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THE USE OF RETAIL AUDIT DATA IN PROJECTING CONSUMER DEMAND FOR FRESH SWEET CHERRIES

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Despite great progress in the field of marketing of fresh fruits in the U.S., little research work has been focused on projecting consumer demand. Previous research has been, in the main, concerned with either production or earlier levels of the marketing chain. In addition, many researchers have been "scared off" by the apparent high cost of consumer research.

The primary objective of this paper will be to demonstrate the use of retail audit data in projecting consumer demand for fresh sweet cherries in selected cities in the U.S. Sin-mei Sin and O'Rourke (4) report the use of a national consumer research study on sweet cherries to make long-term aggregate demand projections for the U.S. While their analysis provides a substantial amount of aggregate information, it does not permit analysis of individual city retail demand. O'Rourke and Casavant (3) made some exploratory analysis of retail demand for individual retail chains, but lack of data prevented prediction of aggregate city demand. The analysis presented below, attempts to predict individual as well as aggregate cities demand at the retail level.

METHOD

The retail audit data used in this study were gathered by Associated Marketing of Chicago in the summer of 1974 (1). During the fresh cherry season, information was gathered from a nationwide sample of retail stores on distribution, price, shelf-space and promotional displays for sweet cherries. The demographic analysis of the 20 major selected cities was drawn from the 1973 Supermarket News Retail Distribution Study of Food Store Sales in 264 Cities (6). Advertised price data was supplied from the records of the Washington State Fruit Commission.

The functional relationship specified for the retail demand equation in the cities was of the form:

(1) $Q = f(A + Y - P + R + S_{tp} + SW + MW + W)$

where:

Q = quantity of fresh sweet cherries demanded (carlot unloads per thousand people),

A = population of age 55 years and over (percent),

Y = income per capita ($),

P = average price of sweet cherries ($/lb),

R = ratio of average price to advertised price of sweet cherries by city,

S_{tp} = sweet cherry share of total produce access footage (percent),

SW = Southwest, NW = Midwest, W = West } Regional dummy variables

Unloads were used as a proxy for consumer purchases. Price and access footage data by city were provided by the retail audit. Population and income data were drawn from the Supermarket News Distribution study. The function was estimated using ordinary least squares under the usual assumptions. Twenty cities were included in the analysis. However, these 20 cities accounted for 70.7% of U.S. shipments of sweet cherries in 1974. Per capita consumption averaged less than 1 lb per head at a season average price of 88.0 cent. The advertised price during special promotions ranged from 12% to 50% below season average price. The share of total produce space allotted to sweet cherries varied from .55 to 2.7%.

The selection of independent variables was based on preliminary analysis and previous work of Sin-mei Sin and O'Rourke (4). In all, eight independent variables were tested but only five proved significant (table1). The variables rejected were households with income $10,000 and over, rate of growth in per capita income by city and percent distribution of sweet cherries by city. Of the dummy variables used to test for differences between regions, only three proved significant.

Results

We report here three separate formulations of the basic model (table 1). In general, the coefficients were statistically significant at the 5% level (as indicated by the bracket t-values) and had signs conforming to a priori expectations and the findings of previous studies. The reported equations explained 70% or more of the variation in the independent

Table 1. Sweet cherry-regression analysis of demand in 20 selected U.S. cities, 1974

	Dependent Variable - Quantity/Population		
	Equation 1	Equation 2	Equation 3
Constant	-.00735	-.03781	-.04429
	(.16158)	(1.08236)	(1.21006)
Population	.00191	.00192	.00200
55 years & over	(2.57093)*	(3.50834)*	(3.52733)*
Income per capita	1.5584×10^{-5}	1.45548×10^{-5}	1.51059×10^{-5}
	(1.81220)	(2.42297)*	(2.45463)*
Average price	-.14339	-.15215	-.15440
	(2.91581)*	(4.41202)*	(4.38642)*
West	.02058		
	(2.17435)*		
Southwest	.02713	.01419	.01360
	(2.59839)*	(1.90141)	(1.78318)
Midwest	.01960		
	(1.70083)		
Cherry footage	.01863		-.00368
	(2.18490)*		(.73497)
Ratio: P/Ad P		.04930	.05512
		(4.80648)*	(4.21041)*
R^2	.70226	.80296	.81082

*t-values significant at the 5% level

variable. Some problems remain in identifying the most satisfactory equation.

For example, in equation 3, the inclusion of both non-price variables, sweet cherry produce footage and the advertising variable leads to the highest R^2, but the produce footage variable becomes non-significant due to multicollinearity. In contrast, when the produce footage variable is entered separately it has the expected sign and is significant at the 5% level (equation 1). However, in that case the unexplained residual can be reduced by the addition of three regional dummy variables. When the advertising variable is substituted for the produce footage variable (equation 2) it is also positive and significant, but only the regional dummy variable for the Southwest remains significant even at the 10% level. Clearly, there are regional shifts in the demand curve which can be partly explained by differences in advertising practices. Sin-Mei Sin and O'Rourke have shown that there are major differences in the average size of purchase which would account for the positive sign on the Southwest regional dummy variable (4). Although data were not available, it is possible that differences in supply and demand for competing fruits may also contribute to regional differences in demand for sweet cherries.

The results for the non-price variables are of some interest to sweet cherry marketers. For example, a 10% reduction in advertised price would increase the ratio of average price to advertised price by 11.1% and the per capita consumption by 27.3% (equation 2). A 10% increase in sweet cherry share of produce footage would lead to an 8.9% increase in consumption. In more concrete terms, one extra foot of shelf-space devoted to sweet cherries in each store nationwide would lead to a 60% increase in consumption. The income elasticity at the mean was 1.91037, again indicating a positive influence on consumption.

Price Elasticities

The price elasticity at the mean for all the selected cities and the 1974 point elasticities for each city derived from equation 2 are presented in table 2. In general, the results are consistent with what has already been found, that the price elasticity of demand for sweet cherries at the retail level is elastic. We found the price elasticity at the mean to be -4.2701. O'Rourke and Casavant found price to be elastic on a weekly basis for the individual stores studied and on an annual basis at the grower level (2). However, the point elasticities for each city varied from highly elastic -20.671 to as low as -1.685. This wide difference in elasticities could be attributed to the fact that those cities with highly elastic demand are the relatively weak markets for fresh sweet cherries. Secondly, the differences could be attributed to the regional differences discussed previously, of which the presence of close substitutes may play a big role. At the time of this analysis retail audit data were not available on specific substitute commodities. However, the authors hope to use USDA market unload data to test for the influence of substitutes when that data becomes available.

Demand Projections

Equation 2 was used to predict 1974 demand in each city. Actual and estimated unloads for 1974 are shown in table 2. The results indicate minimal differences occurred between the two. One could project future demand by city from the above statistical results under many possible combinations of assumptions. For example, one could assume prices at the same level as in 1974, and then examine the impact in 1980 of alternative annual increases of 3%, 4% and 5% in income per capita. Of more direct relevance to industry marketers, one can examine the changes in pricing, advertising or distribution policies needed to stimulate required changes in per capita consumption by city.

Table 2. Average price, actual and estimated unloads per thousand people and price elasticities for 20 selected cities

City	Region	Average Price	Actual 1974 Unloads/Pop.	Estimated 1974 Unloads/Pop.	Actual/ Estimated	Elasticity
		$/lb		*carlots/1000*	*%*	
Albany	East	1.04	.035	.032	91.4	-4.49457
Atlanta	Southeast	.81	.008	.003	37.5	-15.97672
Boston	East	.88	.059	.043	72.9	-2.25576
Buffalo	Mideast	.82	.029	.030	103.4	-4.24125
Chicago	Mideast	.85	.039	.056	143.6	-3.31606
Cleveland	Mideast	.81	.046	.046	100.0	-2.70717
Dallas/Ft. Worth	Southwest	.88	.007	.012	171.4	-17.96047
Denver	Southwest	.78	.070	.066	94.3	-1.68540
Detroit	Mideast	.83	.022	.034	154.5	-5.75437
Houston	Southwest	.95	.007	.006	85.7	-20.67135
Kansas City	Midwest	.86	.032	.028	87.5	-4.43495
Los Angeles	West	.83	.058	.046	79.3	-2.18557
Miami	Southeast	.92	.031	.027	87.1	-4.49156
New York	East	.99	.039	.038	97.4	-3.83017
Philadelphia	East	.90	.032	.029	90.6	-4.24439
Providence	East	.87	.015	.031	206.7	-8.70845
San Francisco	West	.87	.030	.041	136.7	-4.43300
Seattle	West	.82	.039	.036	92.3	-3.20399
St. Louis	Midwest	.98	.015	.011	73.3	-9.68772
Washington, D.C.	East	.88	.013	.013	100.0	-10.64147
20-City Average		.88	.031			-4.01286

IMPLICATIONS

The results obtained from this study indicate that data generated by a retail audit can be used in projecting consumer demand at retail level both on a short and a long term basis. The same procedure is applicable to many other commodities. Since retail audit data can be generated fairly inexpensively, there is no longer justification for avoiding analysis of higher levels of the marketing chain. In addition, retail audit data permit the examination of both price and non-price factors on demand.

In conclusion, the significance of this study lies as much in the framework of analysis as in the particular empirical results presented here. Used in conjunction with time series or consumer panel type data, retail audit data can make an important contribution to the better understanding of final demand and to evaluation of alternative industry marketing policies.

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