Journal of Agricultural and Applied Economics, 46,1(February 2014):73–88

Goodwill and Export Promotion Dynamics

Henry W. Kinnucan and Li Gong

Federal subsidies for nonprice export promotion of farm products have been criticized on the grounds that they merely substitute taxpayer dollars for private promotional expenditures. This "displacement hypothesis" is tested by estimating export demand and advertising–goodwill relations using time series data for 1975–2008. The displacement hypothesis receives some support in that three of the nine tests show an inverse relationship between industry and government expenditures. However, the remaining tests show no relationship. These results, coupled with the finding of Kinnucan and Cai (2011) that expenditures for export promotion may be too high when consumer impacts are taken into account, suggest it is time to let the Market Access and Foreign Market Development programs operated by the U.S. Department of Agriculture lapse.

Key Words: export promotion, foreign market development, international trade, subsidy

JEL Classifications: D61, F14, Q11

"The time has come to debate whether the federal government should be in the business of promoting private goods to foreign buyers."
Senator Tom A. Coburn (Coburn, 2012, p. ii)

Most developed-country governments encourage industry to develop or expand foreign markets through nonprice promotion activities. For example, a 2002 survey of 29 countries found that total expenditures for export promotion of agricultural, forestry, and fishery products exceeded $1.5 billion, of which $465 million, or 30%, represented taxpayer dollars (Table 1). In the United States, the federal government has subsidized nonprice export promotion of agricultural products since 1955 with expenditures between 1985 and 1991 quadrupling to $250 million in real (2000 dollars) before dropping to its current level of $150 million (Figure 1).[1] As

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This research contributes to Hatch Project S-1043 "Economic Impacts of International Trade and Domestic Policies on Southern Agriculture" and to Project ALA011-2-12019 of the Alabama Agricultural Experiment Station.

An earlier draft of this article was presented at a symposium on the economics of food marketing sponsored by the Food Distribution Research Society and organized by Oral Capps, Jr., and Gary Williams.

Appreciation is expressed to Michael Dwyer and Harry Kaiser for providing data and to journal reviewers for helpful comments. Responsibility for final content, however, rests strictly with the authors.

[1] The large expenditure increase between 1985 and 1990 was the result of the Targeted Export Assistance (TEA) program authorized in the 1985 Food Security Act to counter or offset the adverse effects of unfair foreign trade practices on U.S. agricultural exports. The TEA program was replaced by the Market Promotion Program in 1990 at a reduced level of funding, which, in turn, was replaced in 1996 by the Market Access Program (MAP), which operates to this day. For details on the operation of these programs through 1999, including funding levels and restrictions on program participation that help explain the changes in industry expenditures shown in Figure 1, see Ackerman and Smith (1990) and U.S. Government Accountability Office (1999). In fiscal year 2012, $200 million was allocated under MAP and $29.7 million under the Foreign Market Development (FMD) program. For a list of participants and amounts received, see www.fas.usda.gov/mos/Funding/MAP_2011.asp and www.fas.usda.gov/mos/programs/Final_FMD_January%202011_updated.pdf (accessed June 21, 2013; USDA, Economic Research Service, 2010a, 2010b).

Table 1. Expenditures for Nonprice Export Promotion of Agricultural, Forestry, and Fishery Products in 29 Surveyed Countries, 2002[a]

Country	Government Expenditures	Industry Expenditures	Total Expenditures	Government Share of Total (%)
	(Million US Dollars)			
New Zealand	1	352	353	0.3
United States	123	208	331	37.2
Brazil	50	70	120	41.7
Mexico	25	75	100	25.0
France	42	47	89	47.2
South Africa	2	57	59	3.4
Spain	32	21	53	60.4
The Netherlands	7	45	52	13.5
Ireland	16	35	51	31.4
Australia	31	18	49	63.3
Canada	13	13	26	50.0
Chile	13	13	26	50.0
Norway	0	24	24	0.0
Korea	21	3	24	87.5
Austria	4	19	23	17.4
United Kingdom	11	9	20	55.0
Others	74	64	138	53.6
Total	465	1,073	1,538	30.2

[a] Source: Thompson (2004, p. 7). Totals may not sum as a result of rounding error.

noted by Love, Porras, and Shumway (2001), nonprice promotion activities are permissible under the Uruguay Round of the General Agreement on Tariffs and Trade, which may explain their popularity as a policy instrument, yet the programs remain controversial. Proponents argue that export promotion is a type of public good in that "the 'new' markets found would become open for other producers and exporters" (McCalla and Valdes, 1997, p. 8). The free-rider problem implies that private-sector investment would be below the social optimum *sans* government aid. Opponents counter that such aid displaces private investment, is inefficient, has an unclear economic impact, and fails to serve a clear need (Coburn, 2012; Office of Management and Budget, 2010, p. 84; Stansel, 1995).

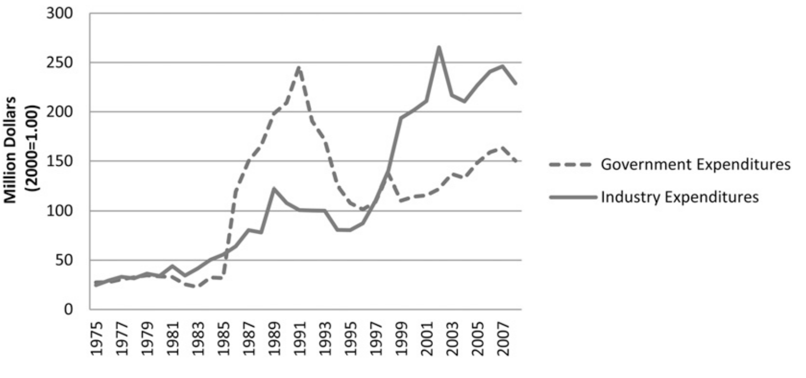

Figure 1. Real Export Promotion Expenditures for Farm Products, United States, 1975–2008 (Source: See Appendix Table 1)

The purpose of this research is to test the displacement hypothesis. Specifically, we address whether the subsidies enlarge total spending for export promotion of farm products or merely encourage industry to substitute taxpayer dollars for private promotional expenditures, a major contention of the U.S. Government Accountability Office (US-GAO). The U. S. Department of Agriculture (USDA) provides the subsidies through two programs: the Foreign Market Development Program (FMD) and the Market Access Program (MAP). MAP funds are aimed at processed foods and "high-value" farm products (e.g., almonds, raisins, salmon, wine) and require dollar-for-dollar matching; FMD funds are aimed at bulk products (e.g., corn, cotton, soybeans, wheat) and require as little as \$1 of industry money per \$9 of taxpayer money (Ho and Hanrahan, 2010, p. 7). In a series of reports, the US-GAO alleged that MAP funds went disproportionately to large and experienced firms that had little need of export assistance and who would simply substitute federal dollars for private dollars (US-GAO, 1999). The US-GAO contended that redirecting the monies to small and "new-to-export" firms that had difficulty accessing international markets would improve the efficiency of the programs.

The scholarly literature is replete with studies that evaluate the effects of export promotion on market demand and producer returns (e.g., Rusmevichientong and Kaiser, 2009, and references therein). However, no study to our knowledge has examined the effects of subsidies on industry spending. The closest related research is a study by Jakus, Jensen, and Davis (2003) that examined whether firm size and export experience matter in the conversion of MAP funds into export sales. The study rejects the US-GAO's contention that redirecting MAP monies to smaller, less export-experienced firms would enhance program efficiency. In a related study, Adams et al. (1997) found that the USDA did indeed tend to ignore small business assistance in its allocation of program funds, placing greater emphasis on the ability of the funds to expand export sales. Kinnucan and Cai (2011) found that an isolated 1% increase in total U.S. expenditures for export promotion increased the U.S. global trade share in farm products by between 0.19% and 0.33% with an associated marginal benefit–cost ratio of between –30:1 and 7:1.[2] Beyond these studies, little is known about how the programs work. The displacement hypothesis, in particular, has not been tested.

In their classic study, Nerlove and Arrow (1962, p. 130) argued that advertising is best modeled as a capital asset, which they called "goodwill," that depreciates over time but that can be replenished by increasing current advertising outlays. The distinction between advertising outlays (a flow variable) and goodwill (a stock variable) is germane because, in a dynamic setting, the relationship between the flow and stock variables is bidirectional (Feichtinger and Sethi, 1994; Sethi, 1977). Specifically, Luhta and Virtanen (1996, p. 2085) show that when advertising budgeting decisions are dependent on sales, the amount of advertising in the current period is a function of the current level of goodwill, which, in turn, is a function of current and past advertising outlays. This implies that in testing the relationship between industry expenditures on export promotion and the subsidy provided by the USDA, it is necessary to have a measure of goodwill. Thus, a secondary objective of this study is to estimate the level of goodwill associated with U.S. investments in export promotion of farm products. The objective is achieved by estimating the parameters of a Cobb-Douglas-type production function for goodwill using time-series data for the period 1975–2004. The estimated parameters are then used to reconstruct the levels of goodwill over the period 1980–2008, which then are used in an advertising–goodwill relationship to test the displacement hypothesis.

The article has five sections. The next section presents the model. We then discuss estimation procedures and results. The hypotheses are then tested, and estimates of the effect of the subsidy on total spending are presented. The final section summarizes key findings.

[2] The "best-bet" MBCR was –12:1, which suggested federal subsidies were too high relative to the social optimum (Kinnucan and Cai, 2011, p. 206).

Theoretical Framework

The basic economics of export promotion in a static partial-equilibrium setting can be illustrated with the aid of the following structural model. In this model, for simplicity, we assume the industry advertises its product strictly in the export market. We abstract from the funding mechanism used to raise funds for export promotion, and prices are assumed to be determined under competitive conditions. Other complicating factors such as price wedges resulting from subsidies and tariffs, product heterogeneity, and domestic farm programs are ignored. Goodwill is treated as exogenous, an assumption we relax in the sections to follow. Other exogenous variables that shift the supply and demand curves are suppressed. With these assumptions, the structural equations may be written as follows:

(1) $Q_d^* = \eta_d P^*$

(2) $Q_x^* = \eta_x P^* + \alpha_x GW^*$

(3) $Q_s^* = \varepsilon_d P^*$

(4) $Q_s^* = k_d Q_d^* + k_x Q_x^*.$

The asterisks (*) indicate proportionate change (e.g., $Q_d^* = dQ_d/Q_d$), the Greek symbols represent elasticities, and the k terms represent quantity shares. Specifically, η_d (< 0) and η_x (< 0) are the price elasticities of demand, respectively, in the domestic and export markets; ε_d (> 0) is the price elasticity of supply for domestic production; $k_d = Q_d^0/Q_s^0$ is the share of domestic production consumed in the home market in the initial equilibrium i.e., before the increase in export demand; $k_x = Q_x^0/Q_s^0 = (1 - k_d)$ is the share of domestic production consumed in the export market in the initial equilibrium; and α_x is the export promotion elasticity that tells the effect of a 1% increase in goodwill (GW) on the quantity exported holding price (P) constant.

The model consists of four endogenous variables (P^*, Q_d^*, Q_x^*, Q_s^*) and one exogenous variable (GW^*). At issue is the effect of an increase in goodwill in the export market on economic surplus in the domestic market.

To determine that, the first step is to solve the model for the reduced form:

(5a) $P^* = \left(\dfrac{\alpha_x}{\varepsilon_x - \eta_x}\right) GW^*$

(5b) $Q_d^* = \left(\dfrac{\eta_d \alpha_x}{\varepsilon_x - \eta_x}\right) GW^*$

(5c) $Q_x^* = \left(\dfrac{\varepsilon_x \alpha_x}{\varepsilon_x - \eta_x}\right) GW^*$

(5d) $Q_s^* = \left(\dfrac{\varepsilon_d \alpha_x}{\varepsilon_x - \eta_x}\right) GW^*$

where $\varepsilon_x = ((\varepsilon_d - k_d \eta_d)/k_x) > 0$ is the export supply elasticity. Under the stated assumptions, an increase in goodwill in the export market increases price, reduces domestic consumption, increases exports, and increases industry output.

The most important principle to be deduced from the reduced form is that it is always more profitable to shift a less elastic demand curve. To see this, let $h = \alpha_x GW^*$ represent the proportionate horizontal shift in the export demand curve, i.e., the shift in the quantity direction from the initial equilibrium point with price held constant. For a given value of h, shifting a steeper demand curve always results in a larger price and quantity effect than shifting a flatter demand curve, as shown in Figure 2. The same result can be seen analytically by noting that the reduced-form elasticities in equations (5a) and (5c) increase as $|\eta_x| \rightarrow 0$. By the same token, if the United States is a small exporter such that it faces a perfectly elastic demand curve in the export market ($\eta_x = -\infty$), then $P^*/GW^* = Q_x^*/GW^* = 0$ and the economic impact of export promotion is nil. This is true regardless of the size of α_x, i.e., regardless of the responsiveness of the export market to the promotion effort.

The welfare effects of the demand shift can be approximated using the following formulas (Kinnucan and Cai, 2011; Wohlgenant, 1993, 1999):

(6a) $\Delta PS = P^0 Q_s^0 \; P^*(1 + 0.5Q_s^*)$

(6b) $\Delta CS = -P^0 Q_d^0 \; P^*(1 + 0.5Q_d^*)$

(6c) $\Delta TS = \Delta PS + \Delta CS.$

where ΔPS, ΔCS, and ΔTS refer, respectively, to changes in producer, consumer, and total

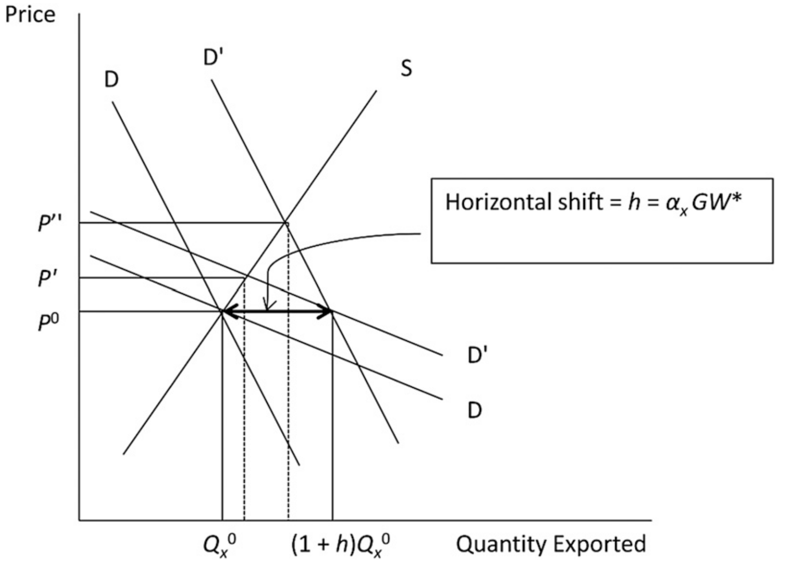

Figure 2. Price and Quantity Effects of an Equal Horizontal Shift in an Elastic versus Inelastic Demand Curve

surplus in the domestic economy. For export promotion to have an economic impact, it must raise price. Thus, if export demand or export supply is perfectly elastic, there is no point spending money on promotion, because the price effect is nil (see equation [5a]). Because $\varepsilon_x = ((\varepsilon_d - k_d\eta_d)/k_x)$ approaches infinity as k_x approaches zero, export promotion will be most effective, *ceteris paribus*, when it is targeted at commodities where a large share of domestic production is exported.[3]

If there is a price effect, domestic producers gain at the expense of domestic consumers (because $\Delta PS > 0$ and $\Delta CS < 0$). The net effect on economic surplus can be found by substituting equations (6a) and (6b) into equation (6c) and simplifying (making use of equation [4]) to yield

$$\Delta TS = P^0 Q_x^0\ P^*(1 + 0.5Q_x^*). \tag{7}$$

The gross benefit to the domestic economy is positive provided promotion increases price. The net benefit depends on whether the gain measured by equation (7) exceeds the cost of the promotion. This, in turn, depends in part on the relationship among goodwill, export promotion expenditures, and government subsidies, to which we now turn.

The Displacement Hypothesis

The foregoing analysis assumes goodwill is exogenous. In reality, goodwill is endogenous, dependent on the level of promotion expenditures, which, in turn, is dependent on the level of goodwill, but also the subsidy. To endogenize goodwill, and to show the role the displacement hypothesis plays in its generation, we augment the structural model with the following equations:

$$GW = f(\tilde{A}) \tag{8}$$

$$A_I = g(GW,\ A_G) \tag{9}$$

$$\tilde{A} = A_I + A_G \tag{10}$$

In these equations, $\tilde{A}$ and A_I are, respectively, total and industry expenditures on export promotion, and A_G is government expenditures.

[3] Producer returns to export promotion commonly are measured by simulating an estimated export demand equation with price fixed. (For a partial listing of such studies, see Table 1 of Rusmevichientong and Kaiser's [2009] article.) Obviously, if price is indeed unaffected by promotion, producer returns are nil. For further discussion of this issue, see Kinnucan and Myrland (2001).

Although equations (8) and (9) inherently are dynamic, in keeping with our static formulation, we have suppressed the time subscripts to focus attention on the variables themselves and how they interact to produce goodwill.

Equation (8) represents the behavior of foreign consumers. Specifically, it indicates the repository of positive feelings that foreign consumers have toward the domestic product as a result of the accumulated expenditures on export promotion. The creation of this store of positive feelings is assumed to be subject to diminishing marginal returns ($f^{'} > 0$, $f^{''} < 0$), i.e., an increase in promotional spending increases goodwill but at a decreasing rate.

Equation (9) represents the behavior of commodity boards, cooperatives, trade associations, corporate entities, and others involved in the export promotion of farm products. Industry expenditures depend on the perceived need to replenish goodwill, but also on the subsidy. In Luhta and Virtanen's (1996, pp. 2087–88) model, advertising expenditures at first increase and then decrease with the level of goodwill with the equilibrium level of advertising occurring on the downward sloping portion of the curve. This implies that if industry is optimizing its level of advertising, the slope of equation (9) with respect to goodwill should be negative, i.e., $\partial A_I/\partial GW < 0$.

The displacement hypothesis implies $\partial A_I/\partial A_G < 0$. That is, holding constant the level of goodwill, an increase in taxpayer monies for export promotion reduces industry expenditures. The implication of this hypothesis for the ability of increased government expenditures to contribute to goodwill can be determined by first substituting equation (9) into equation (10) to yield

$$\tilde{A} = g(GW, A_G) + A_G. \tag{11}$$

Taking the partial derivatives of equations (8) and (11) with respect to subsidy yields

$$\frac{\partial GW}{\partial A_G} = \frac{\dfrac{\partial GW}{\partial \tilde{A}}\left(1 + \dfrac{\partial A_I}{\partial A_G}\right)}{1 - \dfrac{\partial A_I}{\partial GW}\dfrac{\partial GW}{\partial \tilde{A}}}. \tag{12}$$

If industry is optimizing advertising expenditures such that $\partial A_I/\partial GW < 0$, the denominator of equation (12) is positive. In this instance, an increase in subsidy increases goodwill provided displacement is not complete, i.e., provided $-1 < \partial A_I/\partial A_G < 0$. If displacement is complete, i.e., a \$1 increase in subsidy causes industry expenditures to decline by exactly \$1, then $\partial A_I/\partial A_G = -1$ and equation (12) reduces to zero. In this instance, the subsidy has no effect on goodwill and consequently its economic impact is nil.

The displacement hypothesis, therefore, is critical in determining the effectiveness of USDA's nonprice export promotion programs. The remainder of this article is devoted to testing whether the partial derivative $\partial A_I/\partial A_G$ is indeed negative as argued by the proponents of the displacement hypothesis. The first step in the testing process involves the measurement of goodwill.

Measuring Goodwill

To measure goodwill, we follow Doganoglu and Klapper (2006) and posit the Cobb-Douglas function:

$$GW_t = (1 + A_t)^{1-\lambda}(GW_{t-1})^{\lambda} \tag{13}$$

where GW_t is the stock of goodwill in year t; A_t is total export promotion expenditures in year t; and $0 \leq \lambda < 1$ is the goodwill retention parameter. In this formulation, if the industry ceases to advertise, goodwill depreciates at a rate proportional to the level of goodwill in the preceding period.

Demand Specification

Doganoglu and Klapper (2006) estimate the retention parameter by inserting equation (13) into an estimated demand equation. Following this approach, our demand equation assumes the form

$$\begin{aligned} \ln MS_t = {} & \beta_0 + \beta_P \ln P_t + \beta_{PS} \ln PS_t \\ & + \beta_{XR} \ln XR_t + \beta_Y \ln Y_t \\ & + \beta_{GW} \ln GW_t + \mu_t \end{aligned} \tag{14}$$

where $MS_t = PQ_x/Y$ is the share of foreign income spent on U.S. exports of farm products; P and Q_x are the U.S. price and U.S. quantity of

U.S. farm products exported; Y is foreign income; PS is the price of substitutes; XR is an agricultural trade-weighted exchange rate; GW is goodwill; and μ is a random error term. The XR variable is included to test whether foreign buyers' response to exchange-rate movements differs from their response to price movements, as suggested by Chambers and Just (1981). Specifically, because XR is defined as foreign currency unit divided by domestic currency unit, an increase in XR implies dollar strengthening, which means U.S. exports are more expensive to foreign buyers whose currency has depreciated relative to the U.S. dollar. Because P is measured in U.S. dollars, an increase in P and XR should have the same effect on export demand, i.e., $(\beta_P - 1) = \beta_{XR}$.[4] Rejection of this equality would imply evidence in favor of the Chambers-Just hypothesis. Equation (14) is a static version of the model used by Kinnucan and Cai (2011) to estimate the demand curve for U.S. agricultural exports.

Dynamics are incorporated using a Koyck transformation. Lagging equation (14) one period, multiplying both sides by λ, and then subtracting the lagged equation from the original gives

$$\begin{aligned} \ln MS_t - \lambda \ln MS_{t-1} &= \beta_0(1-\lambda) + \beta_P(\ln P_t - \lambda \ln P_{t-1})) \\ &\quad + (\beta_{PS}(\ln PS_t - \lambda \ln PS_{t-1}) \\ &\quad + \beta_{XR}(\ln XR_t - \lambda \ln XR_{t-1}) \\ &\quad + \beta_Y(\ln Y_t - \lambda \ln Y_{t-1}) \\ &\quad + \beta_{GW}(\ln GW_t - \lambda \ln GW_{t-1}) \\ &\quad + \mu_t - \lambda\mu_{t-1}. \end{aligned} \tag{15}$$

The unobserved goodwill terms in equation (15) are eliminated by substituting equation (13) to yield

$$\begin{aligned} \ln MS_t = \delta_0 &+ \beta_P(\ln P_t - \lambda \ln P_{t-1}) \\ &+ \beta_{PS}(\ln PS_t - \lambda \ln PS_{t-1}) \\ &+ \beta_{XR}(\ln XR_t - \lambda \ln XR_{t-1}) \\ &+ \beta_Y(\ln Y_t - \lambda \ln Y_{t-1}) \\ &+ \beta_{GW}(1-\lambda)\ln(1+A_t). \\ &+ \lambda \ln MS_{t-1} + \epsilon_t \end{aligned} \tag{16}$$

where $\delta_0 = \beta_0(1-\lambda)$ and $\epsilon_t = \mu_t - \lambda\mu_{t-1}$ is an autoregressive error term. Market share is a function of own price, traditional demand shifters, current advertising expenditures, and lagged market share. If the estimated coefficient of lagged market share is zero, equation (16) reduces to equation (14) (the static specification), and the goodwill function reduces to $GW_t = (1 + A_t)$. In this instance, the stock of goodwill is depleted in one year, and the distinction between advertising stocks and flows vanishes. If the estimated value of λ is positive, it takes more than one year for market share to adjust to a change in the variables specified in the model, and a portion of the current stock of goodwill lingers to influence demand in next year, and possibly succeeding years, depending on the magnitude of the retention parameter.

Adding a trend variable to equation (16) to account for autonomous shifts in demand resulting from changes in tastes and preferences or other unmeasured factors, the empirical model to be estimated is

$$\begin{aligned} \ln(X_t^{US}/X_t^W) = \delta_0 &+ \beta_P(\ln(P_t^{US}/DEFL_t) \\ &- \lambda \ln(P_{t-1}^{US}/DEFL_{t-1})) \\ &+ \beta_{PS}(\ln P_t^C - \lambda \ln P_{t-1}^C) \\ &+ \beta_{XR}(\ln XR_t - \lambda \ln XR_{t-1}) \\ &+ \beta_Y(\ln(X_t^W/DEFL_t) \\ &- \lambda \ln(X_{t-1}^W/DEFL_{t-1})) \\ &+ \beta_{GW}(1-\lambda)\ln(1+AD_t) \\ &+ \beta_T TREND \\ &+ \lambda \ln(X_{t-1}^{US}/X_{t-1}^W) + \epsilon_t \end{aligned} \tag{17}$$

where X_t^{US} is the nominal value of U.S. agricultural exports in year t in U.S. dollars; X_t^W is the nominal value of world imports of agricultural products in year t in U.S. dollars; P_t^{US} is the unit value of U.S. bulk agricultural exports in year t in U.S. dollars; $DEFL_t$ is a GNP deflator for the world less the United States; P_t^C is a Stone index of real trade-weighted exchange rates for U.S. competitors' agricultural exports; XR_t is a world U.S. agricultural trade-weighted real exchange rate; $AD_t = \bar{A}_t \times SDR_t/FCPI_t$ is real promotion expenditures adjusted for the strength of the U.S. dollar (Dwyer, 1994) where $\bar{A}_t = (A_t + A_{t-1})/2$ is average nominal promotion

[4] This equality implies $\dfrac{\partial \ln Q_x}{\partial \ln P} = \dfrac{\partial \ln Q_x}{\partial \ln XR}$; see equations for elasticities given later.

expenditures between adjacent time periods[5]; and $TREND_t$ is a linear trend variable. A precise empirical definition of all variables, including sources, is given in appendix Table 1.

The unit value of U.S. bulk farm exports serves as a proxy for the U.S. price, and an exchange rate index reflecting competitors' agricultural export prices serves as a proxy for the substitute price. Replacing foreign income with world import expenditures on farm products in essence converts the model to a conditional demand specification. Specifically, world demand for farm exports is implicitly assumed to be weakly separable from all other goods. This assumption, coupled with the two-stage budgeting hypothesis, implies that the price and income elasticities estimated from equation (8) are properly interpreted as conditional elasticities (Phlips, 1990, pp. 71–77).

Recalling that $MS = PQ_x/Y$, the long-run demand elasticities for exported quantity (Q_x) are computed from model parameters as follows:

$$\text{(18a)} \quad \frac{\partial \ln MS}{\partial \ln GW} = \frac{\partial \ln Q_x}{\partial \ln GW} = \alpha_x = \beta_{GW} \text{ (goodwill elasticity)}$$

$$\text{(18b)} \quad \frac{\partial \ln MS}{\partial \ln P} = \left(\frac{\partial \ln P}{\partial \ln P} + \frac{\partial \ln Q_x}{\partial \ln P}\right) \Rightarrow \eta_x = \beta_P - 1 \text{ (own-price elasticity)}$$

$$\text{(18c)} \quad \frac{\partial \ln MS}{\partial \ln PS} = \frac{\partial \ln Q_x}{\partial \ln PS} = \eta_x^{PS} = \beta_{PS} \text{ (cross-price elasticity)}$$

$$\text{(18d)} \quad \frac{\partial \ln MS}{\partial \ln Y} = \left(\frac{\partial \ln Q_x}{\partial \ln Y} - \frac{\partial \ln Y}{\partial \ln Y}\right) \Rightarrow \eta_x^{Y} = \beta_Y + 1 \text{ (income elasticity)}$$

$$\text{(18e)} \quad \frac{\partial \ln MS}{\partial \ln XR} = \frac{\partial \ln Q_x}{\partial \ln XR} = \eta_x^{XR} = \beta_{XR} \text{ (exchange rate elasticity)}$$

Homogeneity implies $\beta_P + \beta_{PS} + \beta_Y = 0$. Equation (17) is estimated with and without the homogeneity restriction to test whether it is compatible with the data.

The critical parameter from the standpoint of goodwill measurement is λ, because it permits the application of equation (13) to construct a data series for goodwill that can then be used to test the displacement hypothesis.

Estimation Procedures and Results

Equation (17) was estimated using annual data for the period 1975–2004. Two observations are lost the result of lagged terms in the model and the estimation procedure. The effective sample period, therefore, is 1977–2004.

Augmented Dickey-Fuller tests showed all variables to be nonstationary in levels but stationary in first differences at the 5% level or better. The Johansen test indicated the $I(1)$ variables are cointegrated.[6] Based on these results, the model was estimated using the Generalized Methods of Moments (GMM) estimator with P^{US} and AD treated as endogenous variables. Thus, we implicitly assume that the United States is a sufficiently large exporter of farm products that shocks in export demand affect price. AD is treated as endogenous because demand-side shocks affect equilibrium quantity, which, in turn, affect the funds available for promotion through industry checkoff programs (for details, see Forker and Ward, 1993). Hence, $COV(P_t^{US}, \epsilon_t) \neq 0$ and $COV(AD_t, \epsilon_t) \neq 0$ are treated as maintained hypotheses. Because weak instruments can introduce significant bias into instrumental variable estimates (Andrews and Stock, 2005), F-tests were performed to eliminate instruments that did not contribute to the explanatory power of the auxiliary equations. Based on this procedure, 12 variables were selected as instruments: AD_{-1}, P_{-1}^{US}, P^C,P_{-1}^C, XR,XR_{-1} X^W, X_{-1}^W,X_{-1}^{US} $DEFL$, $DEFL_{-1}$ and $TREND$.

Because the model contains eight parameters, it is overidentified. The Sargan statistic is used to test whether the overidentifying restrictions are valid. The GMM estimates are

[5] The promotion expenditures are averaged between adjacent time periods to reduce measurement error associated with discrepancies between budgeted and actual expenditures in any given calendar year.

[6] Test results are in an appendix available from the authors on request.

obtained using EViews, version 7. A constant term was included in the instrument list, the estimation weighting matrix was set to the "HAC (Newey-West)" option, and weight updating was set to the "Sequential N-Step Iterative" option. Significance is determined using the $p \leq 0.05$ level unless indicated otherwise. Ordinary least squares (OLS) estimates are provided along with the GMM estimates to indicate the sensitivity of results to the estimation procedure.

Results are satisfactory in that the model "explains" between 75% and 83% of the observed variation in market share depending on whether homogeneity is imposed (Table 2). The *J*-statistic indicates the overidentifying restrictions are valid, i.e., both the unrestricted and restricted models pass the Sargan test. The Ljung-Box *Q*-statistic for serial correlation in the presence of a lagged dependent variable suggests both the unrestricted and restricted models are free of serial correlation up to the third order. The OLS estimates are similar to the GMM estimates, which suggest estimation procedure is not unduly influencing results. The remaining discussion will focus on the GMM estimates.

The estimated (conditional) demand elasticities are sensitive to the homogeneity restriction, to wit:

Model A (homogeneity not imposed)

$$\alpha_x = 0.21 \;\; \eta_x - 1.00 \;\; \eta_x^{PS} = 0.35$$
$$\eta_x^{Y} = 1.00 \;\; \eta_x^{XR} = -0.37(NS)$$

Model B (homogeneity imposed)

$$\alpha_x = 0.03(NS) \;\; \eta_x - 0.76 \;\; \eta_x^{PS} = 0.15$$
$$\eta_x^{Y} = 0.61 \;\; \eta_x^{XR} = -0.41(NS)$$

Specifically, imposing homogeneity causes the estimated advertising effect to become insignificant. A Wald test, however, rejects homogeneity at the $p < 0.02$ level. This suggests equation (17) is inconsistent with demand theory and thus misspecified. However, as noted by Keuzenkamp and Barten (1995), the homogeneity condition has a long history in the empirical demand literature of being problematic. Hence, whether a specification search would overturn the rejection seems doubtful and would raise concerns associated with pretest estimation (Tomek and Kaiser, 1999).[7] The long-run advertising elasticity estimated from Model A, 0.21 (t-ratio = 2.2), is close to the estimate of 0.19 obtained by Kinnucan and Cai (2011) using the same data set but a different model and estimation procedure. It is also consistent with estimates obtained in two consulting reports, which range from 0.14 to 0.20 depending on whether the dependent variable is defined as market share for bulk (e.g., corn, cotton, soybeans) or high-value (e.g., salmon, raisons, wine) U.S. farm products (Global Insight, 2007; Global Insight, I.H.S., 2010). Given the apparent robustness of the advertising effect estimated from Model A, and the fact that the remaining parameters have signs consistent with economic logic, our remaining discussion will focus on Model A, notwithstanding the fact that it is inconsistent with demand theory.[8]

The conditional own-price elasticity of export demand is –1.00, which suggests the export demand curve is sufficiently downward-sloping for export promotion to be remunerative from the U.S. perspective (see Figure 2). The conditional expenditure elasticity of export demand is 1.00, which suggests preferences for U.S. farm exports are homothetic, a key assumption of Armington's (1969) trade model.

A t-test of the restriction $(\beta_P - 1) = \beta_{XR}$ indicates rejection at the $p < 0.02$ level. Hence, the Chambers-Just hypothesis that agents' responses to price movements differ from their responses to exchange rate movements is affirmed.

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[7] The rejection of homogeneity might also be related to our maintained hypothesis that U.S. agricultural exports are weakly separable from all other goods. A reviewer suggested that the assumption be tested. Unfortunately, data were not available to permit an adequate test.

[8] That estimated advertising effects are fragile has been noted in the literature (Coulibaly and Brorsen, 1999; Kinnucan et al., 1997; Tomek and Kaiser, 1999). This should not be surprising, because advertising expenditures for farm products typically are tiny in relation to product value. For example, in our sample, advertising intensity, defined as the ratio of advertising expenditures to export value, is less than 0.7%. With such a low intensity, the demand shift is likely to be tiny, making the effect difficult to estimate reliably.

Table 2. Ordinary Least Squares (OLS) and Generalized Methods of Moments (GMM) Estimates of the Export Demand Equation, U.S. Annual Data, 1976–2004

		Model A (homogeneity not imposed)		Model B (homogeneity imposed)[a]	
Variable/Statistic	Parameter	OLS	GMM	OLS	GMM
Lagged dependent variable	λ	0.636*	0.629*	0.738*	0.595*
		(3.35)[b]	(4.16)	(2.80)	(3.75)
Advertising expenditure	β_{GW}	0.174	0.206*	0.086	0.028
		(1.82)	(2.24)	(0.46)	(0.41)
Own price	β_P	0.005	0.057	0.083	0.235*
		(0.05)	(0.54)	(0.74)	(2.20)
Substitute price	β_{PS}	0.348*	0.351*	0.138	0.153*
		(2.57)	(3.02)	(1.27)	(2.07)
Exchange rate	β_{XR}	–0.407	–0.371	–0.490	–0.410
		(–1.34)	(–1.53)	(–1.39)	(–1.69)
Income	β_Y	0.276	0.251	—	—
		(1.16)	(1.25)	—	—
Trend	β_T	–0.011	–0.012*	–0.003	–0.001
		(–1.83)	(–2.71)	(–1.32)	(–0.27)
Constant	δ_0	–1.969	–2.190	0.189	0.882
		(–1.20)	(–1.63)	(0.19)	(0.95)
R^2	—	0.841	0.832	0.788	0.747
SE of regression	—	0.0501	0.0515	0.0566	0.0617
Number of observations	—	29	28	29	28
Instrument rank	—		13		13
J-statistic (p value)		—	0.304	—	0.577
Q-statistic for serial correlation (p value):					
First order		0.71	0.48	0.29	0.27
Second order		0.64	0.76	0.42	0.54
Third order		0.83	0.88	0.55	0.70

[a] Homogeneity implies $(\beta_P + \beta_{PS}) = -\beta_Y$. The restriction is rejected at the $p < 0.020$ level in model estimated by GMM based on a Wald test.
[b] Asymptotic t-ratio. Asterisk (*) indicates the estimated coefficient is significantly different from zero at the $p \le 0.05$ level based on a two-tailed test.
SE, standard error.

The conditional cross-price elasticity is 0.35 (t-ratio = 3.0), which suggests U.S. and foreign-produced farm products are substitutes. The estimated coefficient of the trend variable is –0.012 (t-ratio = –2.7), which means the U.S. share of world agricultural exports declined, on average, by an estimated 1.2% per year as a result of unmeasured factors such as changes in tastes and preferences.

Turning to λ, the key parameter in this study, its estimated value is 0.63 (t-value = 4.2). Hence, the hypothesis that past levels of goodwill are independent of the current stock is rejected. By way of comparison, Doganoglu and Klapper's (2006) estimate of λ based on weekly store data for three brands of a liquid detergent sold in Germany ranges from 0.70 to 0.90. These estimates fall within the 95% confidence interval of our estimate (0.33–0.92), which suggests the decay rates of "brand equity" of U.S. farm products in foreign markets and liquid detergents in Germany are not dissimilar. To our knowledge, these are the only empirical estimates of λ in the literature. The same parameter estimated from Model B is 0.60 (t-value = 3.8), which suggests the point estimate from Model A is robust.

Goodwill

With an estimated value for λ in hand, it is now possible to reconstruct the implied levels of goodwill over the sample period. The first step in the reconstruction process is to solve equation (13) to yield[9]:

$$(19) \qquad GW_t = \left[\prod_{i=0}^{t-1} (1 + \tilde{A}_{t-i})^{\lambda^i}\right](GW_0)^{\lambda^t}$$

where $\tilde{A}_t = A_t/FCPI_t$ is total advertising expenditures in year t expressed in 2005 dollars, and GW_0 is the level of goodwill in the initial period. Luhta and Virtanen (1996, pp. 2085–86) show that if the marginal cost of goodwill is constant, the equilibrium level of goodwill under conditions of constant advertising expenditure is $\overline{GW} = A/r$ where r is the goodwill depreciation rate. Using this formula, we set $GW_0 = \tilde{\bar{A}}/0.37$ where $\tilde{\bar{A}} = \$90{,}990{,}478$ is the average annual level of real advertising expenditures in the first three years of the sample (1975–1977), and 0.37 is the assumed depreciation rate based on the estimated value of λ. The implied initial level of goodwill is \$245,920,212.

The goodwill series was computed by inserting $\lambda = 0.628$ and $GW_0 = 245{,}920{,}212$ into equation (13) and simulating the equation for observed levels of advertising expenditures (as defined by $\tilde{A}_t$ in equation [19]) for the period 1975–2008. Because the procedure used to compute the initial value is somewhat arbitrary, to minimize its influence on the series, the first five observations are deleted. At $t = 6$, the numerical value for $(GW_0)^{\lambda^t}$ is approximately \$1.00, which means that by 1980, the influence of the initial value effectively is purged from the series. The resulting sample size for estimation is 29 (1980–2008).[10]

The implied goodwill function is

$$(20) \qquad GW_t = \left(1 + \tilde{A}_t\right)^{0.37} (GW_{t-1})^{0.63}.$$

A 1% increase in advertising expenditures increases the current stock of goodwill by 0.37%, holding constant previous-period accumulations. Evaluating the elasticity at mean data points for 1980–2008 yields $\partial GW_t/\partial \tilde{A}_t = 0.41$. This suggests a \$1 increase in current advertising outlays increases the current stock of goodwill by 41 cents.

Testing the Displacement Hypothesis

The displacement hypothesis was tested by estimating the following empirical version of the industry expenditure function (equation [9]):

$$(21) \qquad \begin{aligned} RAI_t = g(&RAG_t, GW_t, RX_t^{US}, SDR_t, \\ &TEA_t, TREND_t, RAI_{t-1}) + e_t \end{aligned}$$

where $RAI_t = AI_t/DEFL_t$ is industry expenditures for export promotion in year t expressed in 2000 dollars; $RAG_t = AG_t/DEFL_t$ is government expenditures for export promotion in year t expressed in 2000 dollars; GW_t is the value of goodwill in year t expressed in 2000 dollars; $RX_t^{US} = X_t^{US}/DEFL_t$ is the value of U.S. agricultural exports in year t expressed in 2000 dollars; SDR_t (Special Drawing Rights) is a proxy for the strength of the U.S. dollar among world currencies in year t as measured by the International Monetary Fund; TEA_t is a dummy variable that assumes a value of one for 1986–1991 and zero otherwise to account for the increase in government expenditures for export promotion associated with the Targeted Export Assistance Program; $TREND_t$ is a linear trend variable to account for a learning curve on the part of program managers or other unmeasured related factors that may have shifted the expenditure function in a systematic fashion over the sample period; and e_t is a stochastic error term.

In addition to control variables, the basic expenditure relation $A_I = g(GW, A_G)$ is augmented with a lagged dependent variable to account for possible delays in the adjustment of actual expenditures to their desired levels as a result of institutional constraints or other factors such as uncertainty about the actual level of goodwill. The model is estimated in

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[9] Appreciation is expressed to Xiang Wan for helping us solve this equation.

[10] The sample size used to estimate the export demand function terminates in 2004 owing to lack of data to construct the cross-price variable after 2004. See Appendix Table 1 for details.

linear, semi-log, and double-log forms to assess the extent to which functional form matters in determining the validity of the displacement hypothesis.

The displacement hypothesis may be stated formally as follows:

$$\text{(22a)} \qquad H_0 : \frac{\partial RAI}{\partial RAG} \geq 0$$

$$\text{(22b)} \qquad H_1 : \frac{\partial RAI}{\partial RAG} < 0$$

The displacement hypothesis posits a negative relationship between industry spending and the subsidy. Asserting a nonnegative relationship in the null implies that we are not prepared to accept the displacement hypothesis unless there is strong evidence in the data to support the claim. The null can be tested using a standard one-tail *t*-statistic (Hill et al., 2011, p. 187).

Estimation Procedures and Results

The variables in equation (21) are $I(1)$, and RX_t^{US} is apt to be endogenous owing to the tendency of firms to set advertising budgets as a proportion of sales. Accordingly, the equation is estimated using the Fully Modified Least Squares estimator of Hansen (1992) and Phillips and Hansen (1990). The FMLS estimator accounts for unit roots, endogenous right-hand-side variables, and serial correlation. Significance is determined using the $p < 0.05$ level.

To assess the sensitivity of results to the retention parameter, the expenditure function was estimated using three alternative measures of the goodwill variable corresponding to $\hat{\lambda} = 0.332$, $\hat{\lambda} = 0.628$, and $\hat{\lambda} = 0.924$. The lower and upper values correspond to the limits of the 95% confidence interval for this parameter; the middle value corresponds to the point estimate. Thus, each functional form is estimated three times, providing nine separate tests of the displacement hypothesis.

Estimation results are satisfactory in that the R^2 exceeds 0.94 across the nine models, the *Q*-statistic indicates the residuals in all of the models are free from serial correlation, and several of the control variables are significant across all models (Table 3).

The estimated coefficient of export value varies from positive to negative but is significant in only one of the nine models. Thus, the fixed advertising-sales rule commonly used by commercial firms appears not to apply to commodity promotion.

The exchange rate effect is negative and significant across all models. Estimates from the double-log model place the elasticity between –1.2 and –1.4. Hence, it would appear that promotion managers are sensitive to exchange rates and respond to dollar strengthening by reducing their levels of spending in the export market. This suggests industry would not be very responsive to the proposal by Armbruster and Nichols (2001) that subsidies for export promotion be increased during periods of a strong dollar to counter the negative effects of a strong currency on export demand.

The Targeted Export Assistance (TEA) program appears not to have had a significant effect on industry expenditures. The estimated coefficient for the TEA variable is significant in only three of the nine models and in these cases only for the limiting values of lambda.

Trend is positive across all models and significant in seven of nine. The estimated coefficient from the double-log model is between 0.037 and 0.046, which suggests industry expenditures increased between 3.7% and 4.6% per year in real terms as a result of unmeasured factors.

In Luhta and Virtanen's (1996, pp. 2087–88) model, advertising expenditures at first increase and then decrease with the level of goodwill with the equilibrium level of advertising occurring on the downward sloping portion of the curve. This implies that if industry is optimizing its level of advertising, the slope of the expenditure function with respect to goodwill should be negative. In the present analysis, the estimated coefficient of the goodwill variable is negative when $\hat{\lambda} = 0.628$ and turns positive as the retention parameter moves to its outer limits. The estimated coefficient is significant only when it is positive, which suggests industry is on the flat or rising portion of the advertising–goodwill curve. This suggests expenditures are below the level that would maximum producer welfare, a result consistent with the bulk of the

Table 3. Fully Modified Least Squares Estimates of the Industry Expenditure Function for Advertising, U.S. Annual Data, 1980–2008

	Linear Model[a]			Semi-log Model			Double-log Model		
Variable/Statistic	$\lambda = 0.332$	$\lambda = 0.628$	$\lambda = 0.924$	$\lambda = 0.332$	$\lambda = 0.628$	$\lambda = 0.924$	$\lambda = 0.332$	$\lambda = 0.628$	$\lambda = 0.924$
Government expenditure	–0.858*	0.383	–0.218*	–55.39	11.22	–20.91	–0.190	0.326	0.086
($AG/DEFL$)	(–2.53)[b]	(1.51)	(–2.10)	(–1.90)	(0.51)	(–1.52)	(–0.79)	(1.98)	(0.84)
Goodwill (GW)	0.384*	–0.227	0.960*	69.56	–14.67	164.1*	0.456	–0.249	0.463
	(2.49)	(–1.75)	(2.81)	(2.04)	(–0.58)	(2.39)	(1.46)	(–1.24)	(0.84)
Export value ($X^{US}/DEFL$)	–0.001	0.0001	–0.001*	–20.51	1.74	–39.42	–0.179	0.058	–0.125
	(–1.85)	(0.18)	(–2.23)	(–0.86)	(0.08)	(–1.42)	(–0.87)	(0.34)	(–0.56)
Exchange rate (SDR)	–80.63*	–70.13*	–154.9*	–104.5*	–102.9*	–172.1*	–1.25*	–1.17*	–1.40*
	(–2.58)	(–2.42)	(–4.38)	(–2.47)	(–2.46)	(–3.44)	(–3.53)	(–3.69)	(–3.50)
Targeted Export Assistance	32.02*	–12.89	48.95*	21.64	5.80	45.82*	0.150	–0.001	0.195
Program (TEA)	(2.40)	(–0.70)	(3.32)	(1.72)	(0.38)	(2.65)	(1.53)	(–0.01)	(1.49)
Trend	3.80*	4.76*	0.919	4.25*	4.01*	2.30	0.046*	0.040*	0.037*
	(3.69)	(4.99)	(0.60)	(3.78)	(3.69)	(1.77)	(4.36)	(4.37)	(3.63)
Lagged dependent variable	0.502*	0.708*	0.579*	0.569*	0.689*	0.613*	0.378*	0.565*	0.484*
($AI_{-1}/DEFL_{-1}$)	(4.24)	(8.29)	(6.67)	(5.25)	(7.43)	(6.33)	(2.51)	(5.06)	(4.09)
Constant	117.1*	63.51	89.88*	86.49	4.65	–320.4	2.59	0.866	0.505
	(3.18)	(1.88)	(2.99)	(0.33)	(0.02)	(–1.12)	(1.14)	(0.45)	(0.24)
R^2	0.954	0.948	0.951	0.949	0.945	0.948	0.964	0.963	0.962
SE of regression	18.68	19.73	19.24	19.59	20.32	19.84	0.140	0.143	0.145
Q-statistic for serialcorrelation									
(p value)									
First order	0.89	0.20	0.19	0.99	0.43	0.34	0.85	0.15	0.34
Second order	0.95	0.44	0.42	0.90	0.73	0.57	0.92	0.16	0.52

[a] Lambda is the retention parameter for goodwill estimated from the export demand equation. See text for details.
[b] Asymptotic t-ratio. Asterisk (*) indicates the estimated coefficient is significantly different from zero at the $p \leq 0.05$ level based on a two-tailed test.
SE, standard error.

empirical literature as summarized in Rusmevichientong and Kaiser (2009).

Turning to government expenditures, the key variable in terms of the research objective of this article, the estimated coefficient varies from positive to negative depending on the considered value of the retention parameter. For $\hat{\lambda} = 0.628$, the estimated coefficient is positive across all three functional forms but is not significant. For $\hat{\lambda} = 0.332$ and $\hat{\lambda} = 0.924$, the estimated coefficient is negative in five of six instances but is significant only in the linear model. The critical t-value for testing the displacement hypothesis is –1.721, and we reject $H_0 : \frac{\partial RAI}{\partial RAG} \geq 0$ if $t \leq -1.721$ or if $p \leq 0.05$. The null is rejected in only three instances, which is not strong support for the displacement hypothesis. Given that seven of the nine estimated coefficients for government expenditures are not significant based on a two-tail test, the preponderance of the evidence indicates no relationship between subsidy and industry expenditure. This suggests eliminating the subsidy would have little effect on private investment in export promotion.

Concluding Comments

Federal subsidies for nonprice export promotion of farm products in the United States have proved controversial, in part because a significant share of the funds has gone to large agribusiness firms that have little apparent need for export assistance. In addition to equity, this has raised concerns about efficiency. One aspect of the efficiency issue is whether the subsidies merely result in industry substituting taxpayer dollars for private promotional expenditures.

A challenge in testing the "displacement hypothesis" is obtaining an empirical measure of goodwill, because this variable is an important determinant of industry expenditures from a theoretical perspective. In this study, we adopted the methodology suggested by Doganoglu and Klapper (2006) and estimated goodwill in a two-step process that entailed first estimating an export demand function and then using the resulting estimate of the goodwill "retention parameter" to reconstruct the implied goodwill series by simulating a Cobb-Douglas-type function using observed values for total advertising expenditures over the sample period. These simulated data were then used as a control variable (along with other control variables) in an industry expenditure function to permit isolation of the subsidy effect.

Estimating the expenditure function using annual time series data for 1980–2008, reconstructed values for goodwill, and three alternative functional forms, the null hypothesis that government expenditures either increase or have no effect on industry expenditures was rejected in only two of nine tests. The estimated *ceteris paribus* relationship between government and industry expenditures was positive in only three instances, but in each instance, the effect was not significant. These results, coupled with the finding of Kinnucan and Cai (2011) that expenditures for export promotion may be too high when consumer impacts are taken into account, suggest it is time to let the Market Access and Foreign Market Development programs operated by the U.S. Department of Agriculture lapse.[11]

[Received November 2012; Accepted August 2013.]

References

Ackerman, K.Z., and M.E. Smith. *Agricultural Export Programs: Background for 1990 Farm Legislation*. Washington, DC: USDA, ERS, CED, 1990.

Adams, B.H., G.C. Davis, K.L. Jensen, and P.M. Jakus. "Priorities and Preferences in the Allocation of MPP Branded Funds to Agribusiness Firms." *American Journal of Agricultural Economics* 79(1997):1319–31.

[11] A U.S. Government Accountability Office (2013) report released shortly after this article was accepted for publication discusses in some detail the benefit–cost ratios estimated in the Global Insight (2007) study commissioned by USDA's Foreign Agricultural Service (FAS). The report does not discuss the benefit–cost ratios in the scholarly literature (e.g., Kinnucan and Cai 2011; Love, Porras, and Shumway 2001), nor does it recommend that FAS make available on its web site the data used in its commissioned studies. Without these data, it is not possible for academic researchers to verify and improve upon the studies.

Andrews, D.W.K., and J.H. Stock. Inference with Weak Instruments. Technical Working Paper 313. Cambridge, MA: National Bureau of Economic Research, 2005.

Armbruster, W.J., and J.P. Nichols. *Commodity Promotion Policy*. Washington, DC: U.S. Department of Agriculture, 2001.

Armington, P.S. "A Theory of Demand for Differentiated Products by Place of Production." *International Monetary Fund Staff Papers* 26(1969):159–78.

Chambers, R.G., and R.E. Just. "Effects of Exchange Rate Changes on US Agriculture: A Dynamic Analysis." *American Journal of Agricultural Economics* 63(1981):32–46.

Coburn, T. 2012. *Treasure Map: The Market Access Program's Bounty of Waste, Loot and Spoils Plundered from Taxpayers*. Internet site: www.coburn.senate.gov/public/index.cfm?a=Files.Serve&File_id=5c2568d4-ae96-40bc-b3d8-19e7a259f749 (Accessed June 21, 2013).

Coulibaly, N., and B.W. Brorsen. "Explaining the Differences between Two Previous Meat Generic Advertising Studies." *Agribusiness* 15(1999):501–15.

Doganoglu, T., and D. Klapper. "Goodwill and Dynamic Advertising Strategies." *Quantitative Marketing and Economics* 4(2006):5–29.

Dwyer, M.J. *Evaluating the Effectiveness of the Market Promotion Program on U.S. High Value Agricultural Exports*. Washington, DC: U.S. Department of Agriculture, Foreign Agricultural Service, Mimeo, 1994.

Feichtinger, G.R.F.H., and S.P. Sethi. "Dynamic Optimal Control Models in Advertising: Recent Developments." *Management Science* 40(1994):195–226.

Forker, O.D., and R.W. Ward. *Commodity Advertising: The Economics and Measurement of Generic Programs*. New York, NY: Lexington Books, 1993.

Global Insight. *A Cost Benefit Analysis of USDA's International Market Development Programs*. Eddystone, PA: Mimeo, 2007.

Global Insight, I.H.S. *A Cost–benefit Analysis of USDA's International Market Development Programs*. Eddystone, PA: Mimeo, 2010.

Hansen, B. "Efficient Estimation and Testing of Cointegrating Vectors in the Presence of Deterministic Trends." *Journal of Econometrics* 53(1992):87–121.

Hill, R.C., W.E. Griffiths, and G.C. Lim. *Principles of Econometrics*. 4th ed. Hoboken, NJ: John Wiley & Sons, Inc., 2011.

Ho, M.D., and C.E. Hanrahan. 2010. *Agricultural Export Programs: Background and Issues*. CRS Report 41202. Congressional Research Service. April 19.

Jakus, P.M., K.L. Jensen, and G.C. Davis. "Revenue Impacts of MPP Branded Funds: A Firm-level Analysis." *Agricultural and Resource Economics Review* 32(2003):184–97.

Keuzenkamp, H.A., and A.P. Barten. "Rejection without Falsification: On the History of Testing the Homogeneity Condition in the Theory of Consumer Demand." *Journal of Econometrics* 67(1995):101–27.

Kinnucan, H.W., and H. Cai. "A Benefit–cost Analysis of U.S. Agricultural Trade Promotion." *American Journal of Agricultural Economics* 92(2011):194–208.

Kinnucan, H.W., and Ø. Myrland. "A Note on Measuring Returns to Nonprice Export Promotion." *Agribusiness* 17(2001):423–33.

Kinnucan, H.W., H. Xiao, C.-J. Hsia, and J.D. Jackson. "Effects of Health Information and Generic Advertising on U.S. Meat Demand." *American Journal of Agricultural Economics* 79(1997):13–23.

Love, H.A., J.J. Porras, and C.R. Shumway. "Measuring the Effectiveness of Non-price Export Promotion Using a Supply-Side Approach." *Empirical Economics* 26(2001):367–89.

Luhta, I., and I. Virtanen. "Non-linear Advertising Capital Model with Time Delayed Feedback between Advertising and the Stock of Goodwill." *Chaos, Solitons, and Fractals* 7(1996):2083–104.

McCalla, A.F., and A. Valdes. "Diversification and International Trade." Paper prepared for the XXIII International Conference of Agricultural Economists, Sacramento, CA, August 16–17, 1997.

Nerlove, M., and K.J. Arrow. "Optimal Advertising Policy under Dynamic Conditions." *Economica* 114(1962):129–42.

Office of Management and Budget. *Terminations, Reductions, and Savings: Budget of the U.S. Government, Fiscal Year 2011*. Washington, DC: White House, 2010.

Phillips, P.C.B., and B. Hansen. "Statistical Inference in Instrumental Variables Regression with $I(1)$ Processes." *The Review of Economic Studies* 57(1990):99–125.

Phlips, L. *Applied Consumption Analysis: Revised and Enlarged Edition*. Amsterdam, The Netherlands: North-Holland Publishing Company, 1990.

Rusmevichientong, P., and H.M. Kaiser. "Measuring the Effectiveness of U.S. Rice Export Promotion Programs." *Agribusiness* 25(2009):215–30.

Sethi, S.P. "Dynamic Optimal Control Models in Advertising: A Survey." *SIAM Review* 19(1977): 685–725.

Stansel, D. "Federal Export Promotion Programs." Congressional Testimony before the Committee on Small Business, United States House of Representatives. Cato Institute. May 23, 1995.

Thompson, M. 2004. "U.S. and Competitor Expenditures for Export Promotion on Agricultural, Forestry, and Fishery Products." U.S. Department of Agriculture, Foreign Agricultural Service. p. 1–76.

Tomek, W.G., and H.M. Kaiser. "On Improving Econometric Analysis of Generic Advertising Impacts." *Agribusiness* 15(1999):485–500.

U.S. Department of Agriculture, Economic Research Service. Internet site: www.ers.usda.gov/Data/Fatus/#calendar (Accessed April 20, 2010a).

———. Internet site: www.ers.usda.gov/Data/Macroeconomics/ (Accessed April 20, 2010b).

U.S. Government Accountability Office. *Changes Made to Market Access Program, but Questions Remain about Economic Impact*. GAO/NSIAD-99-38. April 1999.

———. *USDA Is Monitoring Market Development Program as Required but Could Improve Analysis of Impact*. GAO/NSIAD-99-38. April 2013.

Wohlgenant, M.K. "Distribution of Gains from Research and Promotion in Multistage Production Systems." *American Journal of Agricultural Economics* 75(1993):642–51.

———. "Distribution of Gains from Research and Promotion in Multistage Production Systems: Reply." *American Journal of Agricultural Economics* 81(1999):598–600.

Appendix Table 1. Data Definitions and Sources

Variable Name	Definition	Source
AG	U.S. government expenditures for export promotion	FAS
AI	U.S. industry expenditures for export promotion	FAS
A	Total U.S. expenditures for export promotion ($= AG + AI$)	
HV	Value of U.S. high-value agricultural exports	ERS
$BULK$	Value of U.S. bulk agricultural exports	ERS
X^{US}	Total value of U.S. farm exports $= HV + BULK$	
X^W	Value of world imports of farm products	FAS
$QBULK$	Quantity of U.S. bulk agricultural exports	FAS
P^{US}	Price of U.S. bulk exports $= BULK/QBULK$	
$DEFL$	CPI for developed world (2000 = 100)	FAS
$FCPI$	World GNP deflator less the United States (2005 = 100)	ERS
XR	World U.S. agricultural trade weighted real exchange rate	ERS
SDR	Special Drawing Rights (IMF exchange rate series)	FAS
PC_1	Real exchange rate for U.S. competitors' HV farm products	FAS
PC_2	Exchange rate for U.S. competitors' bulk farm products	FAS
MS_1	U.S. high-value market share $= HV/X^W$	
MS_2	U.S. bulk market share $= BULK/X^W$	
S_1	Normalized U.S. high-value share $= MS_1/(MS_1 + MS_2)$	
S_2	Normalized U.S. bulk share $= MS_2/(MS_1 + MS_2)$	
P^C	Stone index of substitute price $= PC_1^{(1-S_1)} \cdot PC_2^{(1-S_2)}$	

FAS, Foreign Agricultural Services, U.S. Department of Agriculture. The FAS data were obtained from personal correspondence with Michael Dwyer of FAS and Professor Harry Kaiser of Cornell University; ERS = Economic Research Service, U.S. Department of Agriculture. Specific sources are: www.ers.usda.gov/Data/Fatus/#calendar and www.ers.usda.gov/Data/Macroeconomics/.