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The Demand for Wine in Australia Using a Systems Approach: Industry Implications[1]

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Abstract

The objective of this study is to explain the factors determining the demand for wine in Australia, based on a systems approach where wine demand is modelled as part of the broader demand for alcoholic drinks (beer, wine and spirits).

Time series data on retail price indexes and apparent per capita consumption of alcoholic beverages for Australia for the period 1975/76 to 1998/99 are used for econometric estimation of an Almost Ideal Demand System.

The results show that the demand for beer and wine is price inelastic and that both beer and wine are luxury goods. The study also found that current beer and wine consumption strongly follows past consumption patterns.

Drink driving campaigns have not had a significant effect on alcoholic consumption, but there seems to have been a structural change in consumer preferences that has had a significant impact on the volume of wine consumption.

Finally, there seems to have been an overall upward trend in wine consumption and a downward trend for beer consumption. The study re-confirms the importance of developing a model that considers the impacts of both economic and non-economic variables on wine consumption. Implications for wine industry marketing strategies are suggested.

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Introduction

The Australian wine industry has experienced rapid expansion over the last 15 years. Increasing demand for wines in Australia and overseas, coupled with technological advances and the industry's capacity to innovate, has seen plantings almost double and exports multiply 100-fold. In fact, 15 years ago Australia's total exports were less than $10 million per year compared to the present export earnings of almost $2 billion per year.

According to the ABS, wine exports increased 20 per cent in 2000/01 to a record 338 million litres, valued at $1.8 billion. ABARE (1999) predicted that wine export earnings would rise even further, to $2.9 billion, within five years. This would put wine ahead of dairy products, sugar and cotton in terms of farm export earnings, and not far behind wool, beef and wheat. It is predictions like these that give the wine industry an air of optimism. A brief overview of the Australian wine industry at present is given in Table 1. A longer-term perspective is available in Osmond and Anderson (1998) and related publications.

However, there are some signs of an oversupply of winegrapes. Jones (2000) reported that the ratio of stocks to sales in Australia was 'well past its comfort zone' and there was too much wine in stock and not enough being sold. One of the first signs of a glut is a fall in grape prices in the larger grape growing areas in Australia. In the NSW Riverina, grape prices in some cases have fallen to half of what they were a year ago, and some contracts with wineries are not being renewed. This is a sure sign of a plentiful winegrape supply.

Table 1: The Australian Wine Industry In Brief, 1996/97 to 1998/99

	1996/97	1997/98	1998/99
Wineries (number)	990	1104	1115
Area under vine (hectares)[1]	89 797	98 612	122 915
Wine grape production (tonnes)[2]	797 992	975 669	1 100 644
Wine production (million litres)[3]	567	680	793
Wine consumption (million litres)[4]	347	364	371
Wine exports (million litres)	155	194	216
Wine imports (million litres)	14	26	24

Source: Jones (2000).
Notes: 1. Vines yielding grapes for all purposes, 2. Preliminary ABS crush number (ABS 1999b), 3. Beverage wine, 4. Domestic and imported wine (estimated for 1998/99).

The export market looks to be the future for the Australian wine industry. However, it is not clear how easily this can be achieved in a climate of global overproduction and intense international competition. Croser (1997) and Anderson (2000) writing in this *Review* have raised some of these issues. Earnings forecasts for the large listed wine companies have recently been downgraded due to expected slow growth in export markets (Fenech 2002). The domestic market has showed strong growth in the last ten years, and can be expected to continue to grow, but it is unrealistic to expect it to take up much of the increased production. The projected increase in grape supplies will mean that wineries and growers concentrating on the domestic market will come under greater pressure as wine supplies increase. Higher cost wineries and grape growers and those without strong brand loyalty and good distribution chains will be forced to reduce prices and margins in order to compete.

As well, the domestic industry is experiencing significant changes in consumer preferences. There has been a large increase in the value of wine consumed per person because of an increased consumption of bottled table wine. While demand for lower quality wine is in decline, consumption of premium quality wine continues to increase. Demand for white wine is also in decline, while red wine consumption is increasing (Shepherd 1999). There are a number of reasons behind this shift, such as the advent of the 'café society', the perceived health benefits from moderate wine consumption, higher incomes and an increased knowledge of wines. Domestically, red table wine sales now make up about 34 per cent of table wine sales, up from 24 per cent in 1992/93.

This discussion suggests that there are worrying signs of a massive increase in the supply of wine onto the domestic market in the near future. However, the factors influencing the future demand for wine in Australia are not well known. Previous economic studies of wine demand in Australia (Taplin and Ryan 1969, Miller and Roberts 1972, Tsolakis *et al*. 1983, Clements and Johnson 1983, Clements and Selvanathan 1991, Proctor and Phillips 1991) are now quite dated and do not account for the recent developments outlined above.

Hence, the specific objectives of this paper are (1) to update estimates of the own-price, cross-price and expenditure elasticities for wine, (2) to determine whether there are any structural breaks in the demand for wine in Australia, and (3) to suggest some implications for industry marketing strategies. Because wine is regarded as a potential close substitute with other types of alcoholic beverages, particularly beer and spirits, the demand for these three categories of alcoholic drinks is considered to be a 'demand system'. This system is specified as the well-known Almost Ideal Demand System (AIDS) model, and is estimated using time series data from 1975/76 to 1998/99. The estimated demand equations can potentially be used to forecast the demand for wine in Australia. Given that projected supply is readily available, the difference between the projected supply and projected domestic demand will provide an estimate of the amount of wine that needs to be disposed of in overseas markets and the marketing effort required to avoid a glut of Australian wine.

Empirical Model[5]

A large number of past studies have analysed the demand for wine, beer and spirits. Many of these studies were based on a single-equation estimation of demand for aggregate or disaggregated alcoholic beverages; however another set of studies involves estimation of demand systems for groups of alcoholic beverages. The majority of these latter studies applied the AIDS model to demand estimation (eg, Heien and Pompelli 1989; Blake and Nied 1997; Jones 1989; Andrikopoulos, Brox and Carvalho 1997). Other popular models applied included the Rotterdam model by Clements and Johnson (1983) and the CBS and NBR models by Nelson and Moran (1995). The system studies previously conducted in Australia were by Clements and Johnson (1983), Clements and E. Selvanathan (1987), Clements and S. Selvanathan (1991) and E. Selvanathan (1991), while single equation studies include those by Taplin and Ryan (1969), Miller and Roberts (1972) and Tsolakis *et al.* (1983). An earlier version of this current study (Chang and Bettington 2001) compared single equation estimates with demand system estimates.

There is a huge variation between the estimates of the key elasticities across the different studies, both time-series and cross-section. The differing results reflect the differences in model specification, data types and estimation procedures. However, they provide guidance for the specification of the empirical model used in this study. In particular, this study will consider the possible effect of habits and taste changes on alcoholic consumption, as suggested by Clements and Johnson (1983), E. Selvanathan (1988), Jones (1989) and Andrikopoulos *et al*. (1997).

Of the various systems of demand equations available, the AIDS model was used in this study because of its many desirable properties (Deaton and Muellbauer 1980a). First, the functional form is general, allowing beverages to be either substitutes or complements. Second, the system is linear in the parameters and hence simple to estimate. Third, this model is the most satisfactory in terms of being able to test the theoretical restrictions of adding up, homogeneity and symmetry through linear restrictions on fixed parameters. Since Deaton and Muellbauer (1980b), the AIDS model has been widely applied in many empirical studies of consumer behaviour using both cross-sectional and time series data, despite some criticisms in recent years. Part of the reason for the popularity of this demand system (Clements *et al*. 1996) is due to the ease with which it can be estimated and used for testing the predictions of consumer demand theory (Chambers and Nowman 1997).

This system of AIDS demand functions, in budget share form, is expressed as follows:

$$w_i = \alpha_i + \Sigma_j \gamma_{ij} \ln p_j + \beta_i \ln (X/P), \quad (1)$$

where w_i is the budget share for good i, p_j is the retail price for good j, X is total expenditure, P is defined as:

$$\ln P = \alpha_0 + \Sigma_k \alpha_k \ln p_k + \tfrac{1}{2} \Sigma_j \Sigma_k \gamma_{kj} \ln p_k \ln p_j, \quad (2)$$

and α_i, γ_{ij} and β_i are parameters to be estimated.

[5] This section may be ignored by readers not interested in the technical detail of the economic model.

The restrictions from demand theory that can be imposed on equation (1) are:

Homogeneity restriction: $\Sigma\gamma_{ij} = 0, i = 1, 2, ..., n;$ (3)

Symmetry restriction: $\gamma_{ij} = \gamma_{ji}, \quad \text{for } i \neq j;$ and (4)

Adding-up restriction: $\Sigma\alpha_i = 1, \Sigma\gamma_{ij} = 0, \text{ and } \Sigma\beta_i = 0.$ (5)

Because equation (1) is non-linear in the parameters, the Stone price index is commonly used to replace the price index P (2), resulting in the 'linearised' or 'linear approximate' version of the AIDS model (LA/AIDS). The Stone price index P* is defined as:

$$\ln (P^*) = \Sigma w_k \ln p_k \quad (6)$$

Following Buse (1994), elasticities of the LA/AIDS model are calculated using the following formulae:

Expenditure elasticities: $n_i = 1 + \beta_i / w_i;$ (7)

Own-price elasticities: $e_{ii} = \gamma_{ii} / w_i - (1 + \beta_i);$ and (8)

Cross-price elasticities: $e_{ij} = \gamma_{ij} / w_i - \beta_i w_j / w_i.$ (9)

Clements and Johnson (1983), E. Selvanathan (1988), Jones (1989), and Andrikopoulus, Brox and Carvalho (1997) found that habit formation and taste change have affected alcoholic beverage consumption, so these factors are also considered here. These effects can be incorporated into the basic LA/AIDS by making the intercept term α_i a linear function of various demand shifters, including a lagged dependent variable ($W_{i,t-1}$), a time trend (Time) and various dummy variables (such as D1 and D2). That is,

$$\alpha_i = \alpha_{i0} + \gamma_{14} W_{i,t-1} + \gamma_{i5} D_1 + \gamma_{i6} D_2 + \gamma_{17} \text{Time}. \quad (10)$$

After the addition of these variables, the LA/AIDS model for alcoholic beverages in this particular study (or the alcoholic beverages demand system) is formally defined as follows:

$$W_{beer,t} = \alpha_{10} + \gamma_{11} \ln (P_{beer,t}) + \gamma_{12} \ln (P_{wine,t}) + \gamma_{13} \ln (P_{spirits,t}) + \beta_1 \ln (X_t/P_t^*) + \gamma_{14} W_{beer,t-1} + \gamma_{15} D_1 + \gamma_{16} D_2 + \gamma_{17} \text{Time} + e_{1,t},$$

$$W_{wine,t} = \alpha_{20} + \gamma_{21} \ln (P_{beer,t}) + \gamma_{22} \ln (P_{wine,t}) + \gamma_{23} \ln (P_{spirits,t}) + \beta_2 \ln (X_t/P_t^*) + \gamma_{24} W_{wine,t-1} + \gamma_{25} D_1 + \gamma_{26} D_2 + \gamma_{27} \text{Time} + e_{2,t}, \text{ and}$$

$$W_{spirits,t} = \alpha_{30} + \gamma_{31} \ln(P_{beer,t}) + \gamma_{32} \ln(P_{wine,t}) + \gamma_{33} \ln(P_{spirits,t}) + \beta_3 \ln (X_t/P_t^*) + \gamma_{34} W_{spirits,t-1} + \gamma_{35} D_1 + \gamma_{36} D_2 + \gamma_{37} \text{Time} + e_{3,t}. \quad (11)$$

where the $W_{beer,t}$ $W_{wine,t}$ and $W_{spirits,t}$ are the budget shares of beer, wine and spirits at time t, respectively; $P_{beer,t}$, $P_{wine,t}$ and $P_{spirits,t}$ are corresponding retail price indices; X_t is the total expenditure on alcoholic beverages at time t; $W_{beer,t-1}$, $W_{wine,t-1}$ and $W_{spirits,t-1}$ are the budget shares at time t-1; D_1 and D_2 are dummy variables; Time is a trend variable; $e_{1,t}$, $e_{2,t}$ and $e_{3,t}$ are the error terms; and αs, γs and βs are the unknown parameters to be estimated. The error terms $e_{1,t}$, $e_{2,t}$ and $e_{3,t}$ are assumed to be normally distributed with constant means and variances; however they may be contemporaneously correlated since the demands for different alcoholic beverages are likely to be influenced by similar random events. All other variables are as previously defined.

The lagged budget shares $W_{beer(t-1)}$, $W_{wine(t-1)}$ and $W_{spirits(t-1)}$ represent the impact of habit formation which is particularly important in alcohol consumption because of the addictive nature of alcoholic beverages. These lagged budget shares also provide some information about the relative 'tolerance' effects of alcohol. Tolerance means that the body becomes less responsive to alcohol, so that a larger dose of the alcohol is required to gain an effect of the original magnitude. As such, it would be expected that the associated coefficients would be positive and lie between zero and one to satisfy stability conditions.

D_1 in equation (11) is a dummy variable representing the introduction of lower blood alcohol limits for drink driving in the fiscal year 1979/80. Then, the legal limit of blood alcohol reading was reduced from 0.08 per cent to 0.05 per cent, and random breath testing became more stringent and much more regular. Therefore, $D_1 = 1$ for the years 1979/80-1998/99 and zero otherwise.

D_2 represents the swing in the preferences of consumers towards bottled table wine away from the cheaper cask wines and towards red wine for health reasons, as well as a swing away from full strength beer towards low alcohol beer. Both these changes in consumer preferences began in the mid 1980's.

The choice of 1988/89 as a turning point was chosen based on Chow tests, which clearly identified 1988/89 to be the year of structural break for both beer and wine. Therefore, $D_2 = 1$ for the period 1988/89-1998/99 and zero otherwise.

The time trend variable is used to capture other gradual changes in consumer preferences that have not yet specifically been accounted for, such as changing preferences toward wine and spirits and away from beer as the population ages and as the economy moves from manufacturing to service industries.

Data Requirements and Data Sources

For estimation the required data are the retail price indexes and per capita consumption of beer, wine and spirits within Australia. Annual data from 1975-76 through to 1998-99 were sought. Retail price indexes, per capita income and CPI were collected from *Australian Commodity Statistics* (ABARE 1999).

.Apparent per capita consumption of alcohol was collected from the Australian Bureau of Statistics (ABS 1999a) publication, *Apparent Consumption of Selected Foodstuffs, Australia*. Relative prices and per capita consumption of alcoholic beverages in Australia between 1975/76 and 1998/99 are presented in Figures 1 and 2.

The prices of wine relative to beer (W/B price) and to spirits (W/S price) are presented in Figure 1. Two observations are made.

Firstly, the price of wine, in relative terms, decreased steadily during the period between 1975/76 and 1992/93 and increased slightly in the later period.

Secondly, the price of wine both relative to beer and to spirits, is greater than one in the 1979s and 1980s but is less than one in the 1990s. These results mean that not only has the price of wine relative to beer and spirits declined but wine has become cheaper than both beer and spirits.

Figure 1: Relative price of wine to beer and spirits

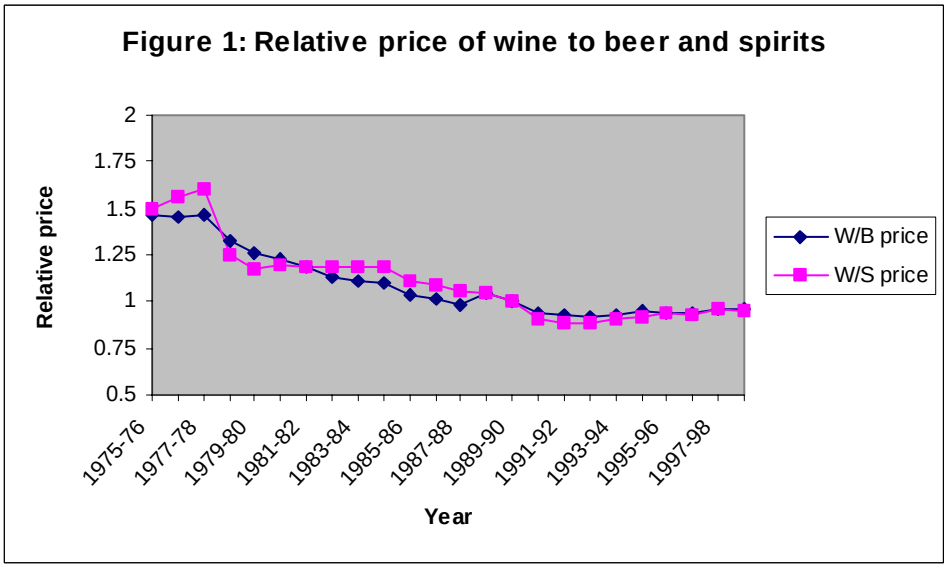
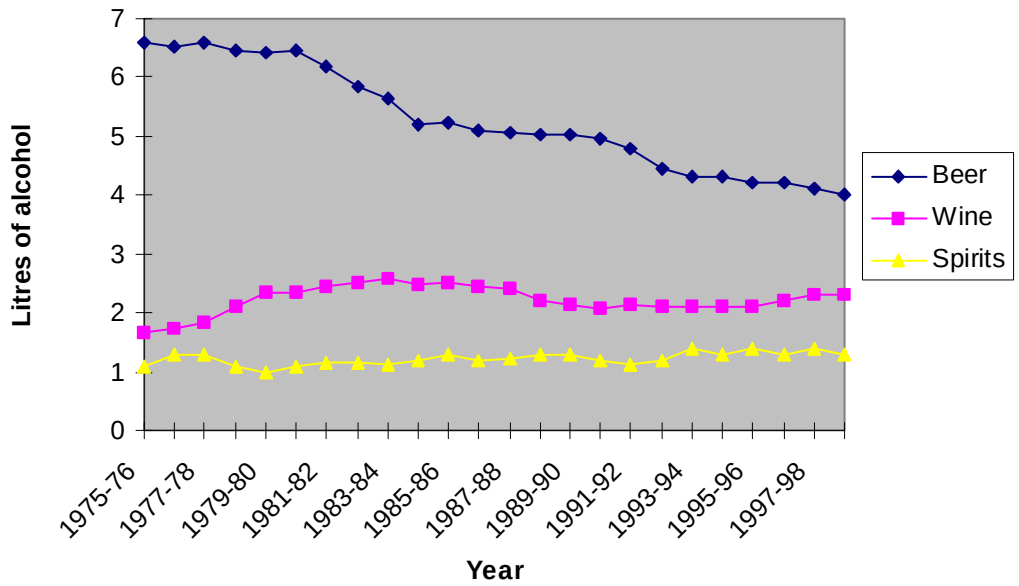


Figure 2: Apparent per capita consumption of alcoholic beverages



As can be seen in Figure 2, per capita beer consumption has declined markedly from 6.59 litres of alcohol per capita (equivalent to 137.4 litres in volume) in 1975/76 down to 4 litres of alcohol per capita (equivalent to 92.8 litres in volume) in 1998/99. By comparison, per capita wine consumption has increased from 1.66 litres of alcohol per capita (equivalent to 13.0 litres in volume) in 1975/76 to 2.3 litres of alcohol (equivalent to 20.4 litres in volume) in 1998/99.

However, there are some ups and downs in between. More specifically, per capita consumption of wine rose steadily up until the mid 1980's, which was followed by a decline which lasted until the early 1990s. The decline was attributed to changing consumer preferences that had resulted in a move away from cheaper cask wine and towards more expensive and better quality bottled wine.

As a result, the quantity of wine consumed decreased although the decline was accompanied by an increase in the expenditure on wine. Wine consumption in Australia was stable at around 2.1 litres of alcohol for a few years before it began to rise in 1996/97, largely because of the publicity surrounding the beneficial effects of wine on health. Spirits have shown a slight increase in the level of consumption over the whole sample period.

Results

To test for theoretical restrictions, two versions of the LA/AIDS model, a restricted model (with symmetry and homogeneity conditions imposed) and an unrestricted model (without restrictions), were estimated using the SHAZAM econometrics software version 8.0 (White 1996). Both symmetry and homogeneity restrictions were not rejected at the 5 per cent level of significance based on a likelihood ratio test.

The calculated χ^2 statistic was 0.58, which is much smaller than the tabulated value of 7.81 with 3 degrees of freedom. Because the imposition of restrictions when they are supported by the statistical test can result in more precise estimates, the results that are presented below are from the restricted LA/AIDS model. The estimated coefficients and their corresponding t-values for the sample period are displayed in Table 2[6]. Only the estimated results for the wine and beer demand equations are shown since wine, and its main competitor beer, are the main focus of this study.

In general, the estimated results are satisfactory and reasonable in terms of goodness-of-fit, precision of the estimates and comparison with results of other studies. The R^2 values indicate that the model can explain 92 and 85 per cent of the variation in per capita consumption of beer and wine, respectively.

[6] The results from the unrestricted model are available from the authors if required. The results are very similar and lend further support to the robustness of the estimated results presented here.

The majority of the estimated coefficients are statistically significant at the 5 per cent level, with only few exceptions. Some price and expenditure coefficients may be insignificant and appear to have the wrong signs. However, there is no cause for alarm at this point.

This is because price and expenditure responses in the AIDS model are non-linear functions of parameters and variables, not individual coefficients. Therefore, an individual coefficient does not have the usual economic interpretation. What is more meaningful to look at are the elasticities, which, as can be expected, would be the focus of our discussion.

The results for variables other than prices and total expenditure are mixed, indicating that consumption patterns of different alcoholic beverages are affected in a variety of ways by social and policy changes in the industry.

For ease of comparison, the results will be divided in two sets: the first set is related to economic factors such as prices and total expenditure of alcoholic beverages, and the second set is related to non-economic factors pertaining to consumption trends and policy and social changes.

Table 2: Estimated coefficients from the restricted LA/AIDS model

	Beer	Wine
Constant	0.36 (1.00)[a]	-0.06 (-0.29)
Ln P_{beer}	0.12 (1.21)	-0.11 (-1.96)
Ln P_{wine}	-0.11 (-1.96)	0.07 (1.70)
Ln $P_{spirits}$	-0.01 (-0.22)	0.04 (1.27)
Ln (X/P^*)	0.02 (0.18)	0.07 (0.72)
W_{t-1}	0.42 (2.14)	0.53 (2.87)
D1	-0.01 (-0.70)	0.001 (0.10)
D2	0.02 (1.97)	-0.03 (-3.09)
Time	-0.005 (-2.14)	0.004 (2.67)
System R^2	0.92	0.87

[a] Figures in parentheses are t-ratios.

Economic influences

Estimated demand elasticities based on the formulae provided in equations (7) to (9), along with their associated t-ratios, are presented in Table 3. Because of the presence of the lagged dependent variable in the demand functions, these elasticities are best interpreted as short-run demand elasticities.

Table 3: Estimated demand elasticities

	Demand Elasticities		
	Beer Price	Wine Price	Total Expenditure
Beer	-0.82 (-5.96)[A]	-0.19 (-1.47)	1.04 (4.79)
Wine	-0.54 (-2.31)	-0.82 (-4.16)	1.25 (3.57)

[a] Figures in parentheses are t-ratios.

The results presented in Table 3 indicate that all the estimated elasticities are statistically significant at the 5 per cent level. In terms of own-price response, the demands for beer and wine are both price-inelastic, and they have the same estimated own-price elasticity of -0.82. This means a 1 per cent increase in their respective own prices will decrease the quantity of beer and wine demanded by 0.82 per cent.

In terms of cross-price response, beer and wine are found to be weak (gross) complements, with estimated cross-price elasticities of -0.19 and -0.54. This means that, a 1 per cent increase in the price of wine will decrease the quantity of beer demanded by 0.19 per cent while a 1 per cent increase in the price of beer will decrease the quantity of wine demanded by 0.54 per cent. Because, beer and wine are normally expected to be substitutes, this counter-intuitive result is examined further using the income-compensated (Hicksian) cross-price elasticities. Income-compensated cross-price elasticities are calculated based on the following formula provided in Barten (1993):

$$s_{ij} = e_{ij} + w_j \eta_i, \qquad (12)$$

where s_{ij} is the compensated (Hicksian) cross-price elasticity; e_{ij} is the uncompensated cross-price elasticity; w_j is the budget share of good j; and η_i is the expenditure share of good i. The calculated income-compensated cross-price elasticities are 0.09 and 0.20 for beer and wine, respectively. This means that beer and wine are gross complements but net substitutes. The reason why this is the case is because the income effect associated with the price change (which is negative) is greater than the price effect, rendering the total effect negative.

The estimated expenditure elasticities are 1.04 and 1.25 for beer and wine, respectively, and both are statistically significant at the 1 per cent level. This means that when there is a 1 per cent increase in total expenditure for alcoholic beverages, both beer and wine consumption can be expected to increase by more than 1 per cent. Moreover, the demand for wine would be increased more than beer if Australian consumers decided to spend more on alcoholic beverages.

Non-economic influences

In addition to demand responses to changes in prices and total expenditure, the second set of results to be discussed will assess the relative impacts of behavioural, social and policy changes on alcoholic beverage consumption in Australia. These impacts are captured by the lagged dependent variable, the dummy variables (D1 and D2), and the time trend.

Let us first look at the tolerance effect and the addictive nature of beer and wine. It can be seen from Table 2 that the estimated coefficients associated with both lagged dependent variables are statistically significant at the 5 per cent level. This result indicates strongly that habit formation has a significant and positive effect on beer and wine consumption. Moreover, the relative magnitude of the coefficients suggests that wine, with a value of 0.53, is probably more addictive than beer which has a value of 0.42. These figures also imply that responses to various changes in the environment in the long run would be greater for wine than for beer.

D1 represents increased random breathalysing and lowering of the blood alcohol content level for drink driving since 1979/80. The result indicates that the drink driving campaign has had little effect on the consumption of either beer or wine as the estimated coefficients associated with D1 are statistically insignificant at the 10 per cent level. This does not mean however that the campaigns have been ineffective - consumers may simply have changed their drinking behaviour to consume more at home and less when out, or may have changed their driving behaviour to not drive when planning to drink. Either outcome would suggest that the policy has been effective, but this cannot be tested with the aggregate data used in this study.

D2 represents changes in consumer preferences towards bottled table wine and red wine, as well as a swing away from full strength beer towards lower alcohol beer. The estimated coefficients for this variable were statistically significant for beer (at the 5 per cent level with a t-ratio of 1.97) and wine (at the 1 per cent level with a t-ratio of -3.09). Hence, changes in consumer preferences since the late 1980s have seen a positive change in beer consumption but a negative change in wine consumption, holding other things constant. This is true despite the fact that there has been a significant negative longer run trend in the consumption of beer and a significant positive trend in the consumption of wine, for reasons unrelated to the effects picked up by D1 and D2. The latter result is borne out by the fact that the coefficients associated with the trend variable are negative and statistically significant for beer but positive and statistically significant for wine.

The results obtained here share some commonality with previous analyses. For example, the finding that demand for alcoholic beverages was price inelastic agrees with the findings of other recent systems studies by Clements and Johnson (1983), E. Selvanathan (1988, 1991), Heien and Pompelli (1989), Jones (1989), and Clements and S. Selvanathan (1991). However, the estimated own-price elasticity for wine found in this study is substantially less than those found earlier by Miller and Roberts (1972) and Tsolakis *et al*. (1983).

Furthermore, Labys (1976), Clements and Johnson (1983) and Tsolakis *et al*. (1983) reported that wine and beer were necessities in the short run while our finding suggested that they were more like luxuries. Also, in this study, wine and beer were found to be gross complements but net substitutes. By comparison, they were found to be gross complements by Heien and Pompelli (1989) but gross substitutes by Clements and Johnson (1983) and E. Selvanathan (1988). Finally, the present results support the findings of Jones (1989) and Andrikopoulos, Brox and Carvalho (1997) that the behaviour of wine consumers strongly reflects past consumption patterns.

The results of this study can be summarised as follows.

Firstly, in the short run, the demands for beer and wine are own-price inelastic; wine and beer are gross complements but net substitutes; and beer and wine are luxury goods.

Secondly, the effect of habit formation is strong on both wine and beer consumption.

Thirdly, the drink driving campaign through random breathalysing and lower legal blood alcohol limits has had little separate effect on alcoholic consumption.

Fourthly, there seems to have been a structural change that has increased beer consumption but lowered wine consumption during the last decade.

Finally, there have been an overall upward trend in wine consumption and a downward trend for beer consumption. Given these results, it is reasonable to conclude that both economic and non-economic have played an important role in affecting the demand for alcoholic beverages in Australia. However, while economic factors seem to affect demand for beer and wine pretty much the same way and to the same degree (because similar estimates for price and expenditure elaticities are obtained), non-economic factors, which are related to social-demographic changes, seems to affect wine and beer consumption quite differently.

Implications

There are a few lessons that can be learned from the analysis. First of all, demand for alcoholic beverages has received substantial attention from government, academia and the wine industry worldwide because of its economic and social implications. However, the research findings obtained so far have varied both across countries and over time.

Although these different results do not help provide clear guidance to either public policy makers or marketing firms on how to influence consumer behaviour, they do suggest that consumption behaviour of alcoholic beverages is diverse and rather complex. That means more attention should be given to the factors that may give rise to those diversity and complexity, for example the cultural, social and demographic changes. One implication is that more disaggregated data, as well as cross-sectional data, may be needed in order to fully understand consumption behaviour of alcohol. The aggregate nature of the data is, therefore, one drawback of the current analysis.

Secondly, governments throughout the world have attempted to use higher taxes as a means to deter or reduce alcohol consumption. However, given the inelastic demand of alcoholic beverages found in most studies, including this one, an increase in the price of alcoholic beverages through taxation may not be an effective means to discourage alcohol consumption. This is good news for the wine industry from a marketing perspective. It suggests that instead of competing on prices, non-price competition such as product quality, brand image, advertising and promotion would be a more effective marketing strategy for increasing sales. An inelastic demand also implies that total revenue may be increased by raising prices.

Thirdly, given that estimated price and expenditure elasticities found in this study are very similar in magnitude for both beer and wine, demands for these two alcoholic beverages are likely to respond in similar ways to external economic shocks that impact on prices and total expenditure. By comparison, non-economic factors have been found to have re-distributional effects between alcoholic beverages. For example, structural change was found to have increased beer consumption but decreased wine consumption, while longer run trends have the opposite effects. Identifying the specific factors that contribute to the structural change and trends may be helpful in developing effective marketing strategies.

Conclusions

Over the past decade there has been a huge increase in the volume of wine grapes produced in Australia. However, projected further increases in the supply of wine grapes will lead to lower prices if demand does not increase at a similar rate.

While continued growth in the export market remains the big hope for the industry, the domestic market is also of major importance. Knowing if and when prices will fall depends on the consumer demand for wine, as well as for other beverages.

With increased competition from non-alcoholic beverages, spurred on by the growing awareness of the dangers of alcohol abuse, competition between beverages can be expected to intensify. The purpose of this paper has been to estimate the demand for alcoholic beverages (beer, wine and spirits) based on a systems approach (the LA/AIDS) in an attempt to understand the factors influencing demand for wine within Australia.

The main findings and implications are the following:

That the expenditure elasticity for wine is greater than unity implies that as total expenditure on alcohol increases (which is to be expected as income grows), wine consumption will also increase. Therefore, generation of wealth within Australian society from better government economic policy will benefit wine producers and marketers and should be supported;

That the demand for wine is confirmed to be price inelastic suggests that policies that attempt to deter alcohol consumption by, for example, increases in wine consumption taxes, may not be effective. This is so because consumers are now not very sensitive to changes in price (although they may have been more price sensitive in the past);

That wine consumers strongly follow past consumption patterns suggests that wine is more addictive than beer or spirits; and

That wine consumption has increased over time, together with the lagged consumption effect, means that opportunities exist for wineries to continue to expand sales into the domestic market.

Given the evidence suggesting that Australian society is becoming increasingly health conscious, the upward trend in wine consumption could be maintained by an education campaign focussing on the demonstrated health benefits of moderate red wine consumption.

Advertising and marketing activity could also make more of the growing trend of wine tourism and of the ageing of the population, with the associated change in tastes toward wine and away from beer.

Therefore, in addition to providing updated elasticity estimates for policy analysis, the demand model reported in this paper has the potential to be used to forecast future growth in wine consumption.

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