

**THE ECONOMIC EFFECTS OF NEW PRODUCT
BEEF PROMOTION IN GUATEMALA**

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Agribusiness, Food, and Consumer Economics Research Center (AFCERC) Commodity Market Research Report No. IM-01-09, December 2009 by Dr. Amanda Leister, Dr. Oral Capps, Jr., and C. Parr Rosson.

ABSTRACT

The United States Meat Export Federation (USMEF) implemented a new product promotion program to increase exports of U.S. beef to Guatemala in response to the implementation of the Central America-Dominican Republic Free Trade Agreement (CAFTA-DR). Consumer responsiveness and the effectiveness of the U.S. branded beef promotion program were analyzed in this study. Demand responses to promotion activities that launched three new U.S. beef cuts in Guatemala were estimated by applying the Parks procedure to pooled, time-series, and cross-sectional data. Empirical results indicated that the promotion increased demand but the costs associated with this endeavor were greater than the benefits.

Key words: Guatemala, beef demand, promotion activities

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EXECUTIVE SUMMARY

The Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) has created opportunities for the expansion of U.S. agricultural exports. The implementation of CAFTA-DR is critical in that it calls for duty-free, quota-free access to most products traded among member nations. The United States Meat Export Federation (USMEF) is the trade association responsible for developing international markets for the U.S. red meat industry and is funded by the USDA, exporting companies, and the beef, pork, lamb, corn, sorghum, and soybean checkoff programs. Guatemala was identified by USMEF as one of the priority markets within the Central and South American region, which lead to the implementation of a U.S. branded beef promotion campaign in 2006.

U.S. high-quality beef may have especially strong potential since all tariffs have been immediately eliminated, and U.S. agricultural producers can take advantage of the reduced market distortions to the extent that they are competitive. This study examined consumer responsiveness to promotion efforts and pricing to evaluate changes in sales and the effectiveness of the USMEF promotion program. Pooled time-series cross-sectional data were used to estimate parameters using the Parks procedure.

The three cross-sections include monthly observations of the Petit Tender, the California Steak, and the Texas Fillet U.S. beef cuts from March 2006 through February 2007. The endogenous variable was volume (quantity in pounds) of the U.S. beef cuts, while exogenous variables included total promotion expenditures incurred by USMEF and the prices of the U.S. beef cuts, both in nominal U.S. dollars. All estimated coefficients were statistically significant; U.S. beef cut sales were positively related to advertising and negatively related to cut prices, results consistent with *a priori* reasoning. The U.S. beef cuts were found to be price elastic with an own-price elasticity of -5.1943. The advertising elasticity of the U.S. beef cuts was estimated to be 0.1375. This positive and statistically significant advertising elasticity indicated that promotion activities led to a rightward shift in demand for U.S. beef cuts. However, the promotion program was not cost effective.

The Benefit Cost Ratio (BCR) of additional revenue generated as a result of the promotion compared to the expenditures of the promotion program was 0.71, indicating that the cumulative costs incurred for the promotion outweighed the cumulative revenue generated by the promotion. The overall cost of the promotion was \$77,878.85, while the additional sales revenue generated was \$55,197.56 over the twelve months of the study. In essence, USMEF spent \$22,681.29 more than was gained as a result of the promotion activities.

Although the program was not cost effective in the short-run, it was successful in increasing demand for the respective cuts. It is important to realize that the U.S. beef cuts were newly introduced into the marketplace, and it typically takes time for new products to penetrate the

market. Given time, the benefits of the promotion could surpass the costs incurred. Demand was increased by the promotion campaign, thus it may be too soon to deem the effort ineffective.

Limitations to this study warrant attention and deserve further consideration when considering the overall effectiveness of the promotion campaign. The three U.S. beef cuts were not available to Guatemalan consumers until March 2006. Consequently, the sample consisted of only twelve monthly observations for each cut. The short time frame and limited number of observations did not permit the inclusion of additional explanatory variables typically found in related demand studies. Prices and advertising accounted for 53 percent of the quantities of U.S. beef cuts sold to Guatemala. If a greater number of observations were available in the form of a longer time-series, additional explanatory variables (e.g. seasonality and income) could be incorporated into the model to account for the remaining variability in sales volume. Prices of substitutes or complementary goods were also unavailable in this study.

Although there was not a statistical difference in the responsiveness of the cuts as a pooled sample compared to the results for the cuts estimated individually, more time-series observations could potentially show differences in the behavior of the three cuts on an individual basis. Additional work in the future could find responses that differ among the cuts, which would be beneficial in understanding individual demand behavior specific to each of the beef cuts. Furthermore, increased time and additional promotion could allow for the disaggregation of the individual promotion activities to evaluate the various efforts of the promotion on an individual basis. This undertaking could prove beneficial as it would allow the exploration of demand responses to specified individual promotional activities

Insight into demand responses possibly can be achieved by examining the impacts of the promotion campaign on the quantities sold throughout Guatemala by geographic location (zone) instead of just focusing on Guatemala City (Lacayo, 2006). By incorporating a spatial dimension to the model, responsiveness according to zone could be understood and used as a management tool to determine future locations for the most effective promotion of U.S. beef.

The introduction of the Petit Tender, the California Steak, and the Texas Fillet U.S. beef cuts had a positive beginning, with \$401,437 in sales over the 12-month study. Increased exports are expected to continue in the future as well, and the outlook for continued growth in exports of the U.S. beef cuts based on our analysis is promising. Continued monitoring efforts on the cost effectiveness of the USMEF promotion program in Guatemala certainly are warranted.

TABLE OF CONTENTS

Abstract	i
Table of Contents	ii
List of Tables	iv
List of Figures	iv
Introduction.....	1
Objectives	2
Methodology	3
Data	4
Estimation Method.....	6
Empirical Results	8
Conclusions and Implications.....	11
References.....	13

LIST OF TABLES

Table 1: Monthly Promotion Expenditures by Activity in U.S. Dollars	7
Table 2: The Estimated Coefficients and Standard Errors Associated With the U.S. Beef Cut Demand Relationship.....	9
Table 3: Contemporaneous Variance/Covariance Matrix of the Disturbance Terms Among the Beef Cuts.....	10
Table 4: Estimated Autocorrelation Coefficients for Each Beef Cut Cross-Section Using the Park Procedure	10

LIST OF FIGURES

Figure 1: Monthly Beef Value Cut Quantities.....	5
Figure 2: Monthly Beef Value Cut Prices per Pound	5
Figure 3: Promotion Expenditures by Share of Total	7
Figure 4: Monthly Promotion Expenditures Incurred by USMEF	7

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INTRODUCTION

The Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) has created opportunities for the expansion of U.S. agricultural exports. The implementation of CAFTA-DR is critical in that it calls for duty-free, quota-free access to most products traded among member nations. The United States Meat Export Federation (USMEF) is the trade association responsible for developing international markets for the U.S. red meat industry and is funded by the USDA, exporting companies, and the beef, pork, lamb, corn, sorghum, and soybean checkoff programs. Guatemala was identified by USMEF as one of the priority markets within the Central and South American region, which lead to the implementation of a U.S. branded beef promotion campaign in 2006.

With a population of approximately 14 million, Guatemala is the largest country in Central America. On average, annual imports of U.S. beef currently are roughly \$4 million. Guatemala previously imposed a 15% tariff on all U.S. beef imported into the country. With the implementation of CAFTA-DR, tariffs were eliminated immediately for prime and choice beef cuts and were gradually phased out for other beef products. These circumstances should allow U.S. beef to become more affordable for importation to Guatemala (Rosson, 2006). Although U.S. meat is less costly to ship to Guatemala with the elimination of the import tariff, it is still true that beef products of local origin continue to have a competitive price advantage over U.S. beef cuts. For this reason, USMEF devised a strategic plan to focus on the Hotel, Restaurant, and Institutional (HRI) sector in an effort to create preference for and recognition of U.S. beef products (Vernazza-Paganini, 2006).

In response to the tariff eliminations brought about by CAFTA-DR, USMEF implemented a marketing campaign to introduce three new U.S. beef cuts in the upper-end foodservice segment of Guatemala. The introductory cuts were labeled as the Petit Tender, the California Steak, and the Texas Fillet. Each of the three cuts corresponds to USDA choice grade. The cuts were selected on the basis of price competitiveness while maintaining high-quality attributes. The selected cuts were also more price competitive than other U.S. cuts, including the Tenderloin, New York Strip, and Ribeye, when compared to local substitutes and therefore were identified as the key cuts for the USMEF promotion (Vernazza-Paganini, 2006). The three cuts are available in the United States; however, the names of the cuts were created to specifically target consumers located in Central and South America. The California Steak is commonly referred to as the Flat Iron Steak; the Texas Steak is called the Ranch Cut; and the Petit Tender retains the same name in the United States. Just as the names of the cuts were altered, the activity for the promotion of these cuts was also specifically tailored for Guatemalan consumers.

It was decided as part of the USMEF marketing strategy for Central America that the most effective way to launch the introduction of these three beef cuts was to focus on one specific importer of U.S. meat. A private firm was identified as the key HRI supplier to support the

promotion. Marketing activities included educational seminars, newspaper advertisements, mini-billboards, television advertisements, menu inserts, table banners, taste tests, and cash incentives for sales associates and restaurant staff. The total expenditures associated with the promotion activities conducted by USMEF were \$77,878.85 (Vernazza-Paganini, 2006). Understanding the demand responses to the promotion of these new products will help to evaluate the effectiveness of the program and provide implications for future promotional activities in the region.

OBJECTIVES

The objective of this work is to evaluate Guatemalan consumer responsiveness to the promotion of the respective U.S. beef cuts. The effectiveness of the promotion is essential to understanding the HRI market in Guatemala and consumer responses to trade liberalization resulting from CAFTA-DR. By analyzing the impacts of the USMEF promotion of U.S. branded beef, U.S. firms are in position to better understand the effects of marketing and promotion in Guatemala. To put our work into proper perspective, Australia is branding beef in developing countries such as Indonesia. To remain competitive, the U.S. may wish to follow suit. Our study measures the responsiveness of foreign HRI consumers to U.S. branded beef promotions. Our study will also aid USMEF and other organizations in identifying and implementing strategic international market promotion programs. Consequently, in regard to the issue of commodity branding strategies in developing countries, our work is tantamount to a viable case study.

The HRI sector in Guatemala City is the setting for this study. Monthly sales data are used to estimate demand parameters using a pooled sample of cross-sectional and time-series observations relating promotional activities and beef prices to sales quantities of the beef cuts introduced in Guatemala City. Monthly sales, quantity, and price data for the Petit Tender, the California Steak, and the Texas Fillet U.S. beef cuts from January 2006 through February 2007 are provided by the private firm. The study is restricted to examining U.S. beef cut quantities sold by the firm as a response to prices and the new product promotion activities conducted. The endogenous variable in this analysis is U.S. beef quantity, while the key exogenous variables are the promotion expenditures of USMEF as well as the prices of the U.S. beef cuts, both expressed in U.S. dollars.

Guatemalan consumer response during the 14-month time period under investigation is the metric used to analyze the relationship between promotion expenditures and the sales of various cut quantities. In this context, we endeavor to estimate the elasticity of the promotion expenditures with respect to the sales of various beef cuts in order to identify changes in consumption behavior as a result of the campaign activities conducted. Costs of resources utilized in the promotion are compared to corresponding benefits of the promotion in order to determine the effectiveness of the campaign. Benefits are defined as the sales of incremental quantities of the U.S. beef cuts associated with the promotion.

USMEF conducted a consumer survey of 200 subjects in Guatemala City before and after the promotion in an effort to determine the changes in consumer perception of U.S. beef resulting from the promotion activities (USMEF, 2006). According to the survey results, increases in

Guatemalan consumer awareness of U.S. beef increased retail store awareness of U.S. beef products, increased country-of-origin attention, and increased “share-of-mind”¹ of U.S. beef were detected post-promotion.

The study was beneficial in that it shed light on the fact that Guatemalan consumers have a positive perception of U.S. beef; however, there was no quantitative analysis to determine the direct effects of the promotion efforts on sales of the U.S. beef products until now. This analysis marks the first study that quantifies the consumer responses to the USMEF promotion in Guatemala City.

METHODOLOGY

Several methods of evaluating promotion activities and consumer demand response to advertising were surveyed in the extant literature. Methodologies used include the use of demand systems, single-equation model specifications, and distributed lags associated with advertising variables in general. While there are multiple ways to effectively evaluate demand responses to promotion and pricing, the appropriate model for this study was selected from a survey of past work to be recounted as follows. Capps (1989) estimated a seemingly unrelated system of retail demand functions pertaining to selected meat products for a supermarket chain in Houston using scanner data over an 18-month time frame. However, the products used were not similar to the cuts indigenous to the evaluation of the USMEF promotion program. Brester and Schroeder (1995) employed a Rotterdam model to estimate the quarterly effects of generic and branded advertising expenditures on the demand for various U.S. meats. Richards, Van Ispelen, and Kagan (1997) evaluated the effectiveness of a U.S. export promotion program by using a variation of the Almost Ideal Demand System (AIDS). While insightful, we cannot use similar model specifications because relevant data are not available from the USMEF.

Given data limitations, the empirical model for our analysis is given as follows:

$$\ln Q_{it} = \beta_0 + \beta_1 \ln PR_{it} + \beta_2 \sqrt{ADV_t} + \beta_3 \sqrt{ADV_{t-1}} + \beta_4 \sqrt{ADV_{t-2}} + \varepsilon_{it}, \quad (1)$$

where Q_{it} corresponds to the quantity sold of beef cut i in time period t (pounds), PR_{it} corresponds to the own-price of beef cut i in time period t (dollars/pound), and $ADV_{(t-k)}$ corresponds to the aggregate promotion expenditure in time period $t-k$, $k = 0, 1, 2$. The square root of advertising is used in order to show the diminishing marginal effects of advertising on the quantity sold of the various beef cuts, as well as to accommodate zero levels of promotion expenditure. Promotion expenditures were not available by beef cut.

In ascertaining consumer responsiveness to promotion activities, it is quite common to consider both contemporaneous and lagged effects, labeled as carryover effects (Forker and Ward, 1998). The rationale for the consideration of lags in promotion is that its impact may not be felt all at once. The impact of advertising and promotion is likely to be distributed over time. To preserve

¹ “Share-of-mind” refers to the percentage of consumers who were able to name the United States when asked what country first came to mind when thinking about beef (Vernazza-Paganini, 2006).

degrees of freedom, we allow k to range from 0 to 2. The appropriate specification of the promotion expenditure variable is determined through the use of the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC), both being commonly accepted statistical measures of model selection.

The subscript i represents the beef cut type (the Petit Tender, the Texas Fillet, and the California Steak). The time period in question corresponds to January 2006 through February 2007, hence fourteen monthly observations are available for analysis. Consequently, the data consist of three cross-sections corresponding to beef cuts and fourteen monthly time-series observations.

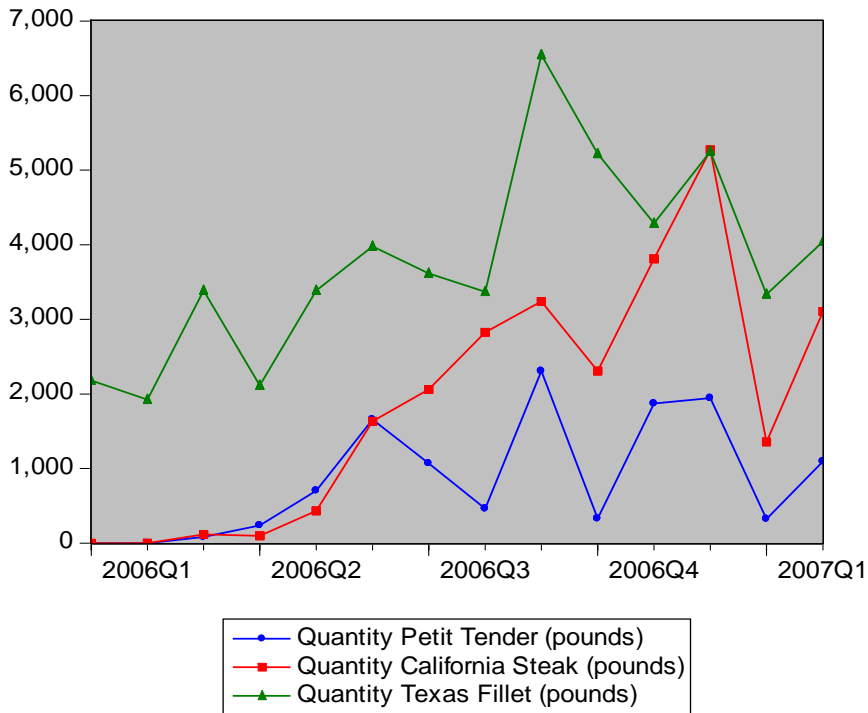
Differences in nominal and real prices were negligible given the short duration of the study. Conversion from nominal to real prices was, consequently, disregarded. Measurements of other relevant product prices also were excluded in the model due to the unavailability of data. Therefore, only own-price effects were entertained. In considering the impacts of pricing information, income variables also are common in demand models but were not included in this specification. The time frame of the entire study is 14 months, and no measurable changes in the income of consumers from Guatemala occurred during this short time-frame. The exclusion of these measurements is supported further by the work of Funk (1977), who found similar cause to eliminate income variables. Finally, in examining international competitiveness through commodity branding strategies, we recognize that seasonality may be a potentially important factor. Although monthly data are used in this analysis, seasonality is ignored due to the inadequate number of observations necessary to measure this effect.

DATA

USMEF identified a Guatemalan importing firm as the in-country partner for the promotion program. Monthly sales data including quantity and prices in the Guatemalan Quetzals currency for the Petit Tender, California Steak, and Texas Fillet U.S. beef cuts in 2006 and 2007 are provided by the firm and used in this analysis. Prices were obtained from the sales database of the private firm and converted into U.S. dollars by using exchange rate values from the National Bank of Guatemala (2007) for the 14-month time period. The key explanatory variables are the expenditures related to the targeted promotion and the respective prices of the beef cuts. A list of all promotional expenditures in U.S. dollars, along with descriptions and dates of promotion activities were provided by USMEF.

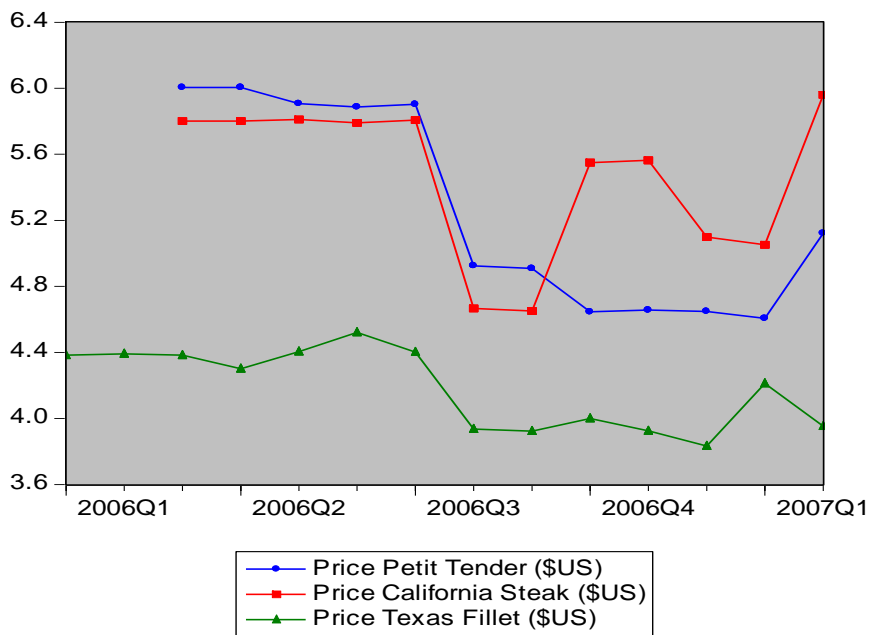
The dependent variable is the pooled set of monthly quantities of the respective U.S. beef cuts, reported in pounds, in Guatemala City, Guatemala. The quantities of each cut sold and the corresponding prices of each cut were recorded monthly and are illustrated in Figures 1 and 2. The Texas Fillet holds the largest share (58%) of the total quantity of beef cuts sold from January 2006 to February 2007. The California Steak comprises 29% of total quantity sold, and the Petit Tender constitutes the remaining 13% of sales quantity. Sales of all beef cuts follow a general upward trend throughout the 14-month time frame analyzed.

Figure 1: Monthly Beef Value Cut Quantities



Source: Private Guatemalan Firm, 2007

Figure 2: Monthly Beef Value Cut Prices per Pound



Source: Private Guatemalan Firm, 2007.

The Petit Tender and California Steak were not available for sale to consumers in Guatemala until the month of March 2006, so there are no price data for these cuts in the months of January 2006 and February 2006. Prices of the California Steak cut are typically the highest, followed by the Petit Tender cut, with the lowest prices accredited to the Texas Fillet.

All promotion expenditures were incurred by the USMEF in the months of April, May, June, July, and August. The promotion expenditures are further illustrated in Table 1, Figure 3, and Figure 4. As shown in Table 1, the largest amount of spending on the promotion program occurred in the months of April and June. The educational seminars and mini-billboards were the most costly of the promotion activities and accounted for over fifty percent of total spending. Additional activities by level of spending include newspaper advertisements, cash awards for sales and service associates, taste tests of the beef cuts, printing/photo costs, and television advertising, respectively, as illustrated in Figure 3. In an attempt to conserve valuable degrees of freedom in the model due to the relatively small sample size, it was necessary to aggregate all advertising expenditures into a single monthly expenditures variable, as illustrated in Figure 4.

ESTIMATION METHOD

The primary objective of this research is to evaluate consumer responsiveness to branded beef promotion activities in Guatemala City over the 14-month time period of January 2006 through February 2007. The secondary objective is to understand consumer sensitivity to changes in prices over the same timeframe. Given the paucity of sample observations, data are pooled to ensure an adequate number of observations from a statistical standpoint. Pooling the data results in increased degrees of freedom, which permits statistical tests with increased power. After a careful examination of the data, the most appropriate method for this analysis is the Parks procedure (Kmenta, 1986).² The Parks procedure allows for a first-order autoregressive process over time of the disturbance terms within each cross-section as well as heteroskedastic and mutually correlated disturbance terms across the cross-sectional units. Capps and Havlicek (1978) used this procedure to estimate demand models of the agricultural uses of gasoline and diesel fuel in Virginia. The Parks procedure is akin to Generalized Least Squares (GLS) estimation. Simply put, with this estimation method,

$$\hat{\beta} = (x^T \Omega^{-1} x)^{-1} x^T \Omega^{-1} y, \text{ and} \quad (2)$$

$$\text{VAR}(\hat{\beta}) = (x^T \Omega^{-1} x)^{-1}, \text{ where} \quad (3)$$

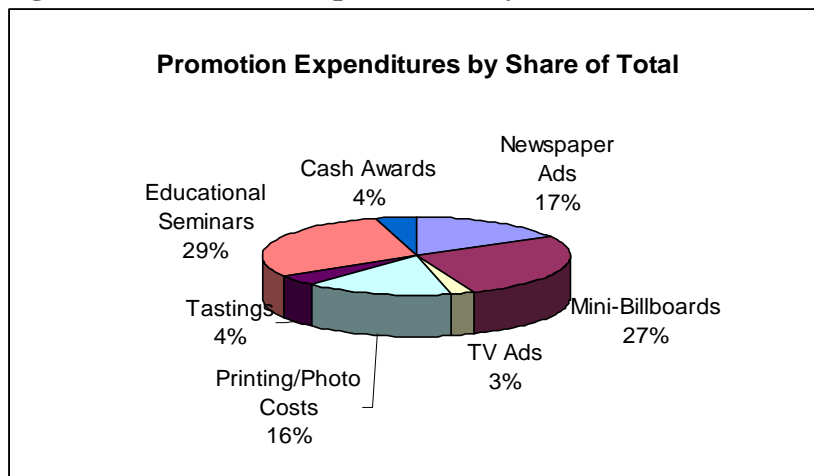
² Statistical tests also were conducted based on seemingly unrelated regression to verify that estimated coefficients for price and promotion were not statistically different by beef cut. Support for this contention was upheld, thus ensuring that the Parks procedure indeed was the most appropriate method for this analysis.

Table 1: Monthly Promotion Expenditures by Activity in U.S. Dollars

	Newspaper Ads	Mini-Billboards	TV Ads	Printing/Photo Costs	Taste Tests	Educational Seminars	Cash Awards	Monthly Total
Apr	\$0	\$0	\$0	\$525	\$0	\$22,870	\$0	\$23,395
May	\$1,102	\$1,246	\$0	\$1,154	\$0	\$0	\$0	\$13,901
Jun	\$8,816	\$14,063	\$1,037	\$0	\$1,750	\$0	\$0	\$25,665
Jul	\$3,306	\$5,625	\$1,037	\$0	\$1,750	\$0	\$0	\$11,718
Aug	\$0	\$0	\$0	\$0	\$0	\$0	\$3,200	\$3,200
Total	\$13,224	\$20,933	\$2,073	\$12,079	\$3,500	\$22,870	\$3,200	\$77,879

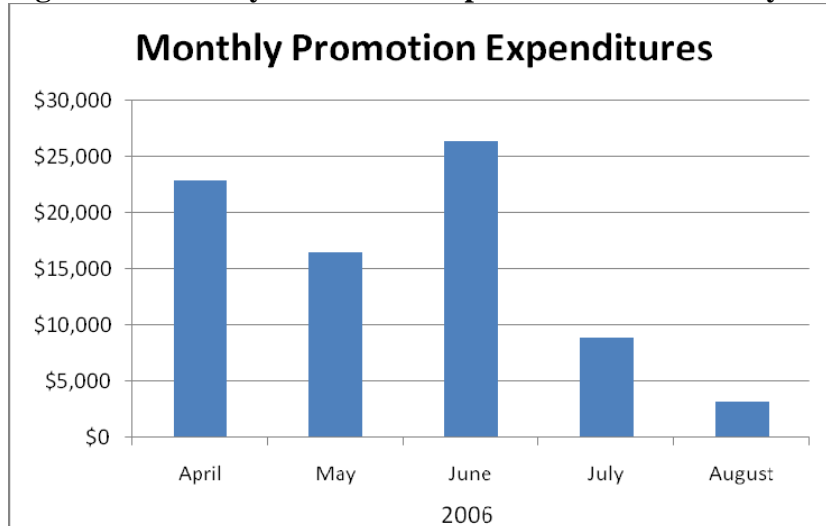
Source: United States Meat Export Federation, 2006

Figure 3: Promotion Expenditures by Share of Total



Source: United States Meat Export Federation, 2006

Figure 4: Monthly Promotion Expenditures Incurred by USMEF



Source: United States Meat Export Federation, 2006

$$\Omega = \begin{bmatrix} \sigma_{11}P_{11} & \sigma_{12}P_{12} & \sigma_{13}P_{13} \\ \sigma_{12}P_{21} & \sigma_{22}P_{22} & \sigma_{23}P_{23} \\ \sigma_{13}P_{N1} & \sigma_{23}P_{N2} & \sigma_{33}P_{33} \end{bmatrix} \quad (4)$$

and

$$P_{ij} = \begin{bmatrix} 1 & \rho_j & \rho_j^2 & \dots & \rho_j^{T-1} \\ \rho_i & 1 & \rho_j & \dots & \rho_j^{T-2} \\ \rho_i^2 & \rho_i & 1 & & \rho_j^{T-3} \\ \vdots & \vdots & \vdots & \dots & \vdots \\ \rho_i^{T-1} & \rho_i^{T-2} & \rho_i^{T-3} & \dots & 1 \end{bmatrix} \quad (5)$$

Notationally, i and $j = 1, 2, 3$, and $T = 3, 2, \dots, 14$ (owing to the fact that price data concerning the Petit Tender cut and the California Steak cut for January 2006 and February 2006 were not available).³ The structural parameters to be estimated are $\beta_0, \beta_1, \beta_2, \beta_3$, and β_4 from (1); $\sigma_{11}, \sigma_{12}, \sigma_{13}, \sigma_{22}, \sigma_{23}$, and σ_{33} from (4); and ρ_1, ρ_2 , and ρ_3 from (5). The σ_{ij} coefficients represent the variances (when $i = j$) and covariances (when $i \neq j$) of the disturbance terms across the cross-sections (the respective beef cuts), while the ρ_i terms reflect the respective autocorrelation coefficients within each cross-section. By applying the Parks procedure to the pooled sample, we expect a reduction in the standard errors of the estimated structural parameters vis-à-vis the use of ordinary least squares (OLS).

EMPIRICAL RESULTS

The econometric analysis was carried out using EViews 6.0 and SHAZAM 10.0. The AIC (Akaike, 1974) and SIC (Schwarz, 1978), were used as metrics to arrive at the appropriate model specifications given by (1). On the basis of these statistical criteria, and considering seven different versions of (1), the model specification selected in this analysis is given by:

$$\ln Q_{it} = \hat{\beta}_0 + \hat{\beta}_1 \ln PR_{it} + \hat{\beta}_3 \sqrt{ADV_{t-1}}. \quad (6)$$

Only the one-month lag structure of promotion expenditures is used because this lag structure minimized the AIC and SIC relative to alternative specifications. The estimated coefficients and standard errors of the demand relationship for the respective U.S. beef cuts are exhibited in Table 2.

³ Accordingly then, all January and February observations from 2006 were eliminated in the pooled sample in order to achieve a balanced design.

Table 2: The Estimated Coefficients and Standard Errors Associated With the U.S. Beef Cut Demand Relationship

Variable	Estimated Coefficient	Estimated Standard Error	t-statistic	p-value
Intercept ($\hat{\beta}_0$)	15.279	1.230	12.42	0.000
ln Price ($\hat{\beta}_1$)	-5.1943	0.8516	-6.100	0.000
Square Root of Promotion Expenditures ($\hat{\beta}_3$)	0.0034136	0.001435	2.379	0.023

Source: Compilation from the authors.

The coefficient of determination, R^2 , is 0.5300, meaning that the model explains 53 percent of the variability in quantities sold of the U.S. beef cuts. The level of significance chosen for this analysis is 0.05. The t-tests linked with the advertising coefficient and the price coefficient were statistically significant, indicating that each of the exogenous variables affects quantities of U.S. beef cuts sold.

The variance/covariance matrix of the disturbance terms estimated from the pooled sample across the cross-sections is exhibited in Table 3.

The autocorrelation coefficient for each cross-sectional data set describes the magnitude of the autocorrelation that exists within each cut. When autocorrelation exists within a cross-section of the pooled sample, the error term associated with each observation depends on past error values within the same cross-section. This relationship is represented by $\varepsilon_{it} = \rho_i \varepsilon_{i,t-1} + u_{it}$. The autocorrelation that exists within each set of the pooled sample may vary from one cross-section to another. The degree of autocorrelation is represented by ρ_i . The value ρ_i estimated for each cross-sectional unit is shown in Table 4. The highest degree of autocorrelation exists within the California Steak cross-section with an estimated autocorrelation coefficient of 0.6980, followed by the Petit Tender cross-section at -0.0826, and then the Texas Steak cross-section with an estimated autocorrelation coefficient of 0.0071. Essentially, no autocorrelation pattern of order 1 is evident for the Petit Tender and the Texas Fillet cuts.

The estimated coefficient for the price variable is the own-price elasticity because the double logarithmic mathematical form was used in the model specification. The own-price elasticity is estimated to be -5.1943, which means that a one percent increase in the price of the U.S. beef cuts results in a 5.2 percent decrease in quantity demanded of U.S. beef cuts. This price elasticity falls in the elastic range, indicating that consumers from Guatemala are very sensitive to changes in the price of U.S. beef cuts. The magnitude of the own-price elasticity of the value cuts is large compared to the own-price elasticity for beef in the United States which consistently lies between -.6 and -.8. However, own-price elasticities in foreign markets are generally higher than those in domestic markets because of greater substitutability prospects. The own-price elasticity measurement for U.S. beef is an overall average, while the own-price elasticity for the U.S. beef cuts in Guatemala City corresponds to specialty products. Consequently, it is not surprising that

Table 3: Contemporaneous Variance/Covariance Matrix of the Disturbance Terms Among the Beef Cuts

	Petit Tender	California Steak	Texas Fillet
Petit Tender	$\hat{\sigma}_{11}$ 0.97051	$\hat{\sigma}_{12}$ 0.42499	$\hat{\sigma}_{13}$ -0.092082
California Steak		$\hat{\sigma}_{22}$ 1.0800	$\hat{\sigma}_{23}$ 0.15576
Texas Fillet			$\hat{\sigma}_{33}$ 0.20407

Source: Compilation from the authors.

Table 4: Estimated Autocorrelation Coefficients for Each Beef Cut Cross-Section Using the Park Procedure

U.S. Beef Value Cut	Autocorrelation Coefficient
Petit Tender ($\hat{\rho}_1$)	-0.0826
California Steak ($\hat{\rho}_2$)	0.6980
Texas Fillet ($\hat{\rho}_3$)	0.0071

Source: Compilation from the authors.

the own-price elasticity for U.S. beef cuts in Guatemala City is greater than the own-price elasticity of U.S. beef in the United States.

The advertising elasticity estimated at the sample means for the 14-month study is 0.1375. A 10 percent change in the level of USMEF promotion expenditures translates into a 1.4 percent change in the quantities of U.S. beef cuts sold. Alternatively, for every dollar of promotion expenditure, U.S. beef cuts increase by 0.0511 pounds. If a dollar was spent each month on advertising for one full year, 0.6136 additional pounds of the beef value cuts would be sold. This result is the approximate equivalent of one individual cut of the Petit Tender (8 ounces per cut), or two individual cuts of either the California Steak (4 ounces per cut) or the Texas Fillet (4 ounces per cut) per year. Although the elasticity of advertising is small relative to the price elasticity of the U.S. beef cuts, these results are consistent with the literature on advertising and promotion (Williams and Nichols, 1998; Davis, 2005).

The overall cost of the USMEF promotion for one year was \$77,878.85. Based on the estimated promotion elasticity, we calculated that the additional revenue (quantity) as a result of the USMEF promotion was \$8,543.92 (1,662 pounds) for the Petit Tender cut, \$19,209.05 (3,611 pounds) for the California Steak cut, and \$27,444.59 (6,674 pounds) for the Texas Steak cut. Thus, the overall additional revenue of the U.S. beef cuts resulting from the USMEF promotion

was \$55,197.56. If the sole objective was to increase export demand, the USMEF promotion program as a whole was successful in that capacity, as the demand for the U.S. beef cuts shifted to the right as a result of the USMEF promotion. Although demand was increased, this finding alone does not ascertain whether the promotion program was cost effective. For the program to be cost effective, the Benefit Cost Ratio (BCR)⁴ should be greater than or equal to one (Alston, Chalfant, and Piggott, 2000). Any BCR measurement that is less than one indicates that the program costs more than the value of the additional revenue generated as a result of the promotion activities. In this case, the BCR is equal to 0.71, which shows that the cost incurred was greater than the additional revenue generated. The promotion program as a whole cost \$22,681.29 more than the revenue generated from March 2006 through March 2007. However, it is important to note that the BCR measured here ignores any future effects from advertising, and, consequently, benefits incurred from advertising efforts likely are understated.

CONCLUSIONS AND IMPLICATIONS

The Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) reduced market distortions for both U.S. and Guatemalan producers. U.S. high-quality beef may have especially strong potential since all tariffs have been immediately eliminated, and U.S. agricultural producers can take advantage of the reduced market distortions to the extent that they are competitive. The U.S. Meat Export Federation (USMEF) identified Guatemala as the target market for increased U.S. beef exports to Central America and launched the introduction of three new U.S. beef value cuts in a 2006 U.S. branded beef promotion. This study examined consumer responsiveness to promotion efforts and pricing to evaluate changes in sales and the effectiveness of the USMEF promotion program. Pooled time-series cross-sectional data were used to estimate parameters using the Parks procedure.

The three cross-sections include monthly observations of the Petit Tender, the California Steak, and the Texas Fillet U.S. beef cuts from March 2006 through February 2007. The endogenous variable was volume (quantity in pounds) of the U.S. beef cuts, while exogenous variables included total promotion expenditures incurred by USMEF and the prices of the U.S. beef cuts, both in nominal U.S. dollars. All estimated coefficients were statistically significant; U.S. beef cut sales were positively related to advertising and negatively related to cut prices, results consistent with *a priori* reasoning. The U.S. beef cuts were found to be price elastic with an own-price elasticity of -5.1943. The advertising elasticity of the U.S. beef cuts was estimated to be 0.1375. This positive and statistically significant advertising elasticity indicated that promotion activities led to a rightward shift in demand for U.S. beef cuts. However, the promotion program was not cost effective.

The Benefit Cost Ratio (BCR) of additional revenue generated as a result of the promotion compared to the expenditures of the promotion program was 0.71, indicating that the cumulative costs incurred for the promotion outweighed the cumulative revenue generated by the promotion. The overall cost of the promotion was \$77,878.85, while the additional sales revenue generated

⁴ The BCR is a measure of the accumulated additional revenue generated as a result of the promotion versus the cumulative cost of the promotion program.

was \$55,197.56 over the twelve months of the study. In essence, USMEF spent \$22,681.29 more than was gained as a result of the promotion activities.

Although the program was not cost effective in the short-run, it was successful in increasing demand for the respective cuts. It is important to realize that the U.S. beef cuts were newly introduced into the marketplace, and it typically takes time for new products to penetrate the market. Given time, the benefits of the promotion could surpass the costs incurred. Demand was increased by the promotion campaign, thus it may be too soon to deem the effort ineffective.

Limitations to this study warrant attention and deserve further consideration when considering the overall effectiveness of the promotion campaign. The three U.S. beef cuts were not available to Guatemalan consumers until March 2006. Consequently, the sample consisted of only twelve monthly observations for each cut. The short time frame and limited number of observations did not permit the inclusion of additional explanatory variables typically found in related demand studies. Prices and advertising accounted for 53 percent of the quantities of U.S. beef cuts sold to Guatemala. If a greater number of observations were available in the form of a longer time-series, additional explanatory variables (e.g. seasonality and income) could be incorporated into the model to account for the remaining variability in sales volume. Prices of substitutes or complementary goods were also unavailable in this study.

Although there was not a statistical difference in the responsiveness of the cuts as a pooled sample compared to the results for the cuts estimated individually, more time-series observations could potentially show differences in the behavior of the three cuts on an individual basis. Additional work in the future could find responses that differ among the cuts, which would be beneficial in understanding individual demand behavior specific to each of the beef cuts. Furthermore, increased time and additional promotion could allow for the disaggregation of the individual promotion activities to evaluate the various efforts of the promotion on an individual basis. This undertaking could prove beneficial as it would allow the exploration of demand responses to specified individual promotional activities

Insight into demand responses possibly can be achieved by examining the impacts of the promotion campaign on the quantities sold throughout Guatemala by geographic location (zone) instead of just focusing on Guatemala City (Lacayo, 2006). By incorporating a spatial dimension to the model, responsiveness according to zone could be understood and used as a management tool to determine future locations for the most effective promotion of U.S. beef.

The introduction of the Petit Tender, the California Steak, and the Texas Fillet U.S. beef cuts had a positive beginning, with \$401,437 in sales over the 12-month study. Increased exports are expected to continue in the future as well, and the outlook for continued growth in exports of the U.S. beef cuts based on our analysis is promising. Continued monitoring efforts on the cost effectiveness of the USMEF promotion program in Guatemala certainly are warranted.

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