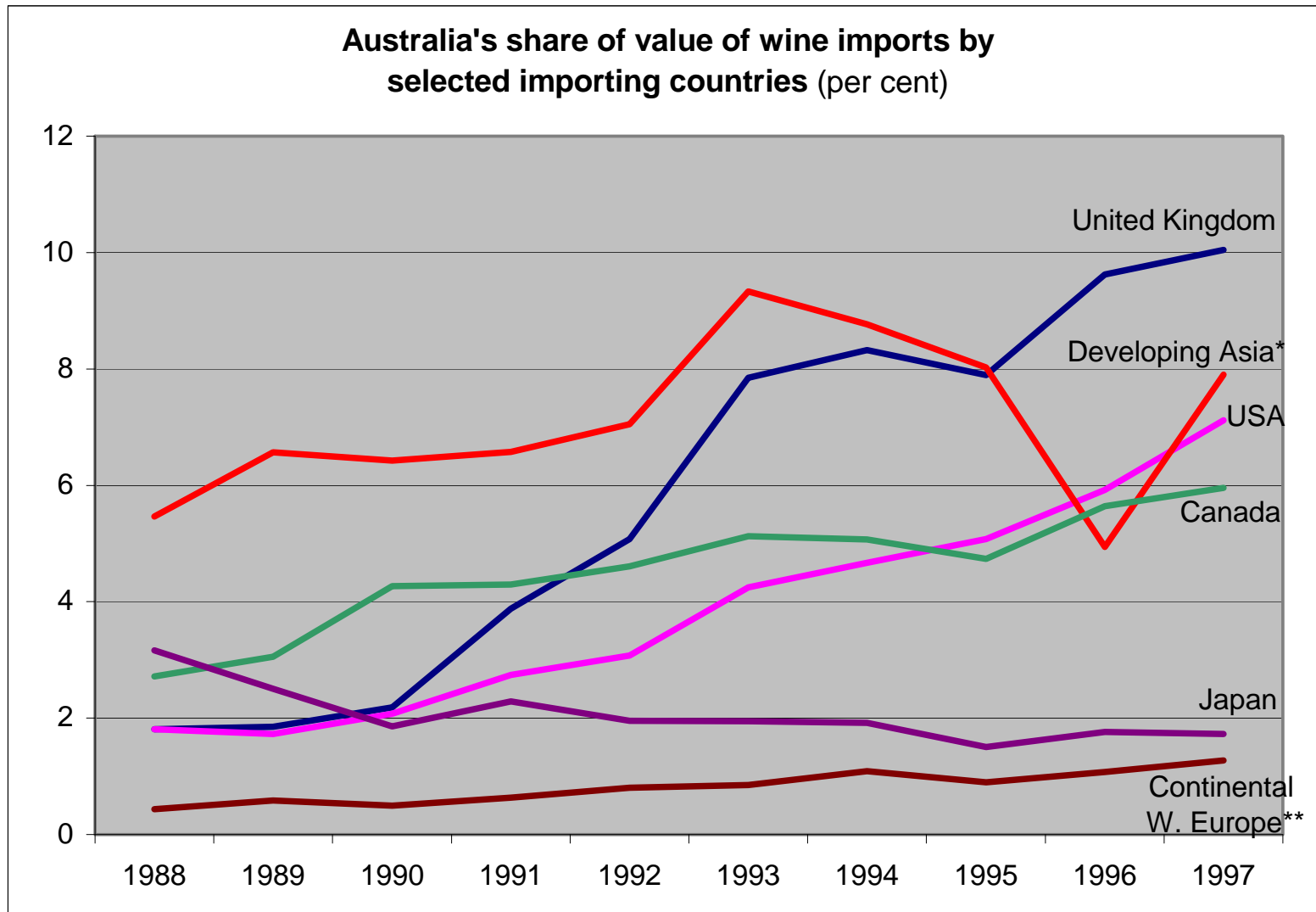
Source: Anderson and Berger (1999, Figure 1)

Figure 3



Source: Anderson and Berger (1999, Figure 2)

Figure 4

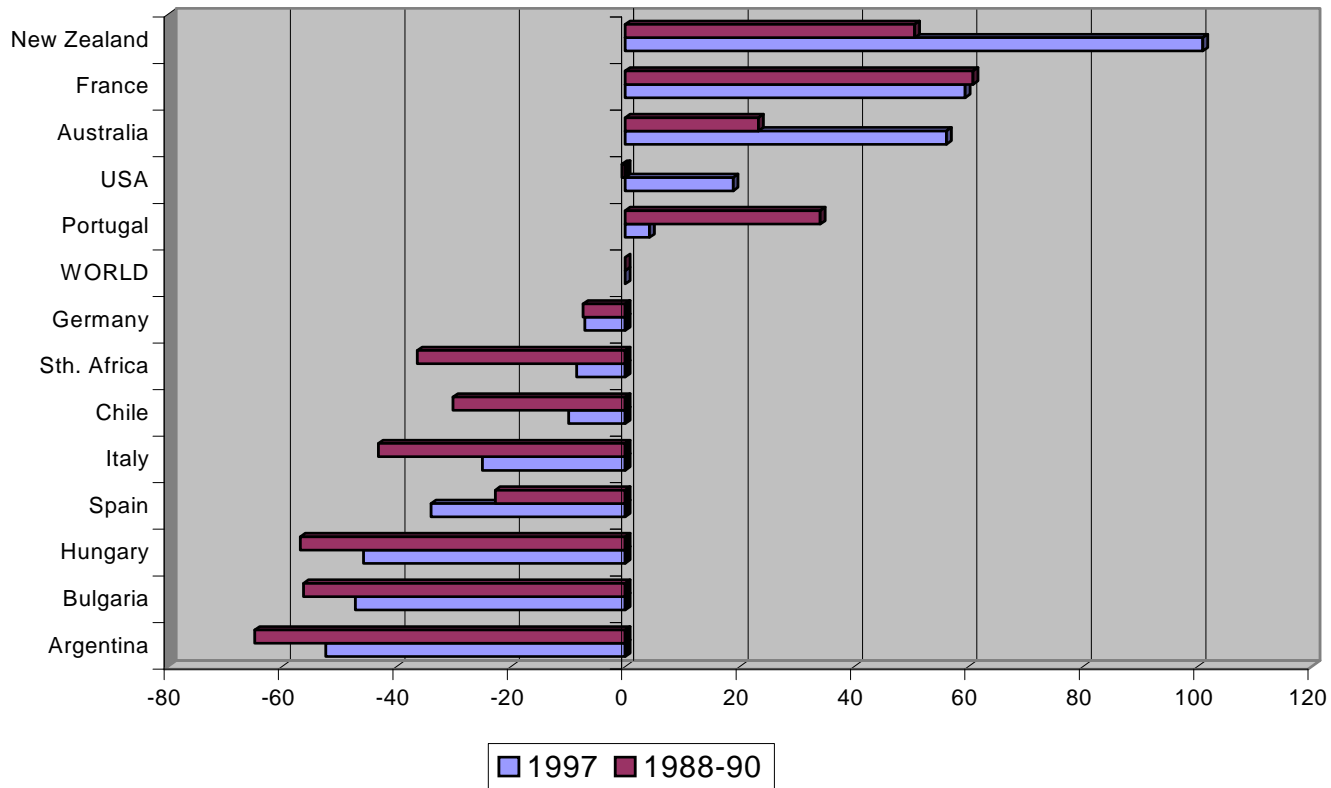


* Developing Asia comprises NIE4, ASEAN4 and China.

** Continental Western Europe excludes the United Kingdom and Ireland

Source: Anderson and Berger (1999), based on raw data from Berger, Spahni and Anderson (1999, Table 22)

Figure 5: Index of relative quality of exported wine



The relative quality index is defined as the unit value of a country's exports expressed as a percentage of the unit value of total world exports, minus 100. Note that the unit value of world exports rose by about 20% over the ten years to 1997, so it is possible for a country's unit value to have risen while its relative quality index as measured here falls (eg France and Spain). Source: Anderson and Berger (1999, Figure 4).

Table 1: Booms and plateaus in the development of Australia's wine industry, vintages 1854 to 2000

Vintages:	Boom/ plateau/ cycle no.	No. of years	Increase in vine area (% pa)	Increase in wine production (% pa)	Increase in wine export volume (% pa)	Share (%) of wine production exported	Domestic per capita consumption (litres p.a.)
1854 to 1871	1st boom	17	15.5	18.4 ^a	14.1	1.8	na
1871 to 1881	1st plateau	10	-1.1	-0.6	-5.2	1.6	na
1854 to 1881	1st cycle	27	8.4	10.7	8.2	1.7	na
1881 to 1896	2 nd boom	15	9.7	7.5	23.0	9.8	na
1896 to 1915	2 nd plateau	19	-0.1	-0.4	0.4	16.5	5.1
1881 to 1915	2nd cycle	34	3.9	3.3	8.7	14.4	na
1915 to 1925	3 rd boom	10	7.0	12.7	4.5	8.5	5.8
1925 to 1945	3 rd plateau	20	0.9	0.1	-1.2	16.4	4.0
1915 to 1945	3rd cycle	30	2.4	3.6	4.9	14.9	4.7
1945 to 1968	slow growth	23	0.2	2.1	0.2	5.4	6.2
1968 to 1975	4 th boom	7	3.3	6.2	-1.4	2.7	10.9
1975 to 1987	4 th plateau	12	-1.7	1.0	8.4	2.2	19.1
1968 to 1987	4th cycle	19	0.2	3.1	2.5	2.4	16.0
1987 to present ^a	5 th boom	>14	7.6	6.7	22.1	19.6	19.2

^a Acreage includes intended plantings in 2000-01; other data are to the 2000 vintage.

Source: Updated from Osmond and Anderson (1998).

Table 2: Shares of major regions in world wine production and consumption volume and in value of exports and imports, including and excluding intra-European Union trade, 1988-90 and 1997
(per cent)

			Incl. intra-EU15		Excl. intra-EU15	
	Prod'n volume	Cons'm volume	Exports	Imports	Exports	Imports
Western European Exporters ^a	56.0	42.3	84.8	8.0	75.4	0.7
1988-90	54.4	38.9	72.3	5.7	54.8	0.9
1997						
Other Western Europe	7.4	16.5	8.6	64.1	7.4	27.1
1988-90	6.0	20.0	6.8	57.8	5.0	28.9
1997						
Europe's Transition Economies ^b	13.2	14.3	2.1	0.8	5.5	2.1
1988-90	12.5	13.9	5.6	4.6	10.7	8.9
1997						
North America						
1988-90	6.8	9.1	1.3	17.8	3.4	46.3
1997	9.4	9.9	3.3	18.2	6.4	34.9
Australia						
1988-90	0.6	1.3	1.5	0.6	3.8	1.5
1997	2.3	1.6	4.8	0.5	9.2	0.9
Other Southern Hemisphere						
Wine Exporters ^c						
1988-90	12.4	13.3	1.1	0.7	2.7	1.8
1997	12.2	10.5	6.7	1.3	12.9	2.5
Rest of World						
1988-90	2.6	3.1	0.7	7.9	1.7	20.5
1997	3.2	5.2	0.5	12.0	1.0	23.0
WORLD TOTAL (%)						
1988-90	100.0	100.0	100.0	100.0	100.0	100.0
1997	100.0	100.0	100.0	100.0	100.0	100.0
WORLD TOTAL (billion litres or US\$)						
1988-90	28.3	24.0	7.1	7.1	2.7	2.7
1997	26.9	22.9	12.3	12.3	6.4	6.4
Growth rate (% p.a.)	-0.8	-0.4	6.5	6.5	9.7	9.7

^a France, Italy, Portugal and Spain.

^b Central and Eastern Europe and the former Soviet Union.

^c Argentina, Brazil, Chile, New Zealand, South Africa, and Uruguay.

Source: Berger, Spahni and Anderson (1999, Tables 6, 7 and 14).

Table 3: Volume of wine production and consumption per capita, trade orientation, and price of exports, by region, 1988-90 and 1997

	Volume of prod'n per capita (litres pa)	Volume of cons'm per capita (litres pa)	Exports as % of prod'n	Imports as % of cons'm	Prod'n as % of cons'm	Index of comp. adv. ^f	Export unit value (US\$/l)
Western European Exporters ^a							
1988-90	98	63	20	7	156	6.34	1.88
1997	88	54	27	8	164	5.95	2.29
Other Western Europe							
1988-90	10	19	20	64	53	0.25	1.48
1997	7	21	25	72	35	0.23	2.11
Europe's Transition Economies ^b							
1988-90	9	8	5	3	108	0.36	0.77
1997	8	8	20	18	106	1.26	1.01
North America							
1988-90	7	8	3	19	89	0.08	1.75
1997	8	8	6	27	112	0.21	2.52
Australia							
1988-90	27	20	11	3	137	1.29	2.17
1997	34	20	29	4	168	4.50	3.31
Other Southern Hemisphere Wine Exporters ^c							
1988-90	15	14	2	1	110	0.38	1.13
1997	12	9	14	4	137	2.49	1.77
Rest of World							
1988-90	0	0	9	38	96	0.02	0.73
1997	0	0	5	46	73	0.02	1.46
WORLD TOTAL							
1988-90	5.5	4.6	14	17	118^e	1.00	1.76
1997	4.6	3.9	22	25	118^e	1.00	2.12
Memo item: EU-15							
1988-90	35	31	5 ^d	2 ^d	129	2.09 ^d	1.84
1997	30	21	7 ^d	5 ^d	123	2.01 ^d	2.27

^a France, Italy, Portugal and Spain.

^b Central and Eastern Europe and the former Soviet Union.

^c Argentina, Brazil, Chile, New Zealand and South Africa.

^d Excluding intra-EU trade from national and global totals.

^e Production exceeds consumption globally because consumption is net of distillation and other industrial uses.

^f The index of comparative advantage is defined as the share of wine in a region's merchandise exports divided by the share of wine in global merchandise exports.

Source: Berger, Spahni and Anderson (1999, Tables 5, 7 and 8).

Table 4: Growth in wine production, consumption and export volume and in export value, major regions, 1988 to 1997

(per cent per year, from log-linear regression equations)

	Export volume	Export value	Production volume	Consumption volume
Western European Exporters ^a	2.0	4.7	-0.7	-0.0
Other Western Europe	0.2	3.9	-3.5	1.1
Europe's Transition Economies ^b	14.9	18.2	-1.9	-1.1
North America	13.4	17.9	1.5	-0.0
Australia	16.1	21.1	4.6	1.0
Other Southern Hemisphere Wine Exporters^c	26.5	29.9	-1.5	-3.2
Rest of World	-3.6	3.2	2.2	4.9
WORLD TOTAL	4.1	6.5	-0.8	-0.4

^a France, Italy, Portugal and Spain.

^b Central and Eastern Europe and the former Soviet Union.

^c Argentina, Brazil, Chile, New Zealand, South Africa, and Uruguay.

Source: Anderson and Berger (1999).

Table 5: Shares of exports of major wine exporters going to various wine importing regions, by value, 1988-90 and 1997

(per cent)

Exports From: ^d	Exports to:	Western European Exporters ^a	Other Western Europe	Europe's Transition Economies ^b	North America	Southern Hemisphere Exporters ^c	Rest of World	WORLD
1. France (41.7%) [27]								
1988-90		4	69	0	17	1	9	100
1997		3	61	1	19	1	16	100
2. Italy (17.2%) [26]								
1988-90		15	57	0	25	1	2	100
1997		7	59	2	25	2	5	100
3. Spain (9.2%) [24]								
1988-90		6	70	1	16	1	6	100
1997		10	71	1	10	1	8	100
4. Australia (4.8%) [29]								
1988-90		0	46	0	27	13	14	100
1997		1	57	0	26	7	9	100
5. Portugal (4.3%) [43]								
1988-90		32	49	0	10	2	8	100
1997		28	47	0	12	3	9	100
6. Germany (3.8%) [28]								
1988-90		1	67	1	17	2	12	100
1997		4	62	6	11	2	16	100
7. Chile (3.6%) [54]								
1988-90		2	19	0	43	8	28	100
1997		3	40	0	40	3	14	100
8. United States (3.3%) [7]								
1988-90		2	38	0	24	1	36	100
1997		2	59	1	17	1	21	100
9. South Africa (1.5%) [11]								
1988-90		3	92	0	0	0	5	100
1997		2	81	0	9	1	7	100
10. Argentina (0.9%) [7]								
1988-90		4	37	6	20	8	25	100
1997		2	31	1	17	20	29	100
ETEs ^c (5.6%) [20]								
1988-90		1	70	14	10	0	5	100
1997		1	29	64	2	0	3	100
WORLD (100%) [22]								
1988-90		8	64	1	18	1	8	100
1997		6	58	5	18	1	12	100

^a France, Italy, Portugal and Spain.

^b Central and Eastern Europe and the former Soviet Union.

^c Argentina, Australia, Brazil, Chile, New Zealand and South Africa.

^d The country's 1997 share of the value of global wine exports is shown in round brackets; its percentage of volume of production exported is shown in square brackets.

Source: Berger, Spahni and Anderson (1999, Table 12).

Table 6: Australian wine export volumes to key markets, by price ranges, October 1999 to September 2000

(per cent)

<i>Price range (AUD)</i>	United Kingdom	United States	New Zealand	Germany	TOTAL, all markets
<\$2.50	16	6	47	18	17
\$2.50-\$4.99	59	27	33	65	49
\$5.00-\$7.50	20	42	13	9	24
>\$7.50	5	25	7	8	10
TOTAL	100	100	100	100	100
Average price (AUD per litre)	\$4.19	\$6.38	\$3.42	\$4.28	\$4.76
<i>Share of Aust. export volume</i>	48	18	7	3	100
<i>Share of Aust. export value</i>	43	25	5	3	100

Source: Australian Wine Export Council (www.awbc.com.au/arms/a_info.html).

Table 7: Vine intensity of cropping in the 30 largest wine-producing countries, 1999^a

Rank in global wine production, 1999	Volume of wine production (mill hl)	Area of bearing grapes (including for non-wine uses) (‘000 ha)	Bearing grape area as % of total crop area
1. France	64	871	4.5
2. Italy	54	871	7.9
3. Spain	33	1163	6.1
4. United States	24	350	0.20
5. Argentina	13	250	0.9
6. Germany	12	102	0.8
7. Australia	9	79	0.15
8. South Africa	8	120	0.8
9. Portugal	7	252	9.8
10. Romania	7	255	9.8
11. Chile	6	122	5.3
12. China	5	193	0.14
13. Greece	4	124	3.2
14. Hungary	4	99	2.0
15. Austria	3	48	3.3
16. Bulgaria	2	107	2.4
17. Brazil	2	57	0.09
18. Russia	2	70	0.05
19. Croatia	2	55	3.5
20. Moldova	1.8	152	7.0
21. Uzbekistan	1.5	102	2.1
22. Serbia/Mon.	1.4	79	2.0
23. Mexico	1.4	43	0.16
24. Macedonia	1.2	29	4.5
25. Switzerland	1.1	15	3.4
26. Uruguay	1.1	10	0.8
27. Slovenia	0.9	18	5.8
28. Ukraine	0.7	110	0.3
29. New Zealand	0.6	8	0.23
30. Cyprus	0.6	20	13.9
WORLD	283	7426	0.49

^a Together, these 27 countries produce 95 per cent of global wine production.

Source: FAO *Production Yearbook*, Rome (from FAO website) and Rosset (2000) in the *Bulletin de l' OIV*, Paris.

Table 8: Growth in area planted to vines, real winegrape prices, and real wine export prices, Australia, 1981-82 to 2000-01

	Vine area ('000 ha)	Vine area change	Real winegrape price ^a	Real wine export price ^a
1980-81	70	0%	0%	6%
1981-82	68	-2%	-4%	-5%
1982-83	66	-3%	-5%	-10%
1983-84	65	-3%	2%	5%
1984-85	64	-1%	-2%	1%
1985-86	60	-7%	-18%	-9%
1986-87	57	-5%	-4%	2%
1987-88	57	0%	22%	8%
1988-89	58	1%	42%	12%
1989-90	59	3%	-28%	1%
1990-91	60	2%	-19%	-4%
1991-92	61	1%	7%	-12%
1992-93	63	3%	9%	-10%
1993-94	67	7%	32%	1%
1994-95	73	9%	19%	14%
1995-96	81	11%	3%	-25%
1996-97	90	11%	-1%	44%
1997-98	99	10%	6%	6%
1998-99	123	25%	2%	8%
1999-00	146	19%	-7%	0%
2000-01	160	9%		

^a In current Australian dollars, deflated by the Australian consumer price index.

Source: Updated from Osmond and Anderson (1998).