



The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

Papers downloaded from AgEcon Search may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

MEASURING IMPACTS ON DEMAND OF AGRICULTURAL COMMODITY PROMOTION*

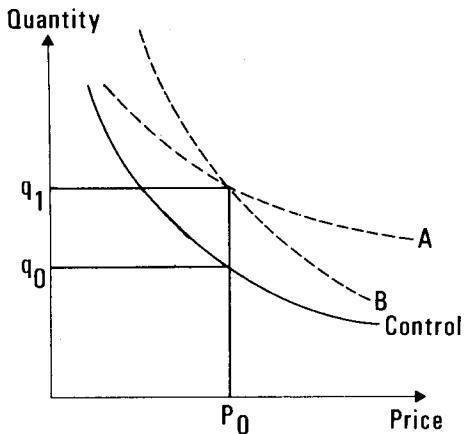
Ronald Raikes and William Vollink

Producer "checkoff" programs have been established for several agricultural commodities. Typically, at least part of the money collected is used to support commodity promotions. But decisions about support of promotions often are made with little information about expected impacts on demand. Studies of selected commodity promotions have provided estimates of promotions' impacts on intercepts of demand functions. But these studies have not provided information about impacts on other demand parameters; *viz.*, the responsiveness of quantity demanded to changes in commodity price, prices of competing commodities or consumer income. The purpose of this paper is to suggest and illustrate a research procedure that provides estimates of a promotion's impacts on the demand function's intercept and on responsiveness of quantity demanded to changes in price, competing prices and income.

Information about impacts of a promotion on responsiveness of quantity demanded to price and income changes should be especially helpful to decision makers who must choose, from among alternatives, a promotional program to be conducted during a period of increasing or decreasing retail price. Figure 1 illustrates this point. Demand curves for a commodity under three promotional treatments are shown: no promotion (control) and alternative promotional programs A and B. Relative impacts on quantity demanded and on total revenue depend on price level. If price rises above P_0 , program A, which reduces demand elasticity, results in a greater increase in quantity demanded and total revenue. On the other hand, if price falls below

P_0 , program B, which increases elasticity, is more effective in increasing quantity demanded and total revenue. Similarly, information about impacts on responsiveness of quantity demanded to changes in competing prices and income would be helpful in comparing promotional programs.

Figure 1.
HYPOTHETICAL COMMODITY DEMAND CURVES UNDER THREE PROMOTION TREATMENTS



In this paper, a conceptual framework for analyzing impacts of a promotion on commodity demand is presented, and a procedure for measuring the impacts of a promotion is developed. Results of an empirical application of this procedure are presented, and the design of promotional programs is discussed.

Ronald Raikes is assistant professor of economics, and William Vollink is research assistant in economics at Iowa State University.

*Journal Paper No. J-8275 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project No. 1978.

CONCEPTUAL FRAMEWORK

The following equations provide a conceptual framework for the analysis of the impacts of a promotion on commodity demand:

$$(1) Q_{ij} = f_i(P_{ij}, PC_{ij}, I_{ij}, T_{ij}, W_{ij}; B_{kip}), \quad i = 1, 2, \dots, I; \quad j = 1, 2, \dots, J; \quad k = 0, 1, \dots, K; \quad p = 1, 2, \dots, P;$$

and $j \neq p$

where

Q_{ij} = quantity demanded per capita in the i -th market and j -th observation period,
 P_{ij} = commodity price,
 PC_{ij} = price of competing commodity,
 I_{ij} = per-capita consumer income,
 T_{ij} = index of consumer tastes and preferences,
 W_{ij} = seasonal consumption index,
 B_{kip} = k -th parameter of demand function during the p -th promotional period,

and

$$(2) B_{kip} = g_{ki}(S_{ip}, AG_{1mip}, AB_{1mip}, A_{ip-n}), \quad 1 = 1, 2, \dots, L; \quad m = 1, 2, \dots, M; \quad \text{and } n = 1, 2, \dots, N;$$

where

S_{ip} = display space allocated to the commodity in the i -th market during promotional period p ,
 AG_{1mip} = generic advertising expenditures for media 1 with theme m ,
 AB_{1mip} = brand advertising expenditures for media 1 with theme m , and
 A_{ip-n} = total advertising expenditures during the n -th previous promotional period.

Equation (1) is a general-form market demand function for the commodity, and the B 's are parameters. A market may be a region of a country, a city or a retail store. The length of the observation period, j , is assumed to be less than 1 year (e.g., 1 week); thus, a seasonal index is included as an explanatory variable. Longer-term trends in consumer tastes and preferences are represented by the index T_{ij} . The k -th demand parameter for market i and promotional period p , B_{kip} , is a function of the promotional treatment. A promotional period is one during which a given promotional treatment is in effect. It may span one or more observation periods. A promotional treatment is defined by a set of values for the explanatory variables in equation (2).

Equations (1) and (2) provide a more general framework for analyzing a promotion's impact on demand than has been used in previous studies. In most of them, attention has been focused on a promotion's impact on the intercept of the demand function.¹ In this model, impacts on responsiveness of quantity demanded to price and income changes,² as well as impacts on the demand function intercept, are hypothesized. In earlier studies, promotional treatments often have been defined by current and past advertising expenditures. In this model, current expenditures for generic and brand advertising using different media (e.g., newspaper, point of purchase, etc.) and theme (e.g., quality, low price, healthful, etc.) combinations are distinguished. Impacts on different markets, which may reflect different socioeconomic groups of consumers, also are delineated.

Some information about impacts of alternative promotional treatments on the intercept of the demand function is available from earlier studies. A common conclusion has been that the intercept increases with current advertising expenditures [2, 5, 8], but at a decreasing rate [2, 6]. Past advertising expenditures have also been found to increase the intercept, but by a smaller amount than current expenditures [2, 8]. Display space has been found positively related to intercepts for lamb and broilers [1, 4], and

¹See, for example, Nerlove and Waugh [8] and Clement, Henderson and Eley [2]. An exception, however, is the paper by Myers [7].

²The measure of responsiveness depends on the functional form of equation (1). If, for example, the function is linear in actual values, responsiveness is measured by the slope coefficients. If the function is linear in logarithms, responsiveness is measured by the elasticity coefficients.

Ward [9] found that brand advertising for citrus had a greater impact than generic advertising. Little information is available about the relative impacts of different media and themes.

Impacts of alternative promotional treatments on other demand parameters have not been examined. Waugh [10, p. 371] asserted that, "Price advertising doubtless makes demand more elastic," but this assertion has not been tested. Information about impacts on responsiveness of quantity demanded to competing price and income changes is not available because procedures used in earlier studies have not provided measures.

A PROCEDURE FOR MEASURING IMPACTS OF A PROMOTION

A procedure providing measures of these promotional impacts may be illustrated by an example. Suppose a commodity promotion is to be conducted over a J -week period in I test stores and that estimates of current and carry-over impacts on demand parameters are desired. Further, assume that the commodity demand function for the i -th test store and j -th week is:

$$(3) Q_{ij} = B_{0ip} + B_{1ip}P_{ij} + B_{2ip}PC_{ij} + B_{3ip}I_{ij} + W_{ij}, \quad j \in p$$

where $p = 1$ for the prepromotion period, $p = 2$ for the promotional period, $p = 3$ for the postpromotion period, u_{ij} is the error term, and the other variables are as defined for equation (1). Assume that the observation period is 1 week and denote the first week of the promotional period $j = J + 53$. Now, suppose that observations on W_{ij} are not available but that observations are available for Q_{ij} , P_{ij} , PC_{ij} , and I_{ij} for weeks $j = 1, 2, \dots, 3J$ and for weeks $j = 52, \dots, 52 + 3J$. That is, observations are available for the promotional period, for J weeks before and J weeks after the promotion, and for these $3J$ weeks in the previous year.

An equation that can be used to obtain estimates of the B 's for the three promotional periods and, thus, the three promotional treatments may be derived as follows. First, assume that $W_{ij+52} = W_{ij}$ and write the following equations for the prepromotion, promotional,

and postpromotion periods:

$$(4) Q_{ij+52} - Q_{ij} = B_{1i1}(P_{ij+52} - P_{ij}) + B_{2i1}(PC_{ij+52} - PC_{ij}) + B_{3i1}(I_{ij+52} - I_{ij}) + u_{ij+52} - u_{ij}, \quad j = 1, 2, \dots, J$$

$$(5) Q_{ij+52} - Q_{ij} = B_{0i2} - B_{0i1} + B_{1i2}P_{ij+52} - B_{1i1}P_{ij} + B_{2i2}PC_{ij+52} - B_{2i1}PC_{ij} + B_{3i2}I_{ij+52} - B_{3i1}I_{ij} + u_{ij+52} - u_{ij}, \quad j = J+1, \dots, 2J$$

$$(6) Q_{ij+52} - Q_{ij} = B_{0i3} - B_{0i1} + B_{1i3}P_{ij+52} - B_{1i1}P_{ij} + B_{2i3}PC_{ij+52} - B_{2i1}PC_{ij} + B_{3i3}I_{ij+52} - B_{3i1}I_{ij} + u_{ij+52} - u_{ij}, \quad j = 2J+1, \dots, 3J$$

These equations may be rewritten

$$(7) \Delta Q_{ij} = B_{1i1}(\Delta P_{ij}) + B_{2i1}(\Delta PC_{ij}) + B_{3i1}(\Delta I_{ij}) + \Delta u_{ij}, \quad j = 1, J$$

$$(8) \Delta Q_{ij} = B_{0i2} - B_{0i1} + (B_{1i2} - B_{1i1})P_{ij+52} + B_{1i1}(\Delta P_{ij}) + (B_{2i2} - B_{2i1})PC_{ij+52} + B_{2i1}(\Delta PC_{ij}) + (B_{3i2} - B_{3i1})I_{ij+52} + B_{1i1}(\Delta I_{ij}) + \Delta u_{ij}, \quad j = J+1, \dots, 2J$$

$$(9) \Delta Q_{ij} = B_{0i3} - B_{0i1} + (B_{1i3} - B_{1i1})P_{ij+52} + B_{1i1}(\Delta P_{ij}) + (B_{2i3} - B_{2i1})PC_{ij+52} + B_{2i1}(\Delta PC_{ij}) + (B_{3i3} - B_{3i1})I_{ij+52} + B_{3i1}(\Delta I_{ij}) + \Delta u_{ij}, \quad j = 2J+1, \dots, 3J$$

where $\Delta X_{ij} = X_{ij+52} - X_{ij}$. Finally, the following indicator variables may be defined:

$$D_{2j} = \begin{cases} 1 & \text{if } j = J+1, \dots, 2J \\ 0 & \text{otherwise} \end{cases}$$

$$D_{3j} = \begin{cases} 1 & \text{if } j = 2J+1, \dots, 3J \\ 0 & \text{otherwise} \end{cases}$$

and equations (7)-(9) may be written in a single equation:

$$(10) Q_{ij} = (B_{0i2} - B_{0i1})D_{2j} + (B_{0i3} - B_{0i1})D_{3j} + B_{1i1}(\Delta P_{ij}) + (B_{1i2} - B_{1i1})(P_{ij+52}D_{2j}) + (B_{1i3} - B_{1i1})(P_{ij+52}D_{3j}) + B_{2i1}(\Delta PC_{ij}) + (B_{2i2} - B_{2i1})(PC_{ij+52}D_{2j}) + (B_{2i3} - B_{2i1})(PC_{ij+52}D_{3j}) + B_{3i1}(\Delta I_{ij}) + (B_{3i2} - B_{3i1})(I_{ij+52}D_{2j}) + (B_{3i3} - B_{3i1})(I_{ij+52}D_{3j}) + \Delta u_{ij}, \quad j = 1, 2, \dots, 3J$$

Coefficients in equation (10) have the following interpretations. The coefficient of D_{2j} on the first line of the right-hand side is the change in the i -th store intercept from the pre-promotional to the promotional period, and the coefficient of D_{3j} is the change in intercept from prepromotional to the postpromotional period. Coefficients on the second line of the right-hand side are estimates of quantity-price slopes. B_{1i1} is the slope for the i -th store in the pre-promotional period, $(B_{1i2} - B_{1i1})$ is change in the slope from the prepromotional to the promotional period, and $(B_{1i3} - B_{1i1})$ represents change in the slope from prepromotional to the postpromotional period. An estimate of B_{1i2} , for example, may be obtained by adding coefficients B_{1i1} and $(B_{1i2} - B_{1i1})$. Coefficients on the third and fourth lines on the right-hand side show quantity-competing price and quantity-income slopes for the i -th store for the three promotional periods.

Ordinary least-squares regression procedures may be used to estimate coefficients in equation (10) and to test several hypotheses.³ The null hypothesis that impacts of the promotion are the same for all stores (markets) may be tested by estimating equation (10) separately for each store and then testing the homogeneity of these equations by using an F-test. F-tests may also be performed to test the null hypothesis that each demand parameter is the same in prepromotional, promotional and postpromotional periods. The null hypothesis that a given parameter remains the same under different promotional treatments may be tested by using t-tests.

AN EMPIRICAL APPLICATION

The procedure just discussed was used to estimate impacts on retail beef demand of a promotion jointly sponsored by the Iowa Beef Industry Council (an organization supported by producer checkoff funds), an Iowa packing firm and a retail grocery chain in Buffalo, New York. The promotion began on Jan. 29, 1973 and continued for 12 weeks. There were 24 test

stores. The theme emphasized the quality of Iowa corn-fed beef. Media used were in-store and point-of-purchase materials, newspapers and radio.

The promotion was conducted during a period of rapidly increasing beef prices, and two important unplanned events that occurred during the promotional period had to be considered in the analysis. First, a ceiling on retail beef prices was announced on March 29, 1973. Second, a nationally organized beef boycott occurred during the tenth week of the promotion.

The beef-demand function assumed in the analysis for the i -th store, j -th week, and p -th promotional period was:

$$(11) \ln Q_{ij} = \ln B_{0p} + B_{1p} \ln P_{ij} + B_{2p} \ln PC_{ij} + B_{3p} \ln I_{ij} + B_{4p} \ln T_j + B_{5p} \ln DB_j + \ln W_{ij} + \ln u_{ij}$$

where B_{kp} is the k -th demand parameter for all stores during the p -th promotion period, DB_j is an indicator variable for the boycott week ($DB_j = 1$ if week $j+52$ is the boycott week and 0 otherwise), and the other variables are as defined in equation (1). Thus, the equation to be estimated was:

$$(12) \Delta \ln Q_{ij} = (1 \ln B_{02} - \ln B_{01}) D_{2j} + (1 \ln B_{03} - \ln B_{01}) D_{3j} + B_{11} (\Delta \ln P_{ij}) + (B_{12} - B_{11}) (\ln P_{ij} + 52 D_{2j}) + (B_{13} - B_{11}) (\ln P_{ij} + 52 D_{3j}) + B_{21} (\Delta \ln PC_{ij}) + (B_{22} - B_{21}) (\ln PC_{ij} + 52 D_{2j}) + (B_{23} - B_{21}) (\ln PC_{ij} + 52 D_{3j}) + B_{31} (\Delta \ln I_{ij}) + (B_{32} - B_{31}) (\ln I_{ij} + 52 D_{2j}) + (B_{33} - B_{31}) (\ln I_{ij} + 52 D_{3j}) + B_{41} (\Delta \ln T_{ij}) + (B_{42} - B_{41}) (\ln T_{ij} + 52 D_{2j}) + (B_{43} - B_{41}) (\ln T_{ij} + 52 D_{3j}) + B_5 (\ln B_{02} - \ln B_{01}) DB_j + \Delta \ln u_{ij}$$

Observations on quantity of beef sold, beef sales, total meat department sales, and total retail store sales were collected for each of 72 weeks for each of the 24 test stores. The 72 weeks included the 12 before the promotion, 12 during the promotion, 12 weeks after it, and the corresponding 36 weeks in the previous year. These data were used to construct the following measures of the variables in equation (11):

\hat{Q}_{ij} = quantity of beef sold in the i -th store during the j -th week,

\hat{P}_{ij} = beef sales/ Q_{ij} ,

³Before using ordinary least-squares regression, it may be well to test for the existence of a crossed-error structure by using the procedure suggested by Fuller and Battese [3]. They also suggest a generalized least-squares procedure that may be used if a crossed-error structure is present.

$$\begin{aligned}\hat{P}C_{ij} &= \text{total meat department sales, minus} \\ &\quad \text{beef sales,} \\ \hat{I}_{ij} &= \text{total retail store sales, and} \\ \hat{T}_j &= j.\end{aligned}$$

Had data been available, quantity of beef sold would have been converted to a per-capita basis, price rather than sales of competing meats would have been used as an explanatory variable, and total retail store sales would have been replaced by more precise measures of consumer income.

The expected signs for coefficient estimates were: the intercept of the demand function was expected to be higher during and after the promotion than before; thus, coefficients of D_{2j} and D_{3j} were expected to be positive. Estimates of B_{11} , the direct price elasticity, were expected to be negative, and the estimates of $(B_{12} - B_{11})$ and $(B_{13} - B_{11})$ were expected to be positive — because the promotion was expected to make demand less elastic and to have a carry-over impact. The expected sign of the estimate of B_{21} was not clear *a priori* because sales, rather than price of competing meats, was used as the explanatory variable. If demand for competing meats is inelastic, price and total revenue vary directly, and a positive sign would be expected. If, on the other hand, demand for competing meats is elastic, a negative sign would be expected. Estimates of $(B_{22} - B_{21})$ and $(B_{23} - B_{21})$ were expected to be of the opposite sign of that of B_{21} because the promotion was expected to reduce the impact of competing meat prices on quantity of beef demanded. All three estimates of income measure coefficients (total store sales) were expected to be positive. Two of the coefficients of the time trend, B_{41} and $(B_{43} - B_{41})$, were expected to have positive signs. Estimates of $(B_{42} - B_{41})$ and B_5 were expected to be negative, reflecting the influence of the boycott.

Equation (12) was estimated by ordinary least squares. The R^2 was 0.76, and coefficient estimates and t-values are shown in Table 1. The table's left column presents estimates and t-values for the before-promotional treatment. Estimates of B_{11} , B_{31} and B_{41} have the expected signs, and that of B_{21} is negative (-1.17), implying that demand for competing meats is elastic. Note that the estimate of the direct price elasticity, -0.97, is consistent with estimates obtained in other studies and that all

coefficients are significantly different from zero at the one percent level. Estimates of differences between during-promotion and before-promotion demand parameters are shown in the middle column. Results suggest that the intercept increased sharply, that demand became less elastic ($-0.97 + 0.40 = -0.57$), and that there was a sharp downward trend in beef consumption during the promotional period. Only changes in the intercept and the coefficient of the time trend were significant, however. Results in the right column suggest that the promotion had little carry-over impact.

Table 1. ESTIMATED BEEF DEMAND PARAMETERS BEFORE PROMOTION AND ESTIMATED CHANGES IN PARAMETERS DURING AND AFTER PROMOTION

	Estimate for before promotion	Estimated change:	
		During promotion minus before promotion	After promotion minus before promotion
		Coefficient (t-value)	
Change in ln intercept . . .		21.63 (6.71 ^a)	-6.47 (-1.98 ^b)
Beef price . . .	-0.97 (-12.62 ^a)	0.40 (1.12)	-0.05 (-0.13)
Competing price . . .	-1.17 (-21.25 ^a)	0.15 (1.26)	.04 (0.40)
Income . . .	2.25 (14.99 ^a)	-0.14 (-1.03)	0.02 (0.20)
Time	0.05 (4.31 ^a)	-5.06 (-7.12 ^a)	1.31 (1.80)
Boycott week . . .		-.02 (-.20)	

^aP < 0.01.

^bP < 0.05.

Those funding the promotion should be encouraged by findings that the promotion increased the intercept of the demand function and made demand less elastic during a period of rapidly rising beef prices. More confidence could be particularly placed in the latter finding, however, if it were supported by results of an additional experiment conducted during a less turbulent period to obtain more precise measures of the variables in equation (12).

DESIGNING PROMOTIONAL PROGRAMS

Estimates of impacts of explanatory variables in equation (2) on demand parameters could be used to help a producer group design a promotional program.

First, a producer group should select several promotional treatments. Second, using an appropriate experimental design, the producer group should sponsor these promotional treatments in selected markets. Data collected during the experiment would include measurements for variables in the demand equation (1). Next, with the procedure described in the previous section, demand parameters for each market and for alternative promotional treatments could be estimated.

Relationships should exist between demand parameters and levels of explanatory variables in promotional treatments. These relationships can be quantified by regressing estimated demand parameters on predetermined sets of values of explanatory variables that define alternative promotional treatments.

Finally, in an optimizing framework, these quantified relationships could be used to maximize total revenue to the industry through a promotional program. Assume that the producer group faces the industry demand curve and that there is a predetermined quantity supplied in each promotional period. Also, for simplicity, assume that any carry-over effects of an advertising expenditure last only one period. Consider a model in which the objective function of the producer group is:

$$\pi = \sum_{p=0}^{T-1} \left[\sum_i \left(P_{ip} Q_{ip} - \sum_m AG_{1mip} - \sum_m AB_{1mip} \right) \right] / (1+r)^p$$

where π is the discounted value of total revenue for T promotional periods, P_{ip} is expected commodity price in the i -th market and p -th period,

Q_{ip} is expected quantity supplied in the i -th market and p -th period, AG_{1mip} and AB_{1mip} are the generic and brand advertising expenditures for media 1 and theme m in the i -th market and p -th period, r represents discount rate, T the number of periods in the planning horizon. Given values of Q_{ip} , P_{ip} , and r , and assuming that second-order conditions are met, an optimal promotional program could be determined by solving the following first-order conditions for advertising expenditures:

$$\frac{\partial \pi}{\partial AB_{1mip}} = \frac{Q_{ip} \sum_k \frac{\partial P_{ip}}{\partial B_{kip}} \frac{\partial B_{kip}}{\partial AG_{1mip}} + Q_{ip+1} \sum_k \frac{\partial P_{ip+1}}{\partial B_{kip+1}} \frac{\partial B_{kip+1}}{\partial AG_{1mip}}}{(1+r)^p} - 1 = 0;$$

$$\frac{\partial \pi}{\partial AB_{1mip}} = \frac{Q_{ip} \sum_k \frac{\partial P_{ip}}{\partial B_{kip}} \frac{\partial B_{kip}}{\partial AG_{1mip}} + Q_{ip+1} \sum_k \frac{\partial P_{ip+1}}{\partial B_{kip+1}} \frac{\partial B_{kip+1}}{\partial AG_{1mip}}}{(1+r)^{p+1}} - 1 = 0;$$

$$1 = 1, 2, \dots, L; m = 1, 2, \dots, M; i = 1, 2, \dots, I; p = 0, 1, 2, \dots, T.$$

Constraints could be added to the objective function if an advertising budget for any period is present.

SUMMARY AND CONCLUSIONS

Previous studies of impacts of agricultural commodity promotions on demand have not provided information about impacts on responsiveness of quantity demanded to changes in prices and income. This paper suggests a procedure that may be used to measure these impacts. Results of an application of this procedure to the analysis of a beef promotion are presented.

Use of the suggested procedure may be limited by data requirements and by expense associated with controlled promotional experiments. The information about a promotion's impacts demand provided by this procedure, however, should be helpful to producer groups in deciding whether and when to sponsor a promotion and in designing promotional programs.

REFERENCES

- [1] Brown, Sidney E. *Retail Sales of Broilers and Meat as Affected by Price, Display Area, and Newspaper Advertising*, Marketing Economics Division, Economic Research Service (Publ.), ERS-180, U.S. Dept. of Agriculture, Washington, D.C., May 1964.
- [2] Clement, W.E., P.L. Henderson, and C.P. Eley. *The Effect of Different Levels of Promotional Expenditures on Fluid Milk*, Economic Research Service (Publ.), ERS-259, U.S. Dept. of Agriculture, Washington, D.C. Oct. 1965.
- [3] Fuller, W.A., and G.E. Battese. "Estimation of Linear Models with Crossed-Error Structure," *Journal of Econometrics*, Vol. 2, No. 1, pp. 67-78, May 1974.
- [4] Grubbs, V.D., W.E. Clement, and J.S. Hunter. *Results of a Promotional Campaign for Lamb in Sacramento, California*, Market Development Branch, Market Research Service, Agriculture Marketing Service (Publ.), MRR-200, U.S. Department of Agriculture, Washington, D.C., Oct. 1957.
- [5] Lester, W.B., and R.E. Branson. *Netted Lamb Roasts: Texas Consumer Market Test*, Texas Agricultural Experiment Station (Publ.), MP-821, College Station, Texas, Dec. 1966.
- [6] McClelland, E.L., Leo Polopolus, and L.H. Meyers. "Optimal Allocation of Generic Advertising Budgets," *American Journal of Agricultural Economics*, Vol. 53, No. 4, pp. 365-372, Nov. 1971.
- [7] Myers, Lester H. "Advertising Response Functions with Random Coefficients," in *Measurement of Sales Response to Generic Promotion of Food Products: Seminar Proceedings*, Texas Agricultural Market Research and Development Center, Texas Agricultural Extension Service (Publ.), MRC-73-6, pp. 21-32, College Station, Texas, Oct. 1973.
- [8] Nerlove, Marc, and F.V. Waugh. "Advertising Without Supply Control: Some Implications of a Study of the Advertising of Oranges," *Journal of Farm Economics*, Vol. XLIII, No. 4, Part 1, pp. 813-837, Nov. 1961.
- [9] Ward, Ronald W. "Evaluation of Generic Advertising Effectiveness with Econometrics," in *Measurement of Sales Response to Generic Promotion of Food Products: Seminar Proceedings*, Texas Agricultural Market Research and Development Center, Texas Agricultural Extension Service (Publ.), MRC-73-6, pp. 55-78, College Station, Texas, Oct. 1973.
- [10] Waugh, Frederick V. "Needed Research on the Effectiveness of Farm Products Promotions," *Journal of Farm Economics*, Vol. XLI, No. 2, pp. 364-376, May 1959.

