Table 1. Average in vitro shoot production from *Vitis* cultivars.

Vitis species and cultivars	No. apices[z]	Shoots/apex[y]
V. bourquiniana		
'Black Spanish'	50	3.2cdef
V. champini		
'Dog Ridge'	50	5.8a
V. rotundifolia		
'Carlos'	50	4.3bc
'Dixie'	30	2.2f
V. vinifera		
'Autumn Seedless'	50	2.7def
'Cabernet Sauvignon'	50	4.3bc
'Carignane'	50	2.5ef
'French Colombard'	50	4.6b
'Ruby Cabernet'	40	3.7bcde
'Tokay'	50	3.4bcdef
Eastern U.S. *Vitis* Hybrids		
'Blanc du Bois'	50	4.0bcd
'Himrod'	50	4.5b
'Niagara Seedless'	49	3.5bcdef

[z]Data combined from 2 consecutive 4-week culture cycles on C_2D medium with 5µM BA.
[y]Means within columns with the same letter are not significantly different at α= 0.01 according to Student-Newman-Keuls test.

champini 'Dog Ridge', a useful nematode-resistant rootstock variety, produced longer shoots and the most shoots per apex (5.8). *V. rotundifolia* 'Dixie', a muscadine variety that developed long stems and large leaves, had the fewest shoots per apex (2.2), but was statistically indistinguishable from six other varieties. However, in an earlier in vitro shoot proliferation study, 'Dixie' produced more multiple shoots (4.0 shoots per apex) over 2 and 3 culture periods (Gray and Fisher,1985), suggesting that additional culture cycles might be responsible for the increased shoot proliferation rate. Lee and Wetzstein (1990) reported that the rate of muscadine shoot proliferation was slow during culture establishment for the first 8 weeks, regardless of BA levels, but later shoots increased rapidly.

Both axillary bud and apical meristem explant sources were compared for 6 *Vitis* cultivars. Laterals and apices did not differ in their ability to produce shoots (data not shown). However, in micropropagation, apices are preferable material from which to initiate disease-free grape cultures. For example, apical meristems are useful in the exclusion of endemic *Agrobacterium tumefaciens* in bunch grape cultivars (Burr et al.,1988) and Pierce's disease in muscadine stock plants (Robacker and Chang,1992).

When we compared shoot proliferation rates between 2 consecutive 4-week culture cycles, we found that significantly more shoots were produced in the second cycle. In the first cycle, 3.4 shoots per apex ($\underline{n}$ = 334) were produced, whereas, in the second cycle, 4.0 shoots per apex ($\underline{n}$ = 335) were produced. One possible explanation for increased shoot proliferation lies in the culture transfer history. Since initiation in Jan. 1992, most of the cultures had been transferred to fresh C_2D medium at 1-month intervals. At the time of this experiment, however, a few cultures were rescued for the first time in 5 months. Therefore, the increase in shoot production between the first and second culture intervals may have been due to these cultures overcoming the growth lag associated with inadequate transfers. Selection of uniformly aged and consistently transferred cultures might ensure consistent shoot proliferation rates in grape micropropagation.

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CONSUMER DEMAND FOR ALCOHOLIC BEVERAGES IN FLORIDA: CONSEQUENCE OF A CHECKOFF PROGRAM

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Abstract. **A consumer demand study using the Almost Ideal Demand System (AIDS) model showed that demand for wine, beer, and spirits in Florida is price inelastic and unitary elastic for income. That is, any price increase following the introduction of a checkoff program will reduce per capita consumption at a lesser percentage, but an increase in personal income will increase consumption proportionately.**

A checkoff program for wine can be viewed as a unit tax on each gallon of wine sold. As a result, it can be assumed that the consumer's demand curve will shift downward, resulting in higher prices and lower consumption. The tax burden will be shared between consumers, retailers, and distributors, depending on the nature of the demand elasticities. If consumer demand for alcoholic beverages is inelastic, the decline in per capita consumption as a result of the price increase will be less then proportionate. Conversely, if demand for alcoholic beverages is elastic, then any increase in price will result in a greater percentage decline in per capita consumption.

Recent events have given rise to concern that an increase in wine prices will have an adverse effect on market demand for alcoholic beverages in Florida. The concern was brought about by the recent decline in per capita consumption for wine and spirits and the relatively high excise tax on alcoholic beverages in the state.

The objective of the study was to estimate price and income elasticities using the Almost Ideal Demand System (AIDS) model and use them to determine the impact of price and income on per capita consumption of wine, beer, and spirits.

The double log single-equation model is commonly used to estimate demand elasticities because of ease of estimation, superior fit, and ease of interpretation of the parameters (Adrian and Ferguson, 1987; Godfrey, 1988; McGuiness, 1983; Uri, 1986). However, it does not fulfill the Engel aggregation and integrability condition and therefore cannot be deduced to have been derived from the maximization of a utility function (Johnson et al., 1984). Recent studies, however, have focused on system-wide approaches such as the Workings model (Clements and Selvanathan, 1987), Synthetic model (Gao et al., 1992), AIDS model (Heien and Pompelli, 1991), and Rotterdam model (Selvanathan, 1989).

The AIDS and Rotterdam models are the two most widely used consumer demand models in the system-wide approach. They are derived from the utility and cost functions and are able to accommodate restrictions and conditions imposed by demand theory, provide first order approximation to any demand system, permit exact aggregation over consumers, have a functional form which is consistent with previous household budget data, and are easy to estimate in their linear approximate form (Blanciforti and Green, 1983; Clements, 1987; Deaton and Muellbauer, 1980). The use of the AIDS model in this study was strictly arbitrary, because both the AIDS and the Rotterdam models are locally flexible and compatible with demand theory.

The estimable form of the AIDS model has several variations. The model could be estimated directly in its original form (absolute version) (Hayes et al., 1991) or more commonly in first difference form (Deaton and Muellbauer, 1980; Alston and Chalfant, 1993; Wahl et al., 1992). The use of first difference has the influence of reducing first order autocorrelation in the model and helps to improve the quality of the estimated parameters. The Full Information Maximum Likelihood approach (FIML) and the Three Stage Least Squares (3SLS) are the two most commonly used techniques to estimate the structural parameters of the models (Eales and Unnevehr, 1992; Wahl et al., 1992).

Materials and Methods

Data. Price, consumption, and expenditure data for wine, beer, and spirits from 1970 to 1992 were obtained from Jobson Wine Handbook, Beer Almanac, and Jobson Liquor Handbook, respectively.

Model Specification. A three-equation model with three endogenous and four exogenous variables was formulated based on the almost ideal demand system (AIDS) model developed by Deaton and Muellbauer (1980). Consumer demand for alcoholic beverages in Florida was expressed as budget shares:

$$W_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \operatorname{Ln} P_j + \beta_i \operatorname{Ln} (X/P)$$

where:

$W_i = P_i Q_i / X$,
P_j = the price of the jth beverage,
Q_i = is the per capita consumption of the ith beverage, and
X/P = is the real expenditure on alcoholic beverages.

The price index P is defined as follows:

$$P = \operatorname{Ln} P = \sum_{i=1}^{n} W_i \operatorname{Ln} P_i$$

The estimable form of the AIDS model is shown below:

$$\Delta W_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \Delta \operatorname{Ln} P_j + \beta_i \Delta \operatorname{Ln} (X/P)$$

Where

$W_i = P_i Q_i / X$
$\Delta W_i = W_{it} - W_{it-1}$
$\Delta P_j = P_{jt} - P_{jt-1}$
$\Delta(X/P) = (X_t - X_{t-1})/(P_t - p_{t-1})$

The following restrictions were imposed on the model:

Adding up	$\sum_{i=1}^{n} \alpha = 1, \ \sum_{i=1}^{n} \gamma_{ij} = 0, \ \sum_{i=1}^{n} \beta_i = 0 \ (i=1, \dots, n)$
Homogeneity	$\sum_{j=1}^{n} \gamma_{ij} = 0$
Symmetry	$\gamma_{ij} = \gamma_{ji} \ (i \neq j)$

The uncompensated elasticities (Marshallian) and compensated elasticities (Hicksian) for price and income were computed from the restricted structural parameters as shown below.

Uncompensated own-price elasticity	$\varepsilon_{ii} = -1 + \gamma_{ii}/W_i - \beta_i$
Uncompensated cross-price elasticity	$\varepsilon_{ij} = (\gamma_{ij} - \beta_i * W_j)/W_i$
Compensated own-price elasticity	$e_{ii} = -1 + \gamma_{ii}/W_i + W_i$
Compensated cross-price elasticity	$e_{ij} = \gamma_{ij}/ W_i + W_j$
Income elasticity	$\eta_i = 1 + \beta_i / W_i$

Results and Discussion

Details of the structural parameters of the AIDS model with restrictions imposed are shown in Table 1. No significant autocorrelation was found in the model.

The compensated (Hicksian) elasticities will be used to discuss the impact of the checkoff program on consumer demand for alcoholic beverages (Table 2). Some of the estimated price and income elasticities for Florida are the same or close to those estimated for the U.S. and provide the results with an increased level of confidence (Table 3).

The estimated own-price elasticities of -0.88, -0.52 and -0.52 for wine, beer, and spirits, respectively, show that consumer demand for alcoholic beverages in Florida is price inelastic. That is, a 1% increase in price for any of the alcoholic

Table 1. Restricted parameter estimates of AIDS model with homogeneity and symmetry imposed.

Beverage/ equation	Coefficient				
	α_i	γ_{i1}	γ_{i2}	γ_{i3}	β_i
Wine	0.0933	0.0015	0.0018	-0.0032	0.0003
	(21.66)*	(0.61)	(0.63)	(-1.78)	(0.22)
Beer	0.2056	0.0018	0.0118	0.0135	0.0022
	(31.50)*	(0.63)	(2.8)*	(-4.87)*	(1.06)
Spirits	0.7011	-0.0032	-0.0135	0.0167	-0.0026
	(105.94)*	(-1.78)	(-4.87)*	(5.51)*	(-1.11)

Figures in parentheses are t values;
* Significant at least at the 0.05 level.

beverages will result in a less than proportionate decrease in per capita consumption of the respective beverages. The cross-price elasticities between the alcoholic beverages show that they are substitutes for each other. A checkoff program of 5 cents per gallon for wine (or a price increase of 0.19% for wine) will result in 0.176% decrease in per capita consumption of wine, and a 0.104% increase in the per capita consumption of beer and spirits (holding all other factors constant).

The estimated income elasticities for wine, beer, and spirits are near unitary elastic. That is, as income increases, consumption of alcoholic beverages in Florida will increase proportionately. Because the estimated income elasticities are larger than the own-price elasticities, increase in the consumer demand for alcoholic beverages in Florida will come from the increase in disposable income rather than a decline in the price of alcoholic beverages.

Table 2. Price and income elasticities for alcoholic beverages in Florida with symmetry and homogeneity imposed.

Beverage	Price/Income	Uncompensated elasticity	Compensated elasticity
Wine	Wine	-0.986	-0.882
	Beer	0.016	0.468
	Spirits	-0.032	0.415
	Income	1.003	1.003
Beer	Wine	0.004	0.107'
	Beer	-0.976	-0.523
	Spirits	-0.032	0.416
	Income	1.005	1.005
Spirits	Wine	-0.007	0.096
	Beer	-0.028	0.420
	Spirits	-0.960	-0.516
	Income	0.994	0.994

Note: Elasticity computed at the means.

The results of a consumer study using the AIDS model show that consumer demand for wine, beer, and spirits in Florida is price inelastic. A checkoff program for wine in Florida within the range of five to ten cents per gallon is not likely to have any adverse impact on per capita consumption of wine or any of the other alcoholic beverages in the state. In fact, if annual income increases, as expected, then the increase in demand will offset the decrease in consumer demand as a result of any price increase. Revenue from the checkoff program could be used to expand the research base and promotional activities for Florida grapes and wines. Several wine producing states have a checkoff program without experiencing any adverse decline in the demand for alcoholic beverages.

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Table 3. A comparison of price and income elasticities for wine, beer, and spirits with selected studies.

Study	Model period	Income elasticities			Own price elasticities		
		Wine	Beer	Spirits	Wine	Beer	Spirits
Clements & Selvanathan (1987	Working's (U.S.) 1949-82	0.46	0.75	1.34	-0.22	-0.09	-0.10
Selvanathan (1988)	Rotterdam (U.S.) 1949-82	0.63	0.71	1.36	-0.05	-0.11	-0.11
Heien & Pompelli (1991)	AIDS (U.S.) 1977	2.10	1.94	2.66	-0.55	-0.84	-0.5
Gao et al. (1992)	Synthetic (U.S.) 1987-88	1.00	1.01	0.99	-0.83	-0.85	-0.95
Leong & Wang (1994)	AIDS (FL) 1970-92	1.00	1.01	0.99	-0.88'	-0.52	-0.52