

## AN INTERNATIONAL COMPARISON OF PRICE AND INCOME ELASTICITIES FOR WINE CONSUMPTION

WALTER C. LABYS

*West Virginia University*

The scarcity of data on wine markets in different countries has prevented comparisons of international wine consumption patterns. Preliminary work on an econometric model of the international wine market by the author (1974), however, has shown that a rough comparison of consumption behaviour in selected nations is possible. Price elasticities have been estimated which can be used to predict wine industry sales and profits as well as to assess the impact of wine taxes on total tax revenues. Income elasticities have been estimated which can predict industry growth based on changes in the standard of living. In this study, price and income elasticities computed for several nations are compared to those found for Australia by Miller and Roberts (1972) and Taplin and Ryan (1969).

There are a number of problems associated with the calculation of wine and liquor elasticities based on time series data, as cited by Simon (1966):

1. Changes in taste in wine consumption occur frequently.
2. Changes in relative prices, relative income, price levels and other variables cause elasticities to vary over time.
3. Wine price series of reasonable quality and quantity are difficult to obtain.
4. Changes in wine prices have been infrequent, although this has been less true since the period beginning 1965.

Because the actual data series worked with did not suffer overbearingly from these problems, the estimation of consumption price and income elasticities was attempted. While methods of estimation suggested by Simon (1966) would be useful if more abundant data were available, especially on a cross-sectional basis, the present results have been obtained employing the conventional consumption elasticity model

$$\log C_t = E - E_1 \log P_t + E_2 \log PB_t + E_3 \log I_t + U_t$$

where wine consumption  $C_t$  and national income  $I_t$  are in per capita form. The wine price variable  $P_t$  and the beer price variable  $PB_t$  as well as  $I_t$  are appropriately deflated. The beer price variable has been included to represent the substitution effect appropriate to models of this type. Accordingly,  $E_1$  is the price elasticity of demand,  $E_2$  is the cross-price elasticity between wine consumption and beer prices, and  $E_3$  is the income elasticity of demand. The econometric relationship is completed with the addition of the stochastic error term  $U_t$ .

Quantity data available for France, Italy, Portugal, Spain, and F. R. Germany represent total wine consumption; for the U. S. they represent table wine moving into trade or distribution channels. Wine price data

for the European countries are in the form of current consumption series. U. S. wine prices are represented by two indices: the U. S. Department of Labor wholesale red wine price index and an imputed import value price index. Beer price data are available only for France. The competitive effect of beer consumption in other countries could be measured only in the form of quantity consumed.

The limitations encountered in estimating the required elasticities based on this data are several. First a consumption relation incorporating the competitive effects of beer could be suitably estimated only for France:

$$\log C_t = -0.0481 \log P_t - 0.0059 \log PB_t + 0.134 \log Y_t$$

(0.28)                      (1.94)                      (0.94)

$$R^2 = 0.92, DW = 1.87$$

Ordinary least squares estimation is employed for this and the remaining equations based on annual data spanning 1954-1971. Here the negative sign of the beer price coefficient implies a complementary rather than a substitution effect. With a 't' value of 1.77 required for significance at the 5% level, the remaining coefficients are not significant.

Second, experimentation with beer consumption variables did not yield meaningful results for other countries. The difficulty of including beer as a competitive variable in wine consumption equations has been confirmed by Farrell and Blauch (1964) as well as in a recent E. E. C. (1972) publication. Some of the theoretical problems of computing such substitution effects are discussed in Labys (1975). Thus, the elasticity estimates reported here do not include the effect of a competitive price variable.

Other shortcomings encountered result from the fact that the consumption variables represent aggregate wine quantities rather than quantities of a particular wine grade or type. In contrast, the price variables are in the form of an index, whose composition represents a substantial but not total portion of the wine type identified in the quantity data.

With this in mind, the regression results in Table 1 indicate an inelastic response to price in most countries, the exceptions being Italy and the imported price equation of the U.S. The elasticity of  $-0.062$  estimated for France can be compared to that of  $-0.06$  found by Fouquet (1973). For the U.S. the domestic price elasticity is  $-0.440$ , while the value reported by Farrell and Blauch (1964) is  $-0.6$  for an earlier period. When the estimates are compared to those of Miller and Roberts (1972) who suggest a value of  $-1.0$  to  $-3.2$  for table wine consumption in Australia, the implication is that Australia has a much higher elasticity of price response than does any of the other countries studied. While some of this effect may be due to the relatively high prices of wine in Australia, I would tentatively suggest that the lower value of  $-1.0$  is the more appropriate.

The income elasticity indicates how consumption will respond to changes in income, with consumption rising as income increases. Values of income elasticities found for most countries are below 0.28, the exceptions being 0.92 for F. R. Germany and 2.34 and 3.34 for the U. S. The income elasticity suggested for Australia by Taplin and

TABLE 1  
*Wine Elasticity and Consumption Levels for Selected Nations*  
 (1954-1971)

| Country                  | Price Elasticity <sup>a</sup> | Income Elasticity <sup>a</sup> | Percapita Wine Consumption (litres) |
|--------------------------|-------------------------------|--------------------------------|-------------------------------------|
| France                   | -0.062<br>(1.17)              | -0.148<br>(4.60)               | 120.7                               |
| Italy                    | -1.003<br>(3.37)              | 0.276<br>(3.84)                | 110.7                               |
| Portugal                 | -0.678<br>(1.65)              | 0.054<br>(0.32)                | 87.0                                |
| Spain                    | -0.366<br>(2.59)              | 0.143<br>(3.25)                | 60.4                                |
| F. R. Germany            | -0.379<br>(5.00)              | 0.508<br>(12.53)               | 13.7                                |
| U. S.:                   |                               |                                |                                     |
| (1) Domestic Price       | -0.440<br>(1.18)              | 2.345<br>(13.30)               | 3.7                                 |
| (2) Import Price         | -1.654<br>(4.32)              | 3.343<br>(12.06)               |                                     |
| Belgium <sup>b</sup>     | -1.142                        | 1.811                          | 8.2                                 |
| Netherlands <sup>b</sup> | —                             | 2.018                          | 1.5                                 |
| Australia                | -1.0 to -3.2 <sup>c</sup>     | 1.0 to 2.0 <sup>d</sup>        | 6.3                                 |

Source: W. C. Labys, 'Preliminary Results of an Econometric Model of the International Wine Market', Mimeographed, Graduate Institute of International Studies, Geneva, 1974.

<sup>a</sup> Values in parenthesis are 't' statistics. The value of 't' needed for significance at the 5% level with  $n - k = 18 - 3$  degrees of freedom is 1.75.

<sup>b</sup> From 'Effets du prix et du revenu sur la consommation des boissons dans les Etats membres des communautés, Collection Etudes No. 19, Commission des Communautés Europeennes, Brussels, 1972.

<sup>c</sup> From G. L. Miller and I. M. Roberts, 'The Effects of Price Change on Wine Sales in Australia,' *Quarterly Review of Agricultural Economics* 25 (1972), p. 238.

<sup>d</sup> From J. Taplin and W. Ryan, 'The Prospects for Wine in Australia,' *Quarterly Review of Agricultural Economics* 22 (1969), p. 201.

Ryan (1969) is in the range of 1.0 to 2.0. Based on these findings, a value closer to or in excess of 2.0 might be the more reasonable.

A further argument supporting this value can be based on the hypothesis of Taplin and Ryan (1969) that a generally inverse relationship exists between income elasticities and consumption levels for wines, as it does for other foods and beverages. Table 1 would confirm this view. France, Italy, Portugal and Spain with consumption levels of 120.7, 110.7, 87.0 and 60.4 litres/head respectively display income elasticities below 0.28. However, Belgium, the Netherlands and the U.S. with consumption levels of 8.2, 1.5 and 3.7 litres/head respectively, all have income elasticities above 1.8. Based on this relationship, Australia with a consumption of 6.3 litres/head and corresponding levels of per capita income is likely to have an income elasticity falling into this range.

Any attempt to infer values of price and income elasticities for Australian wine consumption based on international comparisons is at best only a stopgap measure until better evidence is available. It would be useful to have a more complete record of wine consumption statistics and prices so that econometric estimates at least of the partial type reported here can be made. There are also institutional factors influencing these elasticities which need to be explored. One is the con-

sequence of relatively high wine prices in Australia. Others relate to more complex factors such as national character, social class and occupational structure.

### References

- E. E. C., 'Effects du prix et du revenue sur la consommation des boissons dans les Etats membres des Communautés,' Collection Etudes No. 19, Commission des Communautés Europeennes, Brussels, 1972.
- Farrell, K. R., and O. P. Blaich, 'World Trade and the Impacts of Tariff Adjustments upon the U. S. Wine Industry,' Giannini Foundation Research Report No. 271, California Agr Agricultural Experiment Station, Berkeley, January 1964.
- Fouquet, A., 'Modeles de Projection de la Demande des Menages,' Les Collections de l'INSEE, Menages No. 22, Institut National de la Statistique et des Etudes Economiques, Paris, 1973.
- Labys, W. C., *Dynamic Commodity Models: Specification, Estimation and Simulation* Lexington, Mass.: D. C. Heath and Co., 1973.
- Labys, W. C., 'Preliminary Results of An Econometric Model of the International Wine Market,' Mimeographed, Graduate Institute of International Studies, Geneva, 1974.
- Miller, G. L., and I. M. Roberts, 'The Effect of Price Change on Wine Sales in Australia,' *Quarterly Review of Agricultural Economics* 25 (1972): 231-239.
- Simon, J. L., 'The Price Elasticity of Liquor in the U. S. and a Simple Method of Determination,' *Econometrica* 34 (1966): 193-205.
- Taplin, J. and W. Ryan, 'The Prospects for Wine in Australia,' *Quarterly Review of Agricultural Economics* 22 (1969): 197-209.