Assessing the Effectiveness of MPP and TEA Advertising and Promotion Efforts in the Japanese Market for Meats

Allison Comeau, Ron C. Mittelhammer, and Thomas I. Wahl

An Inverse Almost Ideal Demand System is utilized to determine the effectiveness of Market Promotion Program (MPP) and Target Export Assistance (TEA) advertising and promotion expenditures in the Japanese market for meat. Using annual data, it is found that beef advertising and promotion has had a positive and significant effect on the demand for beef. There is insufficient evidence to conclude that pork and poultry advertising and promotion increased the demand for either commodity.

The U.S. government has implemented several programs, over time, to assist producers of agricultural or food products in entering foreign markets for the first time and expanding foreign markets where they already have a presence. The Market Promotion Program (MPP), that is overseen by the Foreign Agricultural Service (FAS) of the United States Department of Agriculture (USDA) is one such program. Monies made available under the MPP are allocated directly to producer groups for generic and branded advertising programs in foreign countries with the goal of enhancing the market share of U.S. agricultural and food product producers relative to competing suppliers.

Like the Foreign Market Development (FMD) Program that has existed since 1955 and the Targeted Export Assistance (TEA) Program that it replaced in 1990, the MPP promotes a long term market development approach intended to encourage development, maintenance, and expansion of foreign markets for the commercial export of U.S. agricultural and food products. Prior to 1986, FAS had devoted only $6 million per year to these programs through FMD but by 1991, the commitment had grown to $148 million ($143 million in TEA/MPP funds and $5 million in FMD funds).

U.S. producers (and producer groups) have attempted to introduce many agricultural and food products into the Japanese market. This is due to the belief that Japanese consumers may have a potentially large demand for high-quality U.S. products. Most producers have coveted the Japanese market for some time and they applied for MPP funds to assist them in their advertising and promotion efforts. The objective of the producers was to increase both the value and the market share of their products relative to competing suppliers' value and market share in Japan. By 1994, total MPP funds allocated to advertising and promoting meat products in Japan equaled $8,991,300 for beef, $1,090,834 for pork, and $1,076,761 for poultry products.[1]

Assessing the effectiveness of advertising and promotion dollars is important for both FAS and the producer groups that fund such programs through check-off funds. In particular, the results of such assessments are key to developing future programs and/or amending correct ones. The objective of the study reported here was to provide an assessment of the effectiveness of MPP/TEA advertising and promotion efforts to enhance the demand for U.S. meat products in Japan.

The Conceptual Framework

The objective of the study required differentiating several meat products by competing origins of supply, so a demand model was needed that could represent the simultaneous interrelationships between a relatively large number of meat commodities parsimoniously and yet be flexible enough to incorporate advertising and

Respectively research assistant, Professor of Agricultural Economics and Adjunct Professor of Statistics, and Associate Professor of Agricultural Economics at Washington State University, Pullman, WA. The authors acknowledge the helpful review comments of Dr. Don Blayney of the Economic Research Service, USDA.

[1] Data obtained via personal correspondence with the United States Meat Export Federation and the USA Poultry and Egg Export Council.

promotion effects on these commodities. The demand model used in this study is the Inverse Almost Ideal Demand System (IAIDS) model.

The IAIDS is an analogue to the Almost Ideal Demand System (AIDS) model of Deaton and Muellbauer (1980) that leads to an inverse demand system having a similar functional form to the AIDS share-based demand system, except that budget shares are a function of quantities at given levels of prices in the AIDS model as opposed to the IAIDS model in which budget shares are a function of prices at given levels of quantities. The IAIDS model, which was developed independently by Moschini and Vissa (1992) and Eales and Unnevehr (1993), is not a dual to the AIDS model but bears a striking resemblance to it both in terms of functional form and in the way it is derived.

The primary motivation for using an inverse demand system in this analysis is based on the existence of a quota system for meat products sold in the Japanese market that has only recently been relaxed. Beginning in 1961, a quasi-governmental organization known as the Livestock Industry Promotion Corporation (LIPC) was responsible for administering a quota system on beef imports. The quotas were allocated to all foreign sources of beef imports, and were binding in the years in which they were applied. By 1991, the LIPC's role in regulating beef imports via quotas was eliminated. However, given that the study period for this analysis spanned the years 1973–1994, beef quantities in the marketplace were largely predetermined via control mechanisms, and it was prices that cleared the market.

IAIDS Model With Advertising and Promotion

The effect of advertising and promotion on the inverse demand for meats was modeled using the translating procedure of Pollak and Wales (1980). In particular, all quantity variables appearing in the IAIDS model were scaled via multiplication by a variable representing the effective level of advertising and promotion effort. Let A_i^* represent generically the stock of effective advertising and promotion effort of type i. Note that A_i^* itself will generally be some parametric function of more fundamental observable variables such as the level of expenditure on advertising and promotion of type i. The IAIDS model incorporating advertising and promotion effort is then given by

(1)
$$w_i = a_i + \sum_j g_{ij}(\ln q_j + \ln A_j^*) - b_i \ln Q^*, i = 1,...,m,$$

and

(2) $$w_m \equiv 1 - \sum_{i=1}^{m-1} w_i$$

where w_i is the budget share for good i, q_j is the quantity of good j, and Q^* is the IAIDS quantity scale index.

It can be shown that the distance function defined by

(3) $$\ln D(u,a,A^*) = \alpha_0 + \sum_k \alpha_k(\ln q_k + \ln A_k^*) + \frac{1}{2}\sum_k\sum_j \gamma_{kj}^*(\ln q_k + \ln A_k^*)(\ln q_j + \ln A_j^*) + \mu\,\beta_0 \prod_j q_j^{\beta_j}$$

yields the system of budget share equations (1) and (2). By inverting the distance function to solve for the direct utility function, (recall $D(\mu,q,A^*)=1$ when obtaining the utility function) the utility function for q, given advertising effort level A^*, is given by

(4)
$$u(q,A^*) = \left(\frac{-1}{\beta_0 \prod_j q_j^{\beta j}}\right)\left[\alpha_0 + \sum_k \alpha_k(\ln q_k + \ln A_k^*) + \frac{1}{2}\sum_k\sum_j \gamma_{kj}^*(\ln q_k + \ln A_k^*)(\ln q_k + \ln A_j^*)\right]$$

Thus, the effect of an incremental change in the level of effective advertising and promotion effort A_i^* on the level of utility is given by

(5)
$$\frac{\partial u(q,A^*)}{\partial A_i^*} = \frac{-A_i^{*-1}\left[\alpha_i + \sum_j \gamma_{ij}(\ln q_j + \ln A_j^*)\right]}{\left(\beta_0 \prod_j q_j^{\beta_j}\right)},$$

and the corresponding effect on the marginal utility of good j is given by

$$(6)\quad \frac{\partial^2 u(q,A^*)}{\partial q_j \partial A_i^*} = \frac{\frac{A_i^{*-1}}{q_i}\left[\beta_j\left(\alpha_i + \sum_j \gamma_{ij}(\ln q_j + \ln A_j^*)\right) - \gamma_{ij}\right]}{\left(\beta_0 \prod_j q_j^{\beta_j}\right)}.$$

Given a relationship between advertising and promotion effort, A_i^*, and expenditure A_i, of the form $A_i^* = g(A_i, \delta)$, where δ indicates the parameter values of a parametric function of advertising expenditure level A_i, there is sufficient parameter flexibility in the IAIDS specification (1)–(6) for the effect of the A_i's on utility to be negative or positive and for there to be simultaneous interactions of all advertising effects impacting the demand for each commodity. Note that additional flexibility can be introduced by the way the A_i^* functions are themselves parameterized, as will be discussed in the Empirical Model section.

Data Considerations

The study period spanned the years 1973 to 1994, inclusive. The starting year of 1973 was chosen because it represented the first year in which U.S. beef imports reached levels that could be considered commercially significant (10,000 metric tons), representing a 15-fold increase from the previous year. Data for this period were collected for this research from various sources. Annual quantities data on meat imports into Japan was obtained from the Livestock Industry Bureau, Ministry of Agriculture, Forestry, and Fisheries, Japan. The annual import data, in kilograms, for beef, pork, and poultry was available on a per country basis. For non-U.S. produced meats, the quantities of all competing importers were aggregated on a yearly basis and recorded as a total. For the non-U.S. beef category the main competing countries of origin were Australia, New Zealand, Canada, Ireland, and Mexico. For non-U.S. pork the main sources were Taiwan, Denmark, Canada, and the Republic of Korea. For non-U.S. poultry the main countries of origin were Thailand, France, P.R. of China, and Brazil. Japanese-produced quantities of pork and poultry were included in the respective aggregated non-U.S. categories. Japanese beef was disaggregated into two categories, dairy and Wagyu, with dairy beef being added to the non-U.S. category of beef. The aggregation process resulted in the formation of seven categories of meats in the study: U.S. beef, pork, and poultry, non-U.S. beef (including Japanese dairy beef), pork, and poultry, and Japanese Wagyu. All aggregate quantities were transformed into per capita quantities via division by the Japanese population.

Prices of the meat categories were determined by dividing the reported total value of the sales of each meat category at the wholesale level by the total quantity consumed. From the quantities and the prices, a meat budget share for each category was developed by dividing the value of each meat category by total meat expenditures.

The annual advertising and promotion data were obtained from two sources; the United States Meat Export Federation (USMEF) for beef and pork and the Poultry and Egg Export Council (PEEC) for poultry. Advertising and promotion expenditures were converted to Japanese yen, deflated by the Japanese CPI, and divided by the Japanese population in order to express expenditure on a real per capita basis. Finally, the advertising and promotion data were normalized relative to the base year of 1987, the first period in which advertising and promotion efforts began in earnest under the MPP/TEA program. The advertising and promotion expenditures were recorded as zeros until 1987 since the MPP/TEA program was implemented beginning in 1987. Promotion expenditures by private companies in Japan, as well as by other governments and/or foreign competitors was unavailable and so is not analyzed in this study.

The Empirical Model

The effective stocks of advertising/promotion effort in support of U.S. beef, pork, and poultry demand that appear in the IAIDS model were expressed in terms of three alternative parametric functions of real (yen deflated by Japanese CPI) per capita advertising/promotion expenditures, normalized relative to the base year of 1987. These alternative functional forms were

analyzed in an attempt to determine whether, and to what extent, carryover effects of advertising/promotion effort were important determinants of the demand for meat commodities in Japan. Letting A_{it} denote the level of advertising and promotion expenditure on commodity i (i=United States imported beef, pork, and poultry, respectively) at time t, and A_{it}^* denote the corresponding stock of effective advertising/promotion effort in support of the demand for commodity i at time t, the three alternative parametric representations of advertising/promotion stock are as follows:

$$(7) \quad A_{it}^* = \exp(\delta_i A_{it})$$

$$(8) \quad A_{it}^* = \exp(\beta_i A_{it}^d),\ A_{it}^d = \delta_i A_{it} + (1-\delta) A_{i,t-1}^d$$

$$(9) \quad A_{it}^* = \exp\left(\sum_{j=1}^{3} \delta_{ij} A_{i,t-j+1}\right).$$

Regarding the interpretation of each of the parametric representations of advertising effort, note in the case of (7) that A_{it}^* is incremented at a rate of $\delta_i = \frac{dA_{it}^* / dA_{it}}{A_{it}^*}$ in response to a change in current advertising/promotion expenditure. In the case of (8) and (9), a change in A_{it} results in a $\beta_i\delta_i$ or δ_{i1} rate of change in A_{it}^*, respectively. Both (8) and (9) allow for advertising/promotion carryover effects to occur. In the case of (8), carryover effects occur if $\delta_i \neq 1$, in which case the marginal effects of advertising expenditure in period t on advertising/promotion effort in period t_* exhibits a geometric declining pattern given by rates equal to $\beta_i\delta_i(1-\delta_i)^{t_*-t}$, $t_* = t, t+1, t+2, \ldots$ if $0 < \delta_i < 1$. For (9), current period advertising/promotion expenditure is allowed to have an influence on the current advertising/promotion effort, as well as on effort in the subsequent two years. Carryover effects occur if δ_{i2} and/or $\delta_{i3} \neq 0$, and (9) allows additional flexibility in the pattern of the marginal carryover effects in the subsequent two periods as a compared to the geometrically declining pattern of (8).

Stochastic Specification of Japanese Meat Demand

In order to account for the fact that the vector of budget share observations occur in the unit simplex with probability 1, the suggestion of Woodland (1979) was followed whereby the vector of budget shares is specified to have a Dirichlet distribution. The Dirichlet distribution for the budget shares is specified as

$$f(w;a) = \frac{\Gamma\left(\sum_{i=1}^{m} a_i\right)}{\prod_{i=1}^{m} \Gamma(a_i)} \prod_{i=1}^{m} w_i^{a_i - 1}$$

where $w_m \equiv 1 - \sum_{i=1}^{m-1} w_i$. The α_i's are nonnegative-valued parameters which are set equal to the respective right hand sides of the IAIDS share equation after these share equations have been multiplied by a positive-valued parameter k which serves as a flexibility parameter for scaling variances and covariances of the w_i's, $\Gamma(\alpha) = \int_0^\infty x^{\alpha-1}e^{-x}dx$ is the gamma function evaluated at α, and $w_i \geq 0$ for all i. The article by Woodland can be consulted for further details of the stochastic specification, including the form of the contemporaneous variances and covariances that characterize the disturbance terms appended to the IAIDS share equations.

Estimation Results

The three models of Japanese meat demand, respectively based on the IAIDS functional form inclusive of one of the three advertising stock specifications (7) – (9), were estimated via nonlinear maximum likelihood using a combination of the Nelder-Meade algorithm (written in the GAUSS programming language) to condition starting values, and the Newton-Raphson algorithm contained within the OPTMUM application module of the GAUSS programming language to obtain converged values of model coefficients. Based on standard measures of fit between predicted and actual values of budget shares, all three

Table 1. Goodness of Fit Measures for Models I, II, and III.

Fit Measures*		Model I	Model II	Model III	Reduced Model II	Reduced Model III
R^2	U.S. Beef	.94	.95	.95	.95	.95
	U.S. Pork	.94	.94	.94	.94	.94
	U.S. Poultry	.86	.78	.86	.79	.78
	Non-U.S. Beef	.91	.93	.94	.93	.93
	Non-U.S. Pork	.93	.94	.94	.94	.94
	Non-U.S. Poultry	.97	.97	.97	.97	.97
	Japanese Wagyu	.84	.86	.87	.86	.87
MAPE %	U.S. Beef	16.38	16.39	17.08	16.45	16.99
	U.S. Pork	10.51	9.26	9.77	9.78	9.67
	U.S. Poultry	8.87	8.32	7.86	8.40	8.37
	Non-U.S. Beef	3.85	3.15	2.98	3.13	2.98
	Non-U.S. Pork	4.62	4.23	4.24	4.34	4.23
	Non-U.S. Poultry	11.05	10.32	10.12	10.32	10.21
	Japanese Wagyu	3.81	3.45	3.39	3.47	3.36
MPE %	U.S. Beef	-3.92	-3.74	-3.80	-3.78	-3.73
	U.S. Pork	-2.24	-1.88	-1.88	-1.98	-1.90
	U.S. Poultry	-2.83	-2.68	-2.36	-2.73	-2.59
	Non-U.S. Beef	-.15	-.11	-.09	-.11	-.10
	Non-U.S. Pork	-.40	-.37	-.35	-.37	-.36
	Non-U.S. Poultry	-2.79	-2.40	-2.27	-2.42	-2.30
	Japanese Wagyu	-.15	-.13	-.12	-.13	-.12
Residual Runs Test (z-stat)	U.S. Beef	-.44	-.87	-.87	-.87	-.87
	U.S. Pork	-1.31	-1.31	-1.31	-1.31	-1.31
	U.S. Poultry	-1.31	-.44	-.44	0.00	0.00
	Non-U.S. Beef	-.87	-.87	0.00	-.87	0.00
	Non-U.S. Pork	-1.31	-1.31	-.44	-1.31	-1.31
	Non-U.S. Poultry	0.00	-.44	-.44	-.44	-.44
	Japanese Wagyu	-.87	-.87	-.87	-.87	-.87
Theil's U-Statistic	U.S. Beef	1.03	.72	.62	.73	.62
	U.S. Pork	.29	.29	.31	.30	.30
	U.S. Poultry	.61	.56	.62	.58	.57
	Non-U.S. Beef	.87	.75	.71	.75	.72
	Non-U.S. Pork	.37	.34	.32	.35	.34
	Non-U.S. Poultry	.60	.63	.67	.63	.67
	Japanese Wagyu	.67	.62	.61	.62	.60

*NOTE: MAPE is the mean absolute percent error in the prediction of budget shares, MPE is the mean percent error, the residual runs test is the Wald-Wolfowitz test for independence, and Theil's U-Statistic is Theil's measure of turning point prediction accuracy based on predictions of changes in the dependent variable.

Table 2. Advertising/Promotion Coefficients and T-Values (in parentheses).

	Model I	Model II		Model III		
				Current	Lag 1	Lag 2
	δ	β	δ	δ_1	δ_2	δ_3
U .S. Beef	.614	.575	.760	.396	.304	.138
	(5.24)	(5.29)	(5.21)	(3.74)	(2.59)	(1.58)
U.S. Pork	-.021	-.185	.004	-.006	.020	-.010
	(-.44)	(-.31)	(.17)	(-.14)	(.406)	(-.21)
U.S. Poultry	-.290	.0001	145.8	-.361	-.086	.150
	(-1.03)	(.00006)	(.00006)	(-1.39)	(-.27)	(.41)

Table 3. Tests of Advertising/Promotion Hypotheses.

Test Type	Parameter Restrictions	Test Stat	Probability
Model II: Pork and Poultry advertising/promotion has no effect	$\delta_2 = \delta_3 = 0$	$\chi_2^2 = .087$	.96
Model III: Pork and Poultry advertising/promotion has no effect	$\delta_{ij} = 0$, i=2,3, j=1,2,3	$\chi_6^2 = 3.71$	.72
Model II: No carryover effect for Beef advertising/promotion	$\delta = 1$	$\chi_1^2 = 2.87$	.09
Model III: No carryover effect for Beef advertising/promotion	$\delta_2 = \delta_3 = 0$	$\chi_2^2 = 14.02$	.001

Table 4. Final Advertising/Promotion Coefficients and T-Values.

	Advertising/Promotion for Beef Only				
	Model II		Model III		
	β	δ	δ		
			Current	Lag 1	Lag 2
U.S. Beef	.575	.805	.390	.288	.130
	(5.37)	(5.79)	(3.91)	(2.63)	(1.52)

models fit the historical data quite well (see Table 1). The independence of equation residuals could not be rejected at any of the conventional levels of type I error based on the outcomes of the residual runs tests, which are asymptotically distributed as standard normal under the null hypothesis of independence. In particular, the smallest marginal significance value for rejection of the null hypothesis was 0.19 across all three IAIDS models.

Table 2 displays the nonlinear maximum likelihood estimates of the relevant parameters associated with the effects of advertising and promotion on meat demand in Japan. All advertising and promotion parameters relating to U.S. beef are significant at the 0.05 level across all models, except for the parameter on the two-period lag of advertising/promotion expenditure in model III, which is significant at the 0.06 marginal level using a one-sided test (assuming nonnegativity of the effect). On the other hand, none of the parameters relating to the effects of U.S. pork or poultry advertising/promotion are significant at any reasonable level of type I error, and in fact the parameter with the largest t-ratio in any case has an inappropriate sign.

In order to investigate the apparent insignificance of the effect of pork and poultry advertising

and promotion expenditures on meat demand, joint Wald χ^2 tests of the effects of advertising/promotion expenditure was performed for models II and III (see Table 3). The results of the Wald tests of the joint significance of advertising/promotion parameters confirm that there is insufficient evidence to reject the hypothesis of no pork and poultry advertising/promotion effect in the case of the pork and poultry.

An analysis of the estimated U.S. beef advertising/promotion carryover effect in Models II and III suggested that Model I is inadequate to represent the effect of U.S. beef advertising/promotion efforts. The null hypothesis of no carryover effect is soundly rejected by a Wald test in model III, and is also rejected at the .10 level by a Wald test in model II (Table 3). Since model I is nested within both models II and III, model I is henceforth considered to be inappropriate for further consideration.

Both models II and III were reestimated with the insignificant advertising and promotion variables for pork and poultry eliminated. Reduced model results for advertising/promotion coefficients are displayed in Table 4. The values of the parameter estimates associated with advertising/promotion effects are close to the corresponding estimates obtained from the full models in terms of both magnitude and t-ratios. Decay patterns of the effects of advertising and promotion expenditures are thus similar between the full and reduced models, with model II implying the more rapid decay. However, the decay pattern of model II is contained within 95 percent confidence intervals around the decay pattern of model III.

Discussion

Based on either Model II or III, there is convincing evidence in support of the conclusion that U.S. beef advertising and promotion expenditures in the Japanese market exerts a significant positive influence on the Japanese demand for U.S. beef. Likewise, there is a lack of evidence that the much smaller levels of U.S. pork or poultry advertising and promotion expenditures had an expansionary effect on the demand for U.S. pork or poultry products.

The effect of U.S. beef advertising and promotion expenditures is not entirely dissipated in the period when the expenditures occur. There is strong evidence that the effects of advertising and promotion expenditures carries over for at least an additional year beyond the initial expenditures. There is somewhat weaker, albeit still notable, evidence that the effects of advertising and promotion carryover to some degree into the second year beyond the point of initial expenditure.

Regarding the effectiveness of advertising and promotion expenditures on augmenting the demand for U.S. beef in Japan, the flexibility of U.S. beef price with respect to a change in current advertising and promotion expenditures is estimated to be between 0.110 in model III to 0.128 in model II when calculated at the beginning of the MPP/TEA program period, the respective t-values on the flexibilities being 4.06 and 4.74. In order to provide a guideline measure for the marginal per dollar return of incremental advertising and promotion expenditures on the value of U.S. beef sales in 1987, the flexibilities were applied to the existent 1987 wholesale value of beef sales adjusted downward by tariffs, markups, and ocean freight costs. The marginal per dollar return was calculated to be between 15.56 to 1 in model III to 18.11 to 1 in model II. Based on a 95 percent confidence interval for the price flexibilities, lower bounds on the marginal per dollar returns ranged between 8.05 and 10.62 to 1. Note these levels of return to beef producers are not adjusted for additional costs, which include such notable cost categories as production, insurance, and domestic (U.S.) transportation costs, so that the net marginal return per advertising and promotion dollar will be significantly less than the reported figures. Furthermore, it was not possible to account for the potentially large concomitant and correlated level of advertising and promotion expenditures made by private firms, both in the U.S. and in Japan, in support of enhancing the Japanese demand for specific U.S. beef products in retail stores and restaurants. These latter expenditures would act synergistically with MPP/TEA efforts and should rightfully be accounted for by adjusting downward the demand enhancing effects attributed to MPP/TEA efforts.

The flexibility of U.S. beef price with respect to advertising and promotion expenditure was estimated to be between 0.200 (model III) and 0.246 (model II) by the end of the period ana-

lyzed with t-values of 4.04 and 4.81, respectively. Based on the level of advertising and promotion expenditure and the adjusted value of U.S. beef sales existent in 1994 (now based on a 50 percent tariff, with the other adjustments relating to markups and ocean freight costs as described above), the marginal return to advertising and promotion expenditure is estimated to be between 13.06 and 16.08 to 1 for models III and II, respectively. A lower bound on these marginal returns based on a 95 percent confidence interval for the price flexibility is calculated to be between 6.73 and 9.53 to 1. The same caveats stated previously regarding the optimistic nature of these marginal return figures for judging the effectiveness of MPP/TEA expenditures apply here. Comparing the marginal returns at the beginning and at the end of the 1987–1994 period reveal that the effectiveness of advertising and promotion expenditures changed little during the period, with perhaps a slight decrease in effectiveness being realized as the MPP/TEA program matured.

Concluding Comments

Based on the inverse AIDS model of Japanese consumer demand for meat analyzed in this study, it can be concluded that MPP/TEA advertising and promotion expenditures in support of U.S. beef demand had a significant influence on strengthening Japanese demand for U.S. beef. Insufficient evidence was found to make a similar claim regarding advertising and promotion expenditures in support of either U.S. pork or U.S. poultry.

One cannot conclude on the basis of this study that pork and poultry advertising and promotion expenditure is necessarily ineffective in supporting Japanese demand for U.S. pork and poultry. It may be the case that such expenditures have served to protect or maintain market share in the face of competition from other domestic and foreign suppliers. It is known that Australia, New Zealand, and other foreign competitors actively promote their meat products in Japan, and in the absence of the availability of data on these competitive advertising and promotion activities, the share-protecting aspects of advertising and promotion activities can not be appropriately modeled or assessed. In fact, a zero impact of expenditures in the context of the current model is consistent with the maintenance of market shares.

It should also be noted that the MPP/TEA funds in support of U.S. beef demand are notably larger than for either pork or poultry. In particular, beef expenditures are nearly three times the size of poultry expenditures and over four times the expenditure level on pork. It may be that the latter two levels of expenditure have not achieved the critical size necessary to have market-share expanding effects on consumer demand.

As with all econometric studies, the results of the analysis are dependent on the data used and the functional forms of the models estimated. While the model appeared to replicate the historical data very well, and although the IAIDS model utilized in the analysis is a flexible functional form, there are a number of other flexible functional form choices that could be investigated. Also, enriching the data set with information relating to competitors' advertising and promotion efforts would provide an expanded context within which to judge the effectiveness MPP/TEA expenditures.

The authors were unable to secure data on foreign competitors' advertising and promotion effort. It could be profitable for future research to investigate the sensitivity of the conclusions contained in this paper to other forms of demand systems and to other methods of accounting for advertising effort within the demand systems. Securing data regarding foreign competitors' advertising and promotion efforts could also lead to refined analyses of the effectiveness of MPP/TEA efforts that may enhance or alter the conclusions of the current study.

References

Deaton A., and J. Muellbauer. "An Almost Ideal Demand System." *American Economic Review* 70 (June 1980):312–26.

Dwyer, M.J. "Evaluating the Effectiveness of the Market Promotion Program On U.S. High-Value Agricultural Exports." FAS staff paper 1–95. USDA, Washington, D.C. 1995.

Eales, J.S., and L.J. Unnevehr. "Structural Change in U.S. Meat Demand." *American Journal of Agricultural Economics*, 75 (May 1993):259–68.

Hayes, D.J. (ed.) *Meat Marketing in Japan: A Guide for U.S. Meat Exporting Companies.* Des Moines and Ames:

Midwest Agribusiness Trade Research and Information Center. 1990.

International Monetary Fund (IMF). *International Financial Statistics*. Washington, D.C.

Japan Ministry of Agriculture, Forestry and Fisheries (Japan MAFF). The Meat Statistics in Japan. Tokyo: Japan Ministry of Agriculture, Forestry and Fisheries. 1965–94.

Japan Statistics Bureau. *Japan Statistical Yearbook.* Tokyo: Management and Coordination. 1994.

Kerr, W.A., K. Klein, J. Hobbs, and M. Kagatsume *Marketing Beef in Japan.* Food Products Press, Binghamton, New York. 1994.

Mittelhammer, R.C. *Mathematical Statistics for Economics and Business*, Springer-Verlag, New York. 1996.

Moschini , G., and A. Vissa. "A Linear Inverse Demand System." *Journal of Agricultural Resource Economics,* 17 (1992):294–302.

Pollak, R. and T. Wales. "Comparison of the Quadratic Expenditure System and Translog Demand System with Alternative Specifications of Demographic Effects." *Econometrica*, 48 (1980):595–612.

Smallwood D.M., R.C. Haidacher, and J.R. Blaylock. "A Review of the Research Literature on Meat Demand." in *The Economics of Meat Demand*, R.C. Buse, Ed. (1989):93–124.

USDA. *Provisions of the Food, Agriculture, Conservation and Trade Act of 1990.* Agriculture Information Bulletin Number 624. Economic Research Service, Washington, D.C.

Woodland A.D., "Stochastic Specification and the Estimation of Share Equations." *Journal of Economics,* 10 (1979):361–83.