

THE AUSTRALIAN WINE INDUSTRY AT THE CROSSROADS: A COMPARISON OF PERFORMANCE ACROSS MAJOR WINE- EXPORTING COUNTRIES IN 2000

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ABSTRACT: International market dynamics are often cited as the cause of the decline in the Australian wine industry's relative position globally and the subsequent declining economic returns to the country's diverse regions. However, this perspective has been derived principally from international trade data. By way of providing a more nuanced explanation, we compare Australia's wine production and export performance with that of the 10 largest wine-exporting countries from the Southern Hemisphere New World, North American New World and Old World (European) wine-producing regions for the pivotal year 2000. The analysis deploys three performance measures and one measure for productivity developed specifically for this study. The results suggest that these wine exporters occupied a series of complex positions with respect to one another. Further, Australia's situation was at the time far from dire. Nevertheless, the comparative position from the perspective of performance in 2000 initiated a situation where 'the hunter became the hunted'.

KEY WORDS: Competitiveness, efficiency, global markets, performance, winegrapes, wine industry.

1. INTRODUCTION

The global wine industry has long been broadly classified between the so-called 'Old World' (European) and 'New World' regions of wine production, and the latter has been sub-classified as North America New World and Southern Hemisphere New World (SHNW) regions. While it has always been an imprecise regional distinction, the classification has had the merit of highlighting historical differences and differences based on polarized approaches to wine production. The Old World production style has been widely viewed as traditional and *terroir*-based, 'where geography is more important than technology', while producers in the New World regions have been viewed as being more science-based, relying on innovative technologies and marketing of fruit-driven wines (DWCADMIN, 2013).

The final two decades of the 20th century represent a period when this regional classification became less relevant (Robinson, 2006a; 2006b) as New World producers challenged Old World producers in the international wine market. From the 1980s, Australia led the way in developing what Silverman *et al.* (2001) described as "pioneering wine as a universal first choice lifestyle beverage". Its wine industry eroded the share of the global market supplied by the Old World producers and at the same time made an increased contribution to the national economy (see, for example, Mounter *et*

al., 2011). Yet, by the turn of the century, the strategy of the Australian wine industry had been imitated to varying degrees and at different intervals by other SHNW wine-producing countries, notably Argentina, Chile, New Zealand and South Africa.

The United States of America (USA), a North American New World producer, had been a major challenger alongside Australia to the supremacy of Old World producers in wine markets in the final two decades of the 20th century (Morrison and Rabellotti, 2014). But its penetration of export markets had been limited by the fragmented nature of the industry, the poor image of US wines prior to these decades and a still-developing large domestic market (Silverman *et al.*, 2001).

As the old century drew to a close, Old World producers had begun to respond to the challenge, adopting some of the attributes of the New World regions. Robinson (2006a) observed that the regional distinctiveness had begun to dissipate as producers in the Old World “increasingly adopt technical innovation and those in the New World are increasingly exposed to some of the better aspects of tradition”.

The extent to which Australia’s former position of dominance over other New World wine producers has continued to be eroded is a cause of concern, particularly for many regional economies. In this regard inquiries into the industry have been undertaken at both federal and state levels of government (see, for example, Catanzariti Inquiry, 2010; Murray Inquiry, 2005). The industry has also undertaken some attempts at self-regulation (see, for example, Grant *et al.*, 2010; Strachan, 2010) and the Australian Bureau of Agricultural and Resource Economics (ABARE) has recommended several firm-based actions directed at increasing industry competitiveness (see, for example, Jackson, *et al.*, 2009; Sheales, *et al.*, 2006). However, the fact remains that wine is a truly global commodity where international comparison is overwhelmingly dominated by trade data aggregated at the scale of national economies or even larger regional blocs (see, for example, Anderson and Nelgen, 2010).

As economists we are interested in the comparative efficiencies of national wine-producing economies. To attempt to examine this in a definitive way would be a high bar to set indeed, as it would involve the precise capturing of all variables across an irreducibly complex reality into a model with omniscient capacity. However, this should not deter us from examining a

range of factors that contribute to the comparative performance of wine-exporting economies. In what we believe is the first attempt of its kind, we have developed indicators of comparative performance across wine producing economies to produce a more fine-grained analysis of the global wine industry than that offered by the usual metrics, in particular trade data. To deploy this methodology we have chosen the pivotal year of 2000, when Australia had reached the crest of its dominance amongst New World producers and when (aggregate national data informs us) ‘the hunter was becoming the hunted’ in the sense that other New World producers were gaining on Australia’s *primus inter pares* status.

We compare the performance during this pivotal year of six New World producers (Australia, New Zealand, Chile, Argentina, South Africa and the USA) with the five major Old World producers (France, Germany, Italy, Portugal and Spain) using four measures of the transformation of the core input – winegrapes – into wine output volume and value. These measures are:

1. Export market penetration index: the transformation of winegrapes into wine export volume.
2. Export value proposition index: the ability of exporters to capture value from a combination of wine export volume and the perceived quality of these exports.
3. Productivity index: A partial productivity index designed to measure the transformation of winegrapes into total wine output, taking into account the industry servicing both its domestic and export markets.
4. Global value proposition index: the ability of wine producers to capture value from a combination of total wine output and the perceived quality of this output. A value proposition in the context of this study is an affirmation of why a wine buyer should purchase a particular wine based on the rationale that this wine will add more value to the buyer in the market for which it is destined than would any other wine.

These value measures can be obtained with some strong assumptions that enable us to capture perceived product quality as well as volume effects. Data

deficiencies also force us to assume that other winery inputs remain constant across national industries. Winegrapes are the only input included for wineries in our analysis because data sources on other inputs are absent, patchy or unreliable to use in estimating productivity fully. Ideally, we would like to have estimated total factor productivity rather than partial performance measures. Inputs of labour, capital, materials and services used in winemaking would have been included had they been available in an acceptable form. Further, we have avoided using the term 'productivity' for the first two and last performance measures because they are strongly influenced by factors (such as exchange rate and wine demand shifters) that lie outside the influence of the wine industries in sampled countries.

In offering explanations as to the comparative position of wine producers in 2000, this analysis is augmented with accounts of national wine production that are grounded in political economy. Data deficiencies are discussed in the final section of the article.

2. METHOD AND DATA

All performance measures were calculated using DPIN3.0 Professional that enables productivity to be decomposed into frontier positions (in this case, aggregate wine volume and value frontiers) and efficiency scores (technical, scale, mix and revenue) (O'Donnell, 2011). O'Donnell (2011) measured annual productivity change as the change in total factor productivity (TFP), which is the product of the changes in the three efficiency components and technical change. He defined technical change by a shift of the production frontier, whereas we define performance changes for each of the performance measures as a shift of the frontier of the sampled countries for each measure. The performance measures computed here (i.e. 1, 2 and 4 in the above list of measures) relate to the industry level, as distinct from their common interpretation of individual firm efficiency within an industry. An output orientation is adopted on the basis that a wine industry aims to produce the maximum amount of wine from a given amount of winegrapes. Our third measure is indeed productivity, which follows exactly O'Donnell's definition.

Technical efficiency is defined as a wine industry producing the maximum feasible levels of outputs for specified levels of winegrape inputs, subject to a

given wine volume or value frontier. Scale efficiency entails the industry operating at the technically optimal productive scale. Mix efficiency requires an industry to produce an optimal mix of outputs for a given volume of winegrapes after controlling for technical and scale efficiency. Technology is measured as the position of the aggregate frontier for the 11 countries in either volume or value.

Following O'Donnell (2011), revenue efficiency can also be measured as the observed revenue obtained by a national wine industry relative to the maximum revenue that could be obtained by any wine-producing country for given levels of winegrapes used. This study is dominated by revenue allocative efficiency effects, which are an amalgam of the endogenously determined value of wine arising from its quality (as perceived by buyers) and the ability to set exogenously determined output price ratios equal to the marginal rates of transformation between outputs.

The existence of a large number of wine quality grades means that there are numerous individual production possibility frontiers and isorevenue lines of different values within each national industry and across the sample of countries rather than just one as assumed in the usual revenue-allocative efficiency measures. The hybrid isorevenue line for one country therefore varies in value from those for other countries, rendering differences in quality effects a part of the measurement of revenue inefficiency. Our inability to decompose wine into its innumerable and ill-defined quality grades precludes the separation of quality effects from the normal allocative efficiency measure. But, given the overwhelming importance of perceived quality in establishing wine prices, the former effect is assumed to dominate revenue efficiency.

The *DPIN 3.0 Professional* software uses the transitive and multiplicatively complete Färe-Primont index. This index enables a multilateral comparison of indicators across the 11 countries for the year 2000. Throughout the article, for the purpose of making comparisons we set the Australian wine industry at an index of unity in the year 2000.

Four outputs included in the model comprise three variables of wine export volumes and prices, decomposed into bottled still, bulk and bottled sparkling wines, and one domestic supply variable measured as revenue. Prices expressed in US dollars were deflated using the US GDP deflator and expressed in 2000 values. The three export variables used to measure the transformation of winegrapes into wine export volumes are bottled still, bulk

and bottled sparkling wines. Values were derived using data obtained from Anderson and Nelgen (2010). Total domestic wine sales were estimated and added as a fourth output variable when measuring the transformation of winegrapes into total wine volume and value. The data source for this fourth output variable is also Anderson and Nelgen (2010) who compiled all required data except domestic wine values for 2000. Domestic supply volume was calculated as total output minus export volume from Anderson and Nelgen (2010). Given wine is a tradable good in all sampled countries, price data were normalized on 2009 prices reported by Anderson and Nelgen (2010) using the changes in wine export unit values in each country in each year that were then converted to 2000 prices. Revenue from domestic sales was obtained as the product of export unit values and the volume of wine sold in the domestic market.

Input data comprise solely winegrapes in the absence of national data on capital, labor, materials and services used in wine production and marketing. Anderson and Nelgen (2010) provided data on grape output used for wine production for the year 2000.

3. EXPORT STATUS OF NEW WORLD PRODUCERS IN THE YEAR 2000

Examining Table 1, Column 2 ‘Revealed comparative advantage’ is derived directly from Anderson and Nelgen (2010) (i.e.: as a computation derived from aggregate national trade data). However, Columns 3 to 6 inclusive are calculated as described in section 2 of this article (‘Methods and data’). Examining the data from these calculations, several comparisons are immediately salient. For example, three SHNW countries stood out from the other NW countries in terms of our export market penetration index (column 3): Australia (1; recalling that for the purpose of this exercise we set the Australian wine industry at an index of unity in the year 2000) Chile (1.078) and New Zealand (1.243). In commencing our discussion of the results presented in Table 1, we firstly examine these three countries in turn before moving to examine other salient features of Table 1 with respect to other NW producers. Performance differences were found to be dominated by technical efficiency sources rather than either scale or mix efficiency sources. Therefore, the following discussions of these differences mainly reflect

differences in the ability of the wine industry in each country to convert winegrapes into output and value, as opposed to effects emanating from the scale of industry operations or the mix of wines produced

Table 1. Performance Indices in the Year 2000.

1	2	3	4	5	6
Country	Revealed comparative advantage	Export market penetration index	Export value proposition index	Productivity index	Global value proposition index
New World:					
Australia	1	1	1	1	1
Argentina	2.74	0.192	0.243	1.148	0.328
Chile	14.41	1.078	2.179	0.896	0.990
New Zealand	3.24	1.243	0.830	1.018	0.871
South Africa	3.89	0.577	0.805	1.148	0.738
USA	.33	0.429	0.364	1.117	0.750
Old World:					
France	7.34	1.045	1.115	1.029	0.912
Germany	.30	0.882	0.552	1.051	0.374
Italy	4.49	0.970	1.134	0.953	0.605
Portugal	9.20	0.580	0.679	1.034	0.537
Spain	4.81	1.139	0.907	1.047	0.646

Sources: Figures for column 2 ‘Revealed comparative advantage’ are derived from Anderson and Nelgen (2010, p. 107): ‘Calculated in value terms as the share of a country’s or region’s wine exports in its total merchandise exports divided by the share of world wine exports in total world merchandise exports. Thus the higher a country’s index is above (below) 1, the stronger its comparative advantage (disadvantage) in wine, as revealed from the trade data assuming the government has not distorted producer or consumer incentives’ (Anderson and Nelgen 2010, p. xvi). Figures for all other columns have been computed by the authors as per ‘Method and Data’ at 2 in this paper.

Note: Australia’s score for ‘Revealed comparative advantage’ (Column2) is 6.74. Australia = 1.0 for all indices.

Ideally we would have liked to describe the wine industry in each country in terms of clearly delineated taxonomic categories. However, due to the variability of the availability of information across the sample this was not possible and a more general description of each of the wine producers and the aggregated classifications is thus presented.

Australia

A revealed comparative advantage index of 6.74 indicates that Australia had a strong comparative advantage in wine production and export in the year 2000. Table 1, column 6 demonstrates that Australia had the highest score on our global value proposition index, with only Chile (0.99) and France (0.91) coming close to matching it, and the fourth highest export value proposition index behind Chile (2.179), Italy (1.13) and France (1.12) (Table 1, column 4).

Offering an explanation of these figures we can see that 2000 represents the crest of Australia's wine industry in international markets in a number of ways. For example, prior to 1990, Australia's share of world wine export volume was less than 0.5 per cent and its share of world wine export value was less than 1 per cent. This ratio indicates that at that time Australian wines had a quality premium. In 2000, these shares had grown to 4.9 per cent and 7.0 per cent, respectively, making Australia the fourth largest wine exporter after Italy, France and Spain and the seventh largest wine producer with 3.5 per cent of world production (Anderson and Nelgen, 2010, pp. 45, 72, 100).

The Australian industry's expansion throughout the 1990s was a rapid turnaround from the bleak prognostications of the 1980s, which culminated in a federal government-funded vine pull scheme (1985-1987) in response to a perceived over-supply on world markets and excessive domestic production. This scheme ultimately removed 8 per cent of annual winery intake from the national crush (Gow *et al.*, 1991, p. 31). The initial triggers for output growth in Australia, as in other New World countries, were (i) prospects of export growth as baby boomers moved into the middle-age bracket and (ii) the advent of supermarkets as avenues for retail wine sales (Anderson, 2010).

Australia's early export progress was assisted by a decline in the value of the Australian dollar in the mid-1980s (Anderson, 2000), while a

depreciating domestic currency in the latter half of the 1990s helped maintain the buoyancy of exports (Sheales *et al.*, 2006). For example, the average annual exchange rate for the \$A in 1990 was \$US0.78. This declined steadily to an average of \$US 0.55 the period 2000-03, before climbing to \$US 1.03 for the year 2012 (RBA, 2014). A smaller inducement for industry expansion arguably came in the form of a four-year accelerated depreciation program for grapevine establishment costs introduced by the Australian federal government in 1993. However, Australia's ability to take advantage of the export market opportunities and gain ascendancy in the United Kingdom (UK) and US popular-premium markets emerged from its concentrated strategy that was established around developing an innovative culture. This strategy was achieved with the support of numerous organizations including the Grape and Wine Research and Development Corporation (GWRDC), the Winemakers Federation of Australia (WFA), the Australian Wine and Brandy Corporation (AWBC), the Australian Wine Export Council (AWEC) and the Cooperative Research Centre for Viticulture (CRCV). The GWRDC, in particular, was an integral component of the new centralised model with the responsibility of establishing priority areas of R&D, which were financed by producer levies and matching government funds (Aylward, 2008, pp. 385-386). In other words, instruments of economic governance were heavily entwined with Australia's export expansion.

The targeted innovations were crucial in reconfiguring the structure of the industry. For example, the introduction and adoption of new mechanical harvesting and pruning practices offset high labour costs – a significant production cost not borne to the same extent by other SHNW exporters such as Argentina, Chile and South Africa. The restructuring led to a number of mergers and acquisitions resulting in critical mass and the realization of economies of scale in numerous industry sectors and activities. This industry consolidation in turn facilitated the production of large volumes of consistent, popular, low-priced premium wine for the UK and US markets (Anderson, 2010), which together accounted for 70 per cent of Australia's wine export volume in 2000-2001 (Spencer, 2002). Also key to Australia's export success were its marketing activities, both generic and brand, that enhanced Australia's image as 'a producer of good value-for-money wines' (Anderson, 2000).

Australia's strategy earned its industry the reputation of being a 'high-tech producer of technically faultless wine'. However, its success was limited to

the popular–premium or ‘commodity’ sector, where the average bottle price ranged between \$US3 and \$US10 (Aylward, 2008, p. 387). This is reflected in the figures in Table 1, column 5, where Australia’s productivity index (at 1) lagged behind all of the other 10 wine producing nations examined except Chile in the New World (.896) and Italy in the Old World (.953) and was below the mean for both New World producers (1.065) and their counterparts in the Old World (1.035). Otherwise stated, the gap between the Australian wine industry’s performance and that of its competitors was already beginning to show in the critical year of 2000; at least partially due to the hardening of its national wine brand as being ‘good value’ rather than resting on a reputation for premium quality.

New Zealand

For even casual observers, the portrait of the Australian wine industry at 2000 is relatively well-trodden. However, the picture becomes more intriguing when we compare it to its rivals based on the performance indicators developed for this discussion. In 2000, New Zealand had a reasonably strong comparative advantage in wine production and export, with a revealed comparative advantage index of 3.24 (Table 1, Column 2) even though it was weaker than all but three of the other ten major wine-exporting countries. Its export value proposition index in 2000 was 83 per cent of the Australian index (Table 1, column 4), but its export market penetration index was 24 per cent higher than Australia’s index (Table 1, column 3).

This is explained at least partially by the changing relationship between the size of the New Zealand wine industry on the one hand and the volume of the national crush on the other. In the period 1991-2000, the New Zealand wine industry more than doubled in size, with the total area under wine grape cultivation increasing from 5 980 ha to 12 822 ha. The number of wineries increased from 150 to 358. Nevertheless, the annual national crush did not increase at a commensurate rate, rising from 65 708 tonnes to only 80 100 tonnes in the same period, with total wine production increasing from 49.9 million litres to 60.2 million litres. The average yield per hectare actually decreased over the same period, from 12.1 to 7.8 tonnes per hectare. This attention to quality in grape growing, which may have been accompanied by

an increased selectivity for processing, reflected an industry-wide quest for producing wines of greater quality, which (in turn) was reflected in an increase in price over the same period, with average grape prices per tonne rising from \$NZ453 to \$NZ1,195 (NZW, 2001, p. 3). As for all other NW producers except Chile, the productivity index (Table 1, column 5) was higher than Australia's at 2000.

At the same time, exports increased markedly from 5.6 million litres to 19.2 million litres per annum, with the value of exports increasing from \$NZ25.3 million to \$NZ168.6 million. The ratio of exports to production increased by almost a factor of 3 during this time, from approximately 11 per cent to 32 per cent. While being dominated by white wine (76 per cent) export markets were quite diverse, with the UK nevertheless comprising the lion's share (47 per cent) then USA (20.1 per cent), Australia (13 per cent) the Netherlands (4 per cent), Canada (3 per cent) and Japan (2.5 per cent) and several other countries making up the value of all New Zealand wine exports (NZW, 2001, p. 43).

In the face of this expansion, domestic consumption remained almost constant over the period, registering nominal growth from 14.1 million litres to 14.3 million litres, with consumption per capita actually falling from 12.1 litres to 10.6 litres per annum in the period 1991 to 2000 (NZW, 2001, p. 3). This was despite national drinking trends prior to the decade having witnessed a marked increase in wine consumption at the expense of beer (and a decline in the consumption of fortified wines, from 90 per cent of all wine sold in the 1960s to a mere 9 per cent in the mid-1990s (Thompson and White, 2000, p. 280)).

In 2001, the industry comprised nine regions and was dominated by three: Marlborough (at the north-east tip of the South Island) totalling 40 per cent of all production; Hawkes Bay (on the east coast of the North Island) totalling 28 per cent of all production, and Gisborne (just north of Hawkes Bay) totalling 15 per cent of all production (NZW, 2001, p. 8). In turn, these three regions were each dominated by a specific grape variety. Almost 50 per cent of grapes in Marlborough were Sauvignon Blanc; 30 per cent of all grapes in Hawkes Bay were Chardonnay (despite over 20 varieties being grown in the region) while in Gisborne Chardonnay accounted for over 50 per cent of all grapes (NZW, 2001, pp. 17-19). In the same year, white grapes comprised 69 per cent of the national vineyard area (down from 72 per cent in 2000 and 73 per cent in 1999) with Chardonnay and Sauvignon Blanc dominating at 41

per cent and 35 per cent, respectively (NZW, 2001, p. 10). The commensurate national vine area for red wines was, in turn, dominated by three varieties: Pinot Noir (41 per cent); Merlot (25 per cent) and Cabernet Sauvignon (21 per cent).

Chile

By 2000, the wine industry in Chile had attained a very high index of revealed comparative advantage (14.41), higher than the other SHNW producers and over five times the index for the wine industry in neighbouring Argentina (Table 1, Column 2). It also scored an export market penetration index 8 per cent higher than the Australian year 2000 index (Table 1, column 3) and an extraordinarily high export value proposition index (2.179) more than double the Australian year 2000 index (Table 1, column 4). It was the ninth largest wine producer in the world, producing 667 million litres or 2.4 per cent of world production (Anderson and Nelgen, 2010, pp. 45, 47), and the fifth largest wine exporter at 297 million litres of total wine exports, which was 4.7 per cent of world export value (Anderson and Nelgen, 2010, pp. 72, 87). Forty per cent of exported wine volume went to Western European net-importing countries and 34 per cent went to USA and Canada over the period 1996-2001 (Anderson and Nelgen, 2010, p. 261).

Examining dynamics internal to the Chilean wine industry leading up to 2000, it is clear that the wine industry reached its exalted global position in a comparatively short time frame. For example, the combined effects of taxation, prohibition on new plantings and land reform programs were detrimental to the wine industry in Chile for much of the 20th century (Chadwick, 2003). Further, as recently as the 1970s the value of wine exports was negligible (Anderson and Nelgen, 2010, p. 197). However, this situation changed when the government adopted an export-oriented development strategy based on natural resources from 1979. In 1980, the government implemented market liberalization measures and adopted an outward-looking economic strategy that set the scene for the expansion and globalization of the wine industry (Silverman *et al.*, 2001; Knowles and Sharples, 2002). This expansion was around a decade ahead of efforts to boost export production in Argentina (discussed below). The first successful exports of wine to Europe took place in 1985 (Chadwick, 2003), extending export destinations beyond

the traditional Latin American market. Perhaps boosted by the advent of democracy, wine exports increased substantially in the early 1990s, attaining a mean annual value of exports of \$US109 million during the first lustrum (five-year period 1990-94) compared with \$US13 million a decade earlier. Chadwick (2003) has argued that the improved quality of the wines was aided by the planting of fruit-driven varieties and the use of modern viticultural practices, many instigated by foreign investors (see also Kunc and Bas, 2009).

The deep decline in wine consumption per capita over the 20th century had left the wine industry in Chile with little prospect of a substantial increase in domestic consumption into the 21st century. To address this problem, a ‘vent-for-surplus’ strategy was therefore the only alternative the industry could adopt if it was to dispose of its burgeoning wine output. Wines of Chile (2011) emphasised the favourable conditions for developing wine exports:

“One of Chile’s greatest strengths is its privileged agro-climatic conditions that make it a vitivicultural paradise. Its 14 distinct wine regions that extend 1 200 km (745 mi) from north to south are influenced by both the Andes Mountains and the Pacific Ocean and vary widely due to geographic diversity, beneficial climates, and a wide array of soil types. All of these factors work together to produce a broad range of high quality wine varieties and styles that stand out in the world of wine.”

Arguably, production costs in grape and wine production were low relative to the costs in most other major wine-exporting countries, with the exceptions of the fellow SHNW exporters of Argentina and South Africa.

Argentina

Argentina had a relatively low index of revealed comparative advantage in wine production in 2000, at 2.74 (remembering that 1.0 is neutral between comparative advantage and disadvantage) (Table 1, Column 2). In all reasonableness this reflects the fact that its drive into export markets began later than in other SHNW wine-producing countries. Argentina’s indices of export market penetration and export value proposition in 2000 were just 20 per cent and 24 per cent, respectively, of Australia’s year 2000 index (Table

1, columns 3 and 4 respectively). These relatively low indices reflect the mixed success in developing the wine industry up until the 1990s. For a century from the 1880s, Argentina's wine industry focussed its strategy exclusively on the domestic market and on the production of abundant cheap wines, encouraged by government policies (Stein, 2008, pp. 6, 13). Wine-making equipment became outdated and oenological talents were deficient. The contrast between Argentina's productivity index and the global value proposition index (1.148 and 0.338) (Table 1, columns 5 and 6) emphasizes this situation.

Further, Argentina's wine industry was unable to escape the decade of economic stagnation, debt and recession afflicting Argentina in the 1980s. Stein (2008, p. 13) reported that many small- and medium-sized wineries could not afford to upgrade their equipment and went out of business; only the 'larger, better capitalized firms' survived. The focus on the domestic market, adverse economic conditions and government regulations that impeded the penetration of the global market (Silverman *et al.*, 2001) meant that wine exports were trivial until the 1990s: the mean annual export volume for the period 1985-1989 was only 17 million litres (Anderson and Nelgen, 2010, p. 177).

Recovery began in the industry in the late 1990s in the wake of the deregulation and economic reforms that were initiated by the Menem government (1989-99). The removal of restrictions on foreign investment facilitated the upgrading of equipment and vine stocks in the vineyards and wineries that survived the 1980s, and an overvalued peso made it easier for entrepreneurs in the industry to borrow from overseas with the outcome that around USD1.5 billion was invested in the industry between 1991 and 2001 of which only one-third was from local sources (Stein, 2008, p. 15). Universia Knowledge@Wharton (2003) and Stein (2008, pp. 7, 12) also observed that during this period a process referred to as *reconversión* happily coincided with a period of economic stability that encouraged investors to make substantial financial resources available to wineries to upgrade their facilities. Aided by long-established vineyards spanning a wide range of *terroirs*, ventures into the wine export market began in earnest in the 1990s, particularly in the second half of the decade when the mean annual export volume reached 187 million litres according to Anderson and Nelgen (2010,

p. 177), a figure more than tenfold the mean annual export volume in 1985-89.

However, the value of wine exports per tonne of grapes produced for wine in 2000 was just USD89.77 on the basis of statistics reported by Anderson and Nelgen (2010), a fraction of the values for the other SHNW producers. Low labour costs by world standards enabled wine producers to keep their aggregate costs low (Schrock *et al.*, 2001; Thach and Cuellar, 2010) while producing a wide array of wines. Production of a variety of good-quality wines at moderate prices enabled the industry to strengthen its competitive position in global market during the late 1990s (Stein, 2008, p. 30). Nevertheless, by 2000 Argentine wines still had trouble competing on quality in wine export markets as the process of upgrading quality had been a ‘slow burner’ since the early 1990s. This is reflected in all indices for Argentina in Table 1.

South Africa

South Africa had a moderately strong comparative advantage in wine production and export in 2000, with a revealed comparative advantage index of 3.89 (Table 1, Column 2). But its indices of export market penetration and export value proposition in 2000 were only 58 per cent and 80 per cent, respectively, of Australia’s year 2000 index (Table 1, columns 3 and 4). These indices reflect both the severe constraints imposed on the country during the apartheid regime and the subsequent and substantial reinvigoration of the industry when the sanctions were lifted.

For much of the 20th century, the wine industry of South Africa received very little attention on the world stage. This was due to two main reasons. First, after a period of oversupply and depressed prices, in 1918 the South African government-funded the formation of the *Koöperatieve Wijnbouwers Vereniging van Zuid-Afrika Bpkt* (KWV). Although originally proposed and designed as a grapegrower co-operative, the KWV soon grew in power and prominence to where it set policies and prices for the entire South African wine industry. Yields were restricted and minimum prices were set that encouraged the production of brandy and fortified wines rather than table wines (Robinson, 2006a). Second, its isolation was exacerbated by the boycotts of South African products in protest against the country’s system of apartheid introduced in 1948.

It was not until the early 1990s when apartheid ended and the world's export market opened up that the South African wine industry began to transform. Many producers in South Africa quickly adopted new viticultural and winemaking technologies with the assistance of international winemakers. There were also new plantings of more internationally regarded table wine varieties such as Shiraz, Cabernet Sauvignon, Chardonnay and Sauvignon Blanc. Much of the new areas were in the cooler Overberg district of the Eastern Cape. The reorganization of the powerful KWV co-operative into a private business further sparked innovation and improvement in quality as vineyard owners and wineries who had previously relied on the price-fixing structure that bought their excess grapes for distillation were forced to become more competitive by shifting their focus to the production of quality wine. The KWV quota system was abolished in 1992 (Robinson, 2006a).

In 1990, less than a third of all the grapes harvested were used for wine production designed for the consumer market, with the remaining two thirds being discarded, distilled into brandy or sold as table grapes and juice. However, by 2003, the numbers had been reversed with more than 70 per cent of the grapes harvested that year reaching the consumer market as wine (Robinson, 2006a). Between 1990 and 2000 total red variety plantings increased from 16 per cent of total area under vines to 36 per cent; total white variety plantings fell from 84 per cent to 64 per cent. Exports grew from less than 100 million litres in the 1990s to 138 million litres in 2000, and the range of markets expanded. Yet it was not until 1999 that the South African Wine Industry Trust was established with a mandate to advance the transformation of the industry and to promote exports. Thus, progress was slow and there was a residual emphasis on cheap wine for the domestic market rather than quality wine for the world market. The difference between the productivity index and the global value proposition index (1.15 and 0.74) (Table 1; columns 5 and 6) reinforces this view.

USA

In 2000, USA had a strong comparative disadvantage in the production and export of wine, with a revealed comparative advantage index of just 0.33 (Table 1, Column 2). Among the world's main wine-producing countries, only Germany had a comparable index (0.30). The US indices of export

market penetration and productivity were only 43 per cent and 36 per cent, respectively, of Australia's indices (Table 1, columns 3 and 4). These statistics highlight major difference between USA and the SHNW wine-producing countries in terms of the former's much larger domestic market and its comparatively small reliance on exports for market development.

3. OBSERVATIONS

As emphasised in the introduction, the analysis undertaken in this article represents an initial attempt to provide a basis for the comparison of global wine producers other than that relying upon trade aggregated data. To this end the article has used four performance measures of the transformation of the core input – winegrapes – into wine output volume and value. Nevertheless, it would be remiss if we did not note that substantial deficiencies persist in the data available to undertake analyses of the type we report in this article. Six areas of deficiency stand out. First, a strong caveat needs to be made that using national industry-level data does not take account of the high degree of heterogeneity among wine-making firms, which produce a large range of wine products. We expect the aggregate performance trends to hide substantial variations in the competitive positions of individual firms at any point in time and in trends over time.

Second, winegrapes are the only input included for wineries in our analysis. This is because data sources on other inputs are absent, patchy or unreliable to use in estimating productivity fully. As such, the study aimed at measuring comparative performance rather than the economic concept of productivity. Ideally, we would like to have estimated total factor productivity rather than partial performance measures. This would have included precise inputs of labour, capital, materials and services used in winemaking had they been available in an acceptable form.

Third, we have excluded vineyards from our analysis, which leaves a gap in explaining performance differences, especially since many wineries grow the majority of their grapes themselves. There is a need to develop input data for wineries and vineyards across all major wine-producing countries derived from representative samples.

Fourth, there are significant gaps in input prices across the 11-country sample that prevented us from conducting an accurate profitability analysis.

Such an analysis would have provided a more complete picture of the competitiveness of the wine industries under study.

Fifth, the estimation of domestic production was based on a strong assumption about the relationship between export and domestic prices in each country. It would have been desirable to use directly estimated domestic wine revenue data. Finally, it would be useful to disaggregate wine products by quality, at least to some extent. A starting point would be the disaggregation for the year 2009 undertaken by Anderson and Nelgen (2010) who distinguished between super premium, commercial premium and non-premium wines.

Nevertheless, the data contained in Table 1 for the pivotal year of 2000 is explained by our investigations of particular national industries prior to the particular year represented. For example, the dominant position held by Australia in terms of total value productivity for 2000 may reflect that it was witnessing the benefits of large scale investment in the industry in the preceding decade and a flourishing domestic market. Yet this did not accord with its comparative position in terms of total volume performance. Similarly, New Zealand and Chile enjoyed greater export volume performance at the time, but for very different reasons: The former sought to increase quality (as demonstrated by the expanding size of the industry not being matched by annual crushes increasing at a commensurate rate); the latter aggressively pursuing a ‘vent for surplus’ strategy in a variety of markets, achieving a high comparative rate of export value productivity alongside export volume productivity, but falling short of all other 9 wine producing nations in terms of total volume productivity.

Further, we have seen that the data for Argentina and South Africa can be explained by their belated status at the time, a situation that has altered in the ensuing years. Our attention has also been directed principally at the New World producers. The data in Table 1 also contains figures representing the robust position of some Old World producers – and the weakness of others. However, it is the introduction of a new technique in discussing comparative international production that we hope will lead to further efforts in this direction.

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