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The Effectiveness of U.S. Nonprice Promotion of Almonds in the Pacific Rim

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The effectiveness of the federal government's export promotion programs (the Foreign Market Development Program and the Market Promotion Program) for high-value agricultural products is evaluated using U.S. almond exports in the Pacific Rim as a case study. Cross-sectional time-series data are pooled for five Pacific Rim countries. While promotions were ineffective in South Korea and Singapore, some estimations of the import demand model indicate promotions in Japan, Taiwan, and Hong Kong may have been effective.

Key words: government-assisted export promotion, high-value agricultural exports, Market Promotion Program, Pacific Rim import demand, Targeted Export Assistance Program, U.S. almond exports

Introduction

The U.S. government's financial involvement in the promotion of agricultural exports has been an issue of growing debate in recent years. Although the federal government has assisted the U.S. agricultural sector in expanding sales of agricultural products to foreign markets for nearly four decades, the tightening of the federal budget during the 1990s and the dramatic increase in public funding for export promotion which occurred during the 1980s has raised concerns about the effectiveness of the federal promotion programs. Since most of the increased funding for promotions has been directed toward high-value consumer food products (USGAO August 1993), federal export promotion of U.S. almonds in the Pacific Rim is used as a case study to determine the effectiveness of the government's nonprice promotion programs for high-value products.

United States Department of Agriculture's Foreign Agricultural Service (USDA/FAS) currently administers two promotion programs for tree nuts: the Foreign Market Development Program (FMD) and the Market Promotion Program (MPP), which replaced the Targeted Export Assistance Program (TEA) in 1991. While the FMD Program dates back to the 1970s, the TEA Program began in 1986. For the seven-year period 1986–92, TEA/MPP expenditures for almonds in the Pacific Rim totaled nearly $20 million (table 1).

Although agricultural products receive the bulk of federal export assistance (USGAO August 1992), FAS has not established a consistent method for evaluating the effectiveness of promotion expenditures. During the past several years, MPP has come under fire from members of Congress, the media, and taxpayers with criticisms that the federal government is helping large U.S. companies, such as Blue Diamond, promote their products overseas

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Table 1. Pacific Rim Imports and U.S. Export Promotion Expenditures for Almonds, 1986–92

Import Market	Almond Imports ($ thsd.)	U.S. Market Share	Promotion Expenditures[a,b] ($ thsd.)
Japan	598,897	99.7%	11,899
South Korea	68,281	99.7%	4,105
Taiwan	60,668	97.8%	2,050
Hong Kong	36,828	46.9%	1,369
Singapore	27,684	91.5%	108
Total	792,358		19,531

Source: Promotion expenditures are based on fiscal year program data provided by USDA/FAS (15 July 1993); almond imports are calendar year FAO data provided by USDA/FAS, U.S. market share figures, with the exception of Singapore, are based on each country's commodity by country import statistics books published by the Japanese Ministry of Finance, Republic of Korea Office of Customs Administrations, Republic of China Inspectorate General of Customs, and Hong Kong Census and Statistics Department; U.S. market share in Singapore is calculated from U.S. export figures and FAO import data; U.S. Bureau of the Census export data provided by USDA/FAS.

[a]Program budgets were used for 1991 and 1992 due to program participants' lags in reporting actual expenditures.

[b]TEA and MPP account for all program expenditures and budgets between 1986 and 1992 for all countries, except for $14,000 spent in Japan in 1986 under FMD. Figures in this table reflect FMD, TEA, and MPP expenditures.

(USGAO May 1992). Because FAS has not been able to respond to these criticisms with analysis of MPP's effectiveness, congressional funding for the original $200 million program was first reduced to $148 million in 1993, then dropped to $100 million the following year. Continuation of the promotion programs will be determined in the Farm Bill of 1995, and future funding, which is determined by a separate appropriation bill, could be further reduced.

The promotion of U.S. agricultural exports could be vital for U.S. competitiveness. Ironically, without evaluation, the demise of these programs cannot be justified by their opponents nor opposed by their supporters. More specifically, the absence of evaluation of the effectiveness of past programs for almonds leaves future funding uncertain for potential U.S. exports, such as other tree nuts and other high-value agricultural crops, which are less mature in terms of import demand and market promotion.

This article evaluates the effectiveness of the U.S. government's nonprice export promotion programs for almonds in the Pacific Rim markets of Japan, South Korea, Taiwan, Hong Kong, and Singapore. This is the first public study to focus exclusively on the demand for almonds in the Pacific Rim in order to evaluate the effectiveness of the federal government's nonprice promotion programs.

Pacific Rim Almond Markets

Almonds have been an export success for high-value U.S. agriculture. Not only is the United States both the world's largest producer and exporter of almonds (Tse), but demand in foreign markets has fueled much of the growth of the U.S. industry over the last several decades. Traditionally, at least half of U.S. almond production has been exported (USDA/ERS

September 1992a). While the European Community (EC) is the world's second-largest exporter of almonds, usually at least half of U.S. almond exports have been imported by the EC.

The Pacific Rim is the second-largest regional market for U. S. almond exports. Between 1986 and 1992, U.S. exports of almonds to Japan, South Korea, Taiwan, Hong Kong, and Singapore totaled $740 million or roughly 20% of U.S. almond exports to the world (fig. 1). Japan accounts for three-quarters of this total and ranks as the second-largest single market for U.S. almonds following the EC. While U.S. almonds have dominated the market in Japan, South Korea, Taiwan, and Singapore, U.S. market share has been much lower in Hong Kong due to significant competition from China (table 1). Trade barriers have been minimal for almonds in all of these markets (U.S. Agricultural Trade Office Tokyo [USATO] 1991). Almonds have historically accounted for the largest percentage of U.S. tree nut exports to the Pacific Rim as well as the majority of federal promotions for tree nuts in that region.

Japan has historically been a strong and growing import market for almonds. In recent years, however, growth has begun to slow in the Japanese market, while imports of U.S. almonds by other East Asian and Southeast Asian countries have begun to accelerate (fig. 1). While medium-scale promotion expenditures have taken place in the growing import markets of South Korea, Taiwan, and Hong Kong, the stagnation of Japanese almond imports has coincided with the largest funding levels for federal promotion of almonds in the history of the Pacific Rim region (fig. 2). Hypothetically, this could imply that the Japanese import market for almonds has matured and the only remaining effect of promotions is to sustain demand. The continued growth of import demand for U.S. almonds in the other Pacific Rim countries may indicate that these export markets are still in the growth stages of their life cycles and almond promotions may continue to expand demand. This could be especially true for Singapore since previous export promotion funding has been small.

Almond demand in most countries has been driven by two market segments: institutional and retail. In the institutional segment, bulk almonds are imported by food manufacturers for use as inputs in ice cream, confectionery, and bakery products (Japan External Trade Organization [JETRO]). Japan, Korea, and Taiwan have developed large processed food and bakery industries which account for the majority of import demand for U.S. almonds (USATO 1993). For example, U.S. slivered almonds flavored with baby sardines were created specifically for the Japanese market (Blue Diamond Growers [BDG]). Almonds have also been introduced as a snack nut in retail markets. Snack nuts are consumed during holidays and after work in bars. The Japanese government even includes almonds in its school lunch program (Tse).

The Model

The hypothesis to be tested is that U.S. export promotion expenditures have had a positive impact on almond imports of selected Pacific Rim countries. To test this hypothesis, an econometric import demand model was estimated. Due to the limited number of observations available on the promotion variable for individual countries in the region, data were pooled for the seven-year period 1986–92 across five countries (Japan, South Korea, Taiwan, Hong Kong, and Singapore). The use of pooled cross-sectional time-series data in promotion analysis has been limited. Foreign Market Development (FMD) expenditures, which usually cover a longer time span than the Targeted Export Assistance or the Market Promotion Programs, have traditionally been included in past studies.

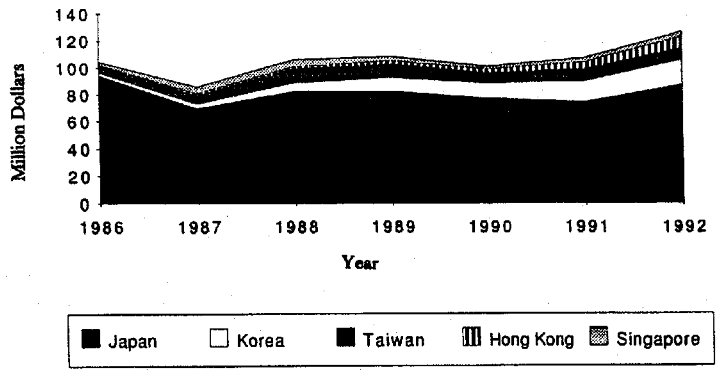

Figure 1. U.S. almond exports to the Pacific Rim, 1986–92

Source: Based on U.S. Bureau of the Census data provided by FAS, USDA.

Specification

The import demand model is specified with an ad hoc approach. Quantity of import demand is represented by total demand since almond production in the studied countries is negligible. The key economic variables affecting total import demand are assumed to be price, income, and any other economic variable, such as promotion expenditures.[1] The general specification is

$$M_{alm} = f(P_{alm}, P_{sb}, P_{cmp}, Y, PROM, T, D, DS),$$

where M_{alm} is the total volume of almond imports in metric tons; P_{alm} is the unit-value import price of almonds in real Pacific Rim currency units per metric ton; P_{sb} is the unit-value import price of an almond substitute in real Pacific Rim currency units per metric ton; P_{cmp} is the unit-value import price of an almond complement in real Pacific Rim currency units per metric ton; Y is the total Gross Domestic Product (GDP) in millions of real Pacific Rim currency units; *PROM* is the U.S. government export promotion expenditures for almonds in real Pacific Rim currency units; T is a time trend (repeated for each cross section) used to capture the effect of changing tastes and preferences over time;[2] D is an intercept dummy variable intended to measure the difference between the intercept of each country and the base country; and DS is a slope dummy variable for promotion expenditures and is equal to D multiplied by *PROM* (or logarithm of promotion in the Cobb-Douglas Functional form to be discussed later).

[1]The AIDS and Rotterdam models were also considered in this study because of the simplicity with which their parameters can be related to the restrictions of demand and other theoretical advantages (Deaton and Muellbauer). However, the lack of available import data on competing tree nuts across all of the studied countries limited the use of these budget share models in this study and such an analysis is outside the intended scope of the research objectives. Furthermore, the use of market shares implied by these models is inappropriate, given that U.S. market share is more than 90% in most of the studied countries.

[2]The starting value of the time trend variable will affect the estimation results. However, with the exception of the intercept term and the coefficient of the time trend, all coefficients converge to asymptotic values as the starting value of the time trend

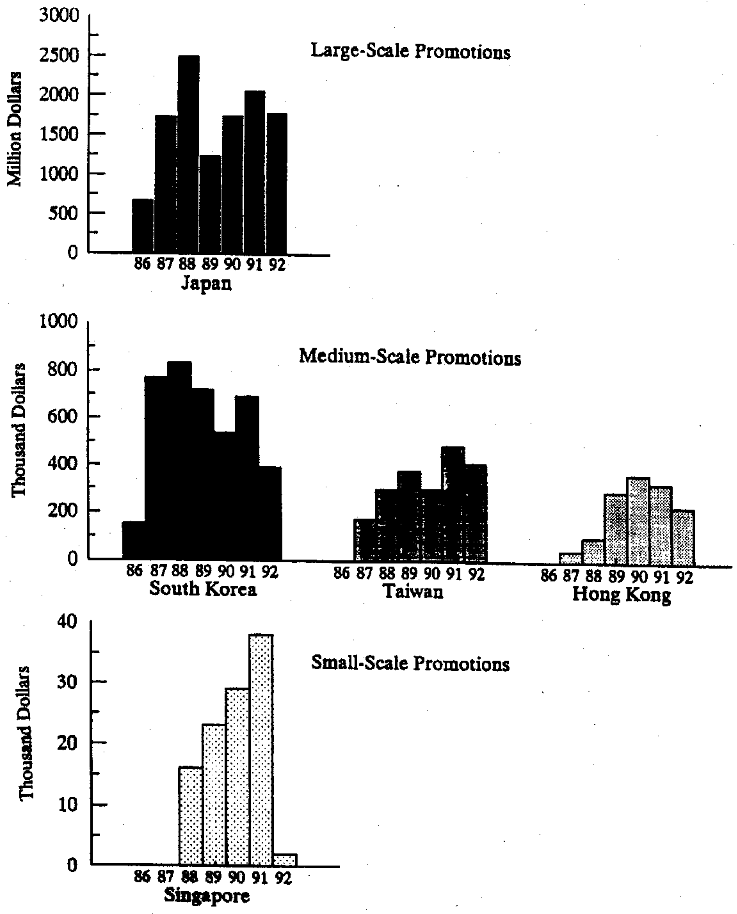

Figure 2. Distribution of U.S. export promotion expenditures[a] for almonds in the Pacific Rim, 1986–92

[a]Program budgets were used for 1991 and 1992 due to program participants' lags in reporting actual expenditures.
Source: Based on fiscal year program data provided by USDA/FAS (15 July 1993).

Economic theory pprovides insight into the relationship between each variable and imports. *PROM*, P_{sb}, Y, and T are expected to be positively correlated with demand for almond imports (M_{alm}); while P_{alm} and P_{cmp} are expected to be negatively correlated with M_{alm}. Due to data limitations for individual tree nuts, cashews and an aggregate of tree nuts other than almonds were the only items specified as likely alternative substitute products for almonds. Prices for other individual nuts, such as walnuts, were not available for all of the studied countries. Confectionery sugar, cocoa butter, and chocolate/chocolate products were included as likely alternative complements. The prices of cashews, other than almond tree

obtained if ln(T) is replaced by T. When T is used in place of ln(T) in the Cobb-Douglas versions, the starting value of the time trend will not affect the results. Therefore, in all Cobb-Douglas results presented in this study, the ln(T) was replaced by (T).

nuts, sugar, cocoa butter, and chocolate are later denoted in the estimation results by P_{csh}, P_{nts}, P_{sug}, P_{coc}, P_{chc}, respectively.[3] A lagged dependent variable, representing habit persistence of almond consumption (Bushnell and King), was also considered as an alternative to the lagged promotion variable to reflect dynamic behavior in the model.

Intercept and slope promotion dummy variables were incorporated in the model to differentiate the intercept and the effect of promotions by country. Four intercept dummy variables (*D*) and four slope dummy variables (*DS*) were specified for Japan, South Korea, Taiwan, and Hong Kong, respectively. Slope dummy variables will be referred to as promotion dummy variables from this point forward. Singapore was specified as the base country.[4] Therefore, the model's overall intercept represents Singapore's intercept, and the model's promotion coefficient represents the coefficient for Singapore.

Data

Promotion expenditures were provided by USDA/FAS. Actual expenditures were used for 1986 through 1990. Budgets were used for 1991 and 1992 due to the delay of companies and cooperators in reporting actual expenditures to FAS. Due to the limited categorization of the data by FAS, only FAS's portion of the programs' expenditures for almonds were available for each country. Therefore, these amounts do not include program participants' second-party contributions or expenditures made by foreign third parties in the importing countries. Program participants are expected to provide matching funds which may imply that the magnitude of the total promotion expenditures for almonds is proportional to the FAS share used in the regression. If that is the case, the estimated coefficients for promotion are unbiased. For a more detailed description of the FAS promotion programs and data, refer to Henneberry, Ackerman, and Eshleman.

Data for all unit-value import prices and the volume of almond imports in each country were provided by the Food and Agricultural Organization of the United Nations (FAO). Nominal GDP and exchange rates for Japan, Korea, and Singapore were collected from the International Monetary Fund (IMF). The same data for Hong Kong and Taiwan were obtained from the USDA Economic Research Service (USDA/ERS September 1992b).

Several steps were taken to transform the pooled data to account for differences in currency and inflation across the five countries. First, nominal GDP was converted from each country's currency, as reported by the IMF, to nominal U.S. dollars using the market exchange rate for each year. Second, promotion expenditures, nominal GDP, and import prices were converted from nominal U.S. dollars, as reported by FAS, IMF, and FAO, to a nominal Pacific Rim currency unit using a nominal trade-weighted exchange rate index complied by the USDA/ERS (October 1993). This index is weighted by each country's agricultural imports from the United States. Finally, the effect of each country's domestic inflation as well as the effect of inflation on the Pacific Rim exchange rate was removed from the price, income, and promotion data in Pacific Rim currency. A detailed description of the procedure used to make inflation adjustments is given in Paarlberg et al. (p. 71).

Three functional forms were used to estimate the coefficients of the almond import demand model specified earlier. These include the Cobb-Douglas, the linear, and the

[3]Cashews, walnuts, pistachios, and pecans are assumed most likely to behave as almond substitutes in the institutional and retail market segments (USATO 1991), but these nuts could also hold complementary relationships in the case of mixed snack nuts or the combined use of the nuts in manufactured food items. However, information on the relationships between almonds and other tree nuts is limited (Dhaliwal).

[4]The estimated coefficients are not affected by the choice of base country.

exponential forms. The Cobb-Douglas and linear forms are the most common forms used to estimate import demand in the absence of promotions (Boylan, Cuddy, and O'Muircheartaigh; Khan and Ross). However, the exponential function implies that each additional dollar spent on promotions has a greater impact on import demand than the previous dollar spent. This behavior is particularly applicable to immature almond markets which account for four of the five export markets analyzed in this study.

Other models were also considered and were estimated. In an alternative specification, lagged promotion variable ($PROM_{t-1}$) was used instead of the current-period promotion. This specification was considered because lag effects are usually associated with advertising (Lee and Brown 1986, 1992; Solomon and Kinnucan; Rosson, Hammig, and Jones). In other specifications, several commodities were tried as alternative substitutes and compliments. Price of cashew nuts (P_{csh}) and price of sugar (P_{sug}) were used instead of price of other than almond nuts. Time trend (T) and the lagged dependent variable ($M_{alm,t-1}$) were also included in alternative specifications.

The models that are selected and presented in this study are compatible with the results obtained from the majority of the alternative specifications of the model and with economic theory. The main criterion that is used in this study to select among various models is the consistency of results (more specifically, the coefficients of P_{alm}, Y, and $PROM$) with what is expected from economic theory. Although the price of almonds is consistently, statistically significant and of the expected sign in all estimations, the coefficients of income and promotion were negative and statistically significant from zero in some estimations including models where the lagged dependent variable was included. Therefore, these results are not reported.

Method of Pooling

The almond import demand model was estimated using Kmenta's method of pooling cross-section time-series data (Kmenta, p. 509). The Kmenta pooling model assumes autocorrelation and heteroskedasticity (Kmenta). The model is estimated with feasible generalized least squares. Shazam's Pool command (pooling with the Kmenta Model) was used in this study (see White et al., pp. 241–47, for details on Shazam's Pool command). The model assumptions are cross-sectional heteroskedasticity with cross-sectional independence and time-wise autoregression. Seemingly unrelated regression and the error components model for pooling were also considered as potential estimation methods, but both required more data observations than were available in this study (Griffiths, Hill, and Judge). The estimated almond model in the Cobb-Douglas, linear, and exponential forms is shown in equations (1), (2), and (3), respectively.

$$\begin{aligned}(1)\quad \ln M_{alm_{i,t}} &= \beta_0 + \beta_{1_{i,t}} \ln P_{alm_{i,t}} + \beta_{2_{i,t}} \ln P_{sb_{i,t}} + \beta_{3_{i,t}} \ln P_{cmp_{i,t}} + \beta_{4_{i,t}} \ln Y_{i,t} \\ &+ \beta_{5_{i,t}} \ln PROM_{i,t} + \beta_{6_{i,t}} T_{i,t} + \sum_{j=1}^{4} \beta_{7,j} D_{j,t} + \sum_{j=1}^{4} \beta_{8,j} DS_{j,t} + e_{i,t};\end{aligned}$$

$$\begin{aligned}(2)\quad M_{alm_{i,t}} &= \beta_0 + \beta_{1_{i,t}} P_{alm_{i,t}} + \beta_{2_{i,t}} P_{sb_{i,t}} + \beta_{3_{i,t}} P_{cmp_{i,t}} + \beta_{4_{i,t}} \ln Y_{i,t} \\ &+ \beta_{5_{i,t}} PROM_{i,t} + \beta_{6_{i,t}} T_{i,t} + \sum_{j=1}^{4} \beta_{7,j} D_{j,t} + \sum_{j=1}^{4} \beta_{8,j} DS_{j,t} + e_{i,t}; \text{ and}\end{aligned}$$

$$\ln M_{alm_{i,t}} = \beta_0 + \beta_{1_{i,t}} P_{alm_{i,t}} + \beta_{2_{i,t}} P_{sb_{i,t}} + \beta_{3_{i,t}} P_{cmp_{i,t}} + \beta_{4_{i,t}} Y_{i,t} + \beta_{5_{i,t}} PROM_{i,t} + \beta_{6_{i,t}} T_{i,t} + \sum_{j=1}^{4} \beta_{7,j} D_{j,t} + \sum_{j=1}^{4} \beta_{8,j} DS_{j,t} + e_{i,t}; \tag{3}$$

where the subscripts i and j represent the importing countries of the Pacific Rim (i = Japan, South Korea, Taiwan, Hong Kong, and Singapore; and j = Japan, South Korea, Taiwan, and Hong Kong); and the subscript t refers to time. β_0 is the intercept and e represents the error term.

Results

The parameter estimates for the Cobb-Douglas, linear, and exponential forms [(1), (2), and (3), respectively] are shown in table 2 for the Pacific Rim region. Several consistencies of the Cobb-Douglas, linear, and exponential estimations are noted. First, the Buse R^2s for all three sets of equations reported in table 2 are high (0.97, 0.99, and 0.99), indicating most of the variability in the dependent variable is explained by the independent variables. The price of almonds is consistently negative and sugar was consistently found to be a significant substitute for almonds in most of the specifications. While the sign of the price of sugar was expected to be negative, indicating a complementary relationship to almonds, there are many confectionery and bakery products containing sugar which do not contain almonds, or any nuts for that matter, that may compete with almond products as a snack food.

Cocoa butter was a significant substitute for almonds in table 2 [refer to equation (2)]. However, the coefficients for both the price of cashew nuts and the price of other tree nuts were not statistically significant.

Income had a significant positive influence on almond consumption in some estimated models. The time trend had a positive impact and resulted in the same pattern of promotion elasticities when included; however, in most cases the results were improved when this variable was excluded. Analysis of the data indicated that income and promotion expenditures were highly correlated with one another as well as with imports as shown in table 3. Such multicollinearity may lead to estimated promotion coefficients which are fragile. Therefore, in the presence of multicollinearity, it is difficult to isolate the effect of promotion expenditures on Pacific Rim imports of almonds from the impact of income. The correlation coefficient of promotion and almond imports is also relatively high. However, the simple correlation coefficient is not to be emphasized as it leaves out the impact of other variables and yields biased estimates.

Promotion expenditures were lagged one year in equation (2), table 2. Actually, the data provided an inherent three-month promotion lag in the static specifications because promotion expenditures were recorded on a fiscal-year basis, while almond imports were recorded on a calendar-year basis. Although the one-year lagged promotion variable showed no significant effect for Singapore and South Korea, it had a statistically significant impact in other countries. Promotion elacticities for individual countries are shown in table 4.

The intercept and promotion coefficients for each country are calculated from the estimated intercept and promotion dummy variable parameters for each of the functional forms. A hypothesis test was conducted to jointly test the difference of each country's intercept coefficient from one another and from zero. The joint hypothesis test is intended for hypothesis testing of a system of equations (refer to White et al. for joint hypothesis

Table 2. Parameter Estimation Results, Pacific Rim Almond Imports, Pooled Cross-Section Time-Series, 1986–92

	Cobb-Douglas Equation (1)	Linear Equation (2)	Exponential Equation (3)
Intercept	4.51	3752.0***	7.578***
	(0.9271)	(3.685)	(31.96)
Price:			
Almonds	–1.694***	– 0.0144***	– 0.2987E–5***
	(6.679)	(5.084)	(6.041)
Cashews	- -	– 0.0061	– 0.1024E–5
		(1.884)	(1.243)
Other Than Almond Nuts	0.024	- -	- -
	(0.065)		
Sugar	0.8526**	- -	- -
	(2.340)		
Cocoa Butter	- -	0.0074***	0.8462E–6
		(3.221)	(0.9452)
Gross Domestic Product	0.919***	– 0.6014E–5	0.1014E–8
	(3.4)	(0.9896)	(1.22)
Promotion Expenditures	– 0.0471	- -	– 0.1768E–7
	(1.297)		(0.2345)
Lagged Promotion Expenditures	- -	0.1254E–3	- -
		(1.2887)	
Intercept Dummy Variables:			
Japan (D_1)	3.673	17894***	3.4194***
	(1.171)	(11.665)	(12.52)
South Korea (D_2)	– 6.563**	4472.0***	1.2923**
	(2.136)	(2.4817)	(2.352)
Taiwan (D_3)	–1.0815*	1661.0***	0.1646
	(2.065)	(2.5757)	(0.8259)
Hong Kong (D_4)	– 0.6645	158.04	0.6704*
	(0.9419)	(0.3191)	(2.174)
Promotion Dummy Variables:			
Japan (DS_1)	– 0.2317	– 0.7483E–4	0.1644E–7
	(1.301)	(0.7672)	(0.2180)
South Korea (DS_2)	0.3314	– 0.1358E–3	0.2058E–7
	(1.841)	(1.3573)	(0.2725)
Taiwan (DS_3)	0.0474	– 0.6050E–4	0.5635E–7**
	(1.286)	(0.6327)	(0.7384)
Hong Kong (DS_4)	0.0076	– 0.6618E–4	0.221E–7
	(0.1556)	(0.7078)	(0.2811)
	$n = 35$	$n = 30$	$n = 35$
	Buse $R^2 = 0.97$	Buse $R^2 = 0.99$	Buse $R^2 = 0.99$

Notes: Figures in parentheses are *t*-statistics; single asterisk (*), double asterisk (**), and triple asterisk (***) denote rejection of H_0 at 0.10, 0.05, and 0.01 significance levels, respectively; promotion expenditure variable represents promotions in Singapore. E followed by a negative number indicates ten to the power of that number.

testing). The statistical significance of this test in the linear and exponential versions of the model [equations (2) and (3)] indicates that each country's level of almond imports in the absence of promotion are significantly different from one another.

Price, income, and promotion elasticities are reported in table 4. The own-price elasticity of almond import demand in the Pacific Rim was statistically significant and

Table 3. Matrix of Correlation Coefficients, 1986–92 Data

	T	Y	$PROM$	P_{alm}	P_{csh}	P_{nts}	P_{sug}	P_{co}	M_{alm}
Time Trend	1.00								
Gross Domestic Product	0.12	1.00							
Promotion Expenditures	0.15	0.90	1.00						
Price:									
Almonds	− 0.28	− 0.16	− 0.90E−01	1.00					
Cashews	− 0.17	0.59	0.56	− 0.36E−01	1.00				
Other Than Almond Nuts	0.46	0.45	0.48	− 0.35	0.60	1.00			
Sugar	0.14	− 0.13E−01	−0.94E−01	0.28	0.14	− 0.77E−01	1.00		
Cocoa Butter	− 0.61	0.27	0.18	0.23	0.63	0.47E−01	0.18E−01	1.00	
Almond Imports	0.78E−01	0.93	0.85	− 0.18	0.44	0.35	− 0.15	0.19	1.00

Table 4. Promotion Elasticities by Country, Price and Income Elasticities by Region, Pacific Rim Almond Imports, 1986–92

	Cobb-Douglas Equation (1)	Linear Equation (2)	Exponential Equation (3)
Intercept	a	a	a
Price:			
Almonds	−1.694***	− 0.6125***	− 0.7712***
Cashews	—	− 0.2973	− 0.3179
Other Than Almond Nuts	0.024	—	—
Sugar	0.8526**	—	—
Cocoa Butter	—	0.3080***	0.2291
Gross Domestic Product	0.919***	− 0.0508	0.0501
Promotion:			
Japan	− 0.2788	0.2890***	− 0.1559
South Korea	0.2843	− 0.1576	0.1259
Taiwan	0.0003	0.5004***	0.8511***
Hong Kong	− 0.0395	0.3996***	0.0677
Singapore	− 0.0471	0.1469	− 0.0211

Notes: Elasticities in the linear and exponential forms are calculated at the mean; single asterisk (*), double asterisk (**), and triple asterisk (***) denote rejection of H_0 at 0.10, 0.05, 0.01 significance levels, respectively; (a) denotes that intercept variable was included in the estimation, but elasticities for it are not meaningful; Wald chi-squared statistics, with one degree of freedom, were used to test the significance of each country's promotion coefficient from zero.

greater than one (in absolute value) in many versions. The Pacific Rim almond import demand is more responsive to own-price than to promotion expenditures. Furthermore, estimation results indicate that cashews are a fairly inelastic complement to almonds, while sugar and cocoa butter are substitutes. When significant, the results indicate that import demand for almonds in the region is slightly income inelastic.

Elasticities of Promotion[5]

The promotion elasticities for South Korea and Singapore were not found to be significant (table 4). This implies that promotion expenditures did not have a significant impact on almond imports in either of these countries. While Taiwan's promotion elasticity was not significant in (1), promotion expenditures in Taiwan were significant at the 1% level in equations (2) and (3), table 4. Promotion elasticities for Japan and Hong Kong were also found to be significant in (2). Again, the joint hypothesis test that was conducted to determine the significant difference of each country's promotion coefficient from one another in these versions of the model supports significant findings for Japan, Taiwan, and Hong Kong. The promotion elasticities reported for Japan, Taiwan, and Hong Kong indicate an inelastic import response to promotions. Using these elasticities, the government's return on investment from the promotion of U.S. almond exports in Japan, Taiwan, and Hong Kong is calculated. The average marginal return on promotion investment in each country is obtained by multiplying the promotion elasticity by the ratio of total import expenditures and the average promotion expenditures in that country (refer to De Brito for further explanation of the procedure used for calculating returns to promotion). The shortcoming of this method of calculating the government's return on investment is that it assumes the cost of producing and exporting an additional unit of output is zero. In other words, it calculates gross return and not net return to investment.

Based on the elasticities reported in table 4 for Japan, Taiwan, and Hong Kong in (2) and for Taiwan in (3), the U.S. government received a return of \$4.95, \$5.94, \$3.69, and \$8.59, respectively, for every dollar of promotion expenditures. These results indicate that use of the promotion programs in Japan, Taiwan, and Hong Kong generated more than a one-to-one return on investment. However, the actual range of return to promotion investment may be wider if other estimates of promotion elasticities (other than those presented in table 4) were considered. Also, the marginal return per dollar calculated at this point would overestimate the actual return since only the first-party FAS contributions are reflected in the promotion variable. Assuming the FAS share accounts for one-third of total promotion expenditures from second and third parties as well, the initial return to investment is divided by three to obtain the actual dollar return per dollar invested (De Brito).

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[5]Promotion elasticities for individual countries are calculated from the estimated coefficients of slope dummy variables ($\beta_{8,j}$) and the promotion parameter (β_5). For the Cobb-Douglas form, the elasticities are obtained by summing (β_5) and ($\beta_{8,j}$) for each country. For the linear form, this sum ($\beta_5 + \beta_{8,j}$) is then multiplied by the ratio of the average value of promotions in country j ($\overline{PROM}_J$) to the average of almond imports in country j ($\overline{M}_{almj}$); that is $\varepsilon_j = (\beta_5 + \beta_{8,j})\overline{PROM_j} / \overline{M}_{alm,j}$. While the definition of an elasticity is the same for an exponential function as it is for a linear one, the change in the dependent variable with respect to the change in the independent variable for the exponential form involves the derivative of a logged value. As a result, the mean value of the dependent variable is not included in the denominator of the elasticity formula for the exponential form. Therefore, the promotion elasticities for an exponential form are calculated as: $\varepsilon_j = (\hat{\beta}_5 + \hat{\beta}_{8j})\overline{\text{PROM}}_J$.

Concluding Remarks

The primary purpose of this study was to determine the effectiveness of the U.S. government's nonprice promotion programs for almonds in the Pacific Rim. While the empirical evidence suggests that promotion expenditures in South Korea and Singapore were ineffective during the 1986–92 period, results concerning Japan, Taiwan, and Hong Kong were less conclusive. Under the assumption of a linear function, promotions were effective in Japan, Taiwan, and Hong Kong. Under the assumption of an exponential function, promotions were effective only in Taiwan. Based on the results from the linear model, the government received a return ranging from $4 to $9 for every dollar of Targeted Export Assistance and Market Promotion Program expenditures spent in these three Pacific Rim countries. The range of return to government's investment will be wider if promotion elasticity estimates from alternative models (not presented here) were considered.

The high R^2s associated with these results indicate that the inclusion of any additional economic variables in the analysis would have provided little improvement in the model's explanatory power. Furthermore, while failure to include competing country and commodity promotions may bias parameter estimates, if these promotions are not correlated with those of competitors, the results are unbiased (De Brito). Even if the United States faced major competition in the Pacific Rim from other almond exporters, which it does not, and if U.S. promotion is not correlated with that of competing countries, the results are unbiased.

Several rationales are offered to explain the results showing ineffectiveness of promotions in some of the countries of the Pacific Rim. While ineffectiveness in more developed markets may have been caused by the mature level of U.S. almond exports to those markets, the programs may have been ineffective in the other countries because the government did not spend enough money on promotions in these markets, particularly in Singapore. Promotion expenditures in Singapore over the time period of this analysis were less than 1% of the amount in Japan. Ineffective allocation of funds to activities within each of the countries could also be blamed for the poor performance of the programs. For example, the promotions in South Korea may have focused too heavily on processors and were not followed up at the retail level appropriately. Also, factors such as the variability of processors' buying cycles due to storage may not have been properly accounted for in the model.

Despite the noted discrepancies of the model's estimation results and the critical scrutiny they are likely to draw, this article did produce one consistent result. In every model estimated, the results consistently indicate a strong relationship between the price of almonds and the demand for almond imports.

In retrospect, analysis of the U.S. government's nonprice export promotion programs for almonds in the Pacific Rim has merely provided one snapshot of the whole export promotion picture. Clearly, the limited data available from the Foreign Agricultural Service on almond promotion program expenditures heavily influenced the scope of this research. However, although the cross-sectional analysis of such a short time period created econometric difficulties, a proper investigation of the government's most substantial outlays for export promotion for almonds and many other products should be restricted to the last seven years, and this is one of the first studies to do so.

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