Export Demand for U.S. Walnuts: Impacts of U.S. Export Promotion Programs

I.M. Onunkwo and J.E. Epperson

The purpose of this study was to estimate the impact of the major factors affecting the export demand for U.S. walnuts in Asia and the European Union (E.U.), which together import about 75 percent of U.S. walnut exports. The primary objective pertained to the impacts of federal promotion programs on the foreign demand for U.S. walnuts. The marginal return per dollar to decreasing promotion expenditures for walnuts was $6.14 for Asia, reflecting prudent utilization of promotion expenditures as the Asian market for U.S. walnuts approaches maturity. The European Union appears to be a mature market for U.S. walnut exports with no detectable responsiveness to promotion expenditures.

Introduction

The United States is the world's leading producer and exporter of tree nuts. U.S. tree nut exports reached $1.4 billion in 1996, representing 40 percent of world tree nut exports, a 79 percent increase over the 1990 figure (USDA, 1997a). The U.S. produces more than one-third of the total world output of tree nuts, followed by Turkey with about 25 percent (mostly hazelnuts); China at 12 percent (mostly walnuts); and Iran with about 5 percent (mostly pistachios). More than 50 percent of all U.S. tree nut exports go to the European Union (E.U.), where primary markets include Germany, Spain, the Netherlands, United Kingdom, France, and Italy. Asia—with Japan as its major market—purchases about 25 percent of U.S. tree nut exports (Johnson, 1997).

Walnuts are the second most important U.S. tree nut export, behind almonds. Although behind China in total production, the United States is the world's largest walnut exporter. U.S. walnuts account for 35 percent of world production and 58 percent of world exports (USDA, 1998). Export values reached $201 million in calendar year 1996, a 112 percent increase over the 1986 value (USDOC, various issues). Japan is the largest U.S. market for shelled walnuts (USDA, 1997b). Virtually all U.S. walnuts are grown in California (USDA, 1998).

Reportedly, the government promotion programs have been valuable to the growth in the U.S. agricultural export market, in general (Ackerman, 1994); in particular, this may also be the case for U.S. walnut exports. Within an 11-year

period—from 1986 to 1996, as reported by the California Walnut Commission (CWC)—total targeted export assistance (TEA) and market promotion program (MPP) allocations for the export promotion of walnuts were about $56 million (CWC, 1997a). Some 58 percent of the federal funds were directed to the E.U. market over this period, while the remainder went to the Asian market.

In the walnut industry, as in most commodity groups, growers contribute a small (self-assessed) fee, in this case 2.5 cents per pound on a shelled basis in order to support research and promotion. As a form of promotion assistance, the U.S. Department of Agriculture matches promotion funds raised by U.S. walnut producers (Holleman, 1998). In recent years, the CWC has carried out active walnut promotion campaigns in Japan, Germany, Spain, Korea, and Italy. The formation of the Japan Nut Association in 1993 has allowed the CWC to maintain close working relationships with importers, distributors, wholesalers, and industrial users who all help to control the direction taken for California walnuts (CWC, 1997b). In Japan, the emphasis has been the marketing of California walnuts as a versatile, high-quality snack or ingredient that adds value to foods prepared at home as well as to processed foods. In the same way, the highly organized Korean Bakers Association has also been helpful in Korea. Noting that walnut-purchasing habits have been relatively seasonal in Germany, the CWC utilizes the healthy aspects of walnuts in its marketing efforts. The health message is a practical means by which the CWC can foster the lengthening of the walnut-selling season beyond the traditional winter holidays (CWC, 1997c).

I. M. Onunkwo and J. E. Epperson are former graduate research assistant and professor, respectively, Department of Agricultural and Applied Economics, University of Georgia.

The study discussed in this paper is the first independent study to estimate the impacts of the major factors affecting the export demand for U.S. walnuts in both Asia and the European Union. Its primary objective is to estimate the impact of federal promotion programs on the foreign demand for U.S. walnuts. This paper is organized as follows: The model specification and a description of the data follow a review of the literature. Next, the econometric analysis, followed by the summary and conclusions, is presented.

Literature Review and Model Specification

Several studies have examined export demand and the effects of U.S. export promotion programs on various agricultural commodities in importing countries. As examples, studies have encompassed measurements of the effectiveness of U.S. export promotion programs for meat and poultry products (Comeau, Mittelhammer, and Wahl, 1997; Le, Kaiser, and Tomek, 1997); fruit and fruit products (Fuller, Bello, and Capps, 1992; Armah and Epperson, 1997; Rosson, Hammig, and Jones, 1986); tree nuts (Halliburton and Henneberry, 1995; Kinnucan and Christian, 1997; Weiss, Green, and Havenner, 1996); and tobacco (Rosson, Hammig, and Jones, 1986).

Halliburton and Henneberry (1995) studied the effectiveness of U.S. non-price promotion of almonds in the Pacific Rim and found no impacts in Singapore and South Korea but found positive impacts in Japan, Taiwan, and Hong Kong. The gross rates of return per dollar invested in U.S. almond export promotion were $4.95 in Japan; $5.94 in Hong Kong; and $8.89 in Taiwan. Using the theoretical framework of Nerlove and Waugh on cooperative advertising, Kinnucan and Christian (1997) also estimated the effectiveness of almond promotion in the Pacific Rim. The study showed that, owing to the instability of the estimated elasticities, no firm conclusions could be made about the effectiveness of almond export promotion.

Regarding walnuts, Weiss, Green, and Havenner (1996) carried out an empirical study on the success of the U.S. promotion program in Japan. They concluded that, generally, the program had been successful with an overall gain of about $5.85 in revenue per dollar of promotion.

As shown by Binkley (1981), single-equation methods are appropriate for estimating import demand when the supply faced by importers is

exogenous; that is, importers are price takers. U.S. walnuts have a variety of competing uses. Depending on the regional markets—Asia and the European Union—walnuts face competition from foreign suppliers and, in some cases, local production. The institutional and retail market segments drive the export demand for the different forms of walnuts, shelled and in shell. For instance, while the Asian market prefers U.S. walnuts in shelled form, the European Union prefers most U.S. walnuts in the shell. These factors, taken together, suggest that competitive forces are sufficient to assure price-taking behavior (Kinnucan and Christian, 1997). As a result, a single-equation model is specified similar to those of Rosson, Hammig, and Jones (1986); Halliburton and Henneberry (1995); and Aviphant, Lee, and Seale (1990).

The important economic variables affecting total export demand are hypothesized to be own price, cross prices, income, and promotion expenditures. The export demand equation for U.S. walnuts is specified as follows:

$$(1) \quad Q_{rt} = f(Pw_t^*, Pp_t^*, Pa_t^*, Y_{rt}^*, Prow_{rt}^*, Prop_{rt}^*, Proa_{rt}^*);$$

$$Pw_t^* = \frac{Pw_t}{I_{at}}; \quad Pp_t^* = \frac{Pp_t}{I_{at}}; \quad Pa_t^* = \frac{Pa_t}{I_{at}}; \quad Y_{rt}^* = \frac{Y_{rt}}{I_{rt}}$$

$$Prow_{rt}^* = \frac{Prow_{rt}}{I_{at}}; \quad Prop_{rt}^* = \frac{Prop_{rt}}{I_{at}}; \text{ and } Proa_{rt}^* = \frac{Proa_{rt}}{I_{at}}.$$

The dependent variable (Q_{rt}) represents the total volume of U.S. walnut exports (Q_w) to the importing region, in metric tons (mt). The explanatory export price (f.a.s.) variables are Pw, price of U.S. walnuts; Pp, price of U.S. pecans; and Pa, price of U.S. almonds. Prices are in dollars per kilogram (kg). Gross Domestic Product (Y) in trillions of dollars is included in the model as a region-specific explanatory variable for Asia and the European Union. The Japanese GDP was used as a proxy for Asia because of the importance of Japan as a customer and because of the importance of the yen as an Asian currency. Other region-specific variables are the indices of consumer prices (base year 1990) in the importing region (I_r) and the United States (I_a); promotion expenditures on U.S. walnuts (Prow); promotion expenditures on U.S. pecans (Prop); and promotion expenditures on U.S. almonds (Proa). Promotion expenditures are in thousands of dollars. The subscripts *r*, *a*, and *t* denote the importing region, the United States, and the year, respectively.

The own-price effect of walnut quantity demanded is expected to be negative according to economic theory. To account for complementary/substitutional relationships, prices of U.S. walnuts, pecans, and almonds were included in the model. A positive relationship is expected between income (Y) of the importing region and the demand for U.S. walnuts. With all else equal, a higher (lower) level of income implies higher (lower) disposable income, allowing for increased expenditure on U.S. walnut exports. To evaluate the influence of promotion programs on the export demand for walnuts, U.S. export promotion expenditures on walnuts, pecans, and almonds were included in the model. Export promotion expenditures on walnuts are expected to have a direct effect on U.S. walnut exports (Hallberg, 1992). U.S. export promotion expenditures on pecans and almonds may positively impact U.S. exports of walnuts if the consumption relationships among these nuts are complementary or if differentiation among them is weak in the region of destination. For situations to the contrary, a negative relationship is plausible.

Dummy variables are used in the model to allow the intercept and slope coefficients to vary by region of the world, that is, Asia and the European Union. The dummy variable, D, indicates Asia, while the European Union is captured in the intercept. The seven slope dummy variables are as follows: Pw*D; Pp*D; Pa*D; Y*D; Prow *D; Prop*D; and Proa*D.

Using GLS, White's (1980) heteroskedasticity-consistent matrix and Newey-West's (1987) autocorrelation-consistent matrix with order one were employed to correct the estimates for any unknown form of heteroskedasticity and autocorrelation of order one, respectively. Based on the signs of the estimated coefficients suggested by economic theory in addition to statistical tests of significance, the following functional form for the U.S. walnut export demand model was deemed appropriate:

$$(2) \ \ln Q_{rt} = \alpha_0 + \alpha_1 Pw_t^* + \alpha_2 Pp_t^* + \alpha_3 Pa_t^* + \alpha_4 Y_{rt}^* + \\ \alpha_5 Prow_{rt}^* + \alpha_6 Prop_{rt}^* + \alpha_7 Proa_{rt}^* + \upsilon.$$

Data

Annual observations from 1986–96 for U.S. export volume of walnuts to Asia and the European Union were obtained from the U.S. Department of Commerce. Thus, the total number of observations for the analysis is 22. All physical quantities are reported on a shelled basis. Implicit unit values (f.a.s.) were calculated by dividing the annual export value by the corresponding export volume to Asia and the European Union.

Annual data on GDP at 1990 price levels and exchange rates were taken from the Organization for Economic Cooperation and Development (OECD, 1997). Indices of consumer prices were obtained from the same source.

Export promotion expenditures on U.S. walnuts and almonds were obtained from the California Walnut Commission and Almond Board of California, respectively. Pecan promotion budget allocations were obtained from the Southern United States Trade Association (SUSTA) and the Western United States Agricultural Trade Association (WUSATA).

In this study, only federal promotion monies from the U.S. Department of Agriculture-Foreign Agricultural Service were used in estimating the model. As such, the estimated dollar returns due to export promotion expenditures are to be attributed to the federal share of export promotion funds. Several studies have estimated promotion impacts on export demand without consideration of monetary contributions made by private parties (Comeau, Mittelhammer, and Wahl, 1997; Le, Kaiser, and Tomek, 1997; Halliburton and Henneberry, 1995). This approach is appropriate where program participants usually provide matching funds; it implies that the magnitude of total promotion expenditures for walnuts is proportional to the FAS share used in the regression. As such, the estimated coefficients for promotion are unbiased (Halliburton and Henneberry, 1995).

This assumption appears to hold in our study as there is no up or down trend in the contributions of private parties and there is scant statistical evidence of substituting private funds for FAS funds over the study period—the correlation coefficient is -0.27.

Econometric Analysis

A description and simple statistics for the variables included in the models are presented in Table 1. The parameter estimates of the export demand equation for U.S. walnuts are shown in Table 2. The measure of goodness-of-fit for the estimated equation was excellent at 0.95, indicating that 95 percent of the variation in U.S. exports of walnuts was explained by the model.

Generally, the region-specific elasticity estimates displayed in Table 3 appear reasonable. For example, the own-price elasticities for walnut ex-

Table 1. Description and Simple Statistics for Variables Included in the Walnut Model, 1986–96.[a]

Variable	Description	Mean		Standard Deviation		Minimum		Maximum	
		Asia	E.U.	Asia	E.U.	Asia	E.U.	Asia	E.U.
Qw	Volume of U.S. Walnut Exports (mt)	4,926.82	22,616.36	2,540.83	2,625.85	1,820.00	17,731.00	9,886.00	26,494.00
Pw*	Price of U.S. Walnuts ($/kg)	3.85	3.86	0.33	0.32	3.31	3.31	4.59	4.59
Pp*	Price of U.S. Pecans ($/kg)	5.20	5.22	1.06	1.01	4.08	4.08	6.98	6.98
Pa*	Price of U.S. Almonds ($/kg)	3.20	3.20	0.31	0.30	2.85	2.85	3.87	3.87
Y*	Gross Domestic Product (trillion $)	3.00	6.71	0.23	0.41	2.54	5.94	3.32	7.33
Prow*	Promotion Expenditures on U.S. Walnuts (thousand $)	1,929.61	2,955.51	636.31	1,313.90	1,090.03	727.89	2,886.60	4,752.74
Prop*	Promotion Expenditures on U.S. Pecans (thousand $)	110.63	62.01	37.80	68.56	58.12	0.00	173.45	189.62
Proa*	Promotion Expenditures on U.S. Almonds (thousand $)	2,180.63	618.08	698.54	437.71	1,049.72	0.00	3,123.29	1,259.03

[a]Dollar values are in 1990 dollars.

Sources: USDOC (various issues); OECD (1997); ABC (1997); CWC (1997); Nagrath (1997); Howell (1997).

Table 2. Estimated Export Demand Equation for U.S. Walnuts, 1986–96.[a]

Variable	Coefficient Estimate	T- statistic
Constant	7.5161[****]	13.26
(Pw[*])	-0.11066[**]	-2.01
(Pp[*])	-0.19398E-1	-1.10
(Pa[*])	0.11620[*]	1.69
(Y[*])	0.38049[****]	11.05
(Prow[*])	0.23607E-4	0.96
(Prop[*])	-0.34010E-3[*]	-1.70
(Proa[*])	0.95320E-4	1.16
(Pw[*]*D)	0.48828E-1	0.24
(Pp[*]*D)	0.11251[**]	2.32
(Pa[*]*D)	-0.24217	-1.03
(Y[*]*D)	-0.40877E-1	-0.07
(Prow[*]*D)	-0.34247E-3[**]	-2.22
(Prop[*]*D)	-0.43016E-2	-1.36
(Proa[*]*D)	-0.56567E-3[****]	-3.87
D	2.2384	0.74

Number of observations	22
F-value	26.82
Adj. R-square	0.95
Degrees of Freedom	6

[a] [*], [**], [***], and [****] on the coefficient estimates denote 15, 10, 5, and 1% levels of significance, respectively, two-tailed test.

Table 3. Elasticity Estimates for Asia and the European Union for U.S. Walnut Exports.[a]

Variable	Asia	European Union
Price		
Walnuts	-0.43	-0.43
Pecans	0.59	_[b]
Almonds	0.37	0.37
Income	1.14	2.55
Promotion Expenditures		
Walnuts	-0.66	_[b]
Pecans	-0.04	-0.02
Almonds	-1.23	_[b]

[a] Elasticity estimates obtained by: $b_{ir} * \bar{x}$, where b_{ir} is the coefficient for independent variable i in region r, and $\bar{x}$ is the mean of independent variable i in region r (Chiang, 1984). The coefficient for each independent variable, b_{ir}, for Asia was the sum of the respective E.U. coefficient estimate and its corresponding slope dummy coefficient for Asia as depicted in Table 2. Insignificant coefficients were valued at zero.

[b] Elasticity estimate is not significantly different from zero.

ports were negative, and the cross-price elasticities of walnuts with respect to almond exports were positive, indicating substitutes. The income elasticities for Asia and the European Union were both positive and, in the case of the European Union, very elastic, indicating that walnuts are a luxury good in Asia and the European Union. However, other elasticity signs were not anticipated, requiring explanation.

The cross-price elasticity of walnuts with respect to pecan prices for Asia was positive, indicating a substitutional relationship with walnut exports. However, a cross-price effect for the European

Union was not detected. This may be due to the sheer magnitude of U.S. walnut exports in terms of volume relative to U.S. pecan exports to the European Union. The walnut promotion elasticity for Asia was negative, indicating that decreasing walnut promotion expenditures were associated with increasing U.S. walnut exports to Asia. Walnut promotion expenditures were trending down, while walnut exports were trending up over the study period. A promotion elasticity of zero for the European Union indicates that walnut exports were not responsive to export promotion expenditures in the European Union.

The almond promotion elasticity in Asia was negative and elastic, indicating strong non-price competition from U.S. almond exports with respect to U.S. walnut exports to Asia. No such competition was found for the European Union (Table 3). The negative signs for the pecan promotion elasticities for Asia and the European Union are indicative of non-price competition from U.S. pecan exports with respect to U.S. walnut exports. This is consistent with the assessments of Gardberg (1993) regarding pecans.

Based on the promotion elasticities shown in Table 3, promotion impacts on walnut exports were evaluated for Asia and the European Union (Table 4). Generally, the results for walnuts were as expected, except for the apparent ineffectiveness of export promotion expenditures for walnuts in the European Union. The European Union appears to be a mature market for U.S. walnut exports with no detectable responsiveness to promotion expenditures. Asia appears to be moving in the same direction, as U.S. walnut exports have trended upward and walnut promotion expenditures have trended in the opposite direction. More U.S. walnut exports have been achieved with fewer promotion dollars. The marginal return to decreasing promotion expenditures for walnuts was considerable, at just over $6 per promotion dollar.

Table 4. Estimated Annual Impacts of Promotion Expenditures on U.S. Walnut Export Demand by Region, 1986–96.

Region/ Product	Real Mean Walnut Export Value	Real Mean Promotion Expenditures	Marginal Return to Promotion Expenditures[a]
	---------($'000)---------		(dollars)
Asia			
Walnuts	17,943.35	1,929.61	6.14[b]
Pecans	17,943.35	110.63	-6.49
Almonds	17,943.35	2,180.60	-10.12
European Union			
Walnuts	86,759.13	2,955.52	0.00
Pecans	86,759.13	62.02	-27.98
Almonds	86,759.13	618.08	0.00

[a] Marginal return to promotion expenditures obtained by: $\bar{N}_r * \xi_{pn}$, $\bar{E}_{nr}$

where $\bar{N}_r$ = real mean walnut export value in region r; $\bar{E}_{nr}$ = real mean promotion expenditures of nut, n, in region, r; and ξ_{pn} = appropriate promotion elasticity (Richards, Van Ispelen, and Kagan, 1997).
[b] Marginal return to decreasing promotion expenditures.

Export promotion expenditures for U.S. pecans and almonds appear to adversely affect U.S. walnut exports, except in the case of export promotion expenditures for almonds in the European Union. This nonresponsiveness of U.S. walnut exports to almond promotion expenditures may again reflect the dominance of U.S. almond exports in terms of volume relative to U.S. walnut exports to the European Union.

Summary and Conclusions

The United States is the world's leading producer and exporter of tree nuts. More than 50 percent of all U.S. tree nut exports go to the European Union. Asia—with Japan as its major market—purchases about 25 percent of U.S. exports.

Walnuts are the second most important U.S. tree nut export, behind almonds. Though the United States is the world's largest exporter of walnuts, it faces stiff competition from China, which is the largest walnut producer and the second largest exporter.

The U.S. Department of Agriculture administers non-price export market promotion programs to assist eligible trade organizations and companies in the development of export markets for U.S. agricultural products. Within an 11-year period from 1986–96, total TEA and MPP allocations for the export promotion of walnuts were about $56 million.

This study estimated the impacts of the major factors affecting the export demand for U.S. walnuts in Asia and the European Union. The primary objective pertained to the impact of federal promotion programs on the foreign demand for walnuts. Only federal promotion monies from the U.S. Department of Agriculture-Foreign Agricultural Service were used in estimating the model. As such, the estimated dollar returns due to export promotion expenditures are to be attributed to the federal share of export promotion funds.

Generally, the results were not unexpected, with the apparent ineffectiveness of export promotion expenditures in the European Union and the considerable marginal return to decreasing promotion expenditures for walnuts in Asia at just over $6 per promotion dollar. The substantial marginal return to decreasing promotion expenditures in Asia reflects prudent utilization of promotion resources as the Asian market for U.S. walnuts approaches maturity. Since the E.U. market for U.S. walnuts appears to be mature with no

detectable response to promotion, it may be that simple reminder-type promotion activities for this market are sufficient. A more aggressive approach might entail greater emphasis on target marketing in the use of promotion expenditures among and within regions of the world emphasizing new and innovative forms of walnut products. Such efforts could counter the promotion impacts for competing nuts and boost overall demand.

References

Ackerman, K.Z. 1994. "Market Development Programs Help Expand U.S. High-Value Agricultural Exports." *Food Review*. 17(3):23–27. Washington DC: U.S. Department of Agriculture, Economic Research Service.

ABC (Almond Board of California). 1997. "Almond Promotional Expenditures." Unpublished report, Modesto, CA. August.

Armah, B.K., Jr. and J.E. Epperson. 1997. "Export Demand for U.S. Orange Juice: Impacts of U.S. Export Promotion Programs." *Agribusiness: An International Journal*. 13:1–10.

Aviphant, P., J. Lee, and J.L. Seale. 1990. "Trade Agreements and U.S. Citrus Exports to Japan." Paper presented at the joint annual meetings of the American and Western Agricultural Economics Associations, Vancouver British Columbia.

Binkley, J. 1981. "The Relationship Between Elasticity and Least Squares Bias." *The Review of Economics and Statistics*. 63(May):307–309.

CWC (California Walnut Commission). 1997a. "Walnut Promotional Expenditures." Unpublished report, Sacramento, CA. August.

CWC (California Walnut Commission). 1997b. "California Walnut Promotional Activity Evaluation Study For Japan, 1997." Unpublished report prepared by Rose Research, Stamford, CT. April.

CWC (California Walnut Commission). 1997c. "California Walnut Promotional Activity Evaluation Study For Germany, 1997." Unpublished report prepared by Rose Research, Stamford, CT. April.

Chiang, A.C. 1984. *Fundamental Methods of Mathematical Economics*, 3rd ed, pp. 292–293. New York, NY: McGraw-Hill.

Comeau, A., R.C. Mittelhammer, and T.I. Wahl. 1997. "Assessing the Effectiveness of MPP and TEA Advertising and Promotion Efforts in the Japanese Market for Meats." *Journal of Food Distribution Research*. 28(July):27–35.

Fuller, B., H. Bello, and O. Capps. 1992. "Import Demand for U.S. Fresh Grapefruit: Effect of U.S. Promotion Programs and Trade Policies of Importing Nations." *Southern Journal of Agricultural Economics*. 24(July):251–260.

Gardberg, N. 1993. "SUSTA Pecan Research Study: Japan, South Korea, and Taiwan." Unpublished research report, Southern United States Trade Association, New Orleans, LA.

Hallberg, M.C. 1992. *Policy for American Agriculture: Choices and Consequences*, pp. 139–158. Ames, IA: Iowa State University Press.

Halliburton, K. and R.S. Henneberry. 1995. "The Effectiveness of U.S. Nonprice Promotion of Almonds in the Pacific Rim." *Journal of Agricultural and Resource Economics*. 20(July):108–120.

Holleman, N. 1998. "Matching Funds Program for the U.S. Walnut Industry." Personal communication, California Walnut Commission, Sacramento, CA. December.

Howell, K. 1997. "Budget Allocated to Pecan Promotion." Unpublished report, Western United States Agricultural Trade Association, Vancouver, WA. 8 September.

Johnson, D.C. 1997. "United States is World Leader in Tree Nut Production, Trade," in *Fruit and Tree Nuts*. Economic Research Service No. FTS-280. Washington, DC: U.S. Department of Agriculture. August.

Kinnucan, H. and J. Christian. 1997. "A Method of Measuring Returns to Non-price Export Promotion with Application to Almonds." *Journal of Agricultural and Resource Economics*. 22(July):120–132.

Le, C.T., H.M. Kaiser, and W.G. Tomek. 1997. *Export Promotion and Import Demand for U.S. Red Meat in Selected Pacific Rim Countries*. NICPRE 97-04, R.B. 97-12. Ithaca, NY: Department of Agricultural Resource and Managerial Economics, National Institute for Commodity Promotion Research & Evaluation, Cornell University.

Nagrath, A. 1997. "Budget Allocated to Pecan Promotion." Unpublished report, Southern United States Trade Association, New Orleans, LA. 5 September.

Newey, W. and K. West. 1987. "A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica*. 55:703–708.

Organization for Economic Cooperation and Development (OECD). 1997. *National Accounts*, Vol. 1. Paris, France: Statistics Directorate.

Richards, T.J., P. Van Ispelen, and A. Kagan. 1997. "A Two-Stage Analysis of the Effectiveness of Promotion Programs for U.S. Apples." *American Journal of Agricultural Economics*. 79(August):825–837.

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

USDA (U.S. Department of Agriculture). 1997a. *Fast Track and Agriculture*. Foreign Agricultural Service, Washington, DC. September.

USDA-FAS (U.S. Department of Agriculture). 1998. "U.S. Walnut Exports Continue Record Expansion." Online. Foreign Agricultural Service, Washington, DC. March.

USDA-FAS (U.S. Department of Agriculture). 1997b. "World Horticultural Trade and U.S. Export Opportunities," in *Walnut Situation and Outlook*. Circular Series FHORT 10-87-97. Foreign Agricultural Service, Washington, DC.

USDOC (U.S. Department of Commerce). Various issues. *U.S. Exports, Schedule E, Commodity By Country*. Bureau of the Census.

Weiss, K., R. Green, and A. Havenner. 1996. "Walnuts in Japan: A Case Study of Generic Promotion Under the USDA's Market Promotion Program," in *Agricultural Commodity Promotion Policies and Programs in the Global Agri-Food System*. Proceedings of NEC-63 Conference, Fiesta Americana, Cancun, Mexico. May.

White, H. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica*. 48(4):817–838.