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GENERIC ADVERTISING IMPACT ON DEMAND FOR ORANGE JUICE

BY

Mark G. Brown

Senior Research Economist

FLORIDA DEPARTMENT OF CITRUS

Economic and Market Research Department

P.O. Box 110249

Gainesville, Florida 32611-2049 USA

Phone: 352-392-1874

Fax: 352-392-8634

Email: mgbrown@ufl.edu

www.floridajuice.com

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Executive Summary

Many factors impact the sales of orange juice (OJ), as well as grapefruit juice(GJ), and the analysis in this study is based on a statistical model that attempts to estimate the impacts of some of the important factors. OJ and GJ gallon sales were related to OJ and GJ media advertising by the Florida Department of Citrus (FDOC) and the major brands, OJ and GJ prices, OJ and GJ store promotions, seasonality variables, consumer income and a time trend variable. The impact of each of these variables was estimated by applying the ordinary least squares method to data from 1997 to 2000. Data on all factors that may impact demand were not available. Due to lack of data, some potentially important variables have not been included in the analysis, e.g., prices and advertising/promotion levels of other beverages, including other 100% juices and less than 100% juice drinks. Omission of these variables and perhaps other unidentified factors could affect the results. Nevertheless, the present analysis does account for many of the basic factors impacting demand and the results are encouraging with respect to a relatively strong FDOC advertising impact on OJ demand.

FDOC generic advertising on OJ was found to significantly increase retail volume sales of 100% OJ products. In contrast, the results of this study suggest that brand OJ advertising did not expand overall OJ volume sales. The brand OJ advertising variable studied included brand advertising on OJ blends, and the impact of this variable on OJ volume sales, which excludes sales of OJ blends, may be reflecting possible substitution of OJ blends for 100% OJ product. The impact of OJ brand advertising may also be indicating substitution of other branded juice products for OJ (based on limited data, brand OJ advertising was positively correlated with brand advertising on other juices). The present results also suggest aggregate FDOC and brand advertising on OJ may have reduced GJ retail volume sales, by apparently causing some GJ consumers to switch to OJ.

This study's FDOC generic advertising impact estimates are consistent with past research findings. The present study suggests generic advertising may have increased OJ demand by about 5% per year over the late 1997 to 2000 period. Past studies found that generic advertising may have increased demand by 3% to 7% per year.

Assuming advertising increases demand by 3% to 7%, grower returns are estimated at $1.30 to $5.90 for each FDOC dollar spent on OJ advertising, depending on the extend OJ prices increase in response to the increased demand resulting from advertising.

Introduction

This study examines the impact of FDOC generic advertising on OJ gallons sales in ACNielsen retail outlets. The impact of brand advertising on sales of OJ is also analyzed. The OJ brand advertising studied is the aggregate advertising by Tropicana, Minute Maid and Florida's

Natural (these are the three major OJ brands which account for about 58% of the OJ volume sales in the retail outlets studied). The focus is on the impact of OJ advertising, but the impact of FDOC generic GJ advertising on ACNielsen GJ gallons sales is also considered. GJ brand advertising by Tropicana, Ocean Spray and Florida's Natural (these are the three major GJ brands which account for about 49% of the GJ volume sales in the retail outlets studied) is included in this part of the analysis. The analysis is based on estimated demand equations that relate retail OJ or GJ gallon sales to generic and brand advertising expenditures, the prices of OJ and GJ, store promotions, consumer income, inflation, population and a time trend variable. The equations were estimated using ACNielsen data for grocery store chains doing at least $2 million annual business plus super centers, and advertising expenditure data provided by Competitive Media Reporting (CMR). The ACNielsen data are on a weekly basis and include dollar and gallon sales for OJ and GJ; prices for OJ and GJ were derived by dividing dollar sales by gallon sales. U.S. Department of Commerce data on the U.S. population, U.S. disposable income, and the consumer price index (CPI) were also used in constructing some of the variables analyzed (gallon sales were transformed to per capita levels; prices were deflated by the CPI; and disposable income was transformed to per capita income and deflated by the CPI) . The CMR advertising data are quarterly expenditures for media advertising. These data were deflated by a media cost index provided by the Richards Group. The quarterly advertising data were combined with the weekly ACNielsen data by repeating the quarterly advertising levels for each week in a given a quarter. The period from week ending September, 1997 through December 2000 was studied (173 weekly observations).

The ACNielsen data studied cover about 50% to 55% of the total U.S. OJ market. Based on the present and past analyses of ACNielsen data, the impact of FDOC advertising in the overall U.S. market and on Florida grower returns is also examined. The estimated advertising impact on the ACNielsen sales is assumed to apply to remaining non-ACNielsen sales. Three scenarios are examined with respect to the impact of FDOC generic OJ advertising. Advertising is assumed to increase demand by 3%, 5% and 7% , with prices constant. These scenarios are based on the present study and studies conducted in the second half of the 1990s by the FDOC, Economic Research Department (staff reports SR-98-03 and SR-98-04, and an article entitled "Health and Nutrition Advertising Impacts on the Demand for OJ in Fifty Metropolitan Regions," by M. Brown and J. Lee in the *Journal of Food Products Marketing,* Vol. 5, 1999).

Media Advertising

Table 1 shows CMR media advertising for OJ and GJ over the five-year period from 1996 through 2000. Brand OJ advertising by the three major brands accounted for 76% of aggregate OJ advertising by these brands and the FDOC, with FDOC advertising accounting for 24%. Brand GJ advertising by the three major brands accounted for 71% of aggregate GJ advertising by these brands and the FDOC, with FDOC advertising accounting for 29%.

Model Specification

A linear demand equation was used in the analysis. Formally, the model can be written as

$$(1) \quad q_t = \alpha_0 + \alpha_1 * p_{1t} + \alpha_2 * p_{2t} + \alpha_3 * inc_t + \alpha_4 * t + \alpha_5 * dis_{1t} + \alpha_6 * dis_{2t} + \alpha_7 * s_{1t} + \alpha_8 * s_{2t} + \alpha_9 * s_{3t},$$

where subscript t stands for time (week); q_t is per capita OJ or GJ gallon sales; p_{1t} and p_{2t} are CPI deflated prices for OJ and GJ respectively; x_t is CPI deflated per capita income; dis_{1t} and dis_{2t} are percentages of all commodity sales with in-store displays accompanied by newspaper ads for OJ and GJ, respectively; s_{1t} , s_{2t}, and s_{3t} are advertising stock variables for FDOC advertising, brand advertising and competitive advertising, respectively; and the α's are parameters to be estimated. For the OJ demand equation, the FDOC and brand advertising variables are for OJ, while competitive advertising is aggregate FDOC and brand advertising for GJ. For the GJ demand equation, FDOC and brand advertising are for GJ, while competitive advertising is aggregate FDOC and brand advertising for OJ.

The advertising variables can be thought of as psychological stocks of past and present advertising. Over time advertising messages wear off and are assumed to be subject to a decay factor (λ) which indicates how much advertising is remembered and remains effective. Formally, the advertising stock variables are defined by

$$(2) \quad s_{i\,t} = ad_{i\,t} + \lambda\, s_{i\,t-1}$$

or, by recursively substituting for $s_{i\,t-1}$ in equation (1),

$$(3) \quad s_{i\,t} = \lambda^t s0_i + s1_i, \quad i=1, 2, 3,$$

where ad_{it} is advertising of type i (FDOC, brand or competitive) in week t; the decay factor $\lambda = .95$ based on previous studies; $s0_i$ is the stock of advertising existing in the week before the first sample observation in 1997; and $s1_i = \sum_{j=0 \text{ to } t-1} \lambda^j ad_{i\,t-j}$ (see "Health and Nutrition Advertising Impacts on the Demand for OJ in Fifty Metropolitan Regions," by M. Brown and J. Lee in the *Journal of Food Products Marketing,* vol. 5, 1999). Note that the stock of advertising is composed of (1) the surviving pre-sample stock, $\lambda^t s0_i$, and (2) the surviving advertising created during the sample period, $s1_i$.

Substituting expression (3) into equation (1) results in

$$(4) \quad q_t = \alpha_0 + \alpha_1 * p_{1t} + \alpha_2 * p_{2t} + \alpha_3 * inc_t + \alpha_4 * t + \alpha_5 * dis_{1t} + \alpha_6 * dis_{2t} + \alpha_7 * s1_{1t} + \alpha_8 * s1_{2t} + \alpha_9 * s1_{3t} + \alpha_{10}\, \lambda^t,$$

where $\alpha_{10} = s0_1 + s0_2 + s0_3$.

In addition to being dependent on the variables on the-right-hand-side of equation (4), OJ and GJ gallon sales are also dependent on season of the year. Two approaches were used to allow for

these demand changes. First, we allowed the intercept α_0 to vary by week by adding 51 weekly dummy variables to equation (4). The other approach was by 52 nd differencing the data for the 52 weeks in a year.

Model Estimates

Equation (4) was estimated by ordinary least squares. Based on the F test, some of the variables explaining OJ demand were not statistically different from zero at any reasonable level of significance and were omitted from the model. These variables were the time-trend, the price of GJ, and the OJ and GJ display-with-newspaper-advertising variables.

The estimates of equation (4) for OJ and GJ are shown in Tables 2 and 3, respectively. For each juice (OJ or GJ), the results for the levels and difference versions of model (4) are similar. First, for OJ, all parameter estimates were statistically significant, except that for GJ advertising (generic and brand) in the difference model. The parameter estimates for the price of OJ were negative and consistent with the law of demand. The income parameter estimates were positive. OJ brand advertising and GJ advertising had negative impacts on OJ gallon sales. The brand OJ advertising variable studied included brand advertising on OJ blends and was also positively correlated with brand advertising on other juices, so that the negative impact of the brand advertising variable on OJ sales, which excludes sales on OJ blends, may be indicating substitution of OJ blends and other branded juice for 100% OJ product.

FDOC advertising on OJ had a positive impact on OJ gallons sales. Based on sample mean values, FDOC advertising on OJ increases per capita OJ gallon sales by an estimated 4.8% based on the levels model and 5.7% based on the difference model. These estimates support advertising impact estimates made by the FDOC in the latter part of the 1990s. In these earlier studies, the advertising impact on volume sales ranged from about 3% to 7%, although a study in 1995 found a low impact of 1.5% (Brown et al, "The Impact of Generic Advertising and the Free Rider Problem: A Look at the U.S. Orange Juice Market and Imports," *Agribusiness*, Vol. 12, 1996). The 3% to 7% advertising impact range is used in the next section to analyze grower returns.

For GJ, all parameter estimates were statistically significant, except those for income, the FDOC advertising variable and the GJ (OJ) display-advertising variables in the levels (difference) model. The parameter estimates for the price of GJ were negative and consistent with the law of demand, while the parameter estimates for the price of OJ were positive indicating a substitute relationship. As intended, the GJ display-advertising variable positively impacts GJ demand. The OJ display-advertising and aggregate FDOC-brand OJ advertising variables negatively impact GJ demand, suggesting that OJ advertising may be causing some GJ consumers to switch to OJ [1]. Brand

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[1] Advertisements featuring both OJ and GJ may alleviate this switching problem. The relatively low level of GJ advertising compared to that for OJ may be contributing to this problem. Over the study period, GJ advertising expenditures represented about 15% of the OJ

GJ advertising also negatively impacts GJ demand. At sample mean values, aggregate FDOC-brand OJ advertising decreases per capita GJ gallon sales by an estimated 8% to 9%.

Extension and Grower Returns

Over the last decade, the U.S. and the world have experienced strong growth in the OJ supplies. If demand had been constant over this time period, this supply growth by itself would have likely resulted in much lower OJ prices than have actually occurred. However, based on the results of the previous section, this growth in supply appears to have been partially offset by advertising-induced demand growth which has helped support prices.

Normally, if the percentage growth in supply is offset by the same percentage growth in demand, prices will be unchanged [2]. If supply grows faster than demand, prices will tend to decline, and vice versa. An estimate of the percentage change in price due to a change in supply, with demand constant, is the percentage change in supply times the inverse of the price elasticity of demand. The price elasticity of demand at the retail level (percentage change in quantity demanded as a result of a one percent change in retail price) has been estimated at about -3/4. Hence, the inverse of the price elasticity of demand at the retail level is -4/3. The elasticity at the grower level tends to be lower (in absolute value) than that at the retail level, so that the inverse of the price elasticity of demand at the grower level is likely to be greater than -4/3 (this result holds to the extent that the retail and grower level demands have the same quantity-price slopes).

The demand for OJ at both the retail and delivered-in levels can be described as inelastic, i.e., the percentage change in price is greater than the percentage change in quantity, other factors constant. The demand at the delivered-in level would be relatively more inelastic than the retail demand. A property of inelastic demands is that price and revenue (price times quantity) move in the same direction, e.g., as price increases, for given quantity decreases, revenue increases. We will

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advertising expenditures (Table1).

[2] Let the demand function for OJ be denoted by $q = q(p, a, z)$ where q and p are the quantity and price of OJ, respectively; a is advertising; and z stands for other factors. We assume supply equals demand so that q represents both quantity demanded and supplied. Totally differentiating this function, we find $dq = \partial q/\partial p\ dp + \partial q/\partial a\ da + \partial q/\partial z\ dz$, where dq, dp, da and dz are changes in variables q, p, a and z, respectively. Dividing both sides of this result by q and multiplying each variable change by one in the form of the ratio of the variable level to itself, find $dq/q = (\partial q/\partial p)(p/q)\ dp/p + (\partial q/\partial a)(a/q)\ da/a + (\partial q/\partial z)(z/q)\ dz/z$, or $Dq = \epsilon_p Dp + \epsilon_a Da + \epsilon_z Dz$, where $Dq = dq/q$, $Dp = dp/p$, $Da = da/a$ and $Dz = dz/z$ (percentage changes); $\epsilon_p = (\partial q/\partial p)(p/q)$, the price elasticity of demand; $\epsilon_a = (\partial q/\partial a)(a/q)$, the advertising elasticity of demand; and $\epsilon_z = (\partial q/\partial z)(z/q)$, the elasticity of demand with respect to z. Rearranging the latter result find $Dp = (Dq - \epsilon_a Da - \epsilon_z Dz)/\epsilon_p$. The term $\epsilon_a Da + \epsilon_z Dz$ represents the growth in demand. Hence if this term equals the change in supply Dq, the change in price will be zero.

use this result below.

In the 1989-90 freeze season, the average delivered-in price for OJ was relatively high at $1.54 per pounds solids (PS), with Florida OJ production being relatively low at 542 million single strength equivalent (SSE) gallons. In the next three seasons, the price decreased to under $1.00/PS, with Florida OJ production more than doubling. Since the 1992-93 season, Florida OJ production and consumption in the U.S. market have continued to experience strong growth, while prices have been more stable ranging from roughly $.80/PS to $1.00/PS. From 1992-93 to 2000-01, U.S. OJ consumption is expected to increase by about 28%, while the delivered-in price is expected to decrease by about 3% (Table 4; Figure 1). If demand were constant, this 28% growth in volume would have been expected to result in more than a 28% decline in the delivered-in price, based on the above price elasticity of demand estimates. The relatively small decline in the OJ price suggests that demand has not been constant and actually increased. Some factors that may have resulted in demand growth are increases in the U.S. population, consumer income and prices of substitutes. From 1992-93 to 2000-01, population grew by about 8% and may have increased OJ demand by a similar percentage. Income also experienced strong growth, but many of our estimates of OJ demand suggest that income is a small or insignificant factor in explaining aggregate OJ demand, although the present study suggests that income may be a more significant factor. The prices of other products, including prices for other juices and beverages, are also factors that may have increased OJ demand (increases in substitute prices tend to result in an increase in OJ demand which may be reflected in part by higher OJ prices). Data are incomplete and probably not rich enough in variation to determine the vast array of possible substitutes and complementary relationships, but changes in the prices of other products may partially explain the apparent growth in OJ demand. (Inflation might be considered as an overall measure of other prices but does not necessarily indicate specific product price changes that may impact OJ demand.) The last factor that we consider is advertising. Our demand estimates suggest that advertising could be increasing demand in some years by 3% or more. If we assume demand growth due to advertising has averaged 3% per year, the growth in demand due to this factor would be about 24% over the eight year period from1992-93 to 2000-01. Such growth in OJ demand would help explain why prices of OJ have not decreased more than they have in face of 28% growth in consumption. Tables 5 and 6 provide supporting data for the OJ volumes in Table 4. Table 5 provides estimates of the amount of OJ from Florida that has been consumed in the U.S. (expected to be in 2000-01). In 2000-01, Florida OJ is expected to account for about 88% of the OJ consumed in the U.S. Table 6 shows that aggregate Florida and Brazil OJ supplies have also experienced strong growth over the last decade.

What would be the impact on grower revenue if advertising had not occurred over the last decade? Tables 7 through 9 show some scenarios addressing this question. The second column of Table 7 repeats the U.S. presumed consumption estimates of Florida OJ with advertising as it actually occurred in the last decade (see Tables 4 and 5), while the next three columns show assumed consumption levels without advertising. The without-advertising levels in columns three through five are 3%, 5% and 7% less than the with-advertising level in column two. Table 8 translates the volumes in Table 7 into grower delivered-in dollars; the last column in this table shows the grower delivered-in prices used. The differences in the with-advertising revenues and the without-

advertising revenues are show in Table 9. This table also shows the FDOC expenditures on OJ advertising in the U.S. market and the benefit-cost ratios (the differences or gains in revenue due to advertising divided by the FDOC advertising expenditures) for the different scenarios. These benefit-cost ratio estimates range from 1.1 to 4.0 over the 1990-91 to 2000-01 period, suggesting that advertising has been effective in supporting grower returns.

The above benefit-cost estimates are low estimates. Recall that for each season, these cost-benefit estimates are based on volume increases and constant prices. The constant price assumption implies that the supply of OJ is perfectly elastic at the price in question, i.e., any amount of OJ will be supplied to the market at this price. However, the volume required to meet an advertising-induced increase in demand may be more than will be supplied at a constant price, i.e., demand is greater than supply at the price in question. In this case, supply would not be perfectly elastic but would normally be upward sloping, i.e., more OJ would be supplied only if price increases. To the extent supply is upward sloping, factors like advertising that shift demand may also impact prices. This situation would tend to result in higher U.S. OJ prices and reallocation of OJ across world markets --- the higher U.S. prices would be expected to draw OJ from elsewhere in the world to the U.S. which would dampen the initial increase in the U.S. price (see M. Brown et al., "The Impact Generic Advertising and the Free Rider Problem: A Look at the U.S. OJ Market and Imports," *Agribusiness*, Vol. 12, 1996). As previously noted, when demand is inelastic, an increase in price results in an increase in revenue, so if advertising increases price, growers can expect to receive more revenue and the benefit-cost ratio will be higher than in the constant price scenarios.

Table 10 shows estimates of benefit-cost ratios for the 2000-01 season under the assumption that volumes are constant and prices change. We estimate that the delivered-in price would decrease by $.05/gallon, $.08/gallon and $.11/gallon, for the without-advertising demand decreases of 3%, 5% and 7%, respectively. The corresponding benefit-cost ratios range from 2.7 to 5.9 which are much higher than the benefit-cost ratios under the constant price assumption which range from 1.3 to 3.1. For the situations in Table 10, advertising would probably result in both volume and price increases. As the table shows, for the constant price situation, inventories would increase to record high levels with the assumed volume decreases without advertising. As inventories tended to accumulate, prices would tend to fall. The final results for the without- advertising situations would likely be decreases in volumes and decreases in prices. For this case, the benefit-cost ratios would be expected to be somewhere between the constant price benefit-cost ratio estimates and the constant volume benefit-cost ratio estimates, assuming demand is inelastic.

Table 1. OJ and GJ Media Advertising Expenditures (CMR), 1996 through 2000.

	OJ		GJ	
	$1000	% Total	$1000	% Total
3 Major Brands	317900	76%	44304	71%
FDOC	98298	24%	18095	29%
Total	416198	100%	62399	100%

Table 2. Per Capita OJ Demand Estimates, Based on ACNielsen Data for Stores Doing $2 Million Sales Plus Super Centers.

	Model	
	Levels	Difference
Variable	Parameter Estimate	
OJ Price	-1.78E-02 *	-1.65E-02 *
Income	6.23E-04 *	5.91E-04 *
FDOC OJ Adv.	4.58E-08 *	5.45E-08 *
Brand OJ Adv.	-1.59E-08 *	-1.47E-08 *
FDOC+ Brand GJ Adv.	-2.90E-08 *	-2.27E-08
Pre-Sample Adv.	5.89E-03 *	6.52E-03 *
R-square	0.941	0.516

FDOC Advertising Impact Estimates

			Row
FDOC OJ Adv. Parameter	4.58E-08	5.45E-08	(1)
FDOC OJ Avg. Stock	6.31E+04	6.31E+04	(2)
Weekly Est. Ga. Sales Due to FDOC	2.89E-03	3.44E-03	(3)=(1)*(2)
Weekly Per Capita Ga. Sales	6.00E-02	6.00E-02	(4)
% Increase in Ga. Sales Due to FDOC	4.8%	5.7%	(5)=(4)/(3)

Note: (1) * indicates parameter is statistically different than zero at the .10 level.
(2) parameter estimates for the intercept and seasonal dummy variables are omitted for convenience.

Table 3. Per Capita GJ Demand Estimates, Based on ACNielsen Data for Stores Doing $2 Million Sales Plus Super Centers.

	Model	
	Levels	**Difference**
	Parameter Estimate	
Time	-3.67E-06 *	-3.76E-04 *
OJ Price	1.25E-03 *	1.43E-03 *
GJ Price	-3.35E-03 *	-2.67E-03 *
Income	1.75E-05	3.42E-05 *
FDOC+ Brand OJ Adv.	-1.05E-09 *	-1.19E-09 *
FDOC GJ	-9.83E-09	6.04E-09
Brand GJ	-4.68E-09 *	-2.74E-09 *
Pre-Sample Adv.	-1.15E-03 *	-1.22E-03 *
OJ Displays-Ads	-1.55E-05 *	-9.37E-06
GJ Displays-Ads	6.37E-06	1.35E-05 *
R-square	0.967	0.941

FDOC OJ Advertising Impact Estimates

			Row
FDOC+Brand OJ Adv. Parameter	-1.05E-09	-1.19E-09	(1)
FDOC+ Brand OJ Avg Stock	2.98E+05	2.98E+05	(2)
Weekly Est. Ga. Sales Due to FDOC	-3.13E-04	-3.54E-04	(3)=(1)*(2)
Weekly Per Capita Ga. Sales	3.73E-03	3.73E-03	(4)
% Increase in Ga. Sales Due to FDOC	-8.4%	-9.5%	(5)=(4)/(3)

Note: (1) * indicates parameter is statistically different than zero at the .10 level.
(2) parameter estimates for the intercept and seasonal dummy variables are omitted for convenience.

Table 4. Florida Grower OJ Prices Versus Supplies.

Season	Est. Fl. Del.-In Price (a)		U.S. OJ Consumption (b)	Fl. OJ Sold in U.S. (c)	Fl. Share of U.S. Mkt.
	$/PS	$/SSE ga.	Mil. SSE Ga.		%
90-91	1.25	1.29	1100	948	86%
91-92	1.18	1.21	1126	935	83%
92-93	0.82	0.84	1286	1086	84%
93-94	0.92	0.94	1381	1122	81%
94-95	0.89	0.91	1382	1220	88%
95-96	1.02	1.04	1374	1256	91%
96-97	0.83	0.85	1435	1295	90%
97-98	0.84	0.86	1597	1414	89%
98-99p	0.95	0.98	1549	1346	87%
99-00e	0.86	0.88	1602	1350	84%
00-01e	0.79	0.81	1648	1456	88%
% Chg 92-93---00-01	-3%	-3%	28%	34%	5%

(a) USDA, NASS, "Citrus Fruits,……," various issues.
(b) FDOC, Economic Research Department estimates.
(c) FDOC, Economic Research Department estimates; see Table 5.

Table 5. Estimated Florida OJ Consumed in the U.S.

Season	(1) Fl. OJ Beg. Inv. (a)	(2) Fl. OJ Prod. (b)	(3) Fl. OJ Imports (c)	(4) OJ Exports U.S. (c)	(5)= .806*(4) OJ Exports Fl. (d)	(6) Fl. OJ Beg. End (a)	(7) = (1)+(2)+(3) -(5)-(6) Fl. OJ Cons. in U.S.	(8)
				Million SSE Gallons				% Chg.
90-91	280	841	186	94	76	283	948	
91-92	283	811	190	107	86	263	935	-1.4%
92-93	263	1131	165	117	94	379	1086	16.2%
93-94	379	1057	215	110	89	439	1122	3.3%
94-95	439	1206	99	142	114	410	1220	8.7%
95-96	410	1213	131	128	103	395	1256	2.9%
96-97	395	1388	178	148	119	546	1295	3.2%
97-98	546	1487	128	145	117	630	1414	9.1%
98-99	630	1156	189	145	117	512	1346	-4.8%
99-00p	512	1423	139	143	115	608	1350	0.3%
00-01e	608	1337	185	141	114	561	1456	7.8%
01-02e	561							
% Chg. 90-91---00-01								53.5%

Sources:
(a) FCPA.
(b) FDOC, Economic Research Department estimates.
(c) U.S. Department of Commerce.
(d) Estimated as 80.6% of U.S. Department of Commerce exports, based on FCPA exports for 1999-00; prior to 1999-00, FCPA did not report bulk chilled orange juice exports.

Table 6. Florida and Brazil Supply of OJ.

	OJ Production		OJ Beg. Inventories		Total	Total
Season	Brazil (a)	Florida (b)	Brazil (a)	Florida (b)	Supply	Supply
			Million SSE Gallons			% Change
90-91	1202	841	132	280	2455	
91-92	1322	811	175	283	2592	5.5%
92-93	1595	1131	95	263	3083	19.0%
93-94	1557	1057	146	379	3139	1.8%
94-95	1568	1206	146	439	3360	7.0%
95-96	1511	1213	216	410	3350	-0.3%
96-97	1604	1388	240	395	3627	8.3%
97-98	1936	1487	175	546	4144	14.3%
98-99p	1649	1156	328	630	3763	-9.2%
99-00e	1894	1423	366	512	4194	11.5%
00-01e	1540	1337	434	608	3920	-6.5%
Change from 90-91---00-01e						59.6%

Sources:
(a) Various attache reports on Brazilian citrus (FAS);
(b) FDOC, Economic Research Department estimates.

Table 7. Advertising Impact Scenarios: Florida Volume Increases with Prices Constant.

	Est. Florida OJ Gallons In U.S.			
	With Adv. Vol Sales (a)	Without Adv. Scenario Assumed % Decrease in Volume Sales		
Season		3%	5%	7%
		Million SSE Ga.		
90-91	948	920	901	882
91-92	935	907	889	870
92-93	1086	1054	1032	1010
93-94	1122	1089	1066	1044
94-95	1220	1184	1159	1135
95-96	1256	1218	1193	1168
96-97	1295	1257	1231	1205
97-98	1414	1371	1343	1315
98-99p	1346	1306	1279	1252
99-00e	1350	1310	1283	1256
00-01e	1456	1412	1383	1354

(a) See Tables 4 and 5.

Table 8. Advertising Impact Scenarios: Grower Value of Volumes in Table 7.

	Est. Grower Value of Fl. OJ Ga. In U.S.				
	With Adv. Value	Without Adv. Scenario Assumed % Decrease in Volume Sales			Est. Fl. Del.-In Price (a)
Season		3%	5%	7%	
		Million $			$/SSE ga.
90-91	1221	1184	1160	1135	1.29
91-92	1136	1102	1079	1056	1.21
92-93	913	886	868	849	0.84
93-94	1060	1028	1007	986	0.94
94-95	1115	1082	1059	1037	0.91
95-96	1312	1272	1246	1220	1.04
96-97	1102	1069	1047	1025	0.85
97-98	1216	1180	1155	1131	0.86
98-99p	1322	1282	1256	1229	0.98
99-00e	1195	1159	1135	1111	0.88
00-01e	1183	1148	1124	1101	0.81

Table 9. Florida Grower OJ Advertising Returns, Based on Volume Increases with Prices Constant.

	(1)	(2)	(3)	(4)	(5)	(6)=(2)/(5)	(7)=(3)/(5)	(8)=(4)/(5)
		Benefit: Est. Gain in Grower $ With Minus Without Adv. (a)			Cost: FDOC Adv. (b)	Benefit/Cost Ratio		
	With Adv. Value (a)	Without Adv. Scenario Assumed % Decrease in Volume Sales				Without Adv. Scenario Assumed % Decrease in Volume Sales		
Season		3%	5%	7%		3%	5%	7%
	Million $					Ratio		
90-91	1221	37	61	85	21.3	1.7	2.9	4.0
91-92	1136	34	57	79	20.8	1.6	2.7	3.8
92-93	913	27	46	64	21.8	1.3	2.1	2.9
93-94	1060	32	53	74	21.7	1.5	2.4	3.4
94-95	1115	33	56	78	23.5	1.4	2.4	3.3
95-96	1312	39	66	92	23.3	1.7	2.8	3.9
96-97	1102	33	55	77	31.3	1.1	1.8	2.5
97-98	1216	36	61	85	30.0	1.2	2.0	2.8
98-99p	1322	40	66	93	23.9	1.7	2.8	3.9
99-00e	1195	36	60	84	25.2	1.4	2.4	3.3
00-01e	1183	36	59	83	27.0	1.3	2.2	3.1

(a) See Table 8.

(b) FDOC, operating budget reports for various years.

Table 10. Alternative Scenarios for Impact of FDOC OJ Advertising on Grower Revenue, 2000-01 Season.

Advertising Impacts Volume Only

	With Adv.	Without Adv. Scenario		
		Assumed % Decrease in Volume Sales		
		3%	5%	7%
		Mil. Ga.		
Beg. Inv.	608	608	608	608
Production	1337	1337	1337	1337
Imports	185	185	185	185
Avail	2130	2130	2130	2130
End. Inv.	561	718	747	776
Exports	114	114	114	114
Dom. Mov.	1456	1412	1383	1354
Decrease in Mov		-44	-73	-102
Mov.: Mil. Ga.	1456	1412	1383	1354
Grower Price: $/Ga.	0.81	0.81	0.81	0.81
Grower Revenue: Mil. $	1183	1148	1124	1100
Decrease in Rev: Mil $		-35	-59	-83
FDOC OJ Adv.: Mil. $		27	27	27
Benefit/Cost Ratio		1.31	2.19	3.07

Advertising Impacts Price Only

	With Adv.	Without Adv. Scenario		
Mov.: Mil. Ga.	1456	1456	1456	1456
Grower Price: $/Ga.	0.81	0.76	0.73	0.70
Decrease in Price		0.05	0.08	0.11
Grower Revenue: Mil. $	1183	1110	1067	1023
Decrease in Rev: Mil $		-73	-116	-160
FDOC OJ Adv.: Mil. $		27	27	27
Benefit/Cost Ratio		2.70	4.31	5.93

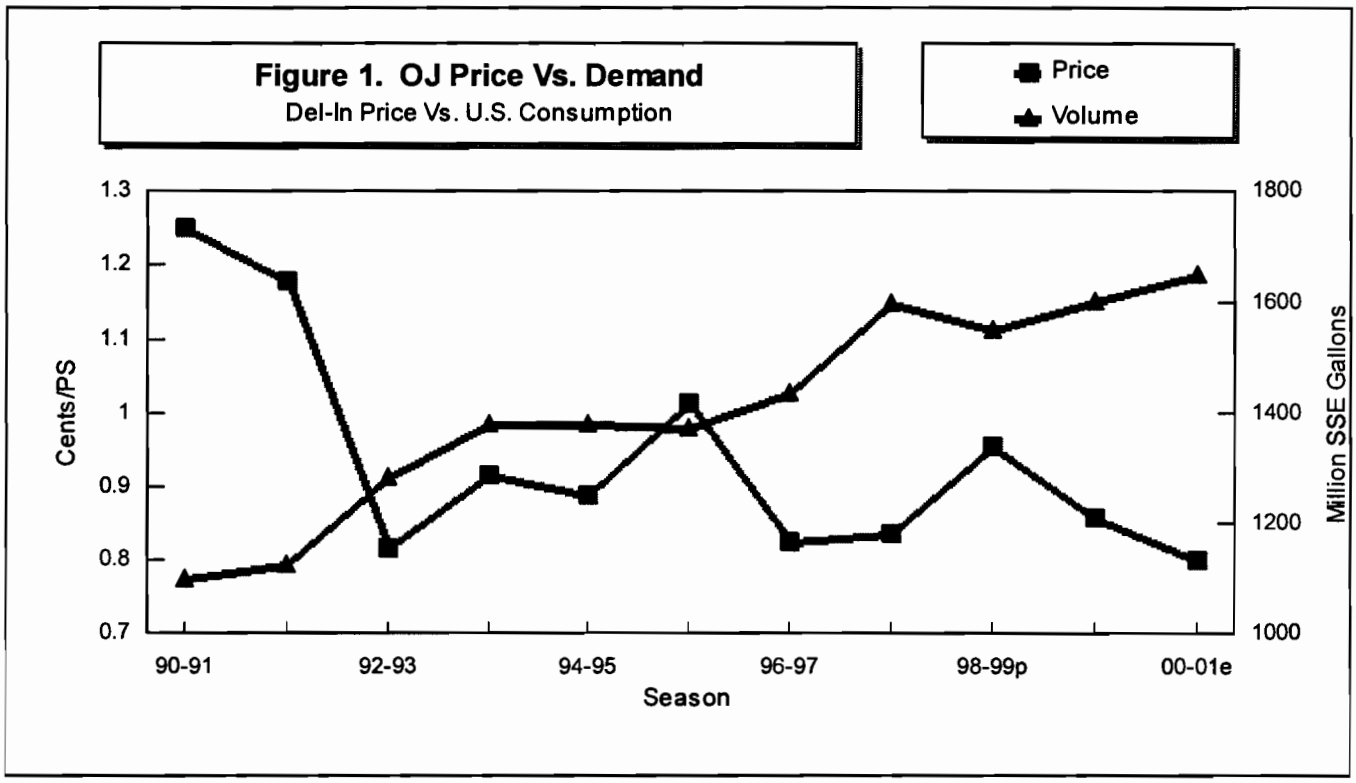
Figure 1. OJ Price Vs. Demand
Del-In Price Vs. U.S. Consumption
Price
Volume
1.3
1.2
1.1
1
0.9
0.8
0.7
Cents/PS
1800
1600
1400
1200
1000
Million SSE Gallons
90-91
92-93
94-95
96-97
98-99p
00-01e
Season