

Demand for Grapefruit Juice in Advertising Test Markets

In February and March 1994, the Florida Department of Citrus (FDOC) carried out generic advertising programs for grapefruit juice (GJ) in 13 test markets. Five markets -- Atlanta, Boston, Chicago, New York City, and Philadelphia -- had seven weeks of advertising (Tier I); and eight markets -- Baltimore, Buffalo, Rochester, Charlotte, Cleveland, Hartford/New Haven, Milwaukee, and Washington, DC -- had three weeks of advertising (Tier II). The targeted audience of the advertising were adults of ages from 18 through 49. The targeted rating point (TRP) for each market was 100 per week (i.e. to expose all targeted audience to GJ advertising once per week, or 50% of the targeted audience twice per week, and so on).

In this study, estimates are made of the impacts of FDOC GJ advertising on GJ gallon sales in the markets mentioned above. Retail sales data provided by A.C. Nielsen for the periods of December 19 through April 13 for 1993 and 1994 were used. Since A. C. Nielsen only provides data for Buffalo and Rochester in aggregate, these two markets were combined, leaving 12 markets to be analyzed. Two demand equations relating GJ gallon sales to GJ price and GJ advertising variables were estimated using TRP and actual advertising expenditures, respectively. The results indicate that FDOC GJ advertising had a significant impact on the demand for GJ in these test markets; however, the return from advertising was low.

Data and Model

Nielsen weekly data on gallon and dollar sales for 1993 and 1994 were used. Basic statistics for Tier I and Tier II markets are presented in Table 1 for the three time periods involved. In general, market shares of total gallon sales for test markets increased during the advertising and post-advertising periods in 1994. GJ prices were calculated by dividing dollar

sales by gallon sales. The level of advertising can be measured by the TRP or actual advertising expenditures. In addition to price and advertising variables, dummy variables were included in the econometric models to capture the basic differences among these markets in GJ demand. The econometric model can be express as

$$(1) \quad dq_{it} = \alpha + \beta_1 dp_{it} + \sum \gamma_i D_i + \beta_2 Adv_{it} + \beta_3 Adv_{it-1} + \varepsilon_{it};$$

where dq_{it} and dp_{it} are the changes in gallon sales and retail price for market i during period t (there were three period considered in this study, i.e., pre-advertising, advertising, and post-advertising period); D_i s are dummy variables for the test markets (Philadelphia and Washington, DC were used, respectively for Tier I and Tier II, as the base for comparison); Adv_{it} is the advertising level for 1994 and Adv_{it-1} is the lagged advertising level (TRP or actual advertising expenditures was used); ε_{it} is the disturbance term; and α , β s, and γ are parameters to be estimated.

Results

The market demand equation (1) estimates are shown in Table 2. The close to perfect R^2 s indicate that the econometric models fit the data very well. All price and advertising parameter estimates had expected signs, i.e., negative for price parameters and positive for advertising parameters. In addition, all price and advertising parameter estimates were statistically different from zero at $\alpha = 0.10$ level.

The parameter estimates presented in Table 2 were used to estimate the return from advertising for Florida grapefruit growers, and the results are presented in Table 3. The results indicate that it cost more than two advertising dollars to sale an additional gallon of GJ. The estimated returns to Florida growers were less than the cost of advertising.

Table 1. Base and test period volume for GJ test and control markets

Time Period	Test Markets (1994)		All Other Markets (1994)		Test Markets (1993)		All Other Markets (1993)	
	Gal. Sales (1,000 gals)	% Total Sales	Gal. Sales (1,000 gals)	% Total Sales	Gal. Sales (1,000 gals)	% Total Sales	Gal. Sales (1,000 gals)	% Total Sales
	Tier I							
Per-Adv.	1,537	25.77	4,429	74.23	1,415	24.76	4,300	75.24
Adv.	1,583	25.73	4,569	74.27	1,356	23.00	4,539	77.00
Post-Adv.	842	24.72	2,560	75.26	794	23.79	2,543	76.21
	Tier II							
Per-Adv.	272	10.57	2,299	89.43	285	11.16	2,272	88.84
Adv.	318	12.11	2,310	87.89	285	11.34	2,227	88.66
Post-Adv.	355	13.28	2,319	86.72	272	10.87	2,229	89.13

^aFor a seven-week period.

^bFor a four-week period.

^cFor a three-week period.

Table 2. Regression results using targeted rating points and actual expenditures

Variable	Targeted Rating Point		Actual Expenditures	
	Parameter	Standard Error	Parameter	Standard Error
Tier 1 -- Five Markets, Seven Weeks				
Intercept	-0.6017	1.2099	1.5285**	0.6978
Advertising	0.0300**	0.0067	1.350x10 ⁻⁴ **	2.158x10 ⁻⁵
Atlanta (D ₁)	-1.1235	1.0866	-2.0575**	0.8375
Boston (D ₂)	-0.2305	0.8441	0.1700	0.6227
Chicago (D ₃)	-1.0151	0.8031	-1.0263*	0.5923
New York (D ₄)	5.9987**	0.8622	4.4587**	0.6403
dp	-10.6995**	3.5896	-3.5754*	2.2384
Lagged Adv.	0.0269**	0.0136	7.712x10 ⁻⁶	3.819x10 ⁻⁵
R ²	0.9567		0.9765	
Adj R ²	0.9135		0.9530	
Tier 2 -- Seven Markets, Three Weeks				
Intercept	-0.3183	0.7739	-1.9372**	0.8783
Advertising	0.0310**	0.0063	0.0003**	0.0001
Baltimore (D ₁)	-1.3822*	0.9642	0.0558	0.9374
Buff/Roch (D ₂)	-0.8911	1.0944	0.9432	1.0985
Charlotte (D ₃)	-1.1145	0.9662	1.4389*	0.9954
Cleveland (D ₄)	-4.1253**	0.9646	-1.8809**	0.9770
Hart/NH (D ₅)	-0.9630	0.9741	0.5628	0.9578
Milwaukee (D ₆)	-2.3303**	0.9776	0.0069	1.0069
dp	-7.2741**	0.7841	-7.5640**	0.7199
Lagged Adv.	0.0338**	0.0067	0.0004**	0.0001
R ²	0.9556		0.9605	
Adj R ²	0.9193		0.9282	

*Statistically different from zero at $\alpha = 0.10$ level.

**Statistically different from zero at $\alpha = 0.05$ level.

Table 3. Estimated return from advertising^a

	Total Return		Return Per Dollar Spent	
	Using TRP	Using Adv. \$	Using TRP	Using Adv. \$
	Change in Retail Demand (SSE gals.)			
Tier I	268,843	123,706	0.41	0.19
Tier II	91,030	85,230	0.49	0.46
	Change in Retail Revenue (\$)			
Tier I	1,169,974	541,877	1.77	0.82
Tier II	378,584	364,993	2.05	1.97
	Change in Grower's Revenue (\$) ^b			
Tier I	182,813	84,120	0.28	0.13
Tier II	61,901	57,956	0.33	0.31

^aAdvertising expenditures for Tier I and Tier II were \$659,596 and \$184,959, respectively.

^bBased on the average price of \$3.015502 and average yield of 4.568594 pound solids per box.