THE EFFECTIVENESS OF GENERIC VERSUS BRAND ADVERTISING FOR MANUFACTURED MILK PRODUCTS--THE CASE OF YOGURT

by

Lana Hall and Ingrid Foik*

April 1982 No. 82-4

* Lana Hall is an assistant professor of agricultural economics at Cornell University and Ingrid Foik is a program officer for the World Bank in the Sudan.

Abstract

In this paper, the effectiveness of generic versus brand advertising for yogurt is evaluated, using a polynomial distributed lag model. Brand advertisement is found to be more than twice as effective as generic in increasing per capita consumption of yogurt. These results are then compared to the effectiveness of generic advertisement of fluid milk and used as a basis for recommending to dairy producers the best allocation of promotion funds.

The Effectiveness of Generic Versus Brand Advertising for Manufactured Milk Products--The Case of Yogurt*

Generic advertising of fluid milk is now common at State levels and has been shown to be effective in increasing per capita consumption of milk. Despite such advertising, fluid milk consumption has been declining steadily since the mid-1950s, leading dairy farmers to question whether promotion funds might better be spent on manufactured milk products, such as cheese and yogurt, the consumption of which has been increasing. Some, such as yogurt, have shown especially impressive gains in sales in recent years; yogurt sales have increased by over 200 percent from 1970 to 1980, in Federal Order Markets.

Given the structure of the milk pricing system, the benefits which might accrue to milk producers from the diversion of promotion funds are not obvious. When Class II milk is used for manufactured products, milk producers will not receive higher prices as a result of an increased utilization of Class II milk, ceteris paribus. There may, of course, be some benefits to producers resulting from increased Class II utilization. In the present situation of milk surplus, increasing the consumption of manufactured milk products with advertising might reduce the surplus and the losses associated with its production, purchase and storage. However, because increased Class I fluid milk utilization does result in a direct farm price increase, diversion of funds to generic promotion of manufactured products (where benefits are derived solely from a reduction in the quantity of surplus milk on the market) should not even be considered by Milk Promotion Boards unless the effectiveness, in terms of increased milk consumption, of advertising manufactured products is absolutely greater than the effectiveness of generic advertisement of fluid milk.

Generic advertisement for fluid milk has been shown to be effective. Thompson, Eiler and Forker [13], using a polynomial lag model in an analysis of milk sales and advertisement data for three markets within New York State, found that an increase in per capita advertising expenditure of 4.5¢ (from 2.4¢ to 6.9¢) yields a per capita fluid milk sales increase of 3 percent in the New York City market. (See [12] for the extension of these results to analysis of net returns to dairy farmers, and Kinnucan [5] for more recent analysis applied to New York State.) However, there has been little published empirical work on the effectiveness of generic advertisement for manufactured milk products. In such

* The authors are grateful to the California Milk Advisory Board and the United Dairy Industry Association for their generous provision of advertising data. Also, Olan Forker, Henry Kinnucan, Andrew Novakovic and Bernard Stanton provided very helpful comments on an earlier draft of this paper.

analysis, though, it would be important to determine generic effectiveness, given the existence of brand advertisement, since much of the advertising for manufactured milk products is performed by brand name manufacturers. Ward [18, 19] has done so, using polynomial and Koyck lag models to study the relative effectiveness of generic and brand name advertisement for Florida citrus and has found that brand advertisement is more effective than generic in increasing citrus industry sales.

A separate issue is the interaction of brand and generic advertising. Generic is generally believed to reinforce brand advertising, rather than vice-versa [3]. Ward [19] did, in fact, find that for the Florida citrus industry, increments to sales resulting from increases in generic are relatively insensitive to the level of brand advertising. The interaction issue, however, is not germane to the present study, which determines the increases in milk sales resulting from generic yogurt advertising relative to those from generic fluid milk advertising.

In this study, the relative effectiveness of brand versus generic advertisement for yogurt in the California market is analyzed because California's Milk Advisory Board is the only one that has engaged in a substantial amount of generic advertising for yogurt. (Generic advertising for yogurt amounted to over $500,000 in 1978). Then, in order to assess the benefits of generic advertisement for a manufactured product, like yogurt, versus that for fluid milk, the results from California are compared to the results from the Thompson, Eiler and Forker study on generic advertisement of fluid milk in New York. Although milk used for the manufacture of yogurt in California is Class I and would thus make a comparison of producer benefits from generic yogurt promotion in California and generic fluid milk promotion in California straightforward, reliable estimates of the advertising response of fluid milk consumption for California are not readily available. The comparison is judged to be valid because the Pacific and Northeast regions, with California and New York as the most significant states in the regions, in terms of population, have high and almost equal per capita consumption levels. They also exhibit strong similarities with regard to the demographic and economic characteristics, such as race and average income levels, which affect yogurt consumption.[1] On the basis of this comparison, we derive a recommendation for the level of generic advertisement.

Measuring Advertising Effectiveness

A polynomial distributed lag model was chosen for analyzing the relationship between generic and brand advertising expenditures and sales of yogurt. Polynomial models have an advantage in that they more easily allow for the estimation of two or more lagged variables, i.e. generic and brand advertisement, without imposing non-linear constraints on the model, or imposing the restriction that the lag structures have the same shape. Secondly, a polynomial model makes it possible to reflect an initial buildup of advertising effectiveness, a factor which is important when using monthly data. While infinite lag models, in

principle, also have this flexibility, structures more complicated than the geometrically declining lag are extremely complicated to estimate.

A linear functional form was chosen for the model. Linearity implies that advertising expenditures show constant marginal effects on sales regardless of the magnitude of the expenditure amount. This assumption may be questioned since advertising often shows decreasing returns [10]. In the present case, however, the functional form may be justified considering the relatively limited range of per capita media expenditures on yogurt. Expressed as annual per capita averages, media expenditure for both brand and generic advertisement combined, ranged from \$0.024 in 1978 to \$0.061 in 1979. Preliminary estimates showed indeed that a linear model has a higher explanatory power than logarithmic models.[2] Eleven binary variables also were included in the model to allow for seasonality in yogurt sales.[3]

Estimation of the Model

The following finite lag model was estimated:

$$Q_t = \alpha_0 + \alpha_1 I_t + \alpha_2 P_t + \sum_{d=1}^{11} \alpha_d D_{td} +$$

$$\sum_{j=0}^{M_1} \beta_{1j} \left[\sum_{i=0}^{N_1} W_{ij} (i) AG_{t-i} \right] +$$

$$\sum_{j=0}^{M_2} \beta_{2j} \left[\sum_{i=0}^{N_2} W_{ij} (i) AB_{t-i} \right] + U_t$$

where

- Q = per capita yogurt sales, in gallons
- D = eleven zero-one dummy variables, to account for seasonal effects
- I = per capita personal income, deflated (1967=100), in dollars
- P = dairy price index (1967=100)
- M = degree of polynomial
- N = specified lag length
- AG = per capita generic advertising expenditure in dollars, deflated (1967=100)
- AB = per capita brand advertising expenditure in dollars, deflated, (1967=100)
- U = error term
- W = the weight defining function for i=0...N, for a polynomial of the jth degree. The weights were defined using the Langrangian interpolation polynomial.

To obtain an indication of the appropriate shape of the lag structure, alternative specifications, varying the degree of the polynomial and the length of the lag, were estimated. It was found that for both brand and generic advertising, a polynomial of degree two provided adequate flexibility to express the shape of the lag. For expenditure on brand advertising, the appropriate length of the lag was found to be seven months while for generic expenditures a lag length of five months proved to be sufficient.[4]

In addition, end-point constraints were imposed to insure that the lagged advertisement coefficients approached a zero value. As this is equivalent to imposing linear constraints, the appropriateness of doing so was tested by performing an F-test which confirmed that the imposition of the constraints was justified.

Data

The data used in the analysis consisted of yogurt sales, generic and brand advertising expenditures, and income, all on a per capita basis, for each of the 48 months between January 1976 and December 1979.

Monthly observations on yogurt sales are actual in-state sales and are available from the California Crop and Livestock Reporting Service, Manufactured Dairy Products, Milk Production, Utilization and Prices. Data on generic advertisement expenditure were obtained from the California Milk Advisory Board , who provided expenditure by type of media used. Over the four years, most (84 percent) promotion funds were spent on television and point-of-sales promotion. These values were deflated by individial media indices, as reported in the Survey of Current Business [15]. The deflated values were then aggregated into one value and converted to a per capita basis.

Data on expenditure for brand advertisement were obtained from the United Dairy Industry Association. The orignial data are listed by firm and product, i.e., yogurt, frozen yogurt, and novelties. Since California sales data refer to yogurt only, advertisement expenditure for the two latter categories was not included. The data were first aggregated over firms and deflated by the media deflator from [15]. The deflated values were then aggregated into one value and converted into a per capita basis. Over the period under consideration, the majority of the funds were spent for television advertising, i.e. on average, 59 percent of the total.

Income data for California from 1976 to 1979 are reported in the Survey of Current Business [15] only on a quarterly basis. Monthly figures were derived by interpolation between the quarterly base points, then deflated by the income deflator for Los Angeles as reported in the Monthly Labor Review [17].

Price data for yogurt are not available. As a proxy, however, the dairy price index, based on prices for milk, butter, cheese and ice cream in Los Angeles and Long Beach, from [16], was used.

Regression Results

The results of the regression are shown in Table 1 and Chart 1. To evaluate the suitability of using the Almon estimator, the OLS results are also presented in Table 1. As may be seen, the OLS results do not differ very widely from the Almon estimates. Especially the sums of the lag coefficients for generic and brand advertising are very similar. The period over which a given brand advertisement message influences sales positively is seven months, with a mean lag period of 2.7 months. Brand advertisement exerts its highest impact on sales with a delay of some two and three months after the expenditure occurred, a phenomenon noted by others [20, 13, 18, and 19]. The sum of the lag coefficients represents the long-run impact of a unit change in advertisement expenditure on sales, which, for branded advertisement expenditure is 329. This sum of lag coefficients translates into a long-run advertising elasticity of +0.11. Thus, a one-tenth of a cent increase in current per capita monthly brand advertising expenditure for 1979 yields an increase in yogurt sales of 0.13 ounces per capita.

The time period over which generic advertisement expenditure positively influences sales is five months with a mean lag of 2.1 months. The sum of the lag coefficients was found to be 143. Compared to brand advertising then, generic advertising is less effective over the five months, and loses its effects on sales earlier. The shape of the lag is somewhat surprising. Most studies using monthly data show an initial buildup in effectiveness. According to the coefficients estimated in this study, however, generic advertisement effectiveness declines almost geometrically. The long-term elasticity of generic advertisement expenditure with respect to sales is +.03. That is, one-tenth of a cent increase in current per capita monthly generic advertising expenditure would yield an increase in per capita sales of only .05 ounces, an effectiveness which is considerably lower than the one for brand advertising.

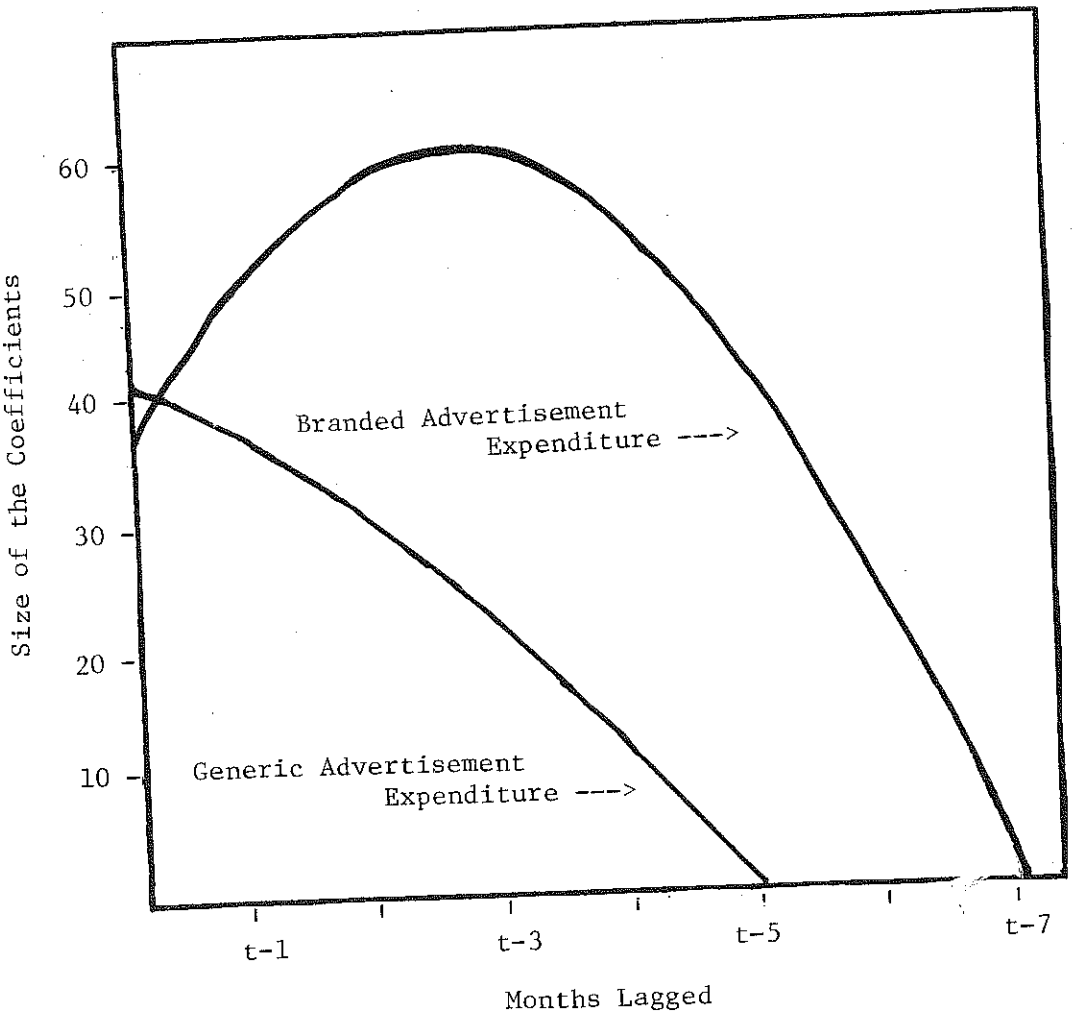
The obtained income coefficient has a positive sign, which is consistent with economic theory. The magnitude of the obtained positive income coefficient implies an income elasticity of +0.20, which is consistent with previous findings. For example, an elasticity of the same magnitude, 0.20 was found by Boehm and Babb [2]. The coefficient obtained for the price variable is not significant and is positive, which is inconsistent with economic theory. The poor results for the price variable are not surprising since the dairy price index is only a proxy for the more relevant yogurt price series.

The low response of yogurt sales to generic advertisement, in terms of the length and strength of the lag described above, given the existence of brand advertising, means that producer returns from generic advertisement of yogurt will not likely not approach the returns that could be obtained from generic advertising for fluid milk.

Table 1. Estimate Coefficients for Brand and Generic Advertisement Expenditures (California) (t-statistics in parentheses)

	Second Degree Polynomial, Endpoint Constraints Imposed		Ordinary Least Squares	
Brand Advertisement	.01	(.007)	0.77	(.51)
(-1)	37.54	(1.97)	56.96	(2.57)
(-2)	51.39	(4.02)	104.89	(5.01)
(-3)	58.84	(5.33)	52.29	(2.10)
(-4)	59.88	(5.18)	57.31	(2.27)
(-5)	54.52	(4.70)	12.23	(.47)
(-6)	42.75	(4.30)	12.81	(.45)
(-7)	24.58	(4.01)	126.00	(3.95)
			43.04	(1.41)
Sum of Lag Coefficients	329.50		465.5	
Generic Advertisement	42.84	(2.67)	41.29	(1.47)
(-1)	37.26	(3.93)	76.90	(1.97)
(-2)	30.19	(3.05)	2.30	(.05)
(-3)	21.62	(2.11)	-17.04	(-.40)
(-4)	11.55	(1.61)	101.31	(3.03)
(-5)	0		-60.63	(-2.24)
(-6)				
Sum of Lag Coefficients	143.46		144.1	
Income	.0004	(.75)	.0004	(.94)
Price	.0077	(1.82)	.0077	(1.16)
D_1	1.15	(6.44)	1.48	(7.47)
D_2	1.07	(5.70)	0.86	(3.63)
D_3	1.91	(9.62)	1.53	(5.79)
D_4	1.76	(8.18)	1.34	(5.01)
D_5	2.18	(10.57)	1.92	(8.09)
D_6	1.57	(7.97)	1.63	(8.02)
D_7	1.14	(4.98)	1.00	(4.18)
D_8	1.12	(4.65)	0.73	(2.86)
D_9	1.04	(4.81)	0.79	(3.04)
D_{10}	1.40	(7.02)	1.21	(4.45)
D_{11}	0.46	(2.65)	0.13	(.61)
R^2	.95		.98	
$\bar{R}^2$	.92		.96	
F	(17/24)	32.27	(27/13)	46.44
SSR	1.17		0.319	
DW	2.38		2.36	
COND (X)	209.70		349.02	

Chart 1. Decay Structure for Branded and Generic Advertisement Expenditure, California



Based on the findings by Thompson, Eiler, and Forker, for the New York Metropolitan Area, a per capita generic advertisement expenditure of $0.01 would, over the long term, increase per capita fluid milk consumption by 19.3 ounces. Even using the results for the city of Syracuse, which exhibited the lowest response to advertising, per capita fluid milk consumption would increase by 2.7 ounces per capita for each $0.01 spent. According to the results of the present analysis, and assuming that the California and New York markets exhibit strong enough economic and demographic similarities affecting yogurt consumption to make a comparison valid, the same amount of generic advertising for yogurt would result in a per capita increase in yogurt consumption and therefore in milk consumption,[5] of only .5 ounces.[6]

If we assume that these results can be applied in general to other markets, and to other State Promotion Boards, it must be concluded that, to maximize milk sales and producer returns, milk promotion funds should not be diverted from fluid milk promotion to promotion of yogurt, given the structure of producer milk prices and the existence of current brand advertising for dairy products. If we can extrapolate the results of this study further, from yogurt to generic advertisement of any manufactured dairy product, we would recommend that milk promotion funds should not be diverted to generic promotion of any manufactured product. This recommendation then would be relevant to the current proposal by the National Milk Producers Federation [7] to institute a mandatory contribution of 5¢/hundredweight from producers to support a national promotion program for manufactured milk products. Of course, the validity of these extrapolations are fruitful areas for futher study. Milk promotion activities will undoubtedly increase as producers attempt to counteract the decline in per capita fluid milk consumption. Studies of advertising effectiveness can give producers the basis for making the best decisions for allocation of their promotion funds.

Footnotes

1 Both the Pacific and Northeast regions have higher than average consumption levels. On a per 1000 capita basis, the Pacific and Northeast regions consumed, respectively, 359 and 304 half pints of yogurt monthly, as compared to consumption levels of 89,105 and 113 pints in the North Central, South and Mountain, and Southwest regions, respectively [14].

Important economic and demographic variables which influence yogurt consumption are income, occupational distribution, percentage of foreign born inhabitants, religion and degree of urbanization [1, 8 and 9]. When compared with U.S. averages, the Pacific and Northeast regions exhibit strong similarities. For example, both regions have a higher percentage of population in the income class over $15,000 and have a higher median income than in the U.S. as a whole. Professionals, who account for higher than average yogurt consumption, constitute a relatively large percentage of the labor force in the Northeast and the Pacific. Both regions have higher degrees of urbanization and higher concentration of foreign born residents and people of the Jewish religion than does the nation as a whole. See Foik [4, pp. 22-32] for a summary of regional differences in the consumption of yogurt.

2 Thompson's results [11, pp. 82-102] have shown that the long-run advertising elasticity is very sensitive to the chosen functional form (e.g., a linear versus a double logarithmic form). However, judging from Thompson's results, different functional forms most likely result only in a different estimate of the overall effectiveness of advertising. There would not be much of a change in the estimated relative effectiveness of brand versus generic advertising. Thus, the basic conclusion of the present analysis would likely not be altered by the use of a different functional form.

3 To correct for seasonality in yogurt sales, the inclusion of time vectors in the model was also tried. During November and December, sales drop and then increase steeply over the first three or four months of the following year. To reflect the sudden drop in sales and the subsequent increase, two time vectors, T and T^2, were constructed, where $t_1 = t_{13} = t_{25} = t_{37}$. However, these vectors introduced a very high degree of multicollinearity into the equation and thus were not included in the final estimation.

4 To reduce apparent multicollinearity, the Ridge regression estimation technique was applied. In performing a Ridge regression, the diagonal elements of the matrix of the regressors, which is almost singular when multicollinearity is serious, are multiplied by (1+d), where "d" is an arbitrarily defined, small value [6, p. 192].

5 The conversion factor of milk to yogurt is one. Conversion ratios (from milk to manufactured products), are higher for other products, e.g. for butter 21:1; and for cheese 8:1. Thus, for these products, the returns to producers resulting from any given sales response from generic (or branded) advertising would be much higher than that for yogurt.

6 For further comparison, we used a more recent study of the returns to fluid milk advertising [5], where, in 1979, a current generic advertisement budget of $936,976 for the New York Metropolitan Area was found to have resulted in an increase of total milk consumption of 24,846,836 gallons. However, the same amount of advertisement expenditure for yogurt would have resulted in an increase of yogurt sales of only 338,502 gallons.

References

[1] American Cultured Dairy Products Institute. Yogurt, Frozen Yogurt, Hard Frozen Yogurt. Washington, D.C. 1978.

[2] Boehm, W.T. and E.M. Babb. Household Consumption of Perishable Manufactured Dairy Products: Frozen Desserts and Specialty Products. Bulletin No. 105, Dept. of Agricultural Economics, Purdue University, September 1975.

[3] Borden, N.H., The Economic Effects of Advertising. Chicago: Richard D. Irwin, Inc., 1944.

[4] Foik, I., "An Econometric Analysis of the Economics of Yogurt Advertisement," M.S. Thesis, Cornell University, 1982.

[5] Kinnucan, H.W. "Demographic vs. Media Advertising Effects on Milk Demand: The Case of the New York City Market." Unpublished manuscript. Dept. of Agricultural Economics, Cornell University, July 1981.

[6] Maddala, G.S. Econometrics. New York: McGraw-Hill, 1977.

[7] National Milk Producers Federation, News for Dairy Coops., Vol. XXXX No. 6, February 15, 1982. Washington, D.C.

[8] Quackenbush, G.G. "More Americans Liking Yogurt More and More." Reprint from Dairy Record, 1978.

[9] _____, "Yogurt Usage and Shopper Attitudes Affecting Its Sales." American Dairy Review 37(1975).

[10] Simon, J.L., Arndt, J. "The Shape of the Advertising Response Function," Journal of Advertising Research 40 (1980).

[11] Thomspon, S. "An Econometric Analysis of Sales Response to Generic Fluid Milk Advertising in New York State," Ph.D. Thesis, Cornell University, 1975.

[12] Thompson, S. and D.A. Eiler. "Determinants of Milk Advertising Effectiveness," American Journal of Agricultural Economics 59(1977) pp. 330-35.

[13] Thompson, S.R., D.A. Eiler, O.D. Forker. "An Econometric Analysis of Sales Response to Generic Milk Advertising in New York State," Search 9 (1976). Cornell University.

[14] United Dairy Industry Association. The Household Yogurt Market. Marketing and Economic Research Division, Rosemont, IL, 1973.

[15] U.S. Dept. Commerce. Survey of Current Business. Bureau of Economic Analysis. Various issues.

[16] U.S. Dept. Labor. CPI, Detailed Report. Bureau of Labor Statistics, Various issues.

[17] _____, Monthly Labor Review, Dept. of Labor Statistics. Various issues.

[18] Ward, R.W., "Measuring Advertising Decay," Journal of Advertising Research 16 (1976)

[19] _____, "Evaluation of Generic Advertising Effectiveness with Econometrics." Measurement of Sales Response to Generic Promotion of Food Products: Seminar Proceedings. Texas Mktg. Res. and Dev. Ctr., MRC 73-6, 1973.

[20] Yon, B. and T.D. Mount. "The Response of Sales to Advertising: Estimation of a Polynomial Lag Structure." Unpublished paper. Dept. of Agr. Economics, Cornell University, 1974.