# Projections of future supply and demand for Australian wine by destination country and price segment to 2018



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**Abstract**

Australia's wine industry is coming out of the bottom of its latest cycle – its 5th since 1850. A key question is: how, and how soon, might producers be able to earn sustainable profits again? This paper briefly examines the anatomy of the latest cycle, which began in the late 1980s. It points to differences as well as similarities with previous cycles. A key feature is the strong export focus of the latest expansion – at a time of rapid globalization of many industries – and then its emulation by other New World wine-producing countries. For nearly two decades the stars were favourably aligned for Australian producers. However, they suddenly became badly misaligned. One major element of the boom and then the crisis was the pattern of movements in real exchange rates. It helps explain the differing phases of the industry's competitiveness in Australia vis-a-vis competitor countries. A model of the world's wine markets is used to show empirically the strength of this influence over recent years. The model also explores prospects for the next five years, focusing in particular on the roles not only of further changes in bilateral exchange rates but also of a return by consumers to higher-quality wine purchases and of continuing rapid growth in wine demand in emerging economies, especially China. The model results reveal how much a devaluation of the AUD could benefit Australian winemakers and hence grapegrowers by 2018, and how quickly China could become the major destination for Australian wine exports. Both could boost substantially the profitability of those in the industry that adapt most successfully to those prospective market developments.

**Executive Summary**

The Australian wine industry enjoyed a boom for nearly two decades from the late1980s, but the past five years have been challenging for its producers and exporters. The strong appreciation of the Australian dollar (AUD) is part of the explanation for the slump in profitability, now that two-thirds of Australian wine production is exported and one-sixth of domestic consumption is imported. (By contrast, in the 1980s both shares were less than 4%). One of the two purposes of this report is to show empirically just how large that adverse influence of real exchange rate movements has been on the industry since 2007. Since that result suggests an AUD devaluation could ease the industry's current challenges, the second purpose of this report is to assess how the industry might be affected by a reversal of those exchange rate movements, along with other expected developments over the next five years – the most important of which is the growth of net imports by China.

Needless to say, the currencies of all wine-producing and wine-consuming countries, not just Australia's, affect each country's international competitiveness. And there are other things happening in the world's wine markets that also need to be taken into account. On the demand side, populations are growing and aging, incomes are mostly growing, and tastes in numerous countries are changing, sometimes rapidly. On the supply side, technologies are improving, capital investments in the industry may or may not be keeping up with depreciation, and real input costs are altering at various rates pertinent economies. Given these numerous influences on the world's wine markets, empirical retrospective and prospective analyses require a formal model of those markets. We therefore revise, expand and update a model we developed a decade ago for similar analytical purposes.

Our simulation results suggest that real exchange rate changes over the period 2007 to 2011 altered substantially the global wine export shares of the Old World versus the Southern Hemisphere's New World exporters and especially Australia. The exchange rate changes also strengthened the competitiveness of the US wine industry, relative to other New World wine producers, in both the US and European markets. Since Australia had the largest appreciation of all wine-exporting countries, its winemakers and hence grapegrowers are estimated to have suffered the largest reduction in domestic prices in real local currency terms from this shock: winegrape and commercial premium wine producer prices are reduced by almost one-third, and

super premium wine prices by one-quarter. Associated with that is a 10 percent decline in the volume of Australia's commercial wine production, and a 6 percent decline in the output of super premium wine. Real prices in domestic currency terms decline in the other Southern Hemisphere countries as well, but by between only one- and two-fifths as much as in Australia. Furthermore, real grape and wine prices (again in domestic currency terms) *rise* in the United States and Western Europe, by between 3 and 8 percent, so output is estimated not to have been reduced at all in those regions as a consequence of recent real exchange rate movements. In short, those exchange rate shocks have been a major contributor to the decline in the international competitiveness of Australian wine producers since 2007.

The real exchange rate movements over the 2007-2011 period are estimated to have reduced Australia's annual wine exports by 130 ML. This is slightly larger than the reduction in all other Southern Hemisphere exporters, and it contrasts with estimated export gains of 33 ML to the United States and just over 300 ML to Western Europe's key wine-exporting countries. This reversed somewhat the massive gains of the Southern Hemisphere exporters at the expense of the Old World over the previous 15 years. It also strengthened the competitiveness of the US wine industry relative to other New World wine producers in both the US and European markets.

How do the modeled outcomes compare with observed export changes in Australia? Historic data indicate that between 2006-07 and 2010-11, the volume of Australia's wine exports fell only slightly, from 768 ML to 727 ML; but exports dropped from almost AUD2.9 billion to just under AUD2.0 billion over that period. The modeled effect of exchange rate changes only slightly overstates the drop in the volume of wine exports, and the modeled drop in value is very close to the observed change.

The second part of the analysis involves updating the model's base to 2011 (the latest year for which all global data were available) and then projecting forward to 2018 under two alternative scenarios: one in which real exchange rates over that period either (a) remain at their 2011 levels or (b) return half-way to their 2009 rates. The latter may well happen long before 2018, given the rapid changes in exchange rates during May-June 2013 when the Australian dollar fell 10 percent against the US dollar, the Euro and the UK Pound (which is more than half the change in those bilateral rates being modeled in this alternative scenario). Nevertheless, a comparison with the no-change scenario gives a sense of the importance of future real exchange rate movements.

For the period to 2018, Australian grape prices are projected to fall slightly if real exchange rates don't change from their 2011 levels, as are wine prices for all but non-premium and iconic still wines. If, on the other hand, exchange rates were to return half-way toward what they were in 2009, Australian premium grape prices in would rise 15 percent above 2011 levels in real terms, and all wine types would receive higher prices.

Even if there were no changes in exchange rates, Australia is projected to expand its output by 2018 for all wine types except non-premium. But, with the reversal in exchange rate trends, output would increase by two-thirds or more.

The income, population and taste changes together mean that consumption volumes grow over the period to 2018 for all but non-premium wine. The percentage increases are very similar in the two scenarios for the Old World and Japan, but are somewhat less in China and other emerging economies and somewhat more in the United Kingdom and especially the United States in the altered currencies' scenario versus the scenario with no changes in real exchange rates.

The differences in trade outcomes between the two scenarios amounts to around 170 ML extra imports from the Southern Hemisphere into the UK and 215 ML extra into the US if the recent exchange rate trend reversed. This is much more than the difference in total imports, because the EU and US would be less competitive in those markets with the projected exchange rate changes. Eastern Europe and the former Soviet Union would switch from a net-importing to a net-exporting region, but this would have very little impact on Southern Hemisphere exports because most of that change would be borne by EU wine exporters. As for China, it would import about 260 ML less than if real exchange rates remained unchanged from 2011, but again most of that adjustment would be borne by Old World exporters.

The projections to 2018 reveal an even more striking prospect, however. It has to do with the continuing growth of China's net imports. China has already become by far the most important wine-consuming country in Asia and, with a projected extra 630-940 ML to be added by 2018 to its consumption of 1630 ML in 2011, that dominance is becoming even greater. Since China's domestic production is projected to increase by 'only' between 180 and 230 ML by 2018, its net imports are projected to rise by between 450 and 710 ML. Australia is projected to supply between 118 and 134 ML of those extra imports, or between one-fourth and one-fifth of the total increase.

What about Australia's exports to other countries? Unlike its exports to China, it depends very much on the scenario. If real exchange rates did not change from 2011 to 2018, Australia's exports would decline with all but Asia, and in aggregate would be little more than in 2011. If exchange rates were to go half-way back to those of 2009, however, Australian exports would increase to all major markets and in aggregate would be 380 ML or about 55 percent more than in 2011.

The share of China in Australia's total value of wine exports is projected to grow to 30 percent by 2018, while the UK and US shares are projected to both fall to below 20 percent – even in the devaluation scenario in which the volumes of those two traditional bilateral trades expand considerably.

These results suggest real exchange rate changes go a long way towards explaining why market shares and producer prices have changed so much for New World wine-exporting countries in recent years – especially the decline in competitiveness for Australia and the improvement for the US. They also suggest exchange rates are capable of playing a major role in the years ahead. But on top of that, the above projections point to the enormous speed with which China may become the dominant market for Australian wine producers– and that could happen by 2016 even if the AUD devalues in ways that allow Australia to become more competitive in the US and UK markets. While the recent and projected rates of increase in per capita wine consumption in China are no faster than what occurred in several West European wine-importing countries in earlier decades, it is the sheer size of China's population – and the fact that grape wine still accounts for only 4 percent of Chinese alcohol consumption – that makes this import growth opportunity unprecedented.

# Projections of future supply and demand for Australian wine by destination country and price segment to 2018

**Background**

Supply and demand balance is an issue which is often debated at wine industry forums with a view to resolving the question as to the future business prospects for the Australian wine industry. The Wine Industry Restructuring Action Agenda (WRAA) was a collaborative project that researched the recent oversupply issue. However, it was unable to address the demand side of the supply-demand balance equation due to Wine Australia's policy of avoiding any estimates that might be construed as forecasts. However WFA, Wine Australia and WGGA now recognise that demand projections are essential in order to define the extent and direction of industry restructuring and the reform agenda to achieve it. Consequently demand projections will enable assessments of required future grape supply by quality and cost and quantity specification, of what changes in the wine product mix may be required, of shifts in wine cost competitiveness, of changes in target markets, and of possible needs to review business strategies to secure future market opportunities. In summary, demand projections (suitably qualified and appropriately interpreted) can greatly reduce uncertainty in the wine industry business environment, thereby creating value across the whole wine value chain.

The issue impacts on all grapegrower and wine producer business decisions and on the priorities of wine industry organisations. It is fundamental to the industry's goal of restoring profitability and adopting the best business models, strategies, policies and innovations to achieve that goal.

The primary objective of this study are to update the Model of the World's Wine Markets from 2009 to 2018 to provide credible and robust baseline projections of future supply and demand for Australian wine in the domestic market and abroad in 2018. The projections are to include grape prices and wine prices (at four price points for still wine and for sparkling wine)

and be validated with key wine industry participants and refined through engagement with the Winemakers' Federation of Australia (WFA) Board and Management. The model scenarios are to be developed in discussion with the WFA and their associates, particularly through a March 2013 workshop with the WFA Board and in subsequent consultations with WFA, Wine Australia and GWRDC.

Two major shocks to the world economy have impacted non-trivially on the wine industry in all major wine-producing countries in recent years. One is the global financial crisis, which brought substantial changes to bilateral exchange rates and – due to the fall in income and wealth – a temporary decline in the quantity and quality of wine demanded in traditional markets. The other development is the rapid economic growth in China and other emerging Asian economies, which slowed only slightly when high-income economies went into recession after 2007. Since Asia's emerging economies are natural resource-poor, their rapid industrialization and economic growth has strengthened primary product prices and hence the real exchange rates of natural resource-rich countries such as Australia. And since their income growth has led to a burgeoning middle class and enriched their elite, the demand for wine in Asia and especially China has surged. The latter in turn has stimulated vineyard expansion and rapid growth in wine production in China, although not (yet) quite enough to match domestic demand growth. Australia's wine industry has been hurt by the appreciating AUD but is being helped by the growth in Asian import demand.

Grapegrowers and winemakers in both the Old World and the New World are far more exposed to such shocks to the world economy now than they were in the 20th century. This is partly because of the move by most countries to flexible exchange rates since the 1980s, and also because the wine industry has become more globalized in the past two decades than ever in its long history. The share of global wine production exported more than doubled between 1989 and 2009, rising from 15 percent (which was already above its peak in the first globalization wave a century before) to 32 percent (Anderson and Nelgen 2011), and it had reached 41 percent by 2012 (OIV 2013). For the four biggest European wine-exporting countries, their export propensity rose over the two decades to 2009 from 20 to 35 percent, while for New World exporters it rose from just 4 percent to 37 percent  (Anderson and Nelgen 2011). By 2012, those shares had reached 49 and 42 percent, respectively, according to OIV (2013).

The extent of exposure to global shocks varies across countries according to not only the share of their production that is exported, but also the extent to which their domestic wine markets are open to imports. Figure 1 shows just how pervasive the growth in two-way trade in this product market has been over the 25 years to 2007, and it has risen even more since then. In 2012, the share of Australian wine production volume that was exported was 64 percent, and 16 percent of its domestic sales volume was supplied by imports (up from just 2 and 3 percent, respectively, in 1980-84). Moreover, it is not only winemakers who are vulnerable to exchange rate and other shocks to the market: even though winegrapes themselves are not often traded internationally, their prices soon adjust when wine price prospects alter.

The dramatic growth in Australia's wine exports since the mid-1980s was stimulated by a low Australian dollar (AUD). In US dollar terms, the AUD hovered between 0.60 and 0.80 from 1983 to 1999, and then it fell to slightly below 0.50 in 2001 before returning to 0.80 by the beginning of 2007. Since then, however, it rose to a peak of US$1.10 in 2011, and it remained in the 0.98 to 1.08 range for the 18 months to early May 2013. Similar paths have been traced by the UK pound since 1985 and the Euro since 2007 (Figure 2). As a consequence of those and other bilateral exchange rate movements, Australia has lost global market share to other wine exporters: since 2007, the gap between the US$ value of Australia's wine exports and that of the smaller New World exporters has halved (Figure 3), while the share of the country's domestic consumption supplied by imports has more than doubled.

In the light of these developments, the purpose of this report is two-fold: to assess the extent to which real exchange rate (RER) movements globally (not just the nominal US$, Euro and UK pound rates for the AUD) have reduced Australia's competitiveness in the world's wine markets since 2007; and to examine how Australia's competitiveness might evolve over the next five years. Two alternative changes from 2011 RERs are considered over those next five years: no change, and a half-way return to 2009 rates. The latter seems the more likely scenario, given recent prognoses by Garnaut (2013) and Sheehan and Gregory (2013) and the sudden 9 percent fall in the value of the AUD in May-June 2013. Nevertheless, a comparison with the no-change scenario gives a sense of the importance of future RER movements.

Exchange rates are not the only pertinent things that will change between now and 2018 of course. There will be changes in national consumption as populations and income grow, and also in national preferences, technologies, and capital investments in grape and wine production.

Two trends in particular that are expected over the next half-decade are the growth in China's import demand, and the expected preference swing toward higher-quality wine consumption in many markets. A formal model of economic behavior in the world's wine markets is used below to analyze the market responses to such anticipated changes.

**Project outputs and performance targets**

The key outputs of the project were baseline projections to 2018 for the 44 countries in the world wine model, a draft of which were presented for scrutiny to the WFA Board in March 2013. A revision was offered for presentation at the WFA's May 2013 meeting, but the agenda of that meeting had to be altered so the revised version was provided as a draft report for WFA and Wine Australia management to consider. That report has since been revised and a summary will be presented at the opening session of the AWITC in Sydney, 14 July 2013. The report will be further revised for inclusion in the AWITC Proceedings, and a derivative version will be placed in the Working Paper series of the Wine Economics Research Centre (WERC) when it is submitted to a journal. The revised version of the model itself is included in the WERC Working Paper 0312 (Anderson and Wittwer 2012) which has been submitted to a journal.

**Method**

Anderson and Wittwer (2012) have revised and updated a model of the world's wine markets that was first published by Wittwer, Berger and Anderson (2003) to examine wine's globalization (Anderson 2004, Ch. 2). Several significant enhancements have been made to that original model. Wine has been disaggregated into five types, namely non-premium (including bulk), commercial-premium, super-premium and iconic still wines, plus sparkling wine.[1] There are two types of grapes, premium and non-premium. Non-premium wine uses non-premium grapes exclusively, super-premium and iconic wines use premium grapes exclusively, and commercial-premium and sparkling wines use both types of grapes.

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[1] Commercial-premium still wines are defined by Anderson and Nelgen (2011) to be those between US$2.50 and $7.50 per litre pre-tax at a country's border or wholesale. Iconic still wines are a small subset of super-premium wines. They are assumed to have an average wholesale pre-tax price of $80 per litre and to account for just 0.45 percent of the volume of global wine production in 2009.

The world is divided into 44 individual nations and 7 composite regions. The model's database is calibrated initially to 2009, based on the data provided in Anderson and Nelgen (2011). For the first part of the report, the model is shocked by the changes in RERs between 2007 and 2011, assuming no other changes occur (so as to isolate the effects of movements in just this one variable). Those exchange rate changes, shown in Appendix Table 1(a), are calculated for each country as the percentage change in national production costs divided by the percentage change in US production costs expressed in that country's local currency units. For the second part of the report, the model is projected forward in two steps. The first step involves using actual aggregate national consumption growth between 2009 and 2011 (Appendix Table 2(a)), together with actual changes in RERs between just 2009 and 2011 (Appendix Table 1(b)). This second step assumes aggregate national consumption and population grow from 2011 to 2018 at the rates shown in Appendix Table 2(b), and that real exchange rates over that period either (a) remain at their 2011 levels or (b) return half-way to their 2009 rates. In each of those two steps, a number of additional assumptions are made concerning preferences, technologies, and capital stocks.

As for preferences, there is assumed to be a considerable demand swing in China towards all wine types as more Chinese earn middle-class incomes, so as to set its increased consumption to the projections of the major commodity forecasters of a 70 percent rise over that that 7-year period. That implies a rise in per capita consumption from 1.0 to 1.6 litres per year. This may be too conservative. China's per capita wine consumption grew faster than that in several West European wine-importing countries in recent decades, and Vinexpo claims China's 2012 consumption was already 1.4 litres. With the number of middle class in China currently around 250 million and growing at 10 million per year (Barton, Chen and Jin 2013), and with grape wine still accounting for only 4 percent of Chinese alcohol consumption, unprecedented increases in volumes of wine demanded are not unreasonable to expect. For the rest of the world, the long trend preference swing away from non-premium wines is assumed to continue.

Both grape and wine industry total factor productivity is assumed to grow at 1 percent per year everywhere, while grape and wine industry capital is assumed to grow net of depreciation at 1.5 percent per year in China but zero elsewhere. This means that China's production rises by 20, 26 and 30 percent for non-premium, commercial premium and super+ premium wines between

2011 and 2018 – which is less than half that needed to keep up with the modeled growth in China's consumption.

The model has supply and demand equations and hence quantities and prices for each of the grape and wine products and for a single composite of all other products. Grapes are assumed to be not traded internationally, but other products are both exported and imported. Each market is assumed to clear before any shock, and to find a new market-clearing outcome following any exogenously introduced shock.

**Results**

   (a) **Impacts of exchange rate movements on competitiveness, 2007 to 2011**
The first column of Table 1, and Figure 4, summarize the actual changes between 2007 and 2011 in real exchange rates in key wine-exporting and wine-importing nations. It is clear that, during the 2007 to 2011 period, Japan and China (like other rapidly emerging East Asian economies) and natural resource-rich Australia appreciated their real exchange rates heavily against the US dollar (by 29-35 percent). Other Southern Hemisphere wine exporters (Chile, New Zealand, South Africa) also saw their real exchange rates appreciate, albeit more moderately (by 9-23 percent). By contrast, the British pound depreciated heavily against the US dollar (by 18 percent), while for other West European countries – both wine-exporting and wine-importing – their real exchange rates remained close to the US dollar during that period.

If there were no other shocks to the world's wine markets over this 2007-11 period, what would those real exchange rate changes lead one to expect? Since Australia has experienced the largest real appreciation among the wine exporters, its wineries are likely to have been affected most adversely: receiving less AUD for their exports, and facing more foreign competition in their home market. As for wine-importing countries, those whose real exchange rates appreciated most (notably China and Japan) would be expected to import more wine, if all other things were equal, while for those experiencing a real depreciation, most notably the United Kingdom, wine imports would be expected to fall.

That is indeed what is shown in the other columns of Table 1; and the impacts on bilateral wine trade volumes are summarized in Table 2. Specifically, the real exchange rate changes are responsible for declines in grape and wine production in the southern hemisphere where real

exchange rates appreciated, and for slight production increases in the United States and Europe where real exchange rates changed relatively little.

Since Australia has had the largest appreciation of all wine-exporting countries, its winemakers and hence grapegrowers are estimated to suffer the largest reduction in domestic prices in real local currency terms from this shock: winegrape and commercial premium wine producer prices are reduced by almost one-third, and super premium wine prices by one-quarter. Associated with that is a 10 percent decline in the volume of Australia's commercial wine production, and a 6 percent decline in the output of super premium wine. Real prices in domestic currency terms decline in the other Southern Hemisphere countries shown in Table 1 as well, but by between only one- and two-fifths as much as in Australia. Furthermore, real grape and wine prices (again in domestic currency terms) rise in the United States and Western Europe, by between 3 and 8 percent, so output is estimated not to have been reduced at all in those regions as a consequence of recent real exchange rate movements. In short, those exchange rate shocks have been a major contributor to the decline in the international competitiveness of Australian wine producers since 2007.

The trade consequences of that set of exchange rate shocks also depend on how it affects wine consumption. With lowered prices for both domestic and imported wines, Australian consumption is estimated to have been boosted by 3 percent because of these real exchange rate changes – and indeed that is also the proportional change in actual consumption during that period (see final two columns of Table 1). This suggests the net effect on domestic consumption of all other influences over the period 2007-11 was zero.

In Europe's key wine-exporting countries and in the United States, by contrast, the rise in their wine prices would have reduced domestic wine consumption in the absence of other influences. Other influences evidently were not absent, however. In the United States, wine consumption actually rose by 2 percent over that period, perhaps as the economy there began recovering from the global financial crisis by 2011. In Western Europe's wine-exporting countries, by contrast, it fell by 10 percent, perhaps because those economies were still recovering from the financial crisis in 2011.

Estimated changes in consumption in wine-importing countries are shown in Table 1(b). The 18 percent real depreciation of the UK pound against the US dollar on its own caused the consumer price of wine in that market to rise such that estimated wine consumption fell 8

percent, which is very close to the actual decrease over that period of 7 percent. Discrepancies arise when there is a non-trivial net effect of economic changes other than in RERs. For example, China's rapid income growth and increasing absorption of western tastes meant that there was a substantial increase in wine demand there between 2007 and 2011, so that observed wine consumption grew by 22 percent over that period despite almost no contribution (0.2 percent) from RER changes. In the case of nations that went into recession, income deterioration between 2007 and 2011 affected actual consumption markedly. For example, Japan's actual wine consumption declined 2 percent even though RER changes on their own are estimated to have induced a 14 percent increase.

The negative impact on consumption of the real depreciation in the United Kingdom is bad news for all wine-exporting countries, but the impact is even worse for Australia (which was the 2$^{nd}$ most important supplier in volume terms of wine to the UK market after Italy, and 3$^{rd}$ in value terms after France and Italy). The first set of rows of Table 2 shows the impact on the UK's import volumes by country of origin. Australia and other Southern Hemisphere countries (most notably South Africa) are the standout losers in this scenario, with annual demand for their wine falling by nearly 100 ML – half of which is borne by Australia. By contrast, the Old World's annual sales fall by only 10 ML as a consequence of RER movements between 2007 and 2011, and US sales to the UK rise by 3 ML.

The modeled reduction in wine consumption in the United States is borne almost entirely by Australian and other Southern Hemisphere producers, whose wines become more expensive than domestically produced or Old World wines in the US market. That set of RER shocks reduces the Southern Hemisphere's share of US total wine consumption from 21 to 18 percent. The pattern of impact on bilateral wine trades with Canada, Germany and other Western European wine-importing countries is not quite as severe, but in all those cases Australian and other Southern Hemisphere producers lose out to US and Old World suppliers.

China remains the market in which wine exporters anticipate the highest rate of import growth in the future. China's renminbi appreciated in real terms more than most major currencies between 2007 and 2011, the effect of which in isolation would be for China to increase its share of global wine consumption. Table 1(b) shows that real local currency prices of wine in China fell by one-sixth due to observed RER movements. This induces increased imports of wine from all sources, with similar increases from both the New World (23 ML including the USA) and Old

World (21 ML). Those imports substituted for domestic wine, whose consumption is discouraged by the real appreciation: estimated consumption of domestic wine is 42 ML less than it would have been without RER changes, and imports 45 ML greater. As for other Asian markets and the rest of the world, Australia again loses while the US and Old World wine exporters gain.

In aggregate, RER movements over the 2007-2011 period are estimated to have reduced Australia's annual wine exports by 131 ML. This is larger than the loss to all other Southern Hemisphere exporters of 118 ML, and it contrasts with estimated export gains of 33 ML to the United States and just over 300 ML to Western Europe's key wine-exporting countries. This reversed somewhat the massive gains of the Southern Hemisphere exporters at the expense of the Old World over the past two decades (Figure 5). It also strengthened the competitiveness of the US wine industry relative to other New World wine producers in both the US and European markets.

Clearly, Australia is the country whose wine trade has been most adversely affected by real currency changes since 2007. In addition to losing export sales, however, it has also seen a considerable increase in imports. One-third of the estimated extra imports due to currency changes are from New Zealand, because of the greater real appreciation of the AUD compared with the NZD. The bracketed numbers in Table 3 show that New Zealand's extra penetration of the Australian market is especially strong in the super-premium category (predominately Sauvignon Blanc and Pinot Noir), while France's is predominantly in sparkling wine and Italy's in commercial-premium wines.

How do the modeled outcomes compare with observed export changes in Australia? Historic data indicate that between 2006-07 and 2010-11, the volume of Australia's wine exports fell only slightly, from 768 ML to 727 ML; but, in domestic currency terms, exports dropped from almost AUD2.9 billion to just under AUD2.0 billion over that period ([www.wineaustralia.com](www.wineaustralia.com)). Therefore, the modeled effect of RER changes slightly overstates the drop in the volume of wine exports, but the modeled drop in value – shown in Table 3 – is close to the observed change.

These results suggest RER changes go a long way towards explaining why market shares and producer prices have changed so much for some New World wine-exporting countries in recent years, and in particular the improvement in competitiveness of the US and EU and the decline for Australian and other Southern Hemisphere exporters between 2007 and 2011. This

only slightly reverses the trend of the previous 15 years though (Figure 5). Nor does it necessarily mean that the era in which Australian and other Southern Hemisphere exporters have gradually increased their share of global wine exports is over. After all, RER changes can easily reverse. We turn now to consider the period to 2018, and in particular to examine how much a reversal of RER trends would affect Australian and other wine exporters.


### (b) Projections of the world's wine markets to 2018

To project global wine markets forward, it is important to first update the model's 2009 baseline with known data. Sufficient data were available globally to calibrate the model to 2011, so we project the model to that year first using actual aggregate national consumption and population growth together with actual changes in real exchange rates between 2009 and 2011 and assumed changes in preferences, technologies, and capital stocks as described. Once this new baseline is in place, the second step is to assume aggregate national consumption and population grow from 2011 to 2018 at the rates shown in Appendix Table 2(b) and that preferences, technologies, and capital stocks continue to change as described above, plus that RERs over that period either (a) remain at their 2011 levels or (b) return half-way to their 2009 rates as reported in Appendix Table 1(b). The latter may well happen long before 2018, according to both Garnaut (2013) and Sheehan and Gregory (2013) and given the rapid changes in exchange rates during May-June 2013 when the Australian dollar fell 9 percent against the US dollar, the Euro and the UK Pound (which is more than half the change in those bilateral rates being modeled in this alternative scenario).

The impacts of those changes on real producer prices in the sector, in local currency units, are reported in Table 4(a) for the world's main wine-producing countries. The changes between 2009 and 2011 are not unlike those discussed in the previous section, so attention will focus in this section on the two alternative scenarios from 2011 to 2018. As with the previous results for the longer 2007-11 period, so in 2009-11 the impact from real exchange rate movements on Australia's grape and wine prices is more adverse than for any of the other wine-producing countries shown. For the period to 2018, grape prices are projected to fall slightly further if real exchange rates don't change from their 2011 levels, as are wine prices for all but the extremes of non-premium and iconic still wines (Table 4(b)). If, on the other hand, RERs were to return half-way toward what they were in 2009, premium grape prices in local currency terms would rise 15

percent above 2011 levels in real terms, and all wine types would receive higher prices (Table 4(c)).

Even if there were no changes in exchange rates, Australia is projected to expand its output by 2018 for all wine types except non-premium. For commercial premium and super-premium, the increases are 21 percent and 62 percent; but, with the reversal in RER trends, those output increases would be 63 and 81 percent, respectively (Table 5). Note that production grows in both hemispheres notwithstanding the fall in real producer prices in local currency terms for all but iconic wines, thanks to the assumed growth in grape and wine productivity of 1 percent per year. Were there also to be a devaluation of Southern Hemisphere exchange rates, Table 5(b) suggests that output in that region would expand even more while output expansion in the Northern Hemisphere would be somewhat less – consistent with the producer price changes shown in Table 4.

Consumer prices tend to move in the same direction as producer prices, but the changes are more muted because of the presence of trade and transport margins (compare Tables 4 and 6).

The income, population and preference changes together mean that consumption volumes grow over the period to 2018 for all but non-premium wine. The percentage increases are very similar in the two scenarios for the Old World and Japan, but are somewhat less in China and other emerging economies and somewhat more in the United Kingdom and especially the United States in the altered currencies' scenario versus the scenario with no changes in real exchange rates (Table 7). This is again consistent with the differences in local currency consumer price changes.

What is even more striking is the concentration of consumption growth and declines, as shown in Figure 6 and in the volumes reported in Table 8. In both scenarios the growth is concentrated in the US, Russia and especially China, while there are some declines in consumption in Italy, Spain and Germany (mostly of non-premium wines).

When combined with the changes projected in production, it is possible to get a picture of what is projected to happen to wine trade. Table 9 provides projections for the main wine-importing regions. It shows that the difference between the two scenarios amounts to around 170 ML extra imports into the UK from the Southern Hemisphere and 215 ML extra into the US if the recent exchange rate trend reversed. This is much more than the difference in total imports, because the EU and US would be less competitive in those markets with the projected exchange

rate changes. Eastern Europe and the former Soviet Union (ECA) would switch from a net-importing to a net-exporting region, but this would have very little impact on Southern Hemisphere exports because most of that change would be borne by EU wine exporters. As for China, it would import about 260 ML less than if real exchange rates remained unchanged from 2011, but again most of that adjustment would be borne by Old World exporters and exports from the Southern Hemisphere to China would be only 27 ML less.

**Conclusions**

The above results suggest that RER changes over the period 2007 to 2011 altered substantially the global wine export shares of the Old World and USA versus the Southern Hemisphere's New World exporters and especially Australia. This development reversed somewhat the massive gains of the latter group at the expense of the Old World over the past two decades (Figure 5). The exchange rate changes also strengthened the competitiveness of the US wine industry, relative to other New World wine producers, in both the US and European markets. Given those results, it is not surprising that the comparison between scenarios involving no RER changes from 2011 versus a half-way return to 2009 rates generate a reversal in international competitiveness of the various exporting countries.[2]

The projections to 2018 reveal an even more striking prospect, however. It has to do with the continuing growth of China's net imports. China has already become by far the most important wine-consuming country in Asia (Figure 7) and, with a projected extra 630-940 ML to be added by 2018 to its consumption of 1630 ML in 2011, that dominance is becoming even greater. Since China's domestic production is projected to increase by 'only' between 180 and 230 ML by 2018, its net imports are projected to rise by between 450 and 710 ML (see the 'Home sourced' and 'Total imports' columns in Table 9). Australia is projected to supply between 118 and 134 ML of those extra imports, or between one-fourth and one-fifth of China's total increase in imports.

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[2] Had we analysed the effect of changes in real exchange rates over the dozen years to 2000, we would have predicted a dramatic growth in Australian wine exports because over that period Australia's currency depreciated in real terms by almost 30 percent. In fact the volume and US$ value of Australia's wine exports grew 16 and 18 percent per year, respectively, over that period. An analysis of the effects of US dollar appreciation at the turn of the century is provided by Anderson and Wittwer (2001).

What about Australia's exports to other countries? Unlike its exports to China, it depends very much on the scenario. If real exchange rates did not change from 2011 to 2018, Australia's exports would decline with all but Asia, and in aggregate would be only 19 ML more than in 2011. By contrast, if exchange rates were to settle at half-way back to those of 2009, Australian exports would increase to all major markets and in aggregate would be 380 ML or about 55 percent more than in 2011 (Figure 8 and Table 10).

Even so, the share of China in Australia's total value of wine exports is projected to grow from 6 percent in 2009 to 30 percent by 2018, while the UK and US shares are projected to both fall to below 20 percent by 2018 – even in the devaluation scenario in which the volumes of those two traditional bilateral trades expand considerably (Figure 9).

The above results suggest RER changes go a long way towards explaining why market shares and producer prices have changed so much for New World wine-exporting countries in recent years – especially the decline in competitiveness for Australia and the improvement for the US. They also suggest exchange rates are capable of playing a major role in the years ahead. But on top of that, the above projections point to the enormous speed with which China may become the dominant market for Australian wine producers; and, according to the dashed lines in Figure 10, that could happen by 2016 even if the AUD devalues in ways that allow Australia to become more competitive in the US and UK markets. While the recent and projected rates of increase in per capita wine consumption in China are no faster than what occurred in several West European wine-importing countries in earlier decades, it is the sheer size of China's population – and the fact that grape wine still accounts for only 4 percent of Chinese alcohol consumption – that makes this import growth opportunity unprecedented.

**Recommendations**

Of course the above projections are not predictions. Where exchange rates settle, and how fast Australian wine producers take advantage of the projected market growth opportunities in Asia (as compared with their competitors abroad), will determine the actual changes in market shares over the coming years. Not all segments of the industry are projected to benefit, with non-premium producers facing falling prices if demand for their product continues to dwindle as assumed above. Nor will all exporting firms benefit. In particular, those firms that fail to invest

sufficiently in building relationship with their initial Chinese importer/distributor may find they do not get repeat orders, for example. But at least the above results can alert producers to possibilities, given the assumptions built into our model of global wine markets.

Given the volatility of today's flexible exchange rates, and the important influence they have on winery and grapegrower profitability, producers may want to consider ways to hedge against future currency fluctuations.

Further research in this area would best be focused on specific developments in market niches in Asia and especially China as all players, including domestic producers in Asia, respond to the expanding market opportunities there. The reason for focusing in China especially is that it is by far the biggest Asian market (see Figure 7), and in particular it is more than 50 times larger than India's.

**Appendix 1: Communication**

In addition to sharing results and interacting with the WFA Board and management and with staff at Wine Australia and GWRDC, the project has led to two PPT presentations (copies attached) before 14 June and two more will follow in July:

- To the Barossa Next Crop group at the NWC, Adelaide, 12 June 2013
- Keynote Address to the America Association of Wine Economists' Annual Conference, Stellenbosch, 26-29 June 2013
- Presentation in the Opening Plenary session of AWITC, Sydney, 14 July 2013
- Presentation in the Opening Plenary session of the Australasian Conference of the International Wine Law Association, UniSA, Adelaide, 26-27 July 2013.

The AWITC paper will be revised for publication in the Conference Proceedings; the paper for the AAWE address in Stellenbosch will be submitted to a journal; and a paper on the revised model of global wine markets has already been submitted to a journal. As well, a non-technical summary of an early set of modelling results has been published in the Australian and New Zealand Wine Industry Journal (Anderson and Wittwer 2013).

**Appendix 2: Intellectual property**

The data that went into the global wine markets model are already freely available on the WERC website and in Anderson and Nelgen (2011). The model itself is available to potential users by contacting Glyn Wittwer at Glyn.Wittwer@monash.edu

**Appendix 3: References**

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**Appendix 4: Staff**

This project was undertaken with a small staff comprising the PI, Kym Anderson; the chief modeler, namely Glyn Wittwer of the Centre of Policy Studies at Monash University; and several part-time research assistants at WERC, the University of Adelaide.

Table 1: Changes in real exchange rates and their estimated impact on domestic prices (in real local currency) and quantities of wine, main exporters and importers, 2007 to 2011

(percent)

(a) Main exporters

| | Real exchange rate | Grape price | Comm. premium wine[b] producer price | Super premium wine[b] producer price | Comm. premium wine[b] prod'n volume | Super premium wine[b] prod'n volume | Domestic wine consum. volume (model) | *Domestic wine consum. volume (actual)* |
|---|---|---|---|---|---|---|---|---|
| W. Europe 6[a] | 0 | 5 | 7 | 5 | 2 | 1 | -1 | *(-10)* |
| United States | 0 | 4 | 8 | 3 | 1 | 0 | -4 | *(2)* |
| New Zealand | 9 | -8 | -5 | -7 | -1 | -2 | -1 | *(0)* |
| Chile | 16 | -13 | -11 | -13 | -3 | -4 | -2 | *(-5)* |
| South Africa | 23 | -8 | -4 | -1 | -9 | -7 | 0 | *(-1)* |
| **Australia** | **33** | **-32** | **-31** | **-26** | **-10** | **-6** | **3** | *(3)* |

(b) Main importers

| | Real exchange rate | Comm. premium wine[b] consumer price | Super premium wine[b] consumer price | Domestic wine consum. volume (model) | *Domestic wine consum. volume (actual)* |
|---|---|---|---|---|---|
| United Kingdom | -18 | 49 | 47 | -8 | *(-7)* |
| Other W. Europe[c] | 4 | -6 | -12 | -0 | *(na)* |
| Japan | 29 | -41 | -43 | 14 | *(-2)* |
| China | 35 | -17 | -18 | 0 | *(22)* |

[a] France, Italy, Spain, Portugal, Germany and Austria.

[b] Commercial-premium wines are defined by Anderson and Nelgen (2011) to be those between US$2.50 and $7.50 per litre pre-tax wholesale or at a country's border.

[c] Other W. Europe = Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland

Source: Authors' model results

Table 2: Impact of real exchange rate changes on export volume of Australia and other wine-exporting countries, 2007 to 2011

(ML)

| Exporter:<br>Importer: | Australia | Other<br>Southern<br>Hemisphere | United<br>States | Western<br>European<br>exporters |
|---|---|---|---|---|
| United Kingdom | -48 | -49 | 3 | -10 |
| United States | -52 | -44 | 0 | 6 |
| Canada | -8 | -10 | 7 | 8 |
| New Zealand | -2 | 0 | 0 | 0 |
| Germany | -4 | -25 | 1 | 1 |
| Other W. Europe[a] | -11 | -29 | 2 | 40 |
| China | 4 | 14 | 5 | 21 |
| Other Asia | -4 | 0 | 8 | 43 |
| Other countries | -6 | 25 | 15 | 197 |
| **TOTAL WORLD** | **-131** | **-118** | **33** | **306** |

[a] Other W. Europe = Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland

Source: Authors' model results

Table 3: Impact of real exchange rate changes on Australia's wine export and import volumes and values, by wine category, 2007 to 2011

| | Volume (ML) | | Value (AUS$m) | |
|---|---|---|---|---|
| | **Exports** | **Imports** (and % from NZ) | **Exports** | **Imports** |
| Non-premium wine | -37 | 0.8 (50) | -106 | 0 |
| Commercial-premium[c] | -77 | 3.2[a](31) | -635 | 6 |
| Super-premium wine | -10 | 1.5 (85) | -107 | 12 |
| Sparkling wine | -6 | 2.9[b] (3) | -42 | 3 |
| Total | -130 | 8.3 (34) | -890 | 21 |

[a] 32 percent of the increase in commercial-premium wine is from Italy.

[b] 39 percent of the increase in sparkling wine is from France.

[c] Commercial-premium wines are defined by Anderson and Nelgen (2011) to be those between US$2.50 and $7.50 per litre pre-tax wholesale or at a country's border.

Source: Authors' model results

Table 4: Real producer price changes, in local currency, 2009-11 and 2011-18

(percent)

(a) 2009 to 2011, actual

| | FRA | ITA | POR | SPN | AUT | GER | AUS | NZL | USA | ARG | CHILE | SAF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium wine | 0.5 | -1.6 | -5.1 | -0.8 | -3.8 | 1.2 | **-37.5** | -31.9 | 6.8 | -3.4 | -24.5 | -30.3 |
| Commercial-premium | 9.7 | 10.5 | 8.7 | 8.2 | 5.0 | 11.8 | **-21.0** | -25.8 | 12.0 | 7.8 | -19.7 | -22.9 |
| Super-premium | 15.1 | 16.2 | 15.8 | 8.9 | 8.5 | 15.6 | **-13.7** | -21.4 | 22.7 | 16.6 | -10.8 | -13.8 |
| Iconic still wine | 13.1 | 12.3 | 11.2 | 8.7 | 9.3 | 14.9 | **-16.9** | -23.4 | 19.2 | 24.0 | 2.7 | -7.1 |
| Sparkling wine | 22.7 | 26.0 | 23.0 | 26.8 | 20.1 | 23.7 | **-19.3** | -13.1 | 27.7 | 31.7 | -2.9 | -13.3 |
| Premium grapes | 8.6 | 7.6 | 6.6 | 6.4 | 5.3 | 9.9 | **-21.5** | -21.6 | 11.1 | 14.0 | -14.0 | -15.7 |
| Non-premium grapes | 7.9 | 4.3 | 2.9 | 4.4 | 2.9 | 7.6 | **-15.0** | -23.3 | 6.3 | 12.1 | -17.3 | -19.0 |

(b) 2011 to 2018, assuming no real exchange rate changes from 2011

| | FRA | ITA | POR | SPN | AUT | GER | AUS | NZL | USA | ARG | CHILE | SAF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium wine | -2.4 | -0.4 | 3.4 | -1.0 | 2.0 | -3.1 | **17.4** | 13.4 | -7.8 | 16.3 | 12.5 | 22.0 |
| Commercial-premium | -9.9 | -10.5 | -8.9 | -8.5 | -5.7 | -11.6 | **-6.5** | 5.0 | -11.3 | 6.3 | 6.9 | 11.9 |
| Super-premium | -14.0 | -14.7 | -14.3 | -8.9 | -8.5 | -14.4 | **-14.4** | -0.8 | -18.8 | -0.9 | -3.5 | 0.4 |
| Iconic still wine | 34.3 | 34.6 | 34.8 | 35.9 | 34.7 | 32.9 | **39.8** | 59.8 | 34.7 | 61.9 | 51.5 | 69.4 |
| Sparkling wine | -19.2 | -21.2 | -19.1 | -21.6 | -17.2 | -19.8 | **-8.3** | -10.1 | -21.9 | -11.6 | -11.0 | 0.3 |
| Premium grapes | -8.5 | -7.8 | -6.9 | -6.7 | -5.7 | -9.5 | **-5.6** | -0.6 | -9.9 | 0.8 | -0.3 | 2.3 |
| Non-premium grapes | -8.1 | -5.2 | -3.9 | -5.2 | -4.0 | -7.9 | **-12.8** | 1.5 | -6.6 | 2.6 | 4.0 | 7.3 |

(c) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

| | FRA | ITA | POR | SPN | AUT | GER | AUS | NZL | USA | ARG | CHILE | SAF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium wine | -2.4 | -0.4 | 3.4 | -1.1 | 2.0 | -3.1 | **42.8** | 30.3 | -7.9 | 27.5 | 27.3 | 44.2 |
| Commercial-premium | -9.9 | -10.5 | -8.9 | -8.5 | -5.7 | -11.7 | **13.8** | 20.6 | -11.3 | 16.5 | 21.0 | 32.3 |
| Super-premium | -14.0 | -14.8 | -14.3 | -8.9 | -8.5 | -14.4 | **4.1** | 14.0 | -18.8 | 8.7 | 9.2 | 18.7 |
| Iconic still wine | 31.5 | 31.7 | 32.0 | 33.2 | 33.9 | 30.8 | **76.8** | 97.7 | 32.4 | 78.4 | 74.4 | 101.6 |
| Sparkling wine | -19.2 | -21.2 | -19.1 | -21.6 | -17.2 | -19.8 | **11.5** | 3.3 | -21.9 | -3.1 | 0.7 | 18.6 |
| Premium grapes | -8.6 | -7.9 | -7.0 | -6.8 | -5.7 | -9.5 | **15.0** | 14.2 | -9.9 | 10.4 | 12.8 | 20.9 |
| Non-premium grapes | -8.1 | -5.3 | -3.9 | -5.3 | -4.0 | -8.0 | **6.8** | 16.6 | -6.6 | 12.5 | 17.5 | 26.4 |

Source: Authors' model results

Table 5: Grape and wine output volume changes, 2011 to 2018

(percent)

(a) 2011 to 2018, assuming no real exchange rate changes from 2011

|  | FRA | ITA | POR | SPN | AUT | GER | **AUS** | NZL | USA | ARG | CHILE | SAF | CHINA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium wine | -9.4 | -14.5 | -16.5 | -10.4 | -16.7 | -9.9 | **-22.9** | -21.4 | -1.3 | -12.8 | -17.0 | -29.0 | 19.6 |
| Commercial-premium | 14.3 | 10.4 | 7.0 | 5.8 | -2.6 | 21.7 | **21.2** | -15.2 | 12.9 | -3.5 | -14.3 | -13.5 | 26.1 |
| Super-premium | 35.9 | 30.5 | 38.1 | 25.2 | 29.3 | 35.6 | **61.5** | 183.0 | 41.2 | 13.3 | 24.1 | 36.8 | 29.4 |
| Iconic still wine | 15.4 | 15.5 | 15.8 | 16.6 | 16.1 | 14.9 | **15.6** | 23.1 | 14.4 | 17.7 | 14.4 | 18.3 | 31.1 |
| Sparkling wine | 35.1 | 44.6 | 37.1 | 48.1 | 27.3 | 35.9 | **26.0** | 25.3 | 46.0 | 58.4 | 28.8 | 0.2 | -8.0 |
| Premium grapes | 16.4 | 11.2 | 9.8 | 9.7 | 12.5 | 17.6 | **17.4** | 66.8 | 21.7 | 2.8 | -0.1 | 1.5 | 14.5 |
| Non-premium grapes | 11.7 | 2.2 | -1.2 | 2.8 | -2.3 | 11.3 | **7.6** | -6.9 | 7.1 | -1.0 | -7.7 | -9.3 | 12.0 |

(b) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

|  | FRA | ITA | POR | SPN | AUT | GER | **AUS** | NZL | USA | ARG | BRA | CHILE | SAF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium wine | -13.6 | -16.2 | -17.3 | -15.3 | -17.6 | -13.0 | **-7.9** | -13.3 | -6.2 | -11.7 | -6.6 | -10.5 | -17.5 |
| Commercial-premium | 3.9 | 1.5 | 0.3 | -1.8 | -4.1 | 7.8 | **63.3** | -6.6 | 6.5 | -0.1 | 14.3 | -1.1 | -2.2 |
| Super-premium | 31.2 | 24.7 | 30.6 | 22.6 | 29.2 | 33.4 | **81.0** | 239.4 | 39.7 | 19.0 | 64.6 | 36.5 | 44.0 |
| Iconic still wine | 15.0 | 15.1 | 15.4 | 16.2 | 16.0 | 14.6 | **16.2** | 24.3 | 14.2 | 17.8 | 15.5 | 14.6 | 18.4 |
| Sparkling wine | 33.0 | 39.0 | 34.1 | 40.6 | 26.8 | 35.0 | **41.3** | 35.5 | 45.3 | 60.5 | 70.5 | 47.6 | 27.2 |
| Premium grapes | 14.1 | 7.9 | 7.2 | 6.7 | 12.4 | 15.2 | **30.7** | 90.0 | 20.4 | 4.4 | 20.5 | 5.0 | 5.6 |
| Non-premium grapes | 8.8 | -0.7 | -3.4 | -0.6 | -3.0 | 8.6 | **26.0** | -2.7 | 4.2 | 0.3 | 7.3 | -2.3 | -3.6 |

Source: Authors' model results

Table 6: Changes in real consumer prices, in local currency, 2011 to 2018

(percent)

(a) 2011 to 2018, assuming no real exchange rate changes from 2011

|  | FRA | GER | ITA | SPN | UK | OWE[a] | RUS | AUS | NZL | USA | ARG | BRA | CHILE | SAF | CHINA | JAP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium | -0.8 | -0.7 | -0.3 | -0.4 | 1.5 | 1.8 | 5.1 | **8.2** | 8.7 | -3.2 | 8.3 | 1.8 | 6.3 | 10.0 | 26.5 | -0.1 |
| Commercial-premium | -4.8 | -4.9 | -5.3 | -3.9 | -4.1 | -3.8 | -0.7 | **-3.5** | 0.9 | -4.7 | 3.4 | 0.0 | 3.5 | 5.3 | 26.3 | -2.1 |
| Super-premium | -7.1 | -7.9 | -7.6 | -4.2 | -5.7 | -6.6 | -9.3 | **-8.3** | -1.1 | -10.5 | -0.6 | -9.6 | -2.1 | 0.0 | 33.5 | -5.3 |
| Iconic still wine | 17.6 | 18.8 | 17.7 | 16.6 | 19.8 | 20.2 | 30.9 | **23.5** | 32.0 | 13.4 | 35.9 | 40.9 | 30.3 | 35.5 | 72.0 | 15.5 |
| Sparkling wine | -10.1 | -11.5 | -10.9 | -10.3 | -11.1 | -11.5 | -17.4 | **-6.4** | -7.6 | -10.6 | -7.0 | -10.6 | -7.5 | -4.9 | -10.5 | -8.2 |
| All other products | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

(b) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

|  | FRA | GER | ITA | SPN | UK | OWE[a] | RUS | AUS | NZL | USA | ARG | BRA | CHILE | SAF | CHINA | JAP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium | -0.9 | -1.1 | -0.3 | -0.5 | -1.0 | 7.0 | 29.0 | **32.5** | 24.7 | -3.6 | 18.7 | 22.1 | 20.2 | 30.0 | -13.3 | 5.0 |
| Commercial-premium | -4.8 | -5.4 | -5.3 | -3.9 | -6.7 | -0.8 | 22.8 | **19.8** | 15.5 | -5.8 | 13.3 | 21.9 | 17.1 | 24.6 | -5.8 | 2.3 |
| Super-premium | -7.1 | -8.0 | -7.6 | -4.2 | -8.7 | 1.2 | 11.3 | **11.8** | 13.8 | -10.9 | 9.0 | 8.7 | 10.8 | 18.3 | 0.0 | -0.8 |
| Iconic still wine | 16.2 | 17.5 | 16.2 | 15.4 | 17.8 | 25.5 | 67.5 | **54.7** | 58.6 | 11.7 | 49.5 | 71.5 | 49.1 | 60.9 | 30.3 | 21.1 |
| Sparkling wine | -10.1 | -11.5 | -11.0 | -10.3 | -11.3 | -7.4 | 0.9 | **17.2** | 8.6 | -10.7 | 2.0 | 9.8 | 6.0 | 17.0 | -28.2 | -3.6 |
| All other products | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

[a] Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland

Source: Authors' model results

Table 7: Changes in quantities of wine consumption, 2011 to 2018

(percent)

(a) 2011 to 2018, assuming no real exchange rate changes from 2011

| | FRA | GER | ITA | SPN | UK | OWE[a] | RUS | AUS | NZL | USA | ARG | BRA | CHILE | SAF | CHINA | JAP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium | -15.6 | -15.4 | -15.5 | -15.5 | -16.0 | -16.0 | -13.3 | **-11.9** | -13.5 | -10.9 | -8.3 | -7.8 | -10.1 | -11.8 | 30.8 | -17.5 |
| Commercial-premium | -0.7 | -0.4 | -0.1 | -0.8 | -0.7 | -0.9 | 4.6 | **6.0** | 2.0 | 4.4 | 10.3 | 10.5 | 6.1 | 4.6 | 99.6 | -4.0 |
| Super-premium | 33.4 | 34.8 | 34.8 | 30.8 | 32.4 | 33.5 | 50.2 | **45.1** | 33.4 | 45.3 | 54.3 | 62.9 | 46.3 | 45.2 | 130.3 | 28.0 |
| Iconic still wine | 14.3 | 12.5 | 14.7 | 16.1 | 12.0 | 11.3 | 24.6 | **15.1** | 2.4 | 27.2 | 24.5 | 19.8 | 18.7 | 20.3 | 120.4 | 13.0 |
| Sparkling wine | 33.1 | 35.7 | 35.6 | 34.4 | 35.8 | 36.1 | 58.6 | **37.0** | 35.9 | 41.8 | 62.0 | 63.9 | 49.3 | 48.6 | 247.6 | 26.3 |
| All wines | 1.1 | -1.9 | -7.4 | -4.8 | -2.1 | 3.1 | 15.5 | **9.2** | 7.6 | 8.5 | -1.2 | 16.3 | 1.0 | 3.1 | 70.0 | 11.2 |

(b) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

| | FRA | GER | ITA | SPN | UK | OWE[a] | RUS | AUS | NZL | USA | ARG | BRA | CHILE | SAF | CHINA | JAP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-premium | -15.5 | -15.3 | -15.5 | -15.5 | -15.3 | -16.2 | -13.8 | **-12.1** | -13.4 | -10.7 | -8.3 | -7.8 | -10 | -11.9 | 18.3 | -17.7 |
| Commercial-premium | -0.7 | -0.1 | -0.1 | -0.8 | 0.6 | -0.8 | 3.4 | **4.9** | 2.2 | 5.0 | 10.3 | 9.5 | 6.1 | 4.6 | 80.1 | -4.1 |
| Super-premium | 33.4 | 34.8 | 34.8 | 30.8 | 36.1 | 31.4 | 48.4 | **44.7** | 33.3 | 45.9 | 54.3 | 62.5 | 46.3 | 45.2 | 116.6 | 27.5 |
| Iconic still wine | 16.2 | 14.2 | 16.7 | 17.8 | 14.5 | 11.1 | 17.6 | **10.4** | -3.9 | 29.8 | 23.8 | 17.5 | 16.9 | 19.7 | 114.8 | 12.2 |
| Sparkling wine | 33.1 | 35.7 | 35.6 | 34.5 | 36.1 | 34.0 | 57.0 | **32.8** | 32.6 | 42 | 61.9 | 60.0 | 47.3 | 42.8 | 212.4 | 25.3 |
| All wines | 1.0 | -1.1 | -7.3 | -4.8 | 1.1 | 2.9 | 8.0 | **9.9** | 11.5 | 13.0 | -1.1 | 13.3 | 0.6 | 3.3 | 46.8 | 9.8 |

[a] Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland

Source: Authors' model results

Table 8: Changes in quantities of wine consumption, 2011 to 2018
(ML)

(a) 2011 to 2018, assuming no real exchange rate changes from 2011

| | Non-premium wine | Commercial-premium | Super-premium | Iconic still wine | Sparkling wine | All wine |
|---|---|---|---|---|---|---|
| FRA | -174.0 | -5.0 | 102.3 | 3.8 | 99.6 | 26.7 |
| GER | -187.7 | -0.2 | 19.9 | 0.4 | 125.9 | -41.8 |
| ITA | -259.3 | -1.0 | 39.2 | 1.5 | 35.0 | -184.5 |
| SPN | -75.1 | -2.4 | 13.7 | 0.6 | 17.9 | -45.4 |
| UK | -69.2 | -11.9 | 22.9 | 0.4 | 29.2 | -28.7 |
| OWE[a] | -73.7 | 1.7 | 78.8 | 1.8 | 38.2 | 46.8 |
| RUS | -37.3 | 58.2 | 18.2 | 0.6 | 159.5 | 199.0 |
| **AUS** | **-20.0** | **7.7** | **33.5** | **1.1** | **25.7** | **48.0** |
| NZL | -3.7 | 1.2 | 6.9 | 0.0 | 2.4 | 6.8 |
| USA | -122.9 | 25.7 | 287.2 | 1.1 | 58.6 | 249.7 |
| ARG | -61.6 | 18.6 | 5.1 | 0.2 | 25.9 | -11.8 |
| BRA | -7.2 | 21.8 | 29.6 | 0.8 | 12.1 | 57.2 |
| CHILE | -16.6 | 3.2 | 11.8 | 0.4 | 3.6 | 2.4 |
| SAF | -15.8 | 7.8 | 14.8 | 0.6 | 3.4 | 10.8 |
| CHINA | 342.6 | 543.6 | 45.8 | 0.3 | 5.3 | 937.7 |
| JAP | -7.0 | -4.8 | 38.3 | 0.1 | 9.8 | 36.5 |
| World | -950.6 | 820.3 | 953.2 | 18.0 | 820.2 | 1661.1 |

(b) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

| | Non-premium wine | Commercial-premium | Super-premium | Iconic still wine | Sparkling wine | All wine |
|---|---|---|---|---|---|---|
| FRA | -173.4 | -5.9 | 101.2 | 4.4 | 99.5 | 25.8 |
| GER | -174.2 | 1.8 | 20.1 | 0.4 | 126.6 | -25.3 |
| ITA | -258.5 | -0.9 | 39.2 | 1.7 | 35.1 | -183.4 |
| SPN | -75.1 | -2.3 | 13.7 | 0.7 | 17.9 | -45.2 |
| UK | -50.9 | 15.4 | 18.6 | 0.4 | 31.2 | 14.7 |
| OWE[a] | -67.1 | -4.9 | 78.1 | 1.6 | 36.8 | 44.5 |
| RUS | -62.6 | 0.2 | 10.8 | 0.4 | 154.3 | 103.1 |
| **AUS** | **-18.7** | **12.5** | **33.8** | **0.8** | **23.3** | **51.8** |
| NZL | -2.5 | 2.7 | 7.2 | 0.0 | 3.0 | 10.3 |
| USA | -91.5 | 99.3 | 311.0 | 1.2 | 61.4 | 381.4 |
| ARG | -60.7 | 18.6 | 5.1 | 0.2 | 25.9 | -10.8 |
| BRA | -7.2 | 13.9 | 27.9 | 0.7 | 11.3 | 46.7 |
| CHILE | -16.6 | 3.1 | 11.8 | 0.4 | 2.8 | 1.5 |
| SAF | -15.8 | 7.8 | 14.8 | 0.6 | 4.3 | 11.8 |
| CHINA | 175.9 | 411.4 | 34.6 | 0.3 | 4.7 | 627.0 |
| JAP | -6.1 | -5.2 | 35.1 | 0.1 | 8.1 | 31.9 |

[a] Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland

Source: Authors' model results

Table 9: Change in wine consumption in major importers by source, 2011 to 2018 (ML)

(a) assuming no changes in exchange rates

| | All Old World | ECA[a] | USA | All Sth Hem[a] | Home sourced | Total imports |
|---|---|---|---|---|---|---|
| **UK** | | | | | | |
| Non-premium wine | -6.1 | -0.5 | 5.6 | -68.2 | 0.0 | -69.2 |
| Commercial-premium | 49.4 | -0.3 | 9.8 | -70.5 | 0.0 | -11.9 |
| Super-premium | 21.1 | 0.0 | 0.7 | 1.0 | 0.0 | 22.9 |
| Iconic still wine | 0.4 | 0.0 | 0.0 | -0.1 | 0.0 | 0.4 |
| Sparkling wine | 28.9 | 0.2 | 1.1 | -1.0 | 0.0 | 29.2 |
| Total | 93.7 | -0.6 | 17.2 | -138.7 | 0.0 | -28.7 |
| **USA** | | | | | | |
| Non-premium wine | -6.8 | -0.3 | 0.0 | -73.3 | -42.2 | -80.7 |
| Commercial-premium | 24.5 | -0.4 | 0.0 | -59.9 | 61.8 | -36.0 |
| Super-premium | -12.3 | 0.0 | 0.0 | 108.0 | 191.7 | 95.5 |
| Iconic still wine | -0.2 | 0.0 | 0.0 | 0.7 | 0.6 | 0.5 |
| Sparkling wine | 21.2 | 0.1 | 0.0 | -0.3 | 37.6 | 21.1 |
| Total | 26.3 | -0.7 | 0.0 | -24.8 | 249.4 | 0.3 |
| **GER** | | | | | | |
| Non-premium wine | -91.5 | -11.1 | 1.9 | -46.8 | -39.9 | -147.8 |
| Commercial-premium | 11.7 | -4.1 | 1.1 | -15.9 | 7.0 | -7.3 |
| Super-premium | 11.4 | 0.1 | 0.1 | 0.0 | 8.4 | 11.5 |
| Iconic still wine | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 | 0.1 |
| Sparkling wine | 28.9 | 0.0 | 0.2 | -0.2 | 97.0 | 28.9 |
| Total | -39.4 | -15.1 | 3.3 | -62.9 | 72.8 | -114.5 |
| **OWE[a]** | | | | | | |
| Non-premium wine | -15.8 | -0.8 | 2.5 | -57.8 | -1.7 | -72.0 |
| Commercial-premium | 50.4 | 0.0 | 2.2 | -41.9 | -8.7 | 10.4 |
| Super-premium | 70.9 | 0.1 | 0.7 | -0.3 | 7.4 | 71.4 |
| Iconic still wine | 1.3 | 0.0 | 0.0 | -0.2 | 0.7 | 1.1 |
| Sparkling wine | 38.4 | 0.1 | 0.3 | -0.6 | 0.0 | 38.2 |
| Total | 145.1 | -0.5 | 5.8 | -100.8 | -2.3 | 49.1 |
| **China** | | | | | | |
| Non-premium wine | 90.8 | 2.7 | 29.3 | 84.4 | 126.1 | 216.5 |
| Commercial-premium | 210.0 | 2.8 | 33.8 | 167.2 | 97.4 | 446.2 |
| Super-premium | 16.1 | 0.0 | 0.3 | 9.4 | 5.7 | 40.1 |
| Iconic still wine | 0.2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 |
| Sparkling wine | 4.5 | 0.1 | 0.2 | 0.2 | 0.0 | 5.3 |
| Total | 321.6 | 5.6 | 63.6 | 261.1 | 229.3 | 708.4 |
| **ECA[b]** | | | | | | |
| Non-premium wine | -206.1 | -26.8 | 0.8 | -16.0 | -65.1 | -37.7 |
| Commercial-premium | 114.2 | 2.3 | 1.3 | -11.4 | 17.7 | 96.9 |
| Super-premium | 122.1 | 0.9 | 0.1 | 0.0 | 23.3 | 14.0 |
| Iconic still wine | 2.2 | 0.0 | 0.0 | 0.0 | 0.3 | 0.4 |
| Sparkling wine | 116.8 | 8.9 | 0.1 | -0.1 | 188.0 | 33.6 |
| Total | 149.1 | -14.7 | 2.3 | -27.5 | 164.3 | 107.2 |

(b) assuming from 2011 bilateral exchange rates return half-way to 2009 rates

| | All Old World | ECA[a] | USA | All Sthn Hem[a] | Home sourced | Total imports |
|---|---|---|---|---|---|---|
| **UK** | | | | | | |
| Non-premium wine | -23.6 | -0.9 | 1.2 | -27.6 | 0.0 | -50.9 |
| Commercial-premium | -34.9 | -1.1 | -1.2 | 52.9 | 0.0 | 15.4 |
| Super-premium | 11.5 | 0.0 | 0.5 | 6.6 | 0.0 | 18.6 |
| Iconic still wine | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| Sparkling wine | 27.8 | 0.1 | 1.1 | 2.1 | 0.0 | 31.2 |
| Total | -18.8 | -1.8 | 1.7 | 34.0 | 0.0 | 14.7 |
| **USA** | | | | | | |
| Non-premium wine | -12.4 | -0.2 | 0.0 | -31.2 | -47.1 | -44.4 |
| Commercial-premium | -7.7 | -0.2 | 0.0 | 71.1 | 36.6 | 62.7 |
| Super-premium | -19.6 | 0.0 | 0.0 | 145.8 | 185.1 | 125.9 |
| Iconic still wine | -0.2 | 0.0 | 0.0 | 0.8 | 0.6 | 0.6 |
| Sparkling wine | 20.4 | 0.2 | 0.0 | 3.4 | 37.3 | 24.1 |
| Total | -19.5 | -0.3 | 0.0 | 189.9 | 212.4 | 169.0 |
| **GER** | | | | | | |
| Non-premium wine | -107.8 | -5.1 | 1.3 | -19.9 | -42.5 | -131.8 |
| Commercial-premium | -2.6 | -0.9 | 0.8 | -0.8 | 5.3 | -3.5 |
| Super-premium | 11.2 | 0.1 | 0.1 | 0.3 | 8.4 | 11.7 |
| Iconic still wine | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 | 0.1 |
| Sparkling wine | 28.6 | 0.8 | 0.2 | 0.2 | 96.8 | 29.8 |
| Total | -70.4 | -5.2 | 2.3 | -20.2 | 68.3 | -93.7 |
| **OWE[a]** | | | | | | |
| Non-premium wine | -40.5 | -1.1 | 1.1 | -24.1 | -1.9 | -65.2 |
| Commercial-premium | -6.7 | -0.3 | 0.7 | 6.0 | -4.3 | -0.6 |
| Super-premium | 58.9 | 0.1 | 0.6 | 7.3 | 11.3 | 66.8 |
| Iconic still wine | 0.9 | 0.0 | 0.0 | 0.0 | 0.7 | 0.8 |
| Sparkling wine | 35.6 | 0.2 | 0.3 | 0.7 | 0.0 | 36.8 |
| Total | 48.1 | -1.1 | 2.7 | -10.2 | 5.8 | 38.7 |
| **China** | | | | | | |
| Non-premium wine | 22.0 | 1.1 | 9.3 | 44.3 | 95.2 | 80.7 |
| Commercial-premium | 111.2 | 1.6 | 18.3 | 177.5 | 81.8 | 329.6 |
| Super-premium | 9.5 | 0.0 | 0.2 | 11.4 | 5.0 | 29.6 |
| Iconic still wine | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 |
| Sparkling wine | 3.7 | 0.1 | 0.1 | 0.4 | 0.0 | 4.7 |
| Total | 146.4 | 2.9 | 27.9 | 233.6 | 182.1 | 444.9 |
| **ECA[b]** | | | | | | |
| Non-premium wine | -273.1 | -28.8 | 0.1 | -9.3 | -59.0 | -78.5 |
| Commercial-premium | -45.3 | -10.9 | 0.4 | -7.1 | 37.9 | -9.1 |
| Super-premium | 99.0 | 0.6 | 0.0 | 0.1 | 24.3 | 4.8 |
| Iconic still wine | 1.8 | 0.0 | 0.0 | 0.0 | 0.3 | 0.2 |
| Sparkling wine | 112.5 | 9.1 | 0.0 | 0.0 | 197.2 | 16.1 |
| Total | -105.1 | -30.0 | 0.6 | -16.3 | 200.7 | -66.5 |

[a] ECA=Bulgaria, Croatia, Georgia, Hungary, Moldova, Romania, Russia, Ukraine, plus other former COMECON countries.

Source: Authors' model results

Table 10: Change in Australia's wine export and import volumes and values, 2011 to 2018

(a) 2011 to 2018, assuming no real exchange rate changes from 2011

| | Volume (ML) | | Value (AUS$m) | |
| | Exports | Imports | Exports | Imports |
|---|---|---|---|---|
| Non-premium wine | -81.0 | -1.0 | -36.9 | 1.8 |
| Commercial-premium | 87.0 | -3.4 | 313.7 | -2.7 |
| Super-premium | 13.5 | 0.5 | 122.4 | 4.4 |
| Iconic still wine | 0.0 | 0.0 | 22.3 | 25.2 |
| Sparkling wine | -0.4 | 10.4 | -5.9 | 45.7 |
| Total | 19.1 | 6.5 | 415.5 | 74.5 |

(b) 2011 to 2018, assuming from 2011 bilateral exchange rates return half-way to 2009 rates

| | Volume (ML) | | Value (AUS$m) | |
| | Exports | Imports | Exports | Imports |
|---|---|---|---|---|
| Non-premium wine | -12.1 | -2.1 | 57.7 | 3.0 |
| Commercial-premium | 356.2 | -8.2 | 1619.3 | -1.1 |
| Super-premium | 31.8 | 0.2 | 275.6 | 4.4 |
| Iconic still wine | 0.3 | -0.1 | 78.3 | 26.5 |
| Sparkling wine | 6.6 | 4.3 | 35.7 | 43.1 |
| Total | 382.8 | -5.9 | 2066.7 | 75.9 |

Source: Authors' model results

Appendix Table 1: Cumulative changes in exchange rates and prices relative to the US dollar, 2007-11

(percent)

(a) 2007 to 2011

| | $\phi_d$ | $P_d^g$ | $P_d^c$ | $\phi_d^R$ | | $\phi_d$ | $P_d^g$ | $P_d^c$ | $\phi_d^R$ |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | | (1) | (2) | (3) | (4) |
| FRA | -1.5 | 5.8 | 6.7 | 0.1 | UKR | 57.8 | 91.4 | 71.4 | 13.0 |
| ITA | -1.5 | 6.5 | 8.6 | 0.7 | TURK | 28.5 | 35.4 | 35.7 | -1.9 |
| POR | -1.5 | 4.3 | 6.9 | -1.3 | AUS | -18.9 | 16.2 | 13.0 | 33.4 |
| SPN | -1.5 | 4.3 | 9.0 | -1.3 | NZL | -7.0 | 8.8 | 13.4 | 9.0 |
| AUT | -1.5 | 6.9 | 9.1 | 1.1 | CAN | -7.9 | 8.5 | 7.5 | 9.7 |
| BEL | -3.9 | 7.3 | 10.5 | 4.0 | USA | 0.0 | 7.3 | 8.5 | 0.0 |
| DEN | -1.4 | 10.3 | 10.1 | 4.1 | ARG | 32.8 | 77.2 | 40.0 | 24.3 |
| FIN | -1.5 | 7.3 | 7.2 | 1.5 | BRA | -14.1 | 34.4 | 24.1 | 45.8 |
| GER | -1.5 | 3.4 | 6.5 | -2.2 | CHILE | -7.4 | 15.7 | 5.3 | 16.4 |
| GRE | -1.5 | 11.3 | 14.1 | 5.3 | MEX | 13.7 | 26.0 | 23.3 | 3.3 |
| IRL | -1.5 | -7.7 | 1.0 | -12.7 | URU | -17.7 | 30.0 | 33.2 | 47.1 |
| NLD | -1.5 | 4.2 | 7.5 | -1.4 | SAFR | 3.1 | 35.8 | 30.8 | 22.8 |
| SWE | -3.9 | 7.3 | 7.2 | 4.0 | OAFR | 5.3 | 52.7 | 61.9 | 35.2 |
| SWI | -26.0 | 3.3 | 2.9 | 30.1 | CHINA | -15.1 | 23.2 | 14.5 | 35.1 |
| UK | 24.9 | 10.4 | 14.2 | -17.7 | HK | -0.2 | 4.8 | 13.0 | -2.2 |
| BUL | -1.6 | 22.0 | 23.3 | 15.5 | INDIA | 12.9 | 34.9 | 46.5 | 11.3 |
| CRO | -0.4 | 13.0 | 12.2 | 5.7 | JAP | -32.2 | -5.8 | -1.0 | 29.4 |
| GEO | 1.0 | 27.4 | 30.1 | 17.6 | KOR | 19.3 | 12.2 | 15.2 | -12.4 |
| HUN | 9.5 | 16.3 | 20.5 | -1.0 | MAL | -11.0 | 14.3 | 11.3 | 19.6 |
| MOLD | -3.3 | 33.2 | 30.3 | 28.4 | SING | -16.5 | 0.7 | 15.9 | 12.5 |
| ROM | 25.0 | 31.9 | 27.8 | -1.7 | TAIW | -15.1 | 23.2 | 14.5 | 35.1 |
| RUS | 14.9 | 55.6 | 47.6 | 26.2 | THAI | -11.7 | 14.5 | 12.1 | 20.7 |

Appendix Table 1 (continued): Cumulative changes in exchange rates and prices relative to the
US dollar, 2007-11

(percent)

(b) 2009 to 2011

| | $\phi_d$ | $P_d^g$ | $P_d^c$ | $\phi_d^R$ | | $\phi_d$ | $P_d^g$ | $P_d^c$ | $\phi_d^R$ |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | | (1) | (2) | (3) | (4) |
| FRA | -0.1 | 2.4 | 3.7 | -1.4 | UKR | 2.3 | 31.6 | 18.1 | 23.9 |
| ITA | -0.1 | 1.7 | 4.3 | -2.1 | TURK | 8.1 | 14.8 | 15.6 | 2.2 |
| POR | -0.1 | 1.7 | 5.1 | -2.1 | AUS | -24.4 | 6.4 | 6.3 | 35.5 |
| SPN | -0.1 | 1.8 | 5.1 | -2.0 | NZL | -20.9 | 3.5 | 6.8 | 25.9 |
| AUT | -0.1 | 3.9 | 5.1 | 0.0 | CAN | -13.4 | 6.3 | 4.7 | 18.1 |
| BEL | -0.1 | 3.7 | 5.8 | -0.2 | USA | 0.0 | 3.9 | 4.8 | 0.0 |
| DEN | 0.2 | 4.7 | 5.1 | 0.6 | ARG | 10.8 | 35.3 | 21.3 | 17.5 |
| FIN | -0.1 | 4.1 | 4.2 | 0.2 | BRA | -16.3 | 15.8 | 12.0 | 33.1 |
| GER | -0.1 | 1.4 | 3.5 | -2.4 | CHILE | -13.8 | 10.5 | 4.8 | 23.3 |
| GRE | -0.1 | 3.4 | 8.2 | -0.4 | MEX | -8.1 | 9.8 | 8.2 | 14.9 |
| IRL | -0.1 | -1.5 | 1.6 | -5.2 | URU | -14.4 | 13.9 | 15.3 | 28.0 |
| NLD | -0.1 | 2.5 | 3.7 | -1.3 | SAFR | -14.3 | 16.5 | 9.5 | 30.8 |
| SWE | -15.2 | 1.9 | 4.2 | 15.6 | OAFR | 7.0 | 22.4 | 22.5 | 10.1 |
| SWI | -18.4 | 0.7 | 0.9 | 18.7 | CHINA | -5.4 | 15.0 | 8.9 | 17.0 |
| UK | -2.8 | 5.3 | 7.9 | 4.2 | HK | 0.4 | 3.9 | 7.7 | -0.4 |
| BUL | 0.0 | 7.9 | 6.8 | 3.8 | INDIA | -3.6 | 17.1 | 21.9 | 16.9 |
| CRO | 1.1 | 3.1 | 3.3 | -1.9 | JAP | -14.7 | -4.2 | -1.0 | 8.1 |
| GEO | 1.0 | 18.5 | 16.2 | 13.0 | KOR | -13.2 | 5.4 | 7.1 | 16.9 |
| HUN | -0.6 | 6.7 | 9.0 | 3.3 | MAL | -13.2 | 11.3 | 4.9 | 23.3 |
| MOLD | 5.7 | 19.3 | 15.6 | 8.7 | SING | -13.5 | 9.1 | 8.2 | 21.4 |
| ROM | 0.0 | 10.9 | 12.2 | 6.8 | TAIW | -5.4 | 15.0 | 8.9 | 17.0 |
| RUS | -7.4 | 29.3 | 15.9 | 34.4 | THAI | -11.1 | 8.1 | 7.3 | 16.9 |

Key: $\phi_d$ = nominal exchange rate change; $P_d^g$ = change in GDP deflator; $P_d^c$ = change in the
consumer price index; $\phi_d^R$ = calculated change in real exchange rate.

Source: Authors' compilation based on data downloaded from data.worldbank.org

Appendix Table 2: Cumulative consumption and population growth, 2009-11 and 2011-18
(percent)

(a) Observed, 2009 to 2011

| | Aggregate consumption | Population | | Aggregate consumption | Population |
|---|---|---|---|---|---|
| FRA | 2.0 | 1.1 | AUS | 5.9 | 3.0 |
| ITA | 0.6 | 1.0 | NZL | 3.0 | 2.1 |
| POR | -2.1 | 0.0 | CAN | 5.7 | 2.2 |
| SPN | 0.2 | 0.7 | USA | 3.7 | 1.6 |
| AUT | 1.6 | 0.6 | ARG | 18.5 | 1.8 |
| BEL | 2.4 | 2.0 | BRA | 12.8 | 1.8 |
| DEN | 0.4 | 0.9 | CHILE | 19.7 | 1.9 |
| FIN | 3.2 | 0.9 | MEX | 8.8 | 2.5 |
| GER | 2.5 | -0.2 | URU | 20.5 | 0.7 |
| GRE | -13.6 | 0.2 | OLAC | 12.9 | 2.2 |
| IRL | -4.3 | 0.6 | SAF | 8.3 | 2.6 |
| NLD | -0.2 | 1.0 | TURK | 13.8 | 2.5 |
| SWE | 5.4 | 1.7 | NAFR | 9.4 | 3.5 |
| SWISS | 2.9 | 2.1 | OAFR | 9.4 | 3.5 |
| UK | 0.4 | 1.3 | MEST | 0.0 | 0.0 |
| OWEN | -1.4 | 0.2 | CHINA | 5.6 | 1.0 |
| BUL | -0.9 | -1.4 | HK | 14.5 | 1.0 |
| CRO | -0.6 | -0.5 | INDIA | 14.8 | 2.8 |
| GEO | 0.0 | 1.7 | JAP | 2.8 | 0.2 |
| HUN | -2.6 | -0.5 | KOR | 6.9 | 1.2 |
| MOLD | 6.5 | -0.2 | MALAY | 5.3 | 3.3 |
| ROM | 15.0 | -0.4 | PHILI | 9.3 | 3.4 |
| RUS | 22.9 | 0.0 | SINGA | 8.6 | 3.9 |
| UKR | 17.6 | -0.8 | TAIW | 5.6 | 1.0 |
| OCEF | 22.9 | 0.0 | THAI | 6.1 | 1.2 |
| | | | OAPA | 0.0 | 4.6 |

Appendix Table 2 (cont.): cumulative consumption and population growth, 2009-11 and 2011-18
(percent)

(b) Assumed, 2011 to 2018

| | Aggregate consumption | Population | | Aggregate consumption | Population |
|---|---|---|---|---|---|
| FRA | 10.0 | 0.7 | AUS | 17.8 | 7.3 |
| ITA | 10.0 | 0.7 | NZL | 15.4 | 5.9 |
| POR | 10.0 | 0.7 | CAN | 14.2 | 5.6 |
| SPN | 10.0 | 0.7 | USA | 15.5 | 5.2 |
| AUT | 10.0 | 0.7 | ARG | 30.0 | 4.9 |
| BEL | 10.0 | 0.7 | BRA | 27.3 | 3.8 |
| DEN | 10.0 | 0.7 | CHILE | 23.4 | 5.0 |
| FIN | 10.0 | 0.7 | MEX | 22.0 | 4.6 |
| GER | 10.0 | 0.7 | URU | 25.6 | 7.3 |
| GRE | 10.0 | 0.7 | OLAC | 25.6 | 7.3 |
| IRL | 10.0 | 0.7 | SAF | 23.1 | 3.0 |
| NLD | 10.0 | 0.7 | TURK | 31.8 | 9.1 |
| SWE | 10.0 | 0.7 | NAFR | 31.8 | 9.1 |
| SWISS | 10.0 | 0.7 | OAFR | 55.8 | 15.1 |
| UK | 10.0 | 0.7 | MEST | 31.8 | 9.1 |
| OWEN | 10.0 | 0.7 | CHINA | 69.0 | 2.7 |
| BUL | 23.1 | 1.9 | HK | 23.7 | 4.7 |
| CRO | 23.1 | 1.9 | INDIA | 63.1 | 7.0 |
| GEO | 23.1 | 1.9 | JAP | 7.1 | -1.3 |
| HUN | 23.1 | 1.9 | KOR | 22.0 | 0.7 |
| MOLD | 23.1 | 1.9 | MALAY | 34.4 | 8.2 |
| ROM | 23.1 | 1.9 | PHILI | 34.4 | 9.8 |
| RUS | 20.6 | -1.7 | SINGA | 18.6 | 5.6 |
| UKR | 23.1 | 1.9 | TAIW | 34.6 | 2.3 |
| OCEF | 23.1 | 1.9 | THAI | 36.0 | 2.6 |
| | | | OAPA | 32.2 | 11.2 |

Source: Projections from global economy-wide modeling by Anderson and Strutt (2012).

Figure 1: Trade volumes as percent of production and consumption volumes, 1980-84 and 2007[a]

(percent)

(a) Exports as percent of production
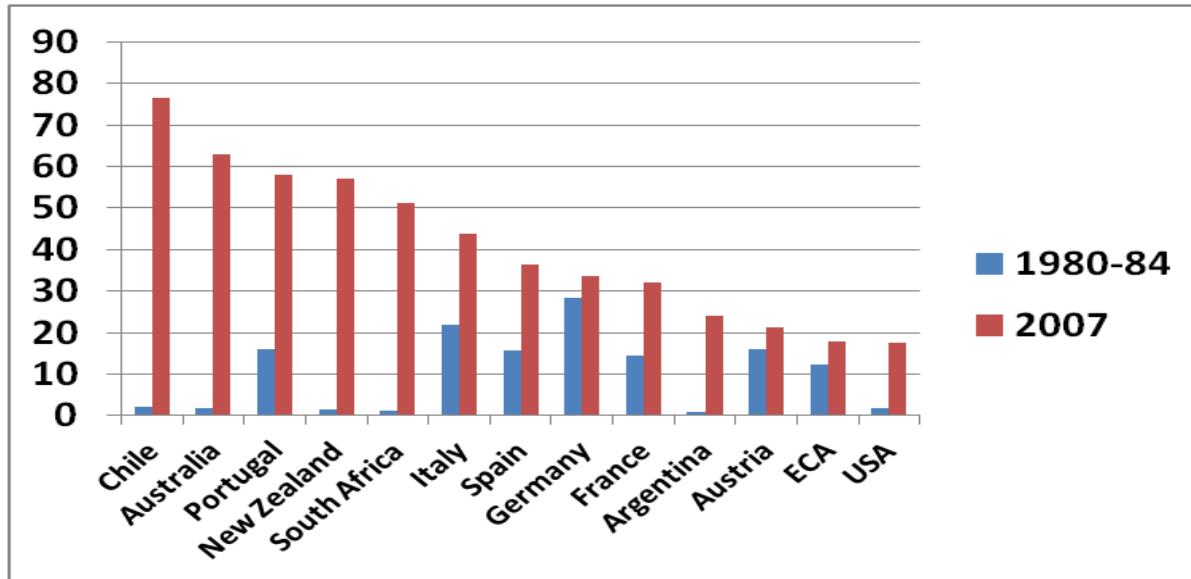


(b) Imports as percent of consumption
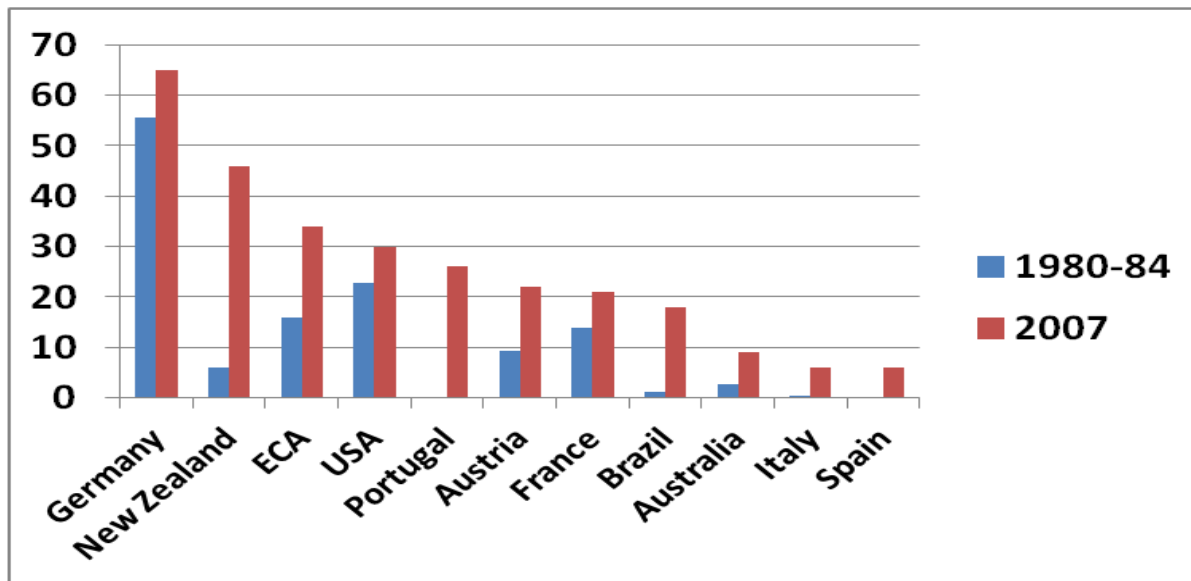


[a] For 2007 the Australian number refers to 2006-08, because 2007 was a severe drought year. ECA is the former Comecon countries of Eastern Europe and the former Soviet Union.

Source: Anderson and Nelgen (2011, Tables 51, 52, 120 and 121)

Figure 2: Nominal value of the Australian dollar, January 1970 to May 2013

(US dollars, Euros and UK pounds per AUD)
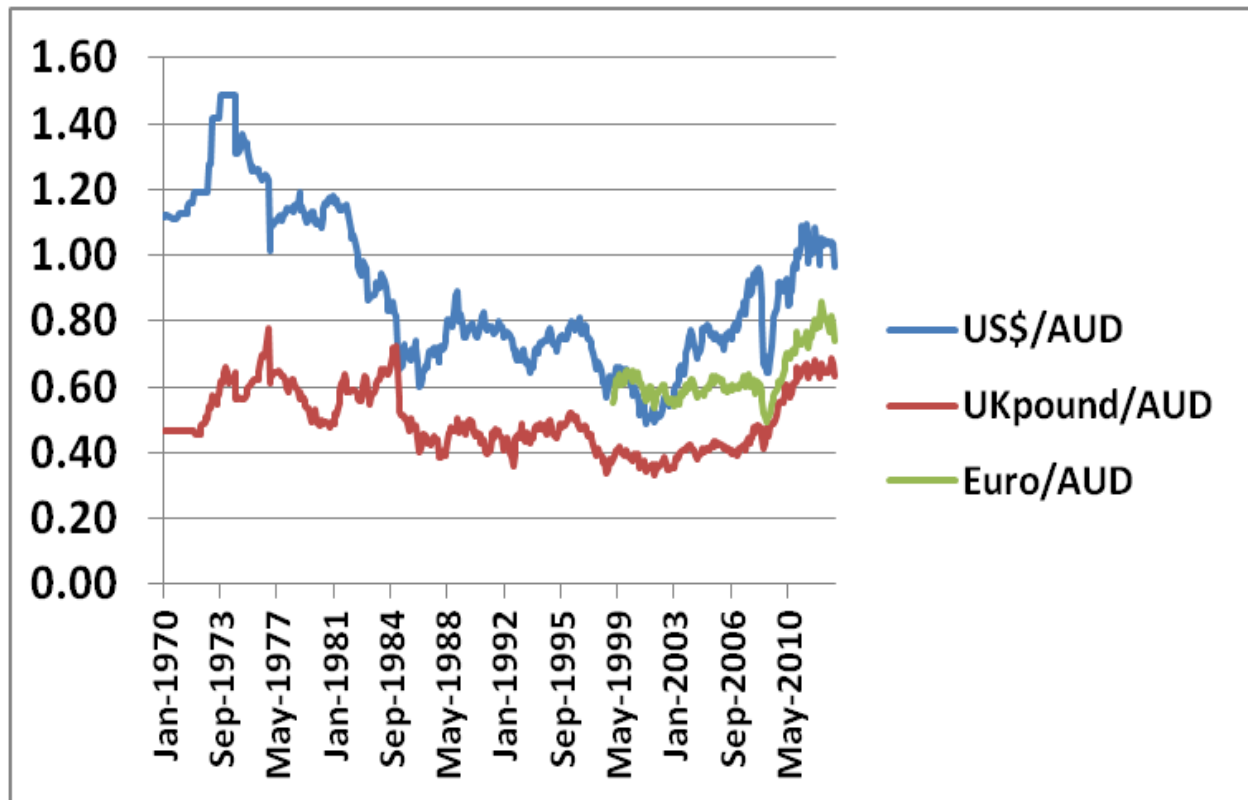


Source: Reserve Bank of Australia (www.rba.gov.au, accessed 11 June 2013)

Figure 3: Value of wine exports from New World countries, 1995 to 2012

(US$ million)
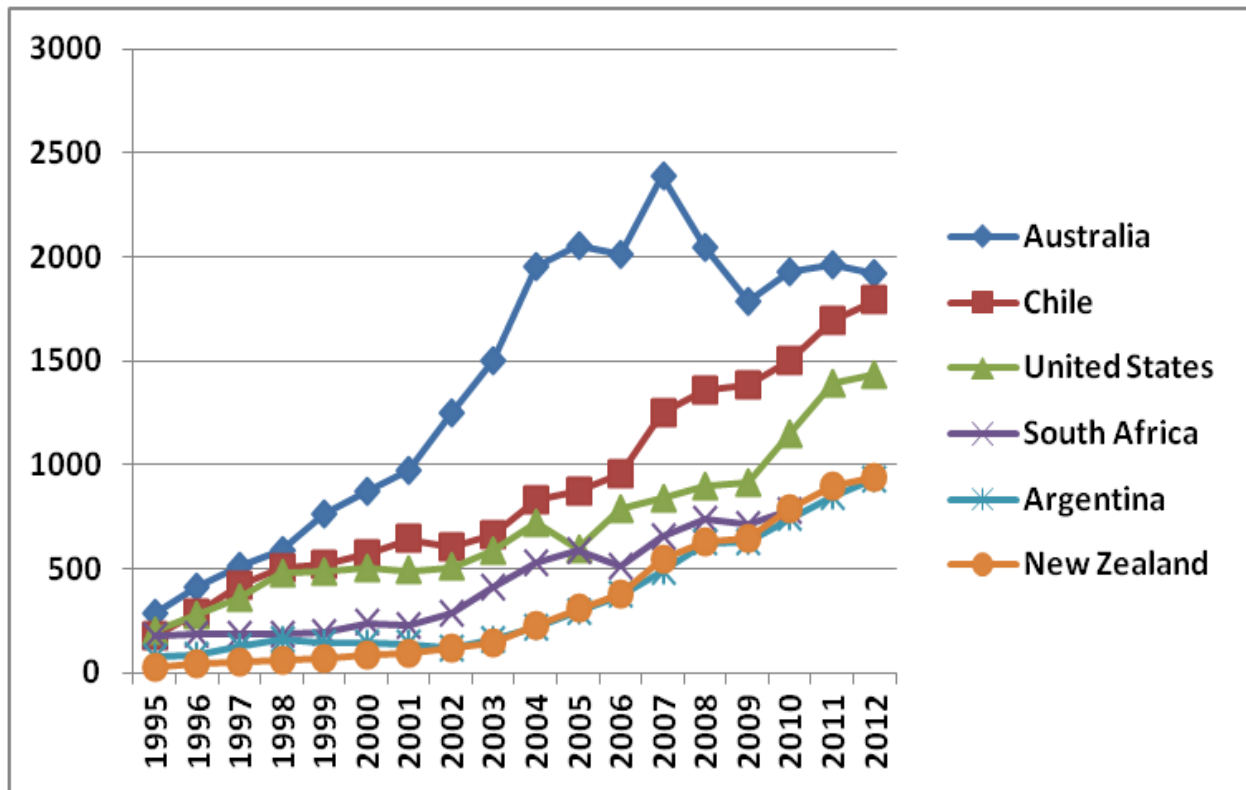


Source: Updated from Anderson and Nelgen (2011, Table 63).

Figure 4: Real exchange rate changes, 2007 to 2011

(percent appreciation relative to US$)

(a) Main exporters



(b) Main importers
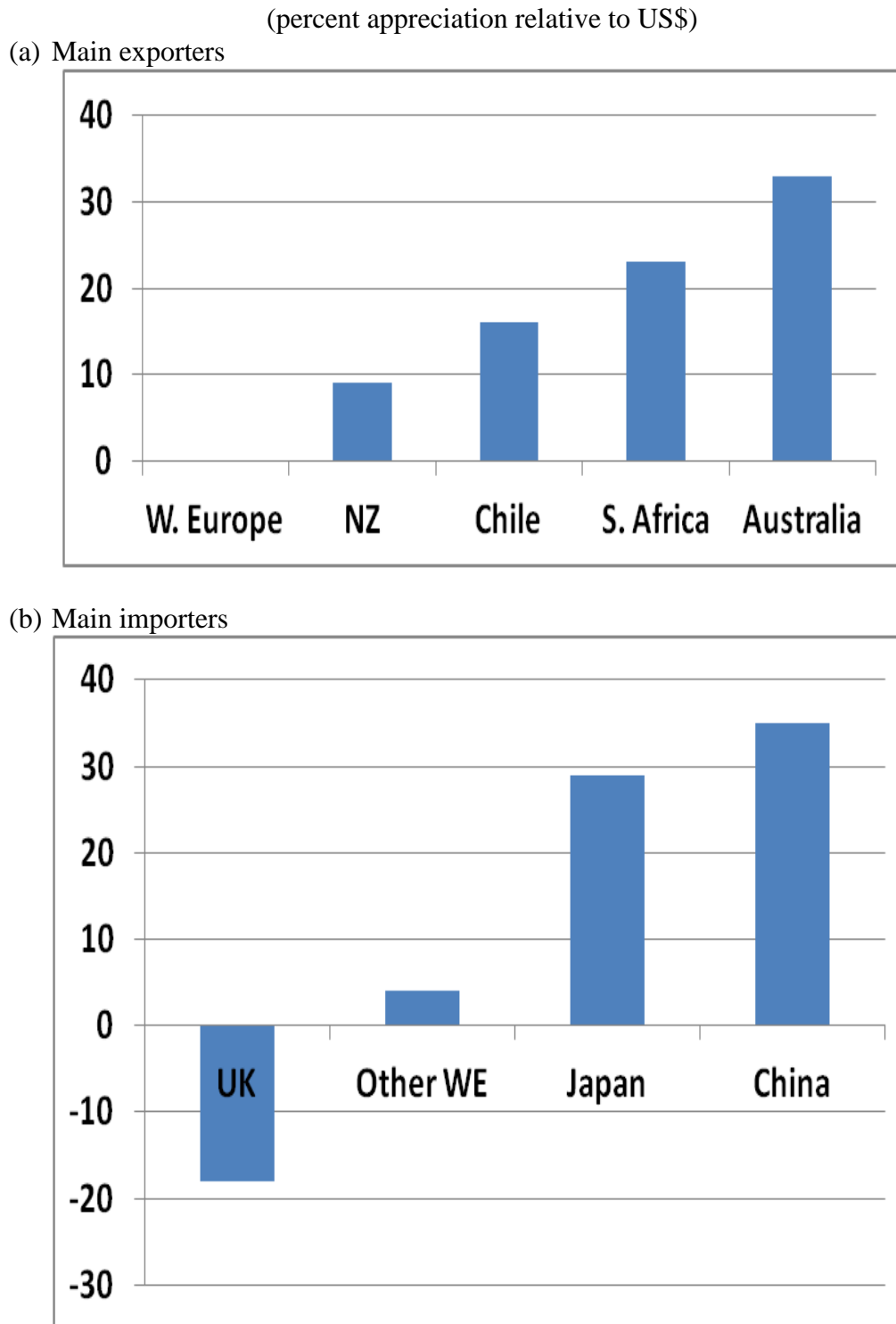


Source: Authors' calculations

Figure 5: Shares in global wine export volume,[a] 1990, 2000, and before and after real exchange rate changes during 2007-11

(percent)
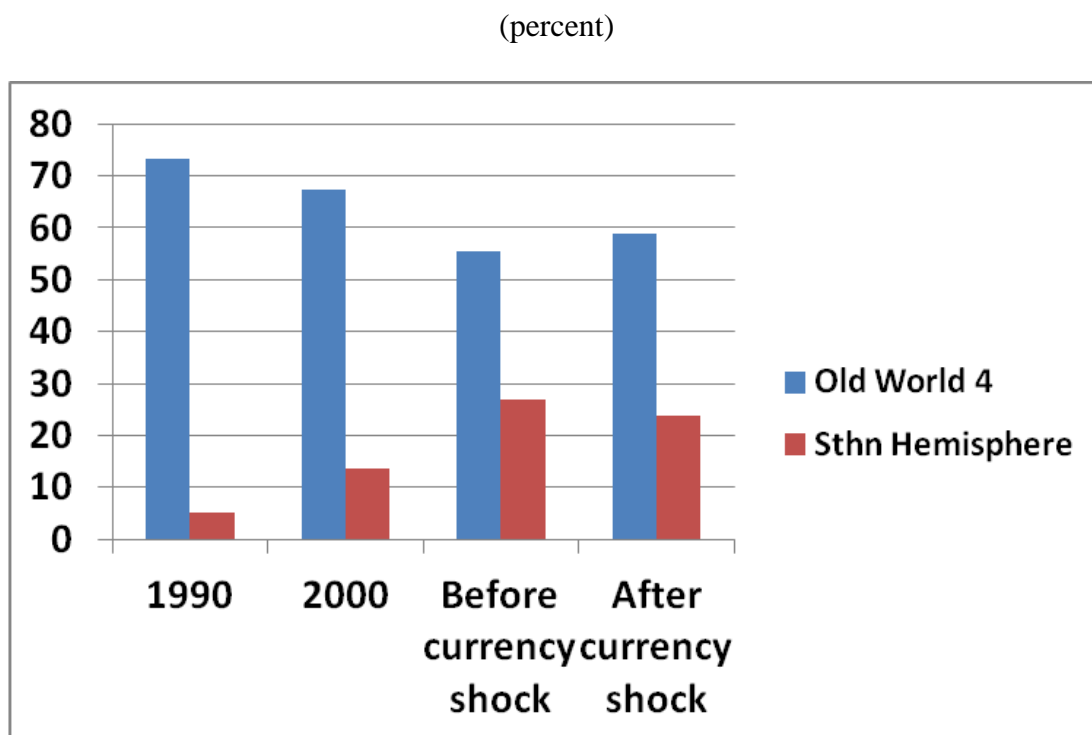


[a] 'Old World 4' refers to France, Italy, Portugal and Spain.

Source: Authors' model results

Figure 6: Changes in consumption of all wines, 2011 to 2018

(ML)
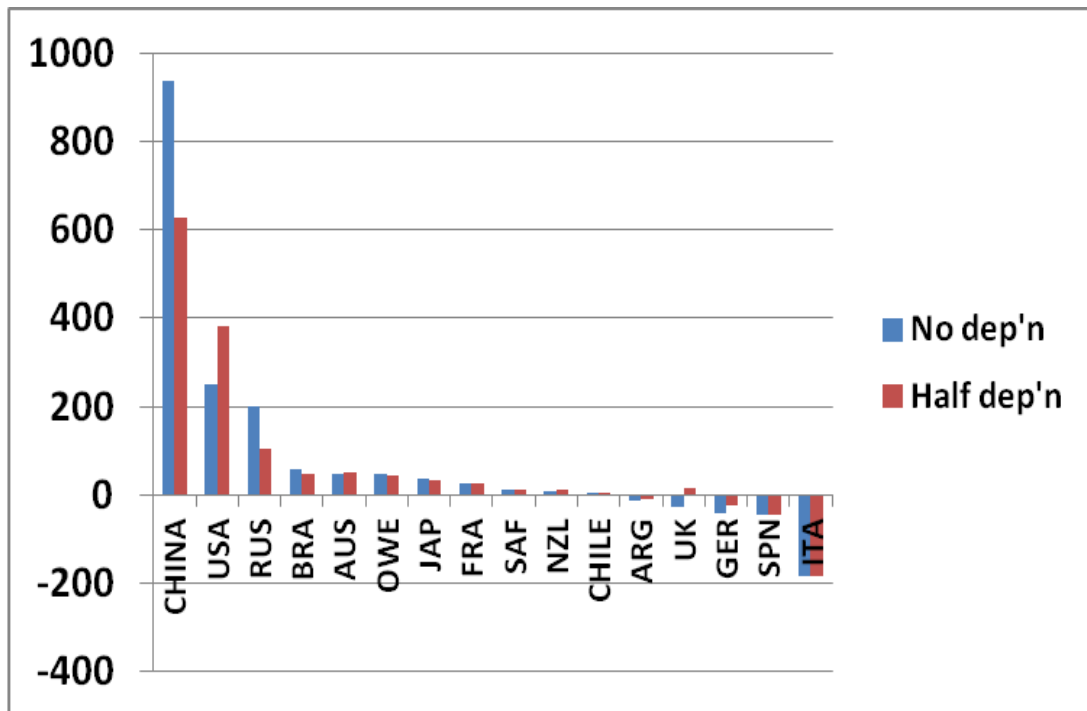


Source: Authors' model results

Figure 7: China's increasing dominance in Asian wine consumption, 2000 to 2012

(ML per year)
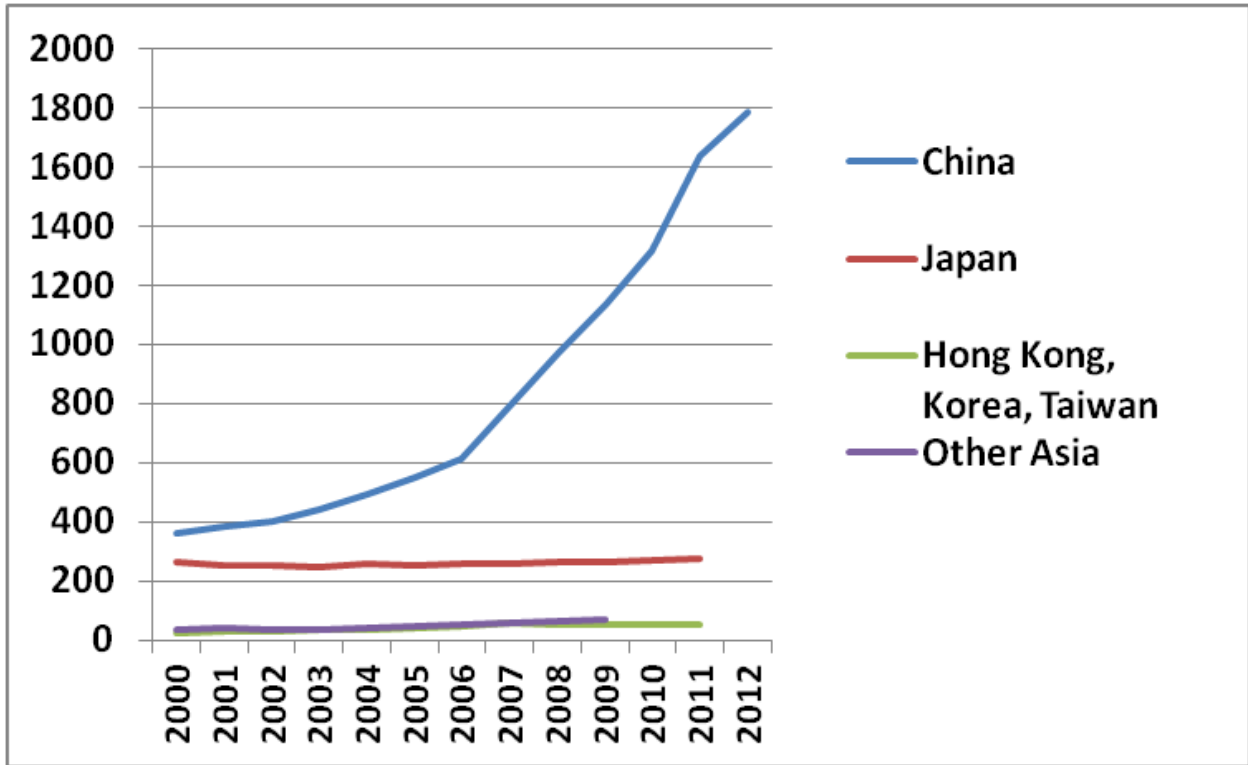


Source: Anderson and Nelgen (2011, Table 16), updated for China from OIV (2013) and for other countries from Euromonitor International.
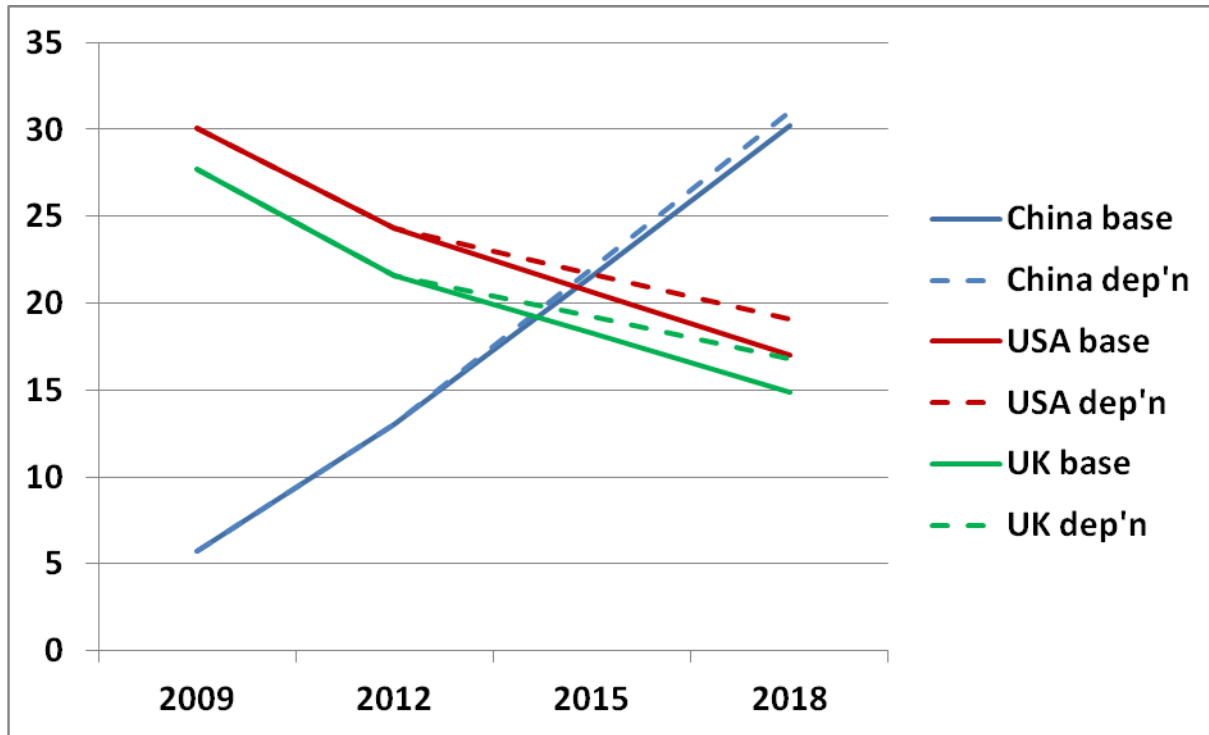
Figure 8: Projected change in volume of Australia's exports to various regions, 2011 to 2018

(ML)
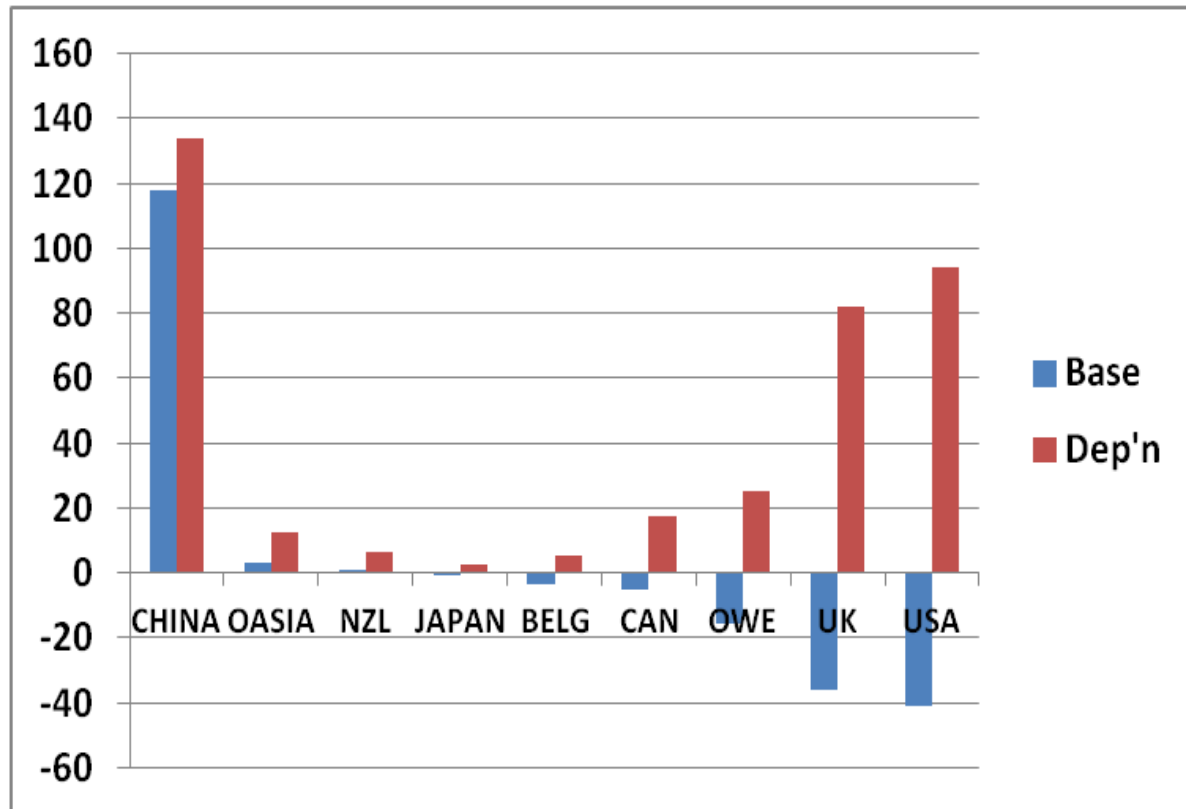


Source: Authors' model results

Figure 9: Shares of value of Australian wine exports to US, UK and China, 2009 to 2018

(percent)



Source: Historical data from www.wineaustralia.com and projections from authors' model results

**Appendix 4: Staff**

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