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PRODUCT ALLOCATION OF GENERIC ADVERTISING FUNDS:
A SALES MAXIMIZATION APPROACH WITH AN
APPLICATION TO MILK AND
CHEESE IN NEW YORK CITY

by

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PREFACE

This is one of a continuing series of reports about the economics of generic or commodity promotion programs from research conducted by and for faculty and staff of the Department of Agricultural Economics at Cornell University.

The research is supported in part by funds provided by the dairy farmers of New York State under the authority of the New York State Milk Promotion Order. Henry Kinnucan, author of this paper, was the principal research investigator on this subject during his three-year tenure as a Research Associate here in the Department of Agricultural Economics. Henry, with a PhD from the University of Minnesota, is now an Assistant Professor of Agricultural Economics at Auburn University, Alabama, where he has been since 1983. He has continued his research on commodity promotion, sometimes as a consultant to this project.

This manuscript has been accepted for presentation at the 1986 American Agricultural Economics Association Annual Meeting in Reno, Nevada, July 27-30, 1986. It is being published as a Staff Paper so that the results can be made immediately available to those persons interested in the economics of milk promotion efforts.

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Abstract

With the passage of the Dairy and Tobacco Adjustment Act of 1983, dairy farmer investment in product research, advertising and promotion in the United States increased from $60 million to $200 million annually. A key decision faced by Boards managing these funds is how best to allocate available advertising funds among the various dairy products. In this paper an economic model is developed that shows the allocation of funds to fluid milk and cheese that would maximize sales in a given market. The model is applied to the New York City market with results suggesting that over the study period diverting funds from fluid milk to cheese advertising would have enhanced milk-equivalent sales in the market by as much as 1.17 percent or 8.21 million gallons annually. Alternatively, the model suggests that the same sales level could have been achieved with a different allocation of funds resulting in an estimated 14.6 percent savings in the amount spent advertising the two products.

Key words: advertising and promotion, generic advertising, dairy promotion, dairy policy

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Weakening demand for basic agricultural commodities such as beef, milk and eggs has increased interest in advertising, promotion and new product research as a means for addressing this problem. In 1983, for example, the inclusion of a promotion provision in the Dairy and Tobacco Adjustment Act resulted in a more than doubling of U. S. funds for advertising dairy products - from $60 to roughly $200 million annually. More recently, the Food Security Act of 1985 contains authorization for commodity promotion programs in beef, pork and watermelons (Manley and Warman). Also, the egg industry is currently attempting to establish a marketing order which will have an expanded promotion budget as a component.

The desirability of these programs from a social welfare standpoint is not at issue here. Rather the purpose of this paper is the more modest one of attempting to address the issue of how best to allocate funds among different product categories. Managers of farm-funded promotion programs, typically an elected or appointed group of farmers engaged in the production of the advertised commodity, face the complex task of "getting the biggest bang for the buck" from available promotion dollars. This requires informed answers to questions such as: (1) where should the money be spent and how much should be allocated to that market? (2) which media, e.g., television, radio or print, should be used to convey the message and what is the appropriate media mix? (3) when should the money be spent, e.g., would a seasonal distribution or pulsing of expenditures be more effective than a continuous constant level of exposure? and (4) which products should receive greater emphasis in the advertising program, e.g., in the case of dairy should fluid milk, butter or cheese receive greater emphasis?

A common thread contained in the above questions is the issue of how best to allocate a finite set of resources among alternatives so as to achieve some goal. Viewed in this way, the questions from an analytical standpoint fall in the category of constrained optimization. Economic principles applicable to resolving these types of problems in a practical agricultural marketing setting are perhaps best articulated in the works of Waugh and Waugh, et al. These principles state that net returns are maximized if allocations take place such that marginal returns from each alternative are equated. For example, if a group of pecan producers is attempting to decide how best to allocate an annual crop of nuts between domestic and export markets, the answer would be to choose that allocation which equates marginal returns in export and domestic markets.

The principles outlined by Waugh implicitly assume that profit maximization is the goal of the producer group. An alternative assumption and the one used in this paper is that producers wish to maximize the quantity of product sold. The rationale for this assumption might be explained as follows: the primary purpose of promotion orders is to increase demand or, as in the case of dairy, to reduce government surpluses. Producer groups which have been given legislative authority to pool resources for the purpose of advertising and promotion should, therefore, make decisions consistent with the original intent of the legislation. Moreover, self-interest may be best served in the long run if the basic problem - slack demand - serves as the primary focus of attention rather than (short run) profit maximization.

This last factor may be especially relevant for the dairy industry because the Food Security Act of 1985 establishes an explicit link between dairy surpluses and the farm price of milk. In particular, beginning January 1, 1988 and continuing through January 1, 1990, provisions of the Act require that the Secretary of Agriculture reduce the support price by 50 cents per hundred pounds of milk marketed if Commodity Credit Corporation (CCC) purchases for the ensuing year are expected to exceed five billion pounds of milk-equivalent (Novakovic). Because dairy surpluses in 1985 at 13.5 billion pounds (USDA) were substantially above the 5 billion pound limit and are expected to continue at high levels even with the whole herd buy-out program contained in the 1985 Act (Dryer), it appears that long term benefits may be greatest if funds are allocated to maximize sales rather than short-term profits. Then, too, it should be noted that under the dairy price support program a strict profit maximization assumption would lead to a recommendation that <u>all</u> advertising dollars be allocated to fluid milk or other Class I products when dairy surpluses exist. This is so because advertising manufactured (Class II) dairy products (cheese, butter, ice cream, etc.) would simply reduce CCC inventories with no effect on farm-level price or marketings (Kinnucan, 1983). Because the sales maximization assumption permits advertising of manufactured dairy products, this assumption would appear to offer a more realistic "engine of analysis" relative to the problem considered in this paper.[1/]

The specific research objective in this study was to develop an approach to determining the "best" allocation of a given size generic promotion budget between two products--fluid milk and cheese. The New York City market serves as the focus for analysis because the needed empirical relationships have been estimated for this market. An implicit assumption is that the producer group managing the New York State Dairy Promotion Order follows a two-step decision process in fund allocation. First, they decide what portion of the total budget to allocate to New York City and then, having made this decision, decide on what share of the New York City budget to place in fluid milk vis-a-vis cheese. A further simplifying assumption is that other dairy products such as butter or yogurt are ignored by the Board as potential products to advertise.[2/]

The Model

The basic assumption of the analysis is that producers funding the advertising program wish to allocate funds so as to achieve the highest level of sales possible. Assuming that a decision has already been made to allocate a* of the total advertising budget to New York City, the problem then is to decide how best to allocate a* between two products--fluid milk (qm) and cheese (qc). Letting

(1) $a^* = am + ac$

where am = milk advertising and ac = cheese advertising, the problem can be cast mathematically as:

$$\max_{am,\, ac,\, \Psi} Z = qm(am) + qc(ac) + \Psi\,(a^* - am - ac) \qquad (2)$$

In principle the values of am and ac providing the maximum level of sales given a* could be obtained by solving the first order conditions of equation (2) for the relevant variables. However, because the available qm and qc functions are nonlinear (i.e., logarithmic), this approach is complicated and hence an alternative one suggested by Waugh was taken. This approach involves the use of isoquants to show graphically the minimum cost method of obtaining a given sales level. To operationalize the procedure, the following ingredients are needed:

1. sales response functions for qm and qc showing the net relationship between (milk-equivalent) sales and advertising,

2. a function which shows the various combinations of am and ac yielding the same level of total milk-equivalent sales; i.e., an empirical expression for the sales isoquant, and

3. a mathematical expression for the slope of the isoquant. This permits construction of an "expansion path" (a curve connecting isoquants at points of equal slope). Under the assumption of sales maximization, the am and ac combination yielding a slope of -1 on the isoquant represents the "best" (cost-minimizing) allocation of advertising dollars for achieving a given level of sales.

Procedures used to accomplish each of these steps are described below. Results are then summarized graphically and discussed.

<u>Sales response functions</u>

In two separate studies Kinnucan and Kinnucan and Fearon used monthly data pertaining to the New York City market to estimate sales-advertising response functions for fluid milk and cheese. Each of these functions included variables to indicate the effects of prices, income, demographic and seasonality factors on market sales of the respective products. The fluid milk equation was estimated using data for the period 1971-1980; the cheese equation is based on data for the 1977-81 period. To permit advertising to have a diminishing marginal effect on sales, logarithmic functional forms were used in the studies.

Letting qm = milk sales in ounces per person per day and qc = cheese sales in ounces per person per day on a milk-equivalent basis, the following sales response functions were obtained:

(3) $qm = 7.66466\ AM^{.05096}$

(4) $qc = 4.39683\ AC^{.05930}$

where AM and AC are generic advertising expenditures for fluid milk and cheese, respectively, expressed in cents per capita per year in 1985 dollars. The exponents in equations (3) and (4) are the estimated long run advertising elasticities associated with each product. Assuming that the constant elasticity assumption implicit in the use of logarithmic equations is valid, the larger elasticity for cheese advertising suggests that the New York City market over the study periods was more responsive to cheese than fluid milk advertising.

The constants in each equation were adjusted to (i) reflect a change in units of the advertising variables from monthly expenditures in dollars to annual expenditures in cents, (ii) to permit pegging each advertising variable to a common base year (1985) and (iii) to insure that estimated sales equals actual sales when the functions are evaluated at mean data points (AM = 23.3¢; AC = 3.4¢). The constant term of the cheese equation also reflects a conversion of cheese sales to a milk-equivalent basis. It was assumed that one pound of cheese is equivalent to 9.9 pounds of raw farm milk. Sample means of daily per capita market sales for the two products were 9.00 ounces for fluid milk and 4.72 (milk-equivalent) ounces for cheese.

Marginal sales functions corresponding to (3) and (4) required for the derivation of the isoquant relation are:

(5a) $\frac{\partial qm}{\partial AM} = .39059\ AM^{-.94904}$

(5b) $\frac{\partial qc}{\partial AC} = .260732\ AC^{-.94070}$.

Evaluating these functions at the respective sample means of advertising (AM = 23.3¢; AC = 3.4¢) gives the following marginal products:

$$\frac{\partial qm}{\partial AM} = .01968 \text{ and } \frac{\partial qc}{\partial AC} = .08362.$$

Because the marginal sales response at average advertising levels are unequal, this suggests that a different allocation of funds would have resulted in greater sales. Specifically, since the marginal sales response to cheese advertising exceeds the marginal sales response to fluid milk advertising at mean data points, it appears that a reallocation of funds from fluid milk to cheese advertising would have enhanced sales relative to the actual allocation. The isoquant apparatus developed below can be used to determine the precise manner in which funds should be reallocated to maximize sales.

The sales isoquant equation

An isoquant is a locus of input combinations, e.g., combinations of AM and AC, yielding the same sales level on a milk-equivalent basis. The equation describing this locus can be constructed as follows. Define total milk-equivalent sales as:

(6) $TS = qm + qc$.

Substituting equations (3) and (4) into equation (5) yields:

(7) $TS = 7.66466\ AM^{.05096} + 4.39683\ AC^{.05930}$.

Solving equation (6) in terms of AC for some fixed level of sales (TS_0) gives:

(8) $AC = e^{\delta}$

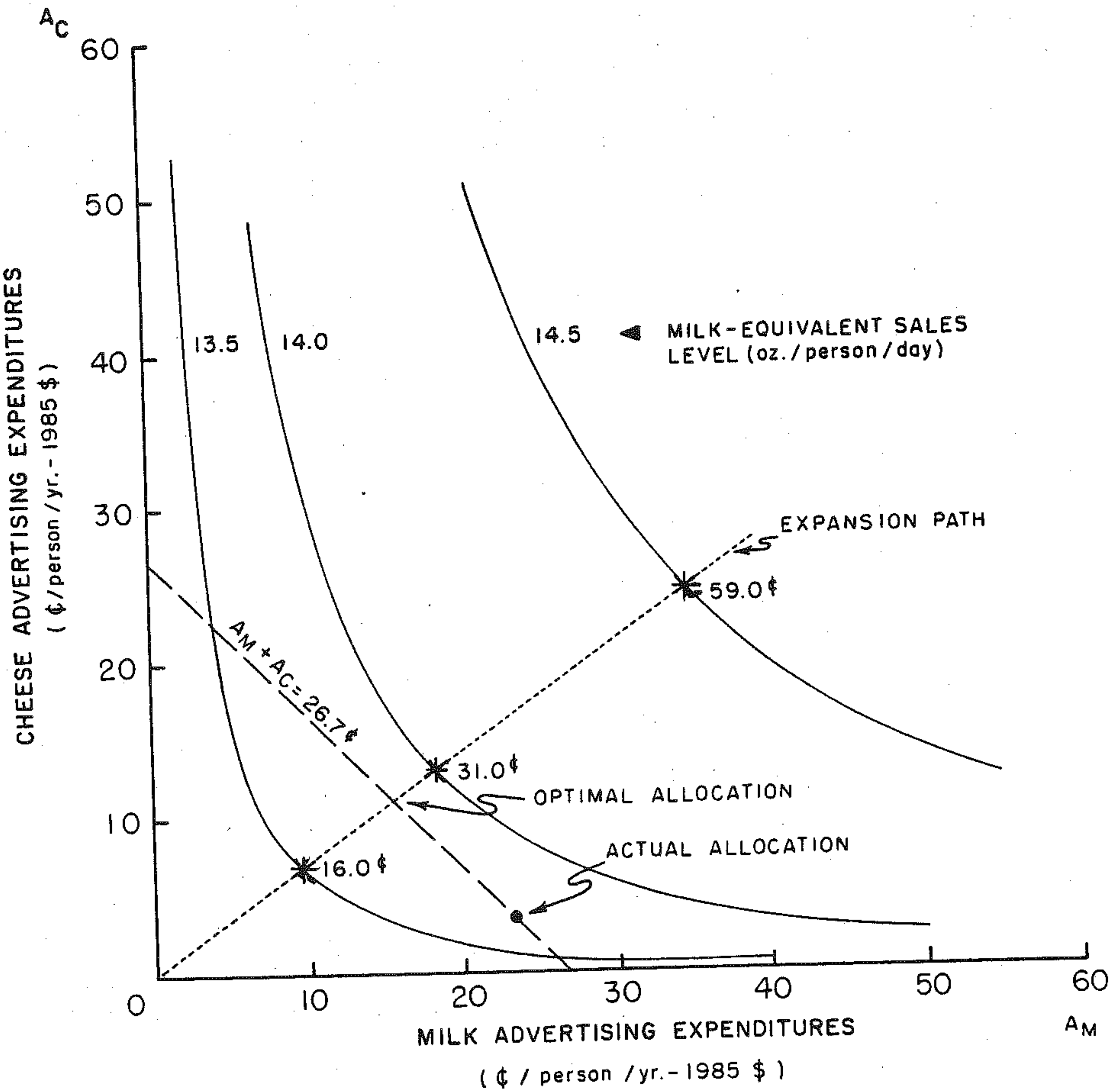
where $\delta = 16.863 \ln(TS_0 - 7.66466AM^{.05096}) -24.972$

By fixing TS at some predetermined level, say 13.72 oz. (the sample mean of combined milk and cheese sales on a milk-equivalent basis) and simulating equation (7) over a range of values for AM, say 1¢ - 70¢ (roughly the sample range of milk advertising expenditures) the various combinations of AM and AC yielding TS_0 can be established. Isoquants associated with milk-equivalent sales levels of 13.5, 14.0 and 14.5 oz. computed in this fashion are graphed in figure 1. Note that the curves are convex to the origin, insuring that the second order sufficient condition for a maximum is satisfied.

The Expansion path

The "expansion path" is a locus of points connecting the least-cost combinations of inputs associated with different isoquants.

FIGURE I. ALLOCATION OF GENERIC ADVERTISING EXPENDITURES TO FLUID MILK AND CHEESE, New York City



Least cost input combinations are found at the point of tangency between a budget line and an isoquant. Because the budget line has a constant slope of -1 (see equation (1)) this tangency occurs at the point on the isoquant yielding a slope of -1. This point can be found using the following expression for the slope of the isoquant based on equation (8):

(9) $$\frac{\partial AC}{\partial AM} = \frac{\partial e^{\delta}}{\partial AM} = e^{\delta} \frac{\partial^{\delta}}{\partial AM}$$

Substituting equation (8) into equations (9) and solving yields

(10) $$\frac{\partial AC}{\partial AM} = \frac{-6.5867AM^{-.94904}AC}{TS_0-7.66466AM^{.05096}}$$
(10)

where AC is defined as in equation (8).

Points on the isoquants when TS_0 = 13.5, 14.0, and 14.5 oz. yielding a slope value of -1 are indicated in figure 1 by an asterisk. For example, given a milk-equivalent sales level for cheese and milk of 14 oz. the minimum cost allocation for achieving this sales level is 18.6¢ to fluid milk and 12.4¢ to cheese for a total annual advertising expenditure of 31.0¢/person. The line connecting the asterisks is the expansion path. It shows the increases in advertising for each product that would minimize cost as sales expands. Note, too, that the spacing of the constructed isoquants along the expansion path suggests that the advertising effort in the market is subject to decreasing returns to scale.[3/]

Model Results

Assuming the parameters of the underlying sales response functions remain unchanged, Figure 1 can be used to show the best allocation of advertising dollars to fluid milk and cheese of any given size advertising budget. This can be done by inserting a budget line into the diagram which shows the various combinations of AM and AC which would add to equal the amount available to spend on advertising. For example, over the sample periods, dairy farmers spent an average of 26.7¢/person/year in 1985 dollars in the market advertising fluid milk and cheese. By locating 26.7¢ on both the vertical and horizontal axes and connecting these points, the "budget line" associated with this expenditure level is constructed. The intersection of the budget line and the expansion path shows the optimum allocation of this expenditure. From the diagram, the "best" allocation of the 26.7¢ is 16.0¢ to fluid milk and 10.7¢ to cheese. Comparing this result to the actual allocation (23.3¢ fluid milk and 3.4¢ cheese), the model suggests that total milk-equivalent sales would have been higher if 7.3¢ had been diverted from fluid milk to cheese advertising.[4/]

Alternatively, the question might be asked: "Given the average milk-equivalent sales in the market of 13.72 oz./person/day experienced over the sample periods, what would have been the cost-minimizing allocation of advertising funds consistent with this level of sales?" By setting TS_0 in equation (10) equal to 13.72, setting the equation equal to -1 and solving for AC in terms of AM, the answer is obtained. Results suggest that the 13.72 oz. of milk could have been sold with a total advertising expenditure of 22.8¢ (with 14.0¢ allocated to fluid milk and 8.8¢ allocated to cheese). Comparing this result with the actual expenditure of 26.7¢ , a savings of 3.9¢ per capita or 14.6 percent is indicated had the cost-minimizing allocation of funds been in place over the study period. The relatively steep curvatures of the sales isoquants, especially at lower sales levels, is suggestive of the substantial cost savings that can be realized by appropriately allocating the budget.

A rather simple and useful algebraic solution exists for the allocation problem described by Figure 1. Note that since both the budget line and the expansion path are linear, the values of AM and AC providing maximum sales for a given size budget AT can be found by solving the following two equation system:[5/]

(11) $$AC + AM = AT$$

and

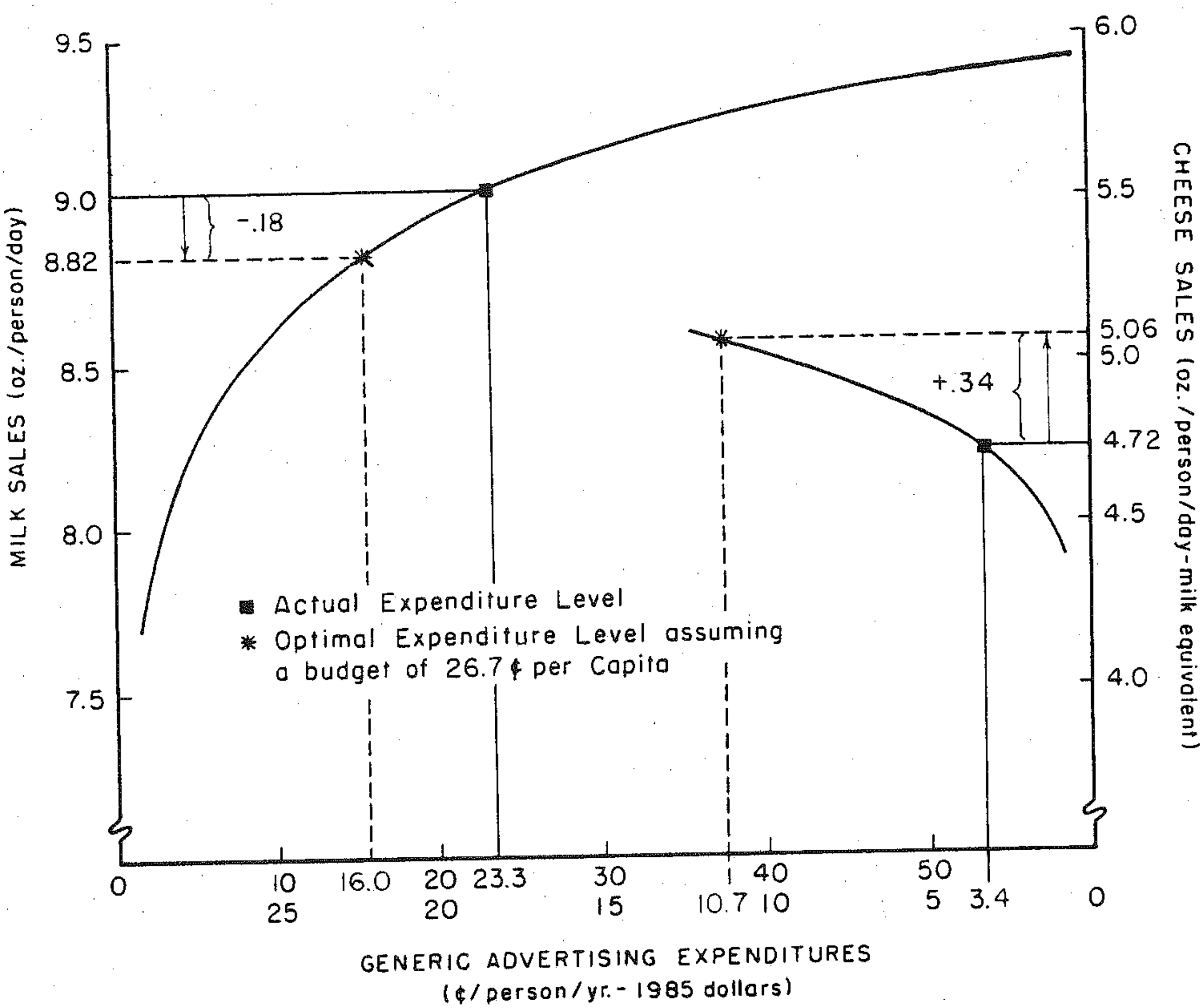
(12) $$AC = k'AM$$

where equation (11) is the expression for the budget line and equation (12) is the expansion path. The k' parameter is the proportion of milk advertising devoted to cheese advertising in sales maximizing equilibrium. According to the results discussed above, k' = 10.7/16.0 = .67. Replacing k' with .67 and solving the above system for AM yields:

(13) $$AM = .60\ AT.$$

Equation (13) indicates that an allocation of 60 percent of the total New York City advertising budget to fluid milk and the remaining 40 percent to cheese would have maximized sales over the sample period.

FIGURE 2. SALES RESPONSE SURFACES FOR FLUID MILK AND CHEESE,[a] NEW YORK CITY, 1979-81



a/ Net regressions which hold constant all variables except advertising at mean data points

The actual allocation was 87 percent to milk and 13 percent to cheese.[6/]

The effect on milk-equivalent sales of reallocating advertising expenditures in the manner indicated by the model is shown graphically in Figure 2. Reducing annual expenditures on fluid milk advertising from 23.3¢ to 16.0¢ per capita results in decline in sales from 9.00 oz./person/day to 8.82 oz./person/day. However, this decrease is more than offset by the milk-equivalent sales gain realized by increasing cheese advertising expenditures by a corresponding amount (7.3¢ per capita). In particular, the simulation results show daily milk-equivalent sales of cheese rising from 4.72 to 5.06 oz. when advertising is increased from 3.4¢ to 10.7¢ providing a net gain of .16 oz. from the reallocation. Comparing total milk-equivalent sales under the "optimum" allocation (13.88 oz.) with the sales level achieved by the actual allocation (13.72 oz.), results suggest that sales could have been enhanced by as much as 1.17 percent if relatively more funds had been allocated to cheese vis-a-vis fluid milk over the study period. Based on a New York City media coverage area population of 18 million, these results suggest that by placing a greater emphasis over the study period on cheese in their advertising strategy, Federal Order 2 dairy farmers could have enhanced annual milk sales in the market by as much as 8.21 million gallons on a milk-equivalent basis.[7/]

Concluding Remarks

The general principle used in the analysis, equalization of marginal sales among products for a given size advertising budget, can be generalized to any problem involving the allocation of advertising funds providing sales (rather than profit) maximization is the goal. Thus, for example, the procedures outlined in the paper could be applied to such issues as how to allocate advertising funds across media (television, radio, print, etc.), markets or seasons.

Of course, to implement the principles discussed in this paper, empirical measures of the relevant sales-advertising relationships are needed and these are not always easy to obtain. Moreover, recommendations based on such models must be tempered by the fact that marketing is a dynamic process. Hence, underlying relationships may change during the implementation period or may have changed by the time the recommended allocation is adopted. Thus, monitoring and follow-up are integral components of any attempt to improve marketing decision-making via the use of economic models such as the one developed in this paper.

Reliable estimates of sales response function parameters are essential if the proposed model is to yield correct results. Because good parameter estimates require high quality and appropriate data, a necessary ingredient in further research efforts regarding farm funded promotion programs is the building of a data base upon which empirical analyses can continue to develop.

FOOTNOTES

1/ For example, applying a profit maximizing model such as the one developed by Thompson and Eiler to the question of how best to allocate advertising funds between fluid milk and manufactured dairy products would result in a recommendation that no funds be spent on Class II product advertising as long as dairy surpluses exist.

2/ Restricting the analysis to only two products is done for practical reasons and not because the approach is limited in its capacity to handle more products. In particular, over the study period Federal Order 2 dairy farmers spent essentially all advertising funds on cheese and fluid milk (D'Arcy, et al.), thus it was unnecessary to develop a more complicated model. Extending the model to include more than two products is straightforward and poses no new analytical difficulties. Of course, the isoquant apparatus discussed could not be used unless some products were aggregated.

3/ Caution must be exercised in interpreting figure 1 because in the case of cheese advertising (but not milk advertising) the graphs of the isoquants exceed the observed range of the data (the maximum annualized monthly expenditure for cheese advertising over the study period was 11.3¢; the corresponding expenditure for milk advertising was 76.0¢). It is possible that the cheese response function is no longer valid at expenditure levels exceeding 11.3¢, in which case points on the expansion path beyond the 27¢ combined advertising level must be treated with extreme caution.

4/ In commenting on the actual implementation of results obtained from models such as the one developed in this paper, Waugh suggested an "iterative" procedure whereby the farm group would make the necessary changes to move toward the optimum allocation in a gradual manner, taking stock of the impact at various intervals during the implementation phase. Waugh (p. 126) argued that "such an iterative procedure has the great advantage of making it possible to re-study the demand functions after each step. If the allocation [to one commodity] is gradually increased from year to year, the statistician may be able to get dynamic measures of demand changes, and thus may find the key to maximizing the flow of returns over a period of several years."

5/Strictly speaking, the expansion path in this problem is nonlinear. However, as demonstrated in the appendix, the error associated with the linear approximation is negligible - less than one percent in magnitude. It should be noted that the approximate linearity of the expansion path found in this study is purely coincidental and is not related to the mathematical properties of the functions involved. For example, linear expansion paths emanating from the origin are expected from Cobb-Douglas type functions because these functions exhibit the mathematical property of homogeneity (Chiang, p. 422). Although equations (3) and (4) are of the Cobb-Douglas type, the expansion path associated with the summation of these two equations (as is done in equation (2)) would not, in general, be linear. The reason is that the sum of two homogeneous functions is not, in general, homogeneous.

6/The relatively heavy allocation of funds to fluid milk advertising in the market over the study period was based on the notion discussed in footnote 1 that cheese advertising was not profitable for the dairy farmer. That some money nonetheless was spent advertising cheese is an indication that the individuals responsible for fund allocation did not completely agree with the notion that advertising manufactured dairy products is uneconomic when surpluses exist.

7/ A recent reference outlining problems commonly encountered when using time series data to estimate sales response functions is Kinnucan (1985). Other approaches include the use of controlled market experiments (Clement and Henderson) varying parameter regression models (Ward and Meyers, Ward and Tilley), and pooled time series cross section estimation (Ward and McDonald).

Appendix

That the error associated with assuming linearity in the expansion path is negligible can be demonstrated by the following derivation of the precise equation for the expansion path. First note that in cost-minimizing equilibrium, the sales maximizing allocation of funds will occur where the ratio of the marginal sales response functions equals minus one, i.e.:

$$\text{(A.1)} \qquad \frac{u_1 \beta_1 AM^{\beta_1 - 1}}{u_2 \beta_2 AC^{\beta_2 - 1}} = -1,$$

where u and β are the parameters indicated in equations (3) and (4) of the text (u_1 = 7.66466, u_2 = 4.39683, β_1 = .05096 and β_2 = .05930). Solving equation (A.1) for AC in terms of AM yields:

$$\text{(A.3)} \qquad AC = \left(\frac{u_1 \beta_1}{u_2 \beta_2}\right)^{\frac{1}{\beta_2 - 1}} AM^{\frac{\beta_1 - 1}{\beta_2 - 1}} .$$

Substituting parameter values and simplifying yields the exact equation for the expansion path, which is:

$$\text{(A.4)} \qquad AC = .65\ AM^{1.0089}.$$

Comparing equation (A.4) with equation (12) of the text (AC = .67AM), it is apparent that the linear approximation results in only a slight error. For example, setting AM equal to 16 in equation (A.4) yields a value for AC of 10.66; a similar substitution for equation (12) yields a value of 10.72 - a difference of .56 percent.

REFERENCES

Chiang, A.C. Fundamental Methods of Mathematical Economics, 3rd edition. New York: McGraw-Hill Book Co., 1984.

Clement, W. E., P. L. Henderson, and C. P. Eley. "The Effect of Different Levels of Promotional Expenditures on Sales of Fluid Milk." USDA, ERS, ERS-259, October 1965.

D'Arcy Mac Manus Masuis, Inc. American Dairy Association Media Plan. Various issues, 1979f.

Dryer, J. "Will Buyout Halt Production Increases?" National Dairy News. March 21, 1986.

Henderson, P. L. "Butter and Cheese: Sales Changes Associated with Three Levels of Promotion." Agr. Econ. Rpt. No. 322, USDA/ERS. January, 1976.

Kinnucan, H. "Demographic Versus Media Advertising Effects on Milk Demand: The Case of the New York City Market." Northeastern J. Agr. and Resource Econ. 15 (1986): forthcoming.

Kinnucan, H. W. "The Economics of Advertising Manufactured Dairy Products." Proceedings. Agr. Econ. Ext. 83-21, Cornell University, 1983.

Kinnucan, H. "Evaluating Advertising Effectiveness Using Time Series Data." in Research on Effectiveness of Agricultural Commodity Promotion. W. J. Armbruster and L. H. Myers (eds.). Arlington, V. A.: Farm Foundation/USDA, September 1985a, pp. 105-122.

Kinnucan, H. and D. Fearon. "Effects of Generic and Brand Advertising of Cheese in New York City with Implications for Allocation of Funds." North Central J. Agr. Econ. 8 (1986): 93-107.

Manley, W. T. and M. Warman. "Commodity Research and Promotion Programs:

A Government View." Symposium paper presented at the annual meetings of the Southern Agricultural Economics Association, Orlando, Florida, February 1986.

Novakovic, A.M. "Detailed Summary of the Dairy Provisions of the Food Security Act of 1985." A.E. Ext. 86-1, Cornell University, January 1986.

Thompson, S. R. and D. A. Eiler. "Determinants of Milk Advertising Effectiveness." Amer. J. Agr. Econ. 59 (1977): 330-35.

U.S. Department of Agriculture. Econ. Res. Ser. Dairy Outlook and Situation Report. DS-403, December, 1985.

Ward, R. W. and W. F. McDonald. "Effectiveness of Generic Milk Advertising: A Ten Region Study." Agribusiness: An International Journal. 2 (1986): 77-89.

Ward, R. W. and L. H. Myers. "Advertising Effectiveness and Coefficient of Variation Over Time." Agricultural Economics Research. 31 (1979): 1-11.

Ward, R. W. and D. S. Tilley. "Time Varying Parameters with Random Components: The Orange Industry." Southern J. Agr. Econ. 12 (1980): 5-12.

Waugh, F. V. "Distribution Among Markets." in Selected Writings on Agricultural Policy and Economic Analysis. J. P. Houck and M. E. Abel (editors). Minneapolis, Minnesota: University of Minnesota Press, 1984.

Waugh, F. V., E. L. Burtis, and A. F. Wolf. "The Controlled Distribution of a Crop Among Independent Markets." Quarterly Journal of Economics. 51 (1936): 1-46.