ECONOMIC EFFECTS of Generic Promotion Programs for Agricultural Exports

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An Overview of Research Approaches and Methods for Evaluating U.S. Agricultural Export Market Development Programs

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From 1986 through 1989, program levels for federal support of U.S. agricultural exports -- including food aid, credit guarantees, market development, and price subsidies -- averaged $7.8 billion annually (Smith and Ballenger). The Export Credit Guarantee Program (GSM-102) is the largest of these programs and is authorized at $5 billion annually. Food aid programs under PL 480 are authorized at $1.5 billion annually. The 1985 Food Security Act emphasized Congress' commitment to export enhancement by authorizing several new programs such as the Intermediate Export Credit Guarantee Program (GSM-103), the Export Enhancement Program (EEP), and the Targeted Export Assistance (TEA) Program. Program levels for the nonprice export market promotion programs -- the Foreign Market Development Program (Cooperator and Export Incentive Programs) and the TEA -- climbed from about $35 million in 1985 to an estimated $234 million in fiscal 1989.

Program levels for the nonprice export market promotion programs climbed from about $35 million in 1985 to an estimated $234 million in fiscal 1989.

The goals of the Foreign Market Development Program, which has been in operation since 1956, are to develop, maintain, and expand markets for U.S. agricultural products. The TEA Program emphasizes trade policy goals by attempting to counteract the "unfair" trade practices of competitors.

USDA's Foreign Agricultural Service administers the two programs, and the participating trade organizations conduct the promotions. Under the Foreign Market Development Program, FAS shares the costs of promotion with the U.S. trade organizations and foreign industry

interests. However, the TEA Program has boosted the federal share of the funding of nonprice export market promotions. In this respect, the export market promotion programs differ from domestic nonprice promotions funded primarily by nonprofit producer organizations through producer assessments and by other private funding sources. As public and private support for export promotion increases, so does the need to measure the effectiveness of market development expenditures in increasing U.S. agricultural exports.

The Foreign Market Development Program and the TEA Program encompass three types of activities: trade servicing, technical assistance, and consumer promotion. Consumer promotion activities include point-of-sale promotions and both generic and brand advertising.

In striving to isolate and define the effects of promotion on product sales, researchers have analyzed consumer behavior; the relationship between advertising and sales; and the effects of prices, income, and promotion expenditures on consumer demand. Market researchers measure consumer behavior by conducting telephone surveys of consumer awareness of products and advertisements, by establishing focus groups and consumer panels, and by conducting consumer tests in retail stores and shopping areas. Researchers develop baseline data by tracking consumer attitudes and product sales. Analytical methods have ranged from basic correlations to conjoint analysis of consumer preferences (Green, Tull, and Albaum).

The inter-commodity effects of advertising programs are ignored through a single equation approach to evaluation of nonprice export promotion programs. Promotion programs on other commodities or on the same commodity originating from other countries may have as significant an impact on the purchases of a commodity as its own promotional programs.

Researchers also have created experimental designs to test or confirm hypothesized relationships between advertising expenditures and sales. Henderson designed an experiment that related the effects of three levels of promotion expenditures to changes in sales of dairy products in sets of control and test markets in the United States (Henderson).

Economic researchers analyze relationships between income, prices, promotion expenditures, and sales or consumption. Import demand analysis has permitted researchers to calculate returns to program contributors and analyze other issues of importance to policymakers. Although many researchers have analyzed the effects of advertising and promotion expenditures on domestic consumer demand, only a few studies have examined the effects of export promotion expenditures on import demand (Lee 1977; Lee and Brown; Lee, Myers, and Forsee; Lee and Tilley; Priscott; Rosson, Hammig, and Jones; Williams; Williams and Myers). In this paper, an overview of the models

that have been used to analyze the impact of foreign market promotion programs will be given. Estimation issues facing researchers, including those of selecting functional forms and modeling the lag effects of promotion expenditures, will be discussed.

MODELING THE IMPACT OF EXPORT MARKET DEVELOPMENT EXPENDITURES

Export market development expenditures are expected to shift the importer's demand curve to the right or rotate the demand curve by changing the elasticity of demand. Assuming no change in the supply schedule, promotion expenditures are expected to increase U.S. exports. Most of the published research on the evaluation of nonprice export promotion programs has attempted to relate promotion expenses to U.S. exports through a single-equation import demand model (Lee; Lee, Myers, and Forsee; Priscott; Rosson, Hammig, and Jones). A major limitation of the single equation approach is that the inter-commodity effects of various advertising programs are ignored (Lee, Brown, and Fairchild). In some cases, the substitution and complementary effects resulting from promotion programs on other commodities or the same commodity originating from other countries may have as significant an impact on the purchases of a commodity as its own promotional programs.

U.S. exports are specified as a function of the following: (1) the importing country's real income, (2) the real U.S. export price or export unit value, (3) the export price of the primary competitor(s), (4) prices of substitutes or complements, (5) production in the rest of the world, and (6) a measure of U.S. market development efforts. Promotional expenditures have often been used as a measure of promotional efforts. Prices and market development expenditures are deflated and expressed in the currency of the importing country or a common currency.

Lee and Brown (1986) used a deflated, common currency, per capita measure of promotional expenditures to evaluate the effectiveness of brand advertising programs for U.S. orange juice in the European market. In their model, per capita orange juice imports from the United States are specified as a function of per capita promotional expenditures, U.S. export price, and Brazilian price. The nominal prices and promotional expenditures in dollar terms were first transformed into nominal foreign currencies by the use of the dollar/foreign currency exchange rate, and then they were transformed into real prices and expenditures by using the foreign consumer price index as a deflator. Real prices and promotional expenditures in each country expressed in foreign denominations were finally transformed to a single denomination (1973-74 dollars) by using the 1973-74 dollar/foreign currency exchange rate.

Tilley and Lee (1981) used a six-equation simultaneous equation system to estimate retail and import demand for orange juice in Canada.

Imports from the U.S. are specified as a function of current and lagged retail quantity demanded in Canada and prices of U.S. and Brazilian imports. Results indicate that the import demand for U.S. orange juice is price inelastic, while the import demand for the Brazilian product is highly elastic. Florida generic advertising in the U.S. and Canada was used to represent promotion efforts.

In a 1969 study (Priscott), U.S. exports of citrus products to several European countries and Canada were specified as a function of the U.S. export price, the importing country's per capita income, and domestic Cooperator expenditures in the country. In another study (Lee, Myers, and Forsee), a competitor export price was added to the earlier import demand equation as an explanatory variable.

Rosson, Hammig, and Jones used a single equation approach to measure the impact of U.S. Cooperator Program expenditures in various regions on exports of apples, poultry, and tobacco. In this study, U.S. export sales of each commodity are specified as a function of U.S. export price in dollars per metric ton, the major competitor's price in dollars per metric ton, regional intercept dummy variables, and real U.S. expenditures for export promotion in dollars. Prices were deflated by the trade-weighted exchange rate.

Other research has attempted to measure the impact of foreign market development expenditures not only on U.S. exports, but also on supply, demand, and world trade. A system of simultaneous equations was used by Williams and Myers to analyze the effects of market development expenditures on soybean and soybean product supply, demand, prices, and trade.

Considerations in Evaluating Import Demand

Foreign demands are excess demands (foreign demand less foreign supply) and therefore do not conform to the usual theoretical restrictions imposed on demand equations. Therefore, researchers have specified more general ad hoc models of demand systems to measure the effects of promotion expenditures instead of models that are simplified by theoretical restrictions, such as the Rotterdam model, the Linear Expenditure System, or An Almost Ideal Demand System.

Selection of a Functional Form

The selection of a functional form may be a critical factor in measuring the impact of advertising and promotion on demand (Kinnucan). Each functional form implies certain assumptions about the impact of promotion such as diminishing marginal returns to advertising or the long-term effects of introducing new technology. Because of the nature

of the data on export promotion programs, simple linear or log-linear models have been used in most cases.

The linear function assumes constant returns to promotion:

$$Y_t = a + bX_t + U_t$$

The doublelog form, which specifies the log of import demand as a linear function of the log of promotion expenditures, assumes constant elasticity of imports with respect to promotion expenditures. On the other hand, a logarithmic, reciprocal transformation (loghyperbola) allows import demand to increase with promotion expenditures, first at an increasing rate then at a decreasing rate to an asymptotic limit. This transformation can be specified as:

$$\log Y_t = a - b/X_t + U_t$$

Tilley and Lee used an inverse functional form (advertising expenditure variables were in the reciprocal form) to measure the impact of commodity advertising on Canadian orange juice import and retail demand. The reciprocal form implies that the marginal effectiveness of the additional expenditures is positive but diminishes with the function asymptotically reaching a maximum. In a 1986 study (Lee and Brown) that analyzed the effect of Cooperator Program expenditures on U.S. orange juice exports to several European countries, per capital orange juice imports were specified as an exponential function of promotion expenditures. This specification implies that the marginal return is a monotonic increasing or decreasing function of program expenditures depending on the sign of the coefficient on the expenditure variable (Lee and Brown 1986, p. 388).

Imports from the innovation may result years after the implementation of the activity. Because of the carryover and decay structure of promotion activities, modeling their impacts can become complicated.

Types of Promotion Expenditures

In most studies, promotion expenditures have not been separated by type of activity (i.e., consumer promotion, trade servicing, technical assistance) and an aggregate measure of expenditures has been used. This may have been because the primary activity of the Florida Department of Citrus, the source of most of the studies, has been consumer promotion.

However, the impact of promotional activities on importer demand for the same commodity in the same country may vary depending

on the type of activity. In consumer advertising, consumer response is expected to peak during or immediately after the advertising campaign and then decline (Rossmiller and Grace). Trade servicing activities are expected to sustain an historical level of exports in more mature markets. Exports would be expected to decrease gradually if the trade servicing activity ceased. Technical assistance projects relate to the adoption of a new technology and adopt the conceptual form of the S-shaped technical innovation curve. Imports from the innovation may result years after the implementation of the activity. Because of the carryover and decay structure of promotion activities, modeling their impacts can become complicated. The lagged effects of promotion expenditures will be discussed later in this paper.

Generic advertising may have a different effect on demand than brand advertising. While generic advertising is designed to increase total sales, brand advertising attempts to increase market share through product differentiation.

Models should account for the differing effects of promotion activities when aggregating expenditures by commodity and country. Aggregating the various types of promotional activities implies that demand response is the same for each dollar of expenditure regardless of the source and nature of promotional activity.

Generic and Brand Advertising

Generic advertising may have a different effect on demand than brand advertising. While generic advertising is designed to increase total sales, brand advertising attempts to increase market share through product differentiation. If the product is homogeneous, the return to generic advertising will be shared among all producers (marketers). Brand advertising becomes more crucial for heterogeneous products (Lee, Brown, and Fairchild). Ward, Chang, and Thompson argue that there can be both competitive and complementary aspects of brand and generic advertising when the two types of activities are conducted separately.

Lagged Effects of Non-Price Promotion Expenditures

Since promotional activities are expected to influence demand beyond the expenditure year, promotion expenditures in some studies have entered the demand function with a lag. The lag structure has varied among studies. Many of the studies dealing with domestic promotion activities and their impact on domestic demand have used a rather elaborate form of lag structure.

Ward and McDonald (1986) used a restricted distributed lag structure to measure the long-run impact of generic advertising expenditures on per capita consumption of fluid milk in 10 regions of the United States. Their advertising expenditure was specified as a weighted sum of current and lagged media advertising expenditures. Thompson and Eiler used a polynomial distributed lag to measure the impact of current and lagged media advertising expenditures on New York City per capita milk sales. In studying the impact of media advertising on fluid milk sales in New York City, Liu and Forker used a consumer information variable to measure the impact of advertising. A semilog function was used to specify consumer information as a function of lagged levels of advertising. Consumer information was assumed to decay over time. Furthermore, the saturation level of advertising in generating consumer information was implied by using a semilog specification. Kinnucan and Forker used a goodwill variable to measure the impact of milk advertising on consumption in the New York City metropolitan area. The goodwill variable was specified as the weighted sum of lagged advertising expenditures. A Pascal distribution (hump shaped) was used to represent the lag structure.

Given that a more elaborate formulation of lag structure may lead to degrees-of-freedom problems, most studies dealing with import demand equations have used a simple linear lag structure. Williams and Myers used a three-year moving average of real promotional expenditures in their 1982 analysis of soybean exports. Rosson, Hammig, and Jones used a weighted average of current and lagged promotional expenditures (finite distributed lag structure) to measure the impact of expenditures on exports of apples, poultry, and tobacco. Other studies have used a single period lagged expenditure variable to measure the impact of promotional activities on sales.

Evaluating Market Share

When evaluating the effect of U.S. export market promotion activities, it is important not only to consider the effect of expenditures on U.S. exports, but also on U.S. and competitor market shares. While U.S. exports may be increasing in absolute values, the U.S. share of the importing country market may be falling.

In a 1981 study, Florida Department of Citrus researchers specified a model that related market shares of Canadian frozen concentrated orange juice imports to import prices and FDOC advertising expenditures in Canada to test the hypothesis of own price effect irreversibility and substitute price effect irreversibility (Lee and Tilley). Their model showed that Florida orange juice advertising in Canada had a positive effect on U.S. market share in Canada for one quarter beyond the quarter in which the advertising actually occurred, and that the Florida orange juice advertising had a negative effect on Brazilian market share in the quarter following the quarter in which Florida orange juice was advertised.

Use of Dummy Variables in Demand Equations

Many researchers have used dummy variables in demand equations to model the variation in the effects of promotional expenditures across time and countries, and to incorporate the effects of seasonal marketing trends and shocks (e.g., freeze) to exports. The dummy variables have been used as intercept shifters or as the regression slope shifters.

In a 1973 study that estimated the effects of generic promotion expenditures for citrus product exports to Canada, a dummy variable technique was applied to account for seasonal marketing trends (Chern). A 1977 Florida Department of Citrus study employed a dummy variable technique to estimate the variations in the effects of promotion expenditures in Europe on U.S. exports across time and countries (Lee 1977). The regional dummy variables were included in the export sales equations for apples, tobacco, and poultry (Rosson, Hammig, and Jones). Kinnucan and Forker used 12 zero-one dummy seasonality variables as slope shifters. The seasonal dummy variables were incorporated to permit the goodwill effect on fluid milk sales to vary on a monthly basis, that is, to allow for a seasonal pattern of consumer response to advertising.

Considering Barriers to Imports

The researcher also should be aware of the factors that impede or reinforce the effects of promotional activities in a country or region. Changes in import demand may result from demographic changes in population due to age distributions and women's participation in the work force. Trade barriers such as quotas and tariffs and institutional factors such as access to ports, the availability of refrigerated storage, food regulations regarding additives and growth hormones, packaging and labeling requirements, and limited access to consumers may translate into demand changes for a particular imported good.

A dollar increase in promotional expenditures from private and public sources combined would increase returns to all contributors by $60 for apples and $31 for tobacco.

When evaluating the effects of promotion activities, the researcher should take into account trade barriers and institutional factors. In analyzing the Japanese demand for Japanese and Pacific Northwest fresh sweet cherries, McCracken, Cassavant, and Miller considered Japan's seasonal import barriers. The study used a yearly dummy variable to account for the opening of the Japanese market to U.S. sweet cherries.

RETURNS TO PROGRAM PARTICIPANTS, COMPARISON WITH OTHER EXPORT PROGRAMS

After estimating the effect of export market development expenditures on U.S. exports, most studies have provided a return per dollar of promotion expenditure. This has normally been done by comparing baseline solutions with solutions obtained assuming promotional expenditures are set at zero. Williams estimates return to program contributors in terms of soybean and product export revenues and in cash receipts to soybean growers. According to Williams, returns to all contributors averaged $62 for each dollar of promotion expenditures in terms of increased export revenues and $58 in terms of soybean cash receipts. Rosson, Hammig, and Jones show that a dollar increase in promotional expenditures from private and public sources combined would increase returns to all contributors by $60 for apples and $31 for tobacco.

As data sets are improved, researchers must find ways to adapt existing trade models to measure the effectiveness of market promotion expenditures.

Florida Department of Citrus (FDOC) researchers also compared the costs of the increases in export demand from export promotion expenditures with the costs of achieving the same increase in export demand from a price subsidy program such as the Export Enhancement Program (EEP). Using a price elasticity derived from their import demand analysis, the FDOC study (Lee and Brown) estimated that the price subsidy program would have been at least twice as costly (and, in some years, five times as costly) as the non-price promotion expenditures to achieve the same increase in export demand.

CONCLUSION

In spite of the growing body of literature available in evaluating the effectiveness of domestic promotion activities, research on the effectiveness of foreign market development programs is limited. The most extensive and detailed set of studies on foreign market development has been sponsored by the Florida Department of Citrus and is restricted to citrus and related products.

Limited import, price, and promotion expenditure data have forced researchers to adopt less elaborate models with fewer parameters and variables. The limited data have made the simultaneous estimation of parameters for several relevant factors difficult. Because relevant variables are excluded, the coefficients on included variables may be biased. However, as data sets are improved, researchers must find ways

to adapt existing trade models to measure the effectiveness of market promotion expenditures.

REFERENCES

Chern, Wen S. *Econometric Analysis of the Consumer Demand for Orange Juice in Canada.* Gainesville: Florida Dept. of Citrus ERD Rep. 73-2, 1973.

Green, Paul E., Donald S. Tull, and Gerald Albaum. *Research for Marketing Decisions*. Englewood Cliffs, N.Y.: Prentice Hall, 1988.

Henderson, Peter L. *Butter and Cheese: Sales Associated With Three Levels of Promotion*. AER-322. Washington, D.C.: USDA ERS, Jan. 1976.

Kinnucan, Henry. "Effect of Canadian Advertising on Milk Demand: The Case of the Buffalo, New York Market." *Canadian Journal of Agricultural Economics*. 35(1987):181-96.

Kinnucan, Henry, and Olan D. Forker. "Seasonality in the Consumer Response to Milk Advertising With Implications for Milk Promotion Policy." *American Journal of Agricultural Economics*. 68(1986):563-71.

Lee, Jonq-Ying. *A Study of the Impact of the Three-Party Program on European Demand for United States FCOJ.* Gainesville: Florida Dept. of Citrus ERD CIR 77-2, 1977.

Lee, Jonq-Ying. "Research Directed Toward Foreign Market Development Programs." Proceedings from Seminar on Research on Effectiveness of Agricultural Commodity Promotion, Arlington, Va., April 9-10, 1985, pp. 57-68.

Lee, Jonq-Ying, and Mark G. Brown. "Economic Effectiveness of Brand Advertising Programmes for U.S. Orange Juice in the European Market: An Error Component Analysis." *Journal of Agricultural Economics*. 37(1986):385-94.

Lee, Jonq-Ying, Mark G. Brown, and Gary F. Fairchild. "Some Observations on the Impact of Advertising on Demand." *Agribusiness*. 5(1989):607-18.

Lee, Jonq-Ying, Lester H. Myers, and Fred Forsee. *Economic Effectiveness of Brand Advertising Programs of Florida Orange Juice in European Markets*. Gainesville: Florida Dept. of Citrus ERD Rep. 79-1, 1979.

Lee, Jonq-Ying, and Daniel S. Tilley. "Irreversible Import Shares for Frozen Concentrated Orange Juice in Canada." *Southern Journal of Agricultural Economics*. 15(1983):99-104.

Liu, Donald J., and Olan D. Forker. "Generic Fluid Milk Advertising, Demand Expansion, and Supply Response: The Case of New York City." *American Journal of Agricultural Economics.* 70-(1988):229-36.

McCracken, Vicki A., Kenneth L. Casavant, and David C. Miller. "Export Demand for High-Value Products -- A Case Study of Sweet Cherries in Japan." *Agribusiness.* 5(1989):1-8.

Priscott, Robert H. "Demand for Citrus Products in the European Market." M.S. Thesis, University of Florida, 1969.

Rossmiller, George E., and Anne F. Grace. "Data Needs for International Market Development Evaluation." Proceedings from Seminar on Research on Effectiveness of Agricultural Commodity Promotion, Arlington, Va., Apr. 9-10, 1985, pp. 31-41.

Rosson, C.P. III, M.D. Hammig, and J.W. Jones. "Foreign Market Promotion Programs: An Analysis of Promotional Response for Apples, Poultry, and Tobacco." *Agribusiness.* 2(1986):33-42.

Smith, Mark, and Nicole Ballenger. "Agricultural Export Programs and Food Aid." *Agricultural-Food Policy Review: U.S. Agricultural Policies in a Changing World.* AER-620. Washington, D.C.: USDA ERS, Nov. 1989, p. 171.

Thompson, Stanley R., and Doyle A. Eiler. "Determinants of Milk Advertising Effectiveness." *American Journal of Agricultural Economics.* 59(1977):330-35.

Tilley, Daniel S., and Jonq-Ying Lee. "Import and Retail Demand for Orange Juice in Canada." *Canadian Journal of Agricultural Economics.* 29(1981):171-86.

Ward, Ronald W., Julio Chang, and Stan Thompson. "Commodity Advertising: Theoretical Issues Relating to Generic and Brand Promotions." *Agribusiness.* 1(1985):269-76.

Ward, Ronald W., and William F. McDonald. "Effectiveness of Generic Milk Advertising: A Ten Region Study." *Agribusiness.* 2(1986):77-89.

Williams, Gary W., and Lester H. Myers. *The Economic Effectiveness of Foreign Market Development Programs: The Case of Soybeans and Soybean Products.* Bala Cynwyd, Penn.: International Agricultural Service, Chase Econometrics, Inc., 1982.

Williams, Gary W. "Returns to U.S. Soybean Export Market Development." *Agribusiness.* 1(1985):243-63.