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Projecting the world wine market from 2003 to 2010

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Abstract

Rapid New World supply increases are imposing downward pressures on prices for grape and wine producers. A per capita decrease in wine consumption in the world's largest wine producers is being offset by consumption increases elsewhere, and growing consumer preferences for higher quality wines. We use a global wine model to project the world's wine markets from 2003 to 2010. Our decomposition of results allows us to examine the contribution of different market forces to changes in prices and outputs relative to 2003.

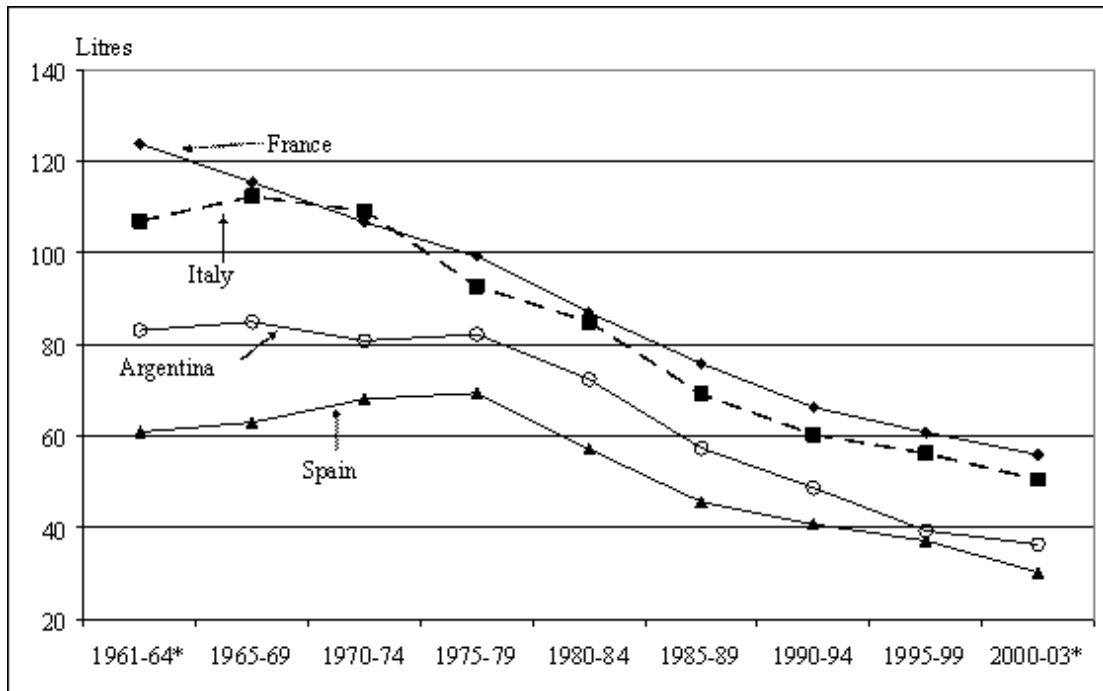
Background

Since the late 1980s, New World wine producers have emerged as significant players in the global wine market. At the same time, the traditional wine-producing regions of Europe, saddled by EU regulation, have struggled to adapt to changing market conditions. While there has been considerable adjustment, in terms of production shares, consumption shares and trade patterns by region, the remainder of the present decade is likely to bring further significant changes. Within the grape and wine sectors in many regions, there are fears of rising import competition, shrinking consumer demand and ultimately, falling returns.

The objective of this paper is to use an empirical model, the World Wine Model (WWM), to examine prospects for the industry. Such a model relies on global data to capture salient features of the international wine market and uses economic theory to fill the data gaps. We use the model to examine how estimated supply growth, consumer patterns and forecast macroeconomic growth might impact on the wine markets of the world from 2003 to 2010. Our concern is with the end-point (2010) rather than the path of adjustment. In particular, are returns to producers likely to decline? If so, this would indicate probable disinvestment in the industry in the next decade or so, and an end to growth in the industry in the New World. On the other hand, New World producers may make further inroads into the global wine market and continue to increase their share of total sales.

There are many challenges ahead for grape and wine producers worldwide. One is that consumption in traditional wine-producing nations, including France, Italy and Spain in Europe and Argentina in South America, has been decreasing over the past four decades (figure 1). A second challenge is that there was a dramatic increase in vineyard plantings in the New World, most notably in Australia and New Zealand, in the late 1990s, leading to rapid New World wine supply increases in the first decade of the new millennium. Another is that the US dollar has depreciated against other currencies including those of major competitors in the global wine market since 2003.

Figure 1. Wine consumption, traditional producers, 1961 to 2002, 5-year averages^a (litres per capita)

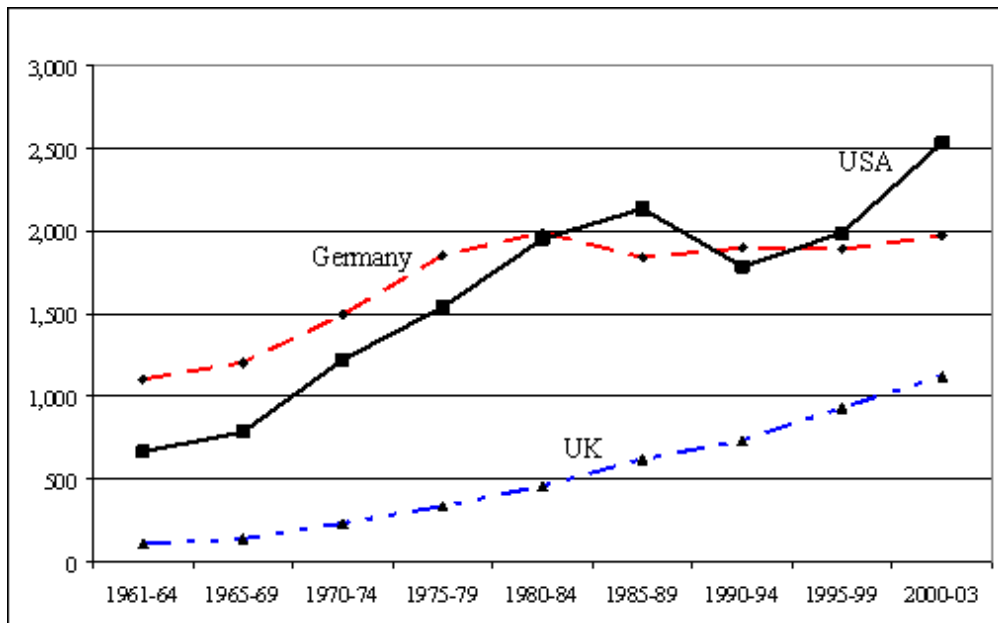


Source: Wittwer and Anderson (2005).

a 4 year averages for 1961 to 1964 and 2000 to 2003

While wine consumption has fallen in the world's largest wine-consuming nations, France and Italy, a different story emerges in the largest wine importers, Germany, the United States and the United Kingdom. In Germany, wine consumed appears to have reached a plateau of 25 litres per capita. In the US and UK markets, per capita consumption has trended upwards over the past few decades (figure 2). These two markets have been the most important destinations for exports from New World producers.

Figure 2. Wine consumption, major importers, 1961 to 2003, 5 year averages^a (ML)



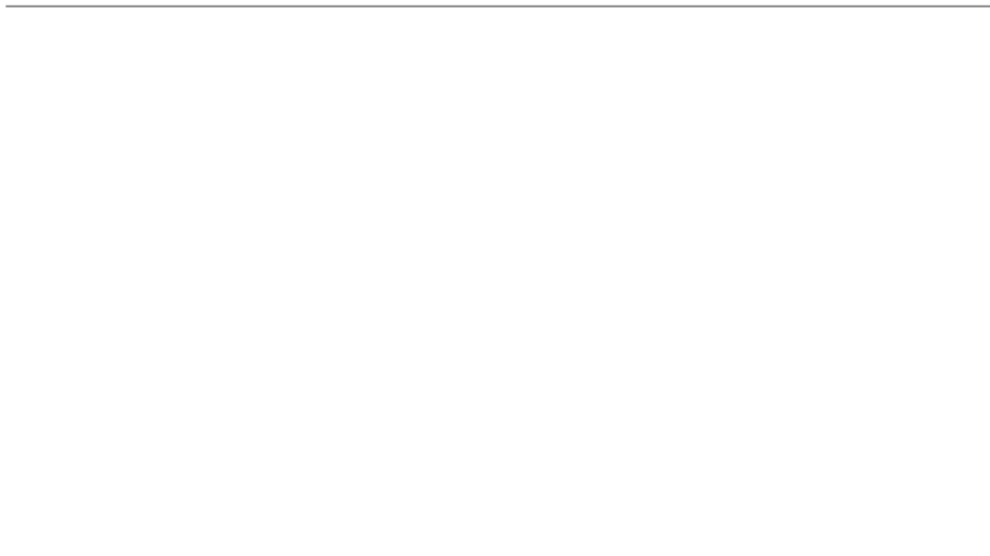
Source: Wittwer and Anderson (2005).

a 4 year averages for 1961 to 1964 and 2000 to 2003

The global wine market assumes a different complexion when we examine available data on the composition of wine consumption. Even in countries with declining consumption, there is a taste swing away from jug or non-premium wine towards higher quality wines. In nations where per capita consumption may have changed little in the past 20 years, there has been a pronounced increase in the quality of wine consumed. In Australia, for example, consumption of non-premium or cask wine fell from 16 litres to 11.5 litres per capita between 1987 and 2003. At the same time, consumption of premium or bottled wine rose from 5 litres to almost 11 litres per capita (ABS, 2005). Such movements become important when we examine New World supply increases, as supply growth has been concentrated in the higher end of the quality spectrum.

Australia has led the New World wine exporters, so much so that by 2003, excluding intra-EU trade, it was the world's largest exporter in volumetric terms (Wittwer and Anderson, 2005). Other New World producers that have experienced rapid export growth are Chile, the USA and New Zealand (figure 3). The status of the United States as a major producer of premium wine is understated by export data: interstate sales account for a high proportion of California's wine output, which in turn accounts for 90 percent of US production. An estimated 80 percent of US sales of Californian wine are either of premium or super-premium quality (Wine Institute of California, 2005). If only a fraction of these sales is diverted to exports, as might be the consequence of a sustained depreciation of the US dollar, there could be a significant realignment of global trade patterns, with the emergence of the United States as one of the world's largest wine exporters.

Figure 3. Value of wine exports, major exporters, 1980 to 2003 (US\$ million)



Source: Wittwer and Anderson (2005).

The next section details the theory and database of the World Wine Model. This is followed by a presentation and discussion of the results of projecting the model from 2003 to 2010.

Details of the model

The World Wine Model is based partly on the theory of the ORANI school of CGE models (Dixon *et al.*, 1982). That is, grape and wine producers seek to minimize costs subject to a technology constraint. Consumers maximise utility subject to a budget constraint, following a [\[1\]](#) linear expenditure system.

The model is partial equilibrium in so far as demands and supplies of non-grape and non-wine commodities are not modelled, except as infinitely elastic inputs to the grape and wine sectors, and as a single composite commodity in household demand. Berger developed the initial version of the model and database. Table 1 presents the equations of the World Wine Model. Wittwer *et al.* (2003) provide a more descriptive version of the theory of the model.

The model contains more variables than equations, so that some variables must be exogenous for the model to solve. Different choices of exogenous and endogenous variables are relevant to different scenarios. In our study, in which we are concerned with growth in the grape and wine sectors to 2010, real aggregate consumption growth in each region is ascribed exogenously. In other applications, aggregate consumption may be determined via the consumption function, thereby providing a measure of welfare.

Table 1: Equations in the World Wine Model in linearized form

Demands for intermediate inputs		(1)
Price of intermediate inputs		(2)
Effective nested price, intermediate inputs		(3)
Nested demand, intermediate inputs		(4)
Primary factor demands		(5)
Nested demand, primary factors		(6)
Primary factor prices		(7)
Zero pure profits in production		(8)
Consumer prices		(9)
Household demands		(10)
Where :	$(\quad) / (\quad)$	(11)
Subsistence demand shifts:		(12)
Discretionary demand shifts		(13)
Household demands, dom.-import composite		(14)
Household demands, import sources		(15)
Effective domestic-import composite price		(16)
Effective import composite price		(17)
Demand for margins services		(18)
Market clearing		(19)
Indirect taxes		(20)
Nominal national income		(21)
Consumption function	$w n c = (Y n / C n) y n f n c$	(22)
Real aggregate consumption		(23)

Symbols in table 1 -- Superscripts/subscripts: industry j ; region n ; input i ; source s ; output o ; primary factor f ; wine type w ; primary factor composite P ; tax/tariff type g ; margin u ; household commodity c ; domestic-import composite d ; import composite m .

Levels (in upper case): cost- or expenditure share S ; tax/tariff value T ; margins value M ; value at producer prices B ; nominal national income

Y ; retail value V^{wn}_s ; aggregate discretionary expenditure V_n ; factor income V^{jn}_f ; nominal household consumption C ; price P ; quantity X .

Variables: quantity x ; taste or technology shift a ; price p ; shifter f ; tax rate t ; population q ; discretionary income v ; national nominal income y ; CPI p_n .

Parameters: marginal budget share β ; CES parameter σ , Frisch parameter ($=-Y_n/V_n$).

Database

The database of WWM in its present form includes six intermediate input commodities (chemicals, water, premium grapes, multipurpose grapes, non-premium wine, and other) and six endogenous outputs (premium winegrapes, multipurpose grapes, premium wine, non-premium wine and non-beverage wine). The model divides global wine markets into 47 regions, 38 of these regions are individual nations, and the remaining nine regions composites of countries in which wine production and consumption are small shares of global totals.

Data for the base year (2003) was taken from Wittwer and Anderson (2005), which is an update of earlier compendia (Berger *et al.* (1998); Berger *et al.* (1999) and Anderson and Norman (2003)). These data rely on Food and Agriculture Organization of the United Nations (2005), various national sources and (for trade) United Nations (2005) data. Given the importance attached to the split between the premium and non-premium segments of the market, Wittwer and Anderson (2005) provides a significant improvement in that detailed actual trade distinguishes different types of wine, premium (bottled), sparkling and non-premium. Price points were used to split premium wine further into commercial premium and super-premium segments. If the unit value of traded wine in UN data was between \$US2.50/litre and \$US5.00/litre for premium wine, it was allocated partly to each wine type. If below \$US2.50/litre, it was allocated entirely as commercial premium wine, and as super-premium wine for unit values above \$US5.00/litre. [\[2\]](#)

Two official agencies provide sufficient detail to disaggregate Australian sales and production data by wine type (ABS (2005); Australian Wine and Brandy Corporation (2005)). New Zealand data indicate that non-premium wine production is a small proportion of the total, whereas in the case of South Africa, the non-premium proportion is higher than for other New World regions (Wine Industry of New Zealand (2005); SAWIS (2005)). Chile's production and trade data were drawn from Vinas de Chile (2004). For other countries, including Spain and Portugal, trade and production data were supplemented by U.S. Department of Agriculture attaché reports.

Classifications of quality in Europe vary from country to country, and are based on regulation rather than consumer preferences. Onivins (2004) provides some indicators of the quality split of consumption and production in France. Geene *et al.* (Figure 2.10) provides a split between premium and other table wine for EU-12 consumption based on European Commission data. Due to regulatory constraints, quality improvements in Europe have been slower than elsewhere.

The USA is one of the largest consumers and producers of wine in the world. The importance of external trade to the Californian industry (which accounts for around 90 percent of national production) is not apparent in international trade statistics, as a large proportion of production is sold interstate. The USA differs from most wine producing nations, in that average quality of domestic sales exceeds that of exports: super-premium wine accounts for over 20 percent of the volume and 40 percent of the value of domestic sales, compared with little more 1 percent of the volume and 2 percent of the value of US exports (Wine Industry of California (2005); Wittwer and Anderson (2005)). Outside Europe and the New World producers, wine production and consumption are small shares of the global totals.

Some indicative national winegrape price data are readily available from the Australian Wine and Brandy Corporation (2005), SAWIS (2005), the Wine Industry of California (2005) and Wine Industry New Zealand (2004). We assume that winegrapes account for approximately 25 per cent of the costs of wine production (based on discussions with Winemakers' Federation of Australia). Otherwise, prices are based to a considerable extent on UN unit value trade data, as in Berger (2000). Onivins (2004) and Geene *et al.* (1999) also provide some guidance in estimating producer prices for winegrapes and wine in cases where data gaps exist.

Berger and Anderson (1999) have compiled wine consumer and import tax rates in all the key wine countries. We assume that transport costs for domestic wine sales are equal to around 15 per cent of the producer price of wine, with higher proportions for imports. Approximately one-fifth of wine consumption is on licensed premises with mark-ups typically exceeding 100 per cent. We assume that overall retail margins range from 46 per cent for super-premium wine to 42 per cent for non-premium wine.

Elasticities

We impose Armington elasticities of substitution in consumption between domestic and imported wine of 5.0, higher than for beverages within the GTAP database for the global economy because of greater possibilities for substitution the more disaggregated a product category (Hertel, 1996). The corresponding elasticity for different sources of wine imports is 10.0.

The expenditure elasticities in the initial database are 1.7 for super-premium wine, 0.8 for commercial premium and 0.5 for non-premium, adapted from estimates for Australia (CIE, 1995). The Frisch parameter (the negative ratio of discretionary to total expenditure) is initially – 1.82 in Australia, the European nations, United States and Canada, and a slightly larger (absolute) value elsewhere, reflecting the latter's lower per capita incomes.

Software

The model is solved using GEMPACK software (Harrison and Pearson, 1999), which allows us to obtain accurate solutions with respect to linearization error while retaining the simplicity of linearized algebra via multi-step solution methods (Dixon *et al.*, 1982, chapter 5). We decompose our projections into groups of exogenous shocks, following Harrison *et al.* (2000). This is an important tool in projecting the model: if we believe that a particular set of assumptions is highly contentious, we are able to examine the extent to which these assumptions influence overall results.

Assumptions in projecting to 2010

In projecting the model from 2003 to 2010, we ascribe different groups of exogenous shocks to reflect forecast changes in the time period. The first group, macroeconomic assumptions, concerns general economic and population growth in all regions of the model. In tables 1 to 5, column (1) shows the impacts of general economic growth, but excludes the impacts of grape- and wine-specific supply and demand shifts or the impacts of a US dollar depreciation. The impacts of these specific effects are shown in isolation under the other headings, as footnoted in tables 2 to 6.

Macroeconomic assumptions

Although the global wine model is partial equilibrium, the macroeconomic growth forecasts are important in projecting the model to 2010. Household demand for wine moves with growth in real aggregate (macroeconomic) consumption in each region. We also ascribe population growth changes to the projection, to ensure that demands are based on changes in real aggregate consumption *per capita*, thereby not overstating income effects arising from differences in the income elasticities of different wine types. Table A1 lists the macroeconomic assumptions for each region.

Supply shifts in the grape and wine sectors by region

In countries in which reliable data exist on bearing and non-bearing vineyard areas, we can estimate grape production a number of years ahead with some accuracy. There are three nations in which we project exceptional supply increases. In response to wine grape price slumps in the 2004 and 2005 vintages in Australia and New Zealand, we expect antipodean plantings to be modest in the remainder of the decade. Nevertheless, we project an increase in premium grape supplies in Australia and New Zealand of 75 percent and 110 percent respectively, reflecting plantings in the late 1990s and the drought-reduced base of 2003.

In Chile, we assume that premium wine grape supply increases by 70%. While there are no clear data reflecting a large increase in overall wine grape supply in Chile in the remainder of this decade, there is some evidence of upward movements in quality (Sawyer, 2004). Indeed, two leading Chilean wine producers have changed strategy in the recent past to concentrate on premium wine production (Langton, 2005; Cid, 2005). They have invested in new winemaking facilities, and have acquired vineyards to facilitate greater control over the quality of fruit supply. There is also a greater emphasis on diversity, with alternative grape varieties being planted in new and emerging grape growing regions in Chile (Richards, 2005). In 2004, the Chilean wine industry association, Vinas de Chile, invested in promotion through trade fairs in the USA (Henriquez, 2004), and also embarked on an aggressive marketing strategy in the UK (Robinson, 2004).

In China, increased vineyard plantings in the new millennium may not necessarily translate into increased wine output. The U.S. Department of Agriculture (2004a) has projected that China's table grape output continues to increase rapidly, with 2004 production of 5,000 kilotonnes trebling that of the second largest producer, Turkey. While Euromonitor (2004) notes double digit growth in China's red wine consumption since 1998, this is off a low base. Anecdotal evidence of a taste swing towards wine in China cited by Euromonitor needs to be weighed against the dominant food and drink culture of the nation, in which wine plays a small role. We include China's proposed wine tariff reduction in our projection, but the impact is small and not reported separately. Grapes, on the other hand, have a significant role in Chinese food. China is a substantial importer of grapes. Overall, new vineyards are likely to concentrate on table grape rather than wine production. Available

evidence indicates moderate growth in wine production. One estimate is that only 8 million people in China drink wine (China Daily, 2004).

Only France and Italy exceed the United States' wine consumption volume. Therefore, production projections for the US market will have a substantial influence on producer prices for grapes and wine in our modelled outcome. A Pierce's disease outbreak in vineyards in southern California in the late 1990s resulted in the removal of 800 hectares of vineyards and has discouraged investment (University of California, 2002). In addition, below average rainfall since 2000 and urban water demands have reduced water availability. We assume little change in vineyard area in the United States, with correspondingly little increase in wine production capacity between 2003 and 2010.

In Europe, we expect any increases in wine production to be concentrated in the higher end of the market. The area of vineyards is shrinking gradually in France, Italy and Portugal, but in Spain, where vineyard area is changing little, grape output is rising with the spread of irrigation (Wittwer and Anderson, 2005, tables 3 and 7).

Table A2 contains details of assumed capital growth in the grape and wine sectors. For all wine types in all regions, we assume total factor productivity (TFP) growth of 10 percent. For grapes, we assume TFP growth of 5 percent for all regions other than Spain. In Spain, we assume that TFP is 10 percent due to the effect of increased irrigation.

Taste swings away from low quality towards high quality wine

There has been a global trend among consumer to switch to higher quality wine since the early 1990s. In Australia, for example, the volumetric share of bottled wine (approximating premium wine rather than bulk quality wine) in total domestic consumption has risen from 28 percent in 1991-92 to 47 percent in 2003-04 (ABS, 2005). This consumption trend favours wine producers who are seeking to raise quality at a given price. In all regions, we impose a preference swing towards both super-premium and commercial premium wine, with a swing against non-premium wine.

Taste swings towards favoured origins

It is possible that Australia could maintain, if not increase its market share in its stronghold markets, namely UK, USA, Canada and New Zealand (Wittwer and Anderson, 2005, table 104). Australia's recent export growth success is the culmination of long-term R&D and training programs (Anderson, 2000). Export promotion has played an important role in overcoming domestic mismatches between production quality and the quality range required by consumers in Australia. We assume that Chile and New Zealand also continue successful promotion in their major export markets. In the UK, the Federation of Wholesale Distribution is providing advice to independent retailers on what wines consumers want, based on survey data. The organisation is backed by New World wine producers and is leading to increased stocking of New World wines by retailers (Heijbroek, 2003).

Argentina, regarded as a "sleeping giant" in the global wine market, is fifth in wine production after France, Italy, Spain and the USA. Australia may overtake its production volume in the middle of the present decade. There are fears among other producers, particularly Chile, that Argentina could become a major exporter of wine in the near future. Exports usually account for less than 10 percent of Argentina's production (Wittwer and Anderson, 2005, table 38). We do not assume any preference swing in any importing region towards Argentinian wine, though with a substantial export campaign, this would be possible.

While France and Italy are dominant in the major wine markets, we expect their export shares to continue declining, given the superior track record of New World producers in responding to changing consumer tastes. There are a number of avenues by which Old World producers might fight back. The 1994 EU-Australia Wine Agreement enhanced Australia's access to Europe, and was crucial to Australia's wine export growth. Australia has had to phase out the use of names that come under EU geographical indications, including Burgundy, Champagne and Port. Given that EU seeks to be WTO-compliant, increased trade protection, particularly for processed rather than raw products, is unlikely. On the other hand, the Old World may slow the loss of global market share by removing some of the regulatory barriers that increase the costs of production. Reforms along these lines may enable Old World producers to adapt more readily to changing consumer tastes, but this seems unlikely in the time horizon of our projection. We also assume that there is insufficient time for Hungary and Romania to increase sales to Western Europe, even if they gain accession to the EU before 2010.

In summary, in our base projection from 2003 to 2010, we assume that there are source-specific taste swings by importers towards commercial-premium and super-premium wine from Australia, New Zealand and Chile. This is equivalent to a taste swing away from French and Italian wines, given their importance in the international market.

Sustained US dollar depreciation

In 2003, there was a sharp depreciation of the US dollar against other major currencies that has not reversed since. We move the import demand curves for US wine outwards in non-US markets, and move US demand for imports inwards. In addition, we assume that there is an

inward shift in the macroeconomic consumption function for the USA.

Results

Table 2 shows the impact of projected supply and demand shifts in the global wine market on outputs and producer prices for three Old World producers (France, Italy and Germany) and five New World producers (Australia, New Zealand, Chile, Argentina and USA). We confine results to commercial-premium and super-premium wines, and premium wine grapes. In each country, as shown in the column headed "total" under "output", there is an increase in output in these premium segments.

Table 2. Output and producer prices, % change between 2003 and 2010, decomposition

	Output					Total	Producer prices					Total
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)	
France												
CP	10.7	7.3	-1.6	-3.0	-2.1	11.3	4.4	2.0	-6.1	-1.1	-0.7	-1.4
SP	19.8	6.4	2.8	-4.2	-0.8	24.1	10.9	2.9	-9.4	-2.2	-0.5	1.7
PG	10.9	1.8	-0.3	-2.0	-1.3	9.2	6.2	1.0	-2.1	-1.1	-0.7	3.2
Italy												
CP	10.1	6.8	-7.0	-2.6	-2.3	5.1	4.2	2.2	-4.5	-1.0	-0.8	0.2
SP	16.6	5.8	-4.8	-4.0	-0.8	12.8	10.6	3.2	-3.8	-2.5	-0.6	6.8
PG	9.5	2.6	-6.5	-1.8	-1.4	2.4	5.8	1.6	0.3	-1.1	-0.9	5.8
Germany												
CP	9.1	7.3	-4.2	-3.9	-2.1	6.3	3.8	2.0	-5.8	-1.3	-0.8	-2.0
SP	12.0	5.8	0.4	-1.8	-0.3	16.1	7.5	3.1	-4.7	-1.2	-0.3	4.3
PG	9.2	4.0	-3.4	-2.5	-1.5	5.7	5.4	2.3	-1.3	-1.5	-0.9	4.0
Australia												
CP	18.5	9.4	35.8	22.2	-6.8	79.1	5.5	2.3	-15.2	6.1	-1.7	-3.1
SP	27.1	7.6	40.8	31.8	-1.7	105.5	12.9	3.3	-22.1	14.4	-1.0	7.4
PG	17.6	4.7	31.0	17.4	-4.0	66.8	6.6	1.7	-16.2	6.4	-1.5	-2.9
New Zealand												
CP	20.3	9.3	35.3	7.5	-6.6	66.7	5.2	2.0	-19.4	3.2	-1.1	-10.1
SP	33.5	8.9	70.4	51.9	-1.7	163.0	11.8	3.2	-28.4	16.8	-0.7	2.7
PG	24.7	8.0	51.8	26.6	-3.7	107.1	6.7	2.2	-21.6	6.5	-0.9	-7.3
Chile												
CP	20.2	9.1	30.2	20.0	-5.6	73.9	5.5	2.2	-15.3	5.1	-1.5	-3.9
SP	25.7	8.0	36.3	22.2	-1.4	90.7	11.3	3.0	-20.2	9.1	-0.8	2.4
PG	18.0	5.1	27.5	14.8	-4.2	61.2	6.9	1.9	-15.8	5.6	-1.6	-3.0
Argentina												
CP	21.1	7.5	4.3	-0.1	-0.4	32.4	6.6	2.1	-12.3	0.0	-0.1	-3.8
SP	28.0	6.7	11.2	-1.4	-0.3	44.1	14.5	2.9	-15.1	-0.7	-0.2	1.4
PG	18.4	2.3	6.7	-0.1	-0.6	26.7	9.0	1.1	-9.8	0.0	-0.3	0.0
USA												
CP	11.8	6.0	3.1	-1.8	12.6	31.7	7.9	3.1	-9.9	-1.2	12.3	12.3
SP	17.6	4.8	8.3	-3.3	-1.2	26.1	17.2	4.5	-12.6	-3.2	8.1	13.9
PG	10.5	3.5	4.9	-1.5	8.8	26.2	17.9	6.1	-14.1	-2.8	21.0	28.1

Key: (1) = macro growth effect; (2) = taste swing toward premium wines and away from non-premium wine; (3) = grape and wine supply growth; (4) = taste swing towards New World wines; (5) = US dollar depreciation.

CP = commercial premium wine; SP = super-premium wine; PG = premium wine grapes.

Source: World Wine Model projections.

[3]

Column (1) shows that general economic growth is strongly positive for both prices and outputs in all the countries shown. In each case, the impacts are larger for super-premium than commercial-premium wine, as its income elasticity is larger. In France, for example, commercial-premium output rises by 10.7 percent, and the producer price by 4.4 percent, compared with 19.8 percent and 10.9 percent for super-premium wine.

Column (2) shows the impact of the switch in consumer preferences in the period 2003 to 2010 from non-premium towards premium wines. The impacts on both premium wines and premium wine types are again positive for both outputs and prices. In the case of US producers, for example, commercial premium output increases by 6.0 percent and the corresponding producer price rises by 3.1 percent due to preference shifts.

Column (3) shows the impact of known supply growth in the respective sectors. The largest output increases are in Australia, New Zealand and Chile, with correspondingly sharp falls in column (3) in these nations for producer prices. In Australia, commercial-premium output rises by 35.8 percent, with a fall in the producer price of 15.2 percent. The effect of increased supply in these New World nations transmits to a negative impact on producer prices in other regions, even though supply in other regions changes little or falls.

The effects of taste-swings towards wine originating in specific countries are shown in column (4). The effects are strongly positive for Australia, New Zealand and Chile and slightly negative for other regions. Chile's super-premium output rises by 22.2 percent, and the price by 9.1 percent, whereas Italy's super-premium output falls by 4 percent and its price by 2.5 percent due to this effect. Column (4) shows us that successful promotion is vitally important in preventing producer prices from falling in the rapidly expanding regions.

Column (5) of table 2 shows the impact of a sustained real depreciation of the US dollar. This entails sector-specific shifts in prices, with the price of US wine falling in terms of foreign currencies, and the price of imports rising in the USA in local-currency terms. It also entails a fall in US aggregate consumption as a share of GDP, as the negative share of the trade balance in US GDP falls. US demand for wine falls relative to no depreciation (as shown in table 3, column (5)). Consequently, even without any increase in output, US wine export supply increases. This depresses producer prices and outputs elsewhere. Since there are constraints on US expansion, much of the response in the US grape and wine sectors is via upwards price pressures rather than greater output increases. The one negative result for the US industry concerns output for super-premium wine, which falls by 1.2 percent. This is a consequence of a negative income effect, with US aggregate consumption falling relative to no depreciation. This segment exports relatively little and so is not boosted significantly by sales elsewhere.

Table 3 shows the projected consumer price and quantity outcomes for three wine types, commercial-premium, super-premium and non-premium. Column (1) for both prices and quantities includes the expenditure effect plus effect of population growth. Column (2) shows the impact of the imposed taste swing, which boosts prices and quantities of the premium wine types while depressing those for non-premium wine. Global wine supply growth, as shown in column (3), raises consumption and lowers consumer prices. An increasing preference for wines sourced from Australia, Chile and New Zealand reduces the quantity of wine consumed in Australia (-2.1 percent for commercial-premium and -3.6 percent for super-premium) while raising consumer prices (table 3, column (4)). From column (5), the US dollar depreciation reduces domestic US wine consumption (-4.8 percent for commercial-premium and -10.1 percent for super-premium) and raises prices paid (9.3 and 9.0 percent respectively) by US consumers.

Table 3. Consumer quantities and prices, % change between 2003 and 2010, decomposition

	Quantity						Consumer prices						
	(1)	(2)	(3)	(4)	(5)	Total	(1)	(2)	(3)	(4)	(5)	Total	
France													
CP	10.2	7.3	2.0	0.3	0.2	20.0	2.8	1.3	-4.0	-0.6	-0.5	-1.0	
SP	14.1	6.2	6.4	1.4	0.4	28.5	7.0	1.9	-6.1	-1.3	-0.3	1.2	
NP	6.2	-14.6	1.1	0.1	0.1	-7.1	4.1	-3.8	-3.8	-0.2	-0.5	-4.1	
Italy													
CP	7.8	7.1	1.4	0.3	0.3	16.9	2.7	1.4	-2.9	-0.6	-0.5	0.1	
SP	11.9	5.9	2.6	1.6	0.4	22.5	6.8	2.0	-2.6	-1.6	-0.4	4.2	
NP	4.1	-14.4	0.2	0.1	0.1	-9.9	3.9	-3.8	-0.6	-0.2	-0.5	-1.3	
Germany													
CP	4.7	7.1	2.0	0.7	0.3	14.8	2.6	1.3	-4.1	-1.4	-0.6	-2.1	

SP	7.5	5.8	3.5	0.9	0.2	18.0	5.1	2.0	-3.5	-0.9	-0.2	2.4
NP	2.2	-14.4	1.2	0.0	0.2	-10.8	4.2	-3.6	-4.2	-0.1	-0.6	-4.3
Australia												
CP	18.3	7.5	5.3	-2.1	0.6	29.6	3.5	1.5	-9.6	3.8	-1.2	-2.0
SP	26.5	6.5	16.2	-3.6	0.7	46.3	7.9	2.0	-13.9	3.0	-0.6	-1.6
NP	11.8	-15.3	2.2	-0.5	0.2	-1.5	5.4	-2.9	-7.1	1.5	-0.7	-3.8
Japan												
CP	10.3	7.2	2.8	0.1	1.3	21.7	3.2	1.5	-5.3	-0.1	-2.4	-3.3
SP	17.6	6.2	6.4	0.7	0.3	31.4	6.7	1.9	-6.0	-0.6	-0.3	1.7
NP	5.2	-14.7	1.9	0.0	1.2	-6.4	5.1	-3.5	-6.0	-0.1	-3.7	-8.2
UK												
CP	15.0	7.4	3.7	3.6	1.0	30.8	3.1	1.4	-6.3	-6.0	-1.8	-9.6
SP	24.2	6.6	9.6	4.8	0.5	45.6	7.0	1.9	-8.2	-4.0	-0.4	-3.8
NP	8.5	-14.9	1.4	-0.1	0.4	-4.7	4.6	-3.4	-4.6	0.2	-1.3	-4.5
USA												
CP	16.0	7.1	3.1	0.1	-4.8	21.5	4.6	1.9	-6.4	-0.2	9.3	9.1
SP	21.6	5.7	8.5	7.1	-10.1	32.9	9.4	2.5	-8.1	-6.7	9.0	6.1
NP	10.9	-14.8	1.9	0.1	-2.3	-4.2	6.1	-3.9	-6.6	-0.4	7.5	2.7

Key: (1) = macro growth effect; (2) = taste swing toward premium wines and away from non-premium wine; (3) = grape and wine supply growth; (4) = taste swing towards New World wines; (5) = US dollar depreciation.

CP = commercial premium wine; SP = super-premium wine; NP = non-premium wines.

Source: World Wine Model projections.

Overall (from the total column in table 3), consumer prices rise for super-premium wines in France (1.2 percent), Italy (4.2 percent) and Germany (2.4 percent), and fall or change little for commercial- and non-premium wines in these nations. Consumer prices fall substantially in the UK and Australia. In the UK case, this reflects the large shares of the three New World suppliers (whose producer prices fall in the simulation period) in total imports, while Australian consumers benefit from the domestic supply increase.

Global economic growth leads to an increase in the volume of wine traded, as shown in column (1) of table 4 (exports) and table 5 (imports). The taste swing towards higher quality wines increases international trade for premium wines, while decreasing that for non-premium wines (column (2) of tables 3 and 4). Rapid New World supply growth between 2003 and 2010 diverts exports from Old World suppliers to the New World: for example, France's commercial-premium exports decline by 56 megalitres, while those of Chile increase by 97 megalitres (table 4, column (3)) as a consequence. A successful New World export promotion campaign reinforces this trend, with Italy's exports of super-premium wine decreasing by 16 megalitres while those of New Zealand increase by 13 megalitres (table 4, column (4)). The US dollar depreciation effect increases US export volumes and decreases US import volumes (tables 3 and 4, column (5)). The total changes shown in table 4 indicate a continuation of the trend observed since the mid-1980s, namely a declining share of Old World exports and increasing share of New World exports in total wine trade.

Table 4. National export volumes (Δ ML), 2003 to 2010, decomposition

		2003 ML	(1)	(2)	(3)	(4)	(5)	Total Δ ML
France	CP	628	75	46	-56	-65	-43	-43
	SP	450	99	29	7	-29	-5	100
	NP	333	26	-38	-33	5	-14	-54
Italy	CP	728	101	47	-151	-53	-47	-105
	SP	152	33	9	-19	-16	-3	3
	NP	416	36	-43	-138	5	-13	-153
Germany	CP	188	40	15	-33	-19	-17	-13
	SP	25	8	1	-2	-3	-1	3
	NP	48	3	-10	-6	1	-1	-13
Australia	CP	312	58	32	144	97	-29	302

	SP	122	34	10	57	53	-3	151
	NP	97	2	-19	19	-12	-5	-15
New Zealand	CP	4	2	1	6	10	-2	17
	SP	22	8	2	16	13	0	38
	NP	0	0	0	0	0	0	0
Chile	CP	189	35	20	97	72	-20	204
	SP	27	6	2	11	7	0	27
	NP	160	13	-26	16	-6	-6	-9
Argentina	CP	35	4	3	6	-1	-5	8
	SP	5	0	0	1	-1	0	1
	NP	108	5	-16	32	0	-9	12
USA	CP	258	0	7	10	-68	164	112
	SP	4	0	0	0	0	1	2
	NP	80	-1	-13	12	3	36	37

Key: (1) = macro growth effect; (2) = taste swing toward premium wines and away from non-premium wine; (3) = grape and wine supply growth; (4) = taste swing towards New World wines; (5) = US dollar depreciation.

CP = commercial premium wine; SP = super-premium wine; NP = non-premium wines.

Source: base data from Wittwer, Anderson; World Wine Model projections.

Table 5 reflects differences in consumption patterns of different countries. In Germany, wine consumers tend to prefer budget-priced wines, so that super-premium consumption levels are projected to remain. This contrasts with the UK and the US markets, in which super-premium wine imports are projected to increase by 55 and 117 megalitres respectively between 2003 and 2010.

Table 5. National import volumes (Δ ML), 2003 to 2010, decomposition

		2003 ML	(1)	(2)	(3)	(4)	(5)	Total Δ ML
UK	CP	701	100	50	24	-37	-8	129
	SP	145	34	9	13	-3	1	55
	NP	244	20	-36	2	0	-2	-15
USA	CP	305	70	28	11	-27	-39	41
	SP	277	76	20	25	12	-15	117
	NP	21	3	-3	-3	-1	-3	-6
Germany	CP	625	25	44	23	6	2	99
	SP	17	1	1	2	0	0	4
	NP	539	12	-77	5	0	0	-60
Belgium	CP	115	10	8	2	0	0	20
	SP	54	7	3	4	1	0	15
	NP	75	4	-11	1	0	0	-6
Japan	CP	55	4	4	1	0	4	13
	SP	78	14	5	5	1	0	24
	NP	38	2	-5	1	0	-2	-4
Canada	CP	112	18	7	2	-2	0	25
	SP	82	17	5	7	-2	0	28
	NP	85	9	-12	2	0	-7	-9

Key: (1) = macro growth effect; (2) = taste swing toward premium wines and away from non-premium wine; (3) = grape and wine supply growth; (4) = taste swing towards New World wines; (5) = US dollar depreciation.

CP = commercial premium wine; SP = super-premium wine; NP = non-premium wines.

Source: base data from Wittwer, Anderson; World Wine Model projections.

Table 6. USA and Australia projections, % change, with alternative expenditure elasticities, 2003 to 2010

Output							Producer prices					
<i>High set</i>	(1)	(2)	(3)	(4)	(5)	Total	(1)	(2)	(3)	(4)	(5)	Total
USA												
CP	16.5	5.5	5.0	-1.6	10.8	36.2	11.9	3.1	-9.4	-1.1	11.9	16.3
SP	20.5	4.2	10.3	-1.8	-3.3	29.8	21.1	4.1	-11.2	-1.9	6.2	18.3
PG	13.9	3.1	6.6	-1.2	7.1	29.6	27.4	6.2	-13.2	-2.6	20.6	38.4
Australia												
CP	28.0	9.1	41.6	23.1	-7.2	94.5	8.4	2.2	-15.0	6.6	-1.9	0.3
SP	32.1	6.8	46.1	32.1	-2.9	114.2	16.5	3.1	-21.6	15.5	-1.7	11.8
PG	24.2	4.4	35.6	17.8	-4.5	77.5	9.6	1.7	-16.1	7.0	-1.8	0.4
<i>Low set</i>												
USA												
CP	9.4	6.2	2.2	-1.9	13.5	29.3	6.0	3.1	-10.2	-1.3	12.5	10.1
SP	13.8	5.4	5.9	-5.0	1.1	21.3	13.0	4.8	-14.1	-4.5	9.9	9.1
PG	8.3	3.8	3.9	-1.7	9.7	24.1	13.1	6.0	-14.5	-2.9	21.0	22.7
Australia												
CP	13.8	9.6	33.2	21.8	-6.6	71.6	4.0	2.3	-15.2	5.8	-1.6	-4.8
SP	20.8	8.5	34.7	31.1	-0.1	94.9	9.3	3.4	-22.5	13.2	-0.4	3.0
PG	13.3	4.9	28.2	17.1	-3.6	59.9	4.8	1.8	-16.2	6.1	-1.3	-4.8
Consumption quantity							Consumer prices					
<i>High set</i>												
USA												
CP	21.8	6.5	5.4	0.1	-8.7	25.2	7.0	1.8	-6.1	-0.2	9.1	11.6
SP	24.9	5.0	11.2	9.4	-13.5	37.0	11.7	2.3	-7.4	-6.2	8.3	8.7
NP	12.1	-14.5	2.5	0.1	-3.2	-3.0	8.0	-3.9	-6.3	-0.3	7.3	4.7
Australia												
CP	26.5	7.2	9.5	-4.1	1.3	40.5	5.4	1.5	-9.5	4.1	-1.3	0.1
SP	32.0	6.0	22.8	-6.1	1.6	56.3	10.1	1.9	-13.7	3.6	-1.0	1.0
NP	13.5	-15.1	2.9	-0.7	0.4	0.9	6.9	-3.0	-6.8	1.6	-0.8	-2.1
<i>Low set</i>												
USA												
CP	12.9	7.3	2.0	0.1	-3.1	19.3	3.5	1.9	-6.5	-0.3	9.3	7.8
CP	17.1	6.5	5.6	4.7	-6.6	27.3	6.9	2.6	-8.8	-7.3	9.8	3.2
SP	8.2	-15.3	0.8	0.1	-1.0	-7.2	4.4	-3.8	-6.9	-0.5	7.6	0.8
NP												
Australia												
CP	14.2	7.6	3.3	-1.3	0.4	24.2	2.6	1.5	-9.6	3.6	-1.1	-3.1
SP	20.0	7.0	10.0	-1.6	0.1	35.5	5.7	2.1	-14.2	2.3	-0.2	-4.3
NP	8.3	-15.4	0.9	-0.2	0.1	-6.3	3.8	-2.8	-7.3	1.5	-0.7	-5.5

Key: (1) = macro growth effect; (2) = taste swing toward premium wines and away from non-premium wine; (3) = grape and wine supply growth; (4) = taste swing towards New World wines; (5) = US dollar depreciation.

CP = commercial premium wine; SP = super-premium wine; PG = premium wine grapes; NP = non-premium wines.

Source: World Wine Model projections.

Finally, we present the results of sensitivity analysis with respect to parameter variation for two countries, the USA and Australia. Already, our decomposition of results indicates the contribution of each set of forward projections to overall change in the simulation. Now, we run the model again with two different sets of wine expenditure elasticities, first with a high set, 2.5, 1.5 and 0.7 and then with a low set, 1.0, 0.5 and

0.2 for super-premium, commercial-premium and non-premium wines respectively. Using the base set of expenditure elasticities, output of US super-premium wine increases by 26.1 percent in the simulation period (table 2). With the high set, the increase is 29.8 percent, and 21.3 percent with the low set (table 6). The corresponding producer price increase is 13.9 percent (table 2). This rises to 18.3 percent for the high set, with a smaller increase of 9.1 percent for the low set (table 6).

Overall, modelled outcomes hinge less on parameter choice than the imposed taste shifts. For example, the producer price for Australian commercial-premium wine ranges from -4.8 percent in the low set case to 0.3 in the high set case, whereas the impact of a taste shift towards New World wines raises the producer price by 14.4 percent (table 2, column (4)).

Conclusion

This paper has used the World Wine Model to project the global wine market from 2003 to 2010. Of particular interest is the increase in New World wine supply, and its impact on producer prices and consumers. Producer price falls in Australia, Chile and New Zealand due to supply growth may continue to be alleviated by effective export promotion. The medium-term picture is far from bleak despite fears of a global glut of wine. The US dollar depreciation presents an opportunity for US producers to increase exports, but supply constraints imply that adjustment in the USA will be substantially via prices and diversions from domestic sales rather than output growth. The non-premium segment of the global market will continue to shrink as consumers switch to higher quality wines.

Our approach based on national boundaries does not consider the impact that large corporate producers and supermarket distributors are having on the global market. The wine market has become increasingly concentrated, while there has been some convergence in consumption patterns across different countries. This might lead to increasing homogeneity in the global wine market. However, as suggested by Anderson *et al.* (2003), wine consumers will seek product variety as their affluence grows. They will become increasingly discriminating, between grape varieties, between countries of origin and between regions within countries of origin. They will use international wine critics to search for brands and labels within brands. The preference for heterogeneity will ensure that geographic origin continues to matter to wine consumers, and that some small and medium wineries continue to exist alongside the few large corporations. The internet is also playing a role, in allowing enthusiasts to discover relatively small wineries from around the world, and to find distributors for these wineries within their own country.

Nevertheless, we could model variants of this projection in which Old World production and marketing are effective in slowing global market share losses, or in which other potential competitors, such as Argentina or EU aspirants, start exporting substantial quantities of wine. Effects such as these acting alone would diminish the returns to other New World producers. Our framework enables us to consider such possibilities and indeed alter projections in response to additional information.

References

- ABS (2005), *Australian Wine and Grape Industry*, catalogue 1320.0, Canberra: AGPS.
- Anderson, K. (2000), "The Anatomy of Australia's Wine Boom – Lessons for Other Industries", *Australasian Agribusiness Review*, 8, paper 1.
- Anderson, K. and Norman, D. (2003), *Global Wine Production, Consumption and Trade, 1961 to 2001: A Statistical Compendium*, Centre for International Economic Studies, The University of Adelaide.
- Anderson, K., Norman, D. and Wittwer, G. (2003), "Globalization of the World's Wine Markets", *The World Economy*, 26(5): 659-687.
- Armington, P.A. (1969), "A Theory of Demand for Products Distinguished by Place of Production", *IMF Staff Papers*, 16:159-178.
- Australian Wine and Brandy Corporation (2005), WINEFACTS statistics. <http://www.awbc.com.au/>
- Berger, N. (2000), *Modelling Structural and Policy Changes in the World Wine Market into the 21st Century*, unpublished M.Ec. thesis, The University of Adelaide, Australia.
- Berger, N., and Anderson, K. (1999), "Consumer and Import Taxes in the World Wine Market Australian in International Perspective", *Australasian Agribusiness Review*, 7, paper 3.
- Berger, N., Anderson, K. and Stringer, R. (1998), *Trends in the World wine Market, 1961 to 1996: A Statistical Compendium*, Centre for International Economic Studies, The University of Adelaide.

Berger, N., Spahni, P. and Anderson, K. (1999), *Bilateral Trade Patterns in the World wine Market, 1988 to 1997: A Statistical Compendium*, Centre for International Economic Studies, The University of Adelaide.

Centre for International Economics (1995), "Generation of Demand Parameters for an Economy-wide Model of the Grape and Wine Industry," prepared for the Commonwealth Inquiry into the Wine Grape and Wine Industry, Canberra.

China Daily (2004), "Capital pours into wine sector", *China Daily*, http://english.people.com.cn/200409/28/eng20040928_158529.html, 28 September.

Cid, M. (2005), "Prices for Chilean Wine", *Santiago Times*, 21st March.

Dixon, P., Parmenter, B., Sutton, J. and Vincent, D. (1982), *ORANI: A Multisectoral Model of the Australian Economy*, Amsterdam: North-Holland.

Euromonitor (2004), "Executive summary China", *Euromonitor International*. http://www.euromonitor.com/Alcoholic_Drinks_in_China, 30 March.

Food and Agriculture Organization of the United Nations (2005), FAOSTAT agricultural data, <http://faostat.fao.org/faostat/>

Geene, A., Heijbroek, A., Lagerwerf, A. and Wazir, R. *The World Wine Business*. Utrecht: Rabobank International, 1999.

Harrison, J. and Pearson, K. (1994), "Computing Solutions for Large Scale General Equilibrium Models Using GEMPACK", *Computational Economics*, 9(2): 83-127.

Harrison, J., Horridge, M. and Pearson, K. 2000. Decomposing Simulation Results with Respect to Exogenous Shocks. *Computational Economics*. 15(3): 227-249.

Heijbroek, A (2003), "Wine is business – Shifting demand and distribution: major drivers reshaping the wine industry", Rabobank International, Food and Agribusiness Research, http://www.rabobank.com/Images/rabobank_publication_wine_is_business_2002_tcm25-156.pdf

Hertel, T. (ed.) (1996), *Global Trade Analysis: Modeling and Applications*, New York: Cambridge University Press.

Henriquez, V.M (2004), "Chilean Wine Organisation Receives U.K. Award". *Santiago Times*, 10 June.

Klein, L. and H. Rubin (1949), "A constant-utility index of the cost of living." *Review of Economic Studies*, 15: 84-87.

Langton, P. 2005. Chilean Wine – Partnership's radical strategy is paying off, *Off Licence News*. 18th March.

Meagher, G.A., Parmenter, B., Rimmer, R. and Clements, K (1985), "ORANI-WINE: Tax issues and the Australian wine industry", *Review of Marketing and Agricultural Economics*, 53(1): 47-62.

Onivins (Office national interprofessionnel des vins) (2004), *Statistiques sur la filiere viti-vinicole*, Paris: Onivins.

Richards, P. (2005), "Chilean Wine – always expect the unexpected in Chile", *Off Licence News*, 18th March.

Robinson, J. (2004), 'Chilean Wine grows up', *Financial Times*, 14th February.

SAWIS (S.A. Wine Information and Systems) (2005), *SA Wine Industry Statistics*, <http://www.sawis.co.za/downloads/download-2140-370.pdf>

Sawyer, C. 2004. Chile moves from quantity to quality. *Wine Business Monthly*. <http://winebusiness.com/html/MonthlyArticle.cfm?Aid=96915&issueId=96878>, 14 December.

Shanghai Star. 2003. Eating grapes with wine does your heart good. *Shanghai Star*. <http://www.china.org.cn/english/DO-e/52947.htm>, 30

January.

United Nations (2005), UN Commodity Trade Statistics Database. <http://unstats.un.org/unsd/comtrade/>

USDA (2004a), “World table grape situation and outlook”, <http://www.fas.usda.gov/http/horticulture/grapes/Table%20Grapes%202004.pdf>, 30 March.

USDA (2004b), “Grape crush report overview”, <ftp://www.nass.usda.gov/pub/nass/ca/Crush/Final/2004/200403gcbnarr.pdf>, 30 October.

USDA (2005), “USDA baseline projections to 2014”, <http://www.ers.usda.gov/Data/>, 15 February.

Vinas de Chile (2004), Online statistics, http://www.vinasdechile.com/ingles/asociacion/estadisticas/f_estadisticas.html.

Wine Industry of California (2005), “Strong sales growth in 2004 for California wine as shipments reached new high”, <http://www.wineinstitute.org/communications/statistics/Sales2004-2.htm>.

Wine Industry of New Zealand (2005), “New Zealand Wines Online”, <http://www.nzwine.com/statistics/>

Wittwer, G. (2000), “The Australian wine industry during a period of boom and tax changes”, unpublished Ph.D. thesis, The University of Adelaide, Australia.

Wittwer, G., Berger, N and Anderson, K. (2003), “A Model of the World’s Wine Markets”, *Economic Modelling*, 20(3): 487-506.

Wittwer, G. and Anderson, K (2002), “Impact of the GST and wine tax reform on Australia’s wine industry: a CGE analysis”, *Australian Economic Papers*, 41(2): 69-81.

Wittwer, G. and Anderson, K. (2005), *The Global Wine Statistical Compendium*. Adelaide: Australian Wine and Brandy Corporation.

University of California Agriculture and Natural Resources (2002), “UC battles Pierce’s disease.” <http://ucanr.org/externalstories/PDstory.shtml>.

U.S. Census Bureau (2005), “International Data Base”, <http://www.census.gov/cgi-bin/ipc/idbsprd>

Appendix: details of assumptions in projecting from 2003 to 2010

Table A1. Macroeconomic assumptions (% change, 2003 to 2010)

	a	b		a	b
France	2.4	13.3	Ukraine	-4.2	36.7
Italy	0.2	11.0	Uzbekistan	12.7	28.8
Portugal	2.5	13.3	Other Cent/East Europe	2.1	28.8
Spain	0.8	15.7	Australia	6.1	22.6
Austria	0.6	11.8	New Zealand	7.1	21.4
Belgium-Luxembourg	0.9	11.8	United States	6.5	21.2
Denmark	2.4	13.3	Canada	6.3	19.4
Finland	1.2	13.3	Argentina	6.9	26.3
Germany	-0.1	7.2	Brazil	7.4	25.2
Greece	1.1	18.9	Chile	6.8	26.6
Ireland	8.4	18.9	Mexico	8.4	26.7

Netherlands	3.5	13.3	Uruguay	3.3	26.6
Sweden	1.1	13.3	Other Latin Amer/Carrib	10.8	24.3
Switzerland	2.8	13.3	South Africa	-2.6	20.4
United Kingdom	2.0	18.9	Turkey	7.6	32.9
Other Western Europe	3.4	14.9	North Africa	11.6	34.1
Azerbaijan	5.0	33.8	Other Africa	18.3	31.6
Bulgaria	-5.8	28.2	Middle East	16.3	35.2
Croatia	-0.2	28.2	China	4.3	57.2
Georgia	-2.3	28.8	Japan	0.0	14.2
Hungary	-1.8	24.0	Other North East Asia	3.9	33.9
Moldova	2.3	28.8	South East Asia	9.7	37.7
Romania	-0.9	24.0	Other Asia Pacific	11.2	33.9
Russia	-2.6	37.0			

a Population growth; **b** Real aggregate consumption growth

Sources: a U.S. Census Bureau; b based on real GDP projections from U.S. Department of Agriculture 2004a.

Table A2. Capital growth by sector (% change, 2003 to 2010)

	Commercial premium	Super-premium	Sparkling wine	Non-premium wine	Table and multi-purpose grapes	Premium grapes
France	-6	0	-5	-10	0	-6
Italy	-15	-15	-5	-25	0	-15
Portugal	-5	-5	-5	-5	-5	-5
Spain	20	20	-5	10	10	20
Germany	-10	-10	-5	-15	-15	-10
Other Western Europe	-5	-5	-5	-5	-5	-5
Eastern Europe/ Former Soviet Union	10	10	10	10	10	10
Australia	50	50	-5	5	0	60
New Zealand	90	120	-5	0	0	120
United States	5	5	-5	0	5	5
Canada	15	15	15	15	15	15
Argentina	15	15	15	15	15	15
Brazil	15	15	15	15	15	15
Chile	50	50	-5	0	20	55
Mexico	15	15	15	15	15	15
Uruguay	15	15	15	15	15	15
Other Latin Amer/ Carrib	15	15	15	15	15	15
South Africa	0	0	-5	5	0	0
Turkey	5	5	5	5	5	5
North Africa	5	5	5	5	5	5
Other Africa	5	5	5	5	5	5
Middle East	5	5	5	5	5	5
China	0	0	0	0	30	0
Japan	5	5	5	5	5	5
Other North East Asia	5	5	5	5	5	5
South East Asia	5	5	5	5	5	5
Other Asia Pacific	5	5	5	5	5	5

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[1]

For studies in which the linear expenditure system is too restrictive (i.e., no specific substitutability), aggregated wine or all alcoholic beverages could form a single nest in the linear expenditure system of the model, with conditional own-price and cross-price Slutsky parameters being imposed within the nest (see Meagher, Parmenter, Rimmer and Clements and Wittwer and Anderson (2002) for examples).

[2]

Arend Heijbroek, of Rabobank, recommended that we use price points to classify wine.

[3]

We do not present results for non-premium wine or multi-purpose grapes in table 2, as changes are small. In the case of non-premium wine,

the positive impact of economic growth is more than offset by the negative consumer preference swing.