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Effect of a Health Hazard "Scare"
on Consumer Demand[*]

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THE possibility of pesticide residue contaminations has become public knowledge in recent years. Such possible health hazards are new phenomena affecting the marketing of food. For example, when the Secretary of Health, Education, and Welfare announced on November 9, 1959, that cranberries may contain residues of a herbicide known as amino triazole, a major health hazard "scare" developed. This announcement received much consumer attention, and producers felt that the sale of cranberries from unsprayed bogs was hurt as a result [1]. Satisfactory documentation of the economic effects of this announcement is lacking, however.

This paper examines weekly household consumption of cranberries before (1957–58), during (1959), and after (1960–62) this pesticide "scare." Data were obtained from a panel of approximately 300 families in Atlanta, Georgia, who reported weekly food purchases for six years from 1957 through 1962. The analysis was based on weekly observations from households that purchased fresh and/or processed cranberries during the fourth quarter of each year.

The hypothesis is that consumer knowledge of possible pesticide contamination of cranberries would increase the price elasticity of demand. This hypothesis is based on two assumptions: (1) that the price elasticity of cranberries is similar to that of all fruit, and (2) that consumer knowledge of possible pesticide contamination may have the opposite effect of advertising on price elasticity.

Advertising tends to reduce the substitutability of a product through product differentiation. Advertising may also encourage more emotional buying and effort to consider substitutes [4]. Furthermore, ". . . advertisement may not only convince the new buyers that they should buy the product, but it may also convince the old buyers that the product is so good that they should not give up buying the same amount at much higher prices" [3]. Thus, advertising may decrease the price elasticity of demand. Conversely, known product contamination, or adverse advertising, may increase the elasticity.

Method

Variation in per capita purchases (Y) of fresh cranberries (pounds) and processed cranberries (ounces) was postulated to be dependent on

variation in the following independent variables, by week, during the fourth quarter of each year, 1957 through 1962:

$$Y = f(X_1, X_2, X_3)$$

where

X_1 = average price (cents per unit of weight),
X_2 = age of homemaker (1 = under 30, 2 = 31-45, 3 = 46-60, and 4 = over 60), and
X_3 = per capita income (dollars).

Thus, the derived demand elasticities are adjusted for the effects of age and income.

Linear and logarithmic least-squares equations were computed. The choice of the model was based upon the size of the coefficient of determination and the number of significant coefficients. Under these restrictions, the linear model was chosen for processed cranberries. Fresh cranberries were omitted from the analysis because the price coefficient was significant ($p \leq 0.05$) for only two of the six years.

Results

Forty-six percent of the households purchased processed cranberries during 1957-58 and 1960-62; 33 percent, in 1959. Per capita purchases of processed cranberries dropped 26 percent during 1959, compared with 1957–58, but regained the 1957–58 level during 1960–62. Retail prices, on the average, remained fairly constant.

Based on the linear regression equations for each year, the homemaker's age was positively ($p \leq 0.05$) related to per capita purchases of processed cranberries. Income was also positively ($p \leq 0.01$) related to per capita purchases, except during 1961. The quantity-price coefficient was significant ($p \leq 0.01$) in each of the six years. The demand elasticities for processed cranberries, computed at the mean values of these independent variables, were as follows:

$$1957, \varepsilon = -0.87 \qquad 1960, \varepsilon = -1.16$$
$$1958, \varepsilon = -0.93 \qquad 1961, \varepsilon = -0.88$$
$$1959, \varepsilon = -0.93 \qquad 1962, \varepsilon = -0.77$$

To test the hypothesis of difference in these demand elasticities, an equation was estimated for the combined six years to test if one regression can be used for all observations, as follows:

$$Y = 7.754 - 4.5672X_1 + 1.7631X_2 + 0.0012X_3$$
$$(0.4166) \quad (0.1840) \quad (0.0001)$$

$N = 1419$ $\qquad\qquad R^2 = 0.203$

Based on the computed F value, no significant differences existed among the six years. Thus, no statistical evidence exists to support the hypothesis of an increase in demand elasticity following a period of public knowledge of possible pesticide contamination.

The observations for 1959 and 1960 and for 1961 and 1962 were paired, since no significant difference existed between the regressions for each year within these two pairings. It was postulated that the observed decrease in demand elasticity from 1959–60 to 1961–62 was significant and might possibly be due to the increased advertising expenditures that occurred, at least in part, for the industry.[1] Following the same testing procedure used for the hypothesis of increased elasticity, it was found that no significant difference existed between the two regressions for the two periods. Thus, no statistical evidence exists to support this supposition about advertising expenditures.

Implications

The Food and Drug Administration has issued assurances about the safety of our food from pesticides. Their studies indicate residues ". . . are substantially below the limits set for acceptable daily intake by the World Health Organization and United Nations Committees" [2]. This record, however, does not prevent the occurrence of incidents similar to the 1959 cranberry pesticide "scare."

The 1959 incident appeared not to have had any significant affect on the elasticity of demand for processed cranberries among households in Atlanta, Georgia. The only apparent effects were temporary declines in the number of households purchasing processed cranberries and in per capita purchases among purchasing households. Advertising may be an effective tool to offset in part a change in demand elasticity resulting from a pesticide residue incident. This area warrants further research, particularly identification of socio-economic sub-groups who react either positively or negatively to various forms of advertising in relation to their levels of purchasing.

References

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[3] MYERS, A. L., Elements of Modern Economics, New York, Prentice-Hall, Inc., 1937.
[4] TOMEK, W. G., "Changes in Price Elasticities of Demand for Beef, Pork, and Broilers," J. Farm Econ. 47:793–802, Aug. 1965.

[1] Personal letter from Edward Gelsthorpe, President, Ocean Spray Cranberries, Inc., March 19, 1968.