**An Economic Analysis of the Cattlemen's Beef Promotion and Research Board
Demand-Enhancing Programs**

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Summary and Conclusions

In this study, an independent evaluation was conducted of the economic effectiveness of the programs funded by the Cattlemen's Beef Promotion and Research Board (CBB), which has a central mission to increase the demand for beef through implementing consumer advertising, marketing partnerships, public relations, educational programming, research, and new product development.

More specifically, this research addressed three important objectives:

1. Quantify and measure the economic benefit to cattlemen of CBB-funded programs for the period 2006-2013 in terms of net return on investment.

2. Quantify and compute marginal rates of return on investment for alternative existing and potential checkoff-funded activities.

3. Estimate the optimal allocation of the CBB budget across the various program activities.

In this study, the impacts of all factors affecting domestic and export beef product demand for which data were available were measured statistically. In this way, the analysis netted out the impacts of other important factors besides CBB activities affecting beef demand over time. In addition, the value of the incremental sales generated by CBB activities was estimated. These benefits to beef producers were then compared with the costs associated with the CBB.

To carry out this research, three econometric equations were estimated, including: (1) retail domestic beef demand, (2) retail domestic beef supply, and (3) U.S. beef export demand. These three equations were used to test whether various activities by the CBB such as advertising, export market development and promotion activities, nutritional research, and other CBB activities had a statistically significant impact on beef demand.

The retail domestic beef demand model indicated that the own price elasticity was negative and equal to -0.431. The interpretation of this is a 1% increase in the retail consumer price index, holding all other demand factors constant, led to a 0.431% decrease in per capita beef quantity demanded. As expected, both chicken and pork products were found to be substitutes for beef with elasticities of 0.150 and 0.028, respectively. That is, a 1% increase in the chicken (pork) price, holding all other demand factors constant, resulted in a 0.15% (0.028%) increase in beef demand. Per capita disposable income was the most important demand determinant for beef demand. A 1% increase in per capita income resulted in a 0.691% increase in per capita beef demand, holding constant all other demand factors, indicating that beef is what economists refer to as a "normal good" - demand increases as consumer income increases. Generic pork advertising was found to have a carry-over effect of one month and had a cumulative elasticity value of -0.0035. That is, a 1% increase in generic pork advertising decreased per capita beef demand by 0.0035% over a one-month period.

The statistical results indicated that all eight demand-enhancing domestic activities by the CBB had a positive and statistically significant impact on increasing per capita beef demand. Generic beef advertising, channels marketing, public relations, and industry information had a one-month carry over effect with a cumulative elasticity of 0.0181 meaning a 1% increase in their expenditures increased per capita beef demand by 0.0181%. New product development and product enhancement research each had an elasticity of 0.0118. Nutritional research and beef safety research had elasticites of 0.0132 and 0.009, respectively. All elasticities were statistically different from zero.

The domestic demand model was simulated from 2006 through 2013 by setting all independent variables equal to historical levels to determine how well *predicted* coincided with *actual* per capita beef demand. The average prediction error (mean absolute percentage error) was only 2.78%, which indicated the model had a high degree of accuracy. A second-set of counterfactual scenarios was simulated with the demand model to determine the impact of the eight categories of domestic demand-

enhancing CBB activities. Each scenario was identical to the baseline, except that CBB expenditures were reduced to 1% of historical levels in order to determine how it impacted domestic demand. The results of the simulation clearly showed the positive impact on domestic beef demand due to the CBB's promotion programs. From 2006 to 2013, the CBB's promotion activities increased total domestic beef demand by 15.7 billion pounds in total, or 2.1 billion pounds per year. In other words, had there been no CBB-funded domestic marketing activities over the period 2006-2013, domestic beef demand would have been 11.3% lower than it actually was.

In terms of the eight individual domestic CBB program areas and the one foreign market development activity:

1. Had there been no generic beef advertising by the CBB, domestic beef demand would have been 0.7% lower over this period than it actually was;

2. Had there been no CBB channels marketing, domestic beef demand would have been 0.6% lower over this period than it actually was;

3. Had there been no CBB industry information marketing, domestic beef demand would have been 0.2% lower over this period than it actually was;

4. Had there been no CBB new product development, domestic beef demand would have been 1.2% lower over this period than it actually was;

5. Had there been no CBB public relations, domestic beef demand would have been 0.5% lower over this period than it actually was;

6. Had there been no CBB nutritional research, domestic beef demand would have been 3% lower over this period than it actually was;

7. Had there been no CBB beef safety research, domestic beef demand would have been 2.1% lower over this period than it actually was;

8. Had there been no CBB product enhancement research, domestic beef demand would have been 0.4% lower over this period than it actually was; and

9. Had there been no CBB foreign market development expenditures, foreign beef demand would have been 6.4% lower than it actually was.

Note that the percentage impacts of the eight individual domestic activities summed to less than 11.3% indicating that there are positive synergistic impacts of these activities collectively.

The retail beef supply model indicated that the own price elasticity is 0.083. That is, holding all other supply factors constant, a 1% increase in the retail beef price resulted in a 0.083% increase in quantity supplied by beef retailers. By construction of the model, the impact of the steer price on retail beef supply was the exact opposite of the retail price impact, i.e., a 1% increase in the steer price resulted in a 0.083% decrease in retail beef supply, reflecting that the steer price is a major cost to beef retailers. The trend variable was negative and statistically significant, which has had a negative impact on retail beef supply. Rather than picking up the effects of technology on supply, the trend variable may have picked up increases in other retailing costs such as energy prices.

An Armington-type market share trade model (Armington, 1969) was used to model the impact of U.S. beef export promotion expenditures on U.S. market share for beef. The model measured export demand in terms of the U.S. share of the export market. The Armington model distinguishes commodities by type and source of origin. Based on the export demand model, the value of the U.S. dollar had the most important impact on U.S. beef market share in the world market. The long-run elasticity estimate was -0.961 indicating a 1% increase in the value of the U.S. dollar decreased U.S. market share of beef exports by 0.961%, holding all other demand determinants constant. GDP was positive indicating that U.S. beef is a normal good. The short- and long-run elasticities for GDP were 0.104 and 0.155, respectively. The results clearly indicate that the BSE incident in 2004 in Washington State had a decimating impact on U.S. beef export market share in 2004, 2005, and 2006.

The statistical results indicated that U.S. foreign market development programs had the effect of increasing market share of U.S. beef exports. The estimated results indicated that a 1% increase in foreign market development expenditures increased U.S. beef market share by 0.167% in the short-run and 0.249% in the long-run. The estimated Armington trade model was simulated for two scenarios to

gauge the overall impact of CBB funds for export promotion. An in-sample simulation was conducted for the past five years for two scenarios: (1) baseline scenario, where export promotion expenditures were set equal to historical levels, and (2) no-CBB contribution scenario, where CBB contributions to export promotion were eliminated. Overall, the results indicated that CBB contributions to foreign market development for U.S. beef had a substantial impact on the export market. Over the period 2009-2013, CBB contributed $4.8 million per year, on average, to foreign market development programs to these seven countries. The average annual difference in total revenue from beef exports to these seven countries over this period was simulated to be $232 million per year. In other words, every dollar invested in export promotion by CBB yielded an increase in gross (before costs are netted out) beef export revenue of $48.39. In terms of breakdown by the seven countries, this return of 48.39:1.00 was as follows:

Japan	29.46:1.00	South Korea	26.12:1.00
Russia:	14.34:1.00	Mexico	124.78:1.00
Taiwan	29.14:1.00	China/Hong Kong	48.03:1.00
EU	16.32:1.00		

Based on the simulation results, CBB funds for export promotion to Mexico had the highest payout in additional export revenue followed by China/Hong Kong. The lowest return was in the Russia and the EU.

The net benefits of each of the seven CBB activities were measured through simulation of an equilibrium displacement model (EDM) using a marginal analysis. The EDM was simulated for the most recent 7-year period, 2006-2013. A BCR was computed based on the marginal analysis, which measured the benefits to the industry in terms of additional profits from an extra dollar invested in each activity. The highest marginal BCRs were for product enhancement research, nutritional research, industry information, and beef safety research. Based on the period 2006-13, an extra dollar invested in product enhancement research, nutritional research, industry information, and beef safety research yielded an

extra $43.00, $29.70, $27.90, and $22.70, respectively in producer surplus (i.e., incremental profit).

Clearly if the CBB had an additional dollar to spend on activities, these would be its highest priorities

based on these very high marginal BCRs. The next highest return was for new product development,

where an extra dollar invested in it earned $19.90 in incremental producer surplus. Foreign market

development and PR were the next two highest BCRs. An extra dollar invested in foreign market

development and PR yielded $14.20 and $12.70 in incremental producer surplus. Finally, beef

advertising had marginal BCRs of 6.4. It should be noted that there is generally an inverse relationship

between the amount of money spent on a promotion or research activity and its marginal BCR, i.e., the

greater the budget for an activity, the lower its marginal BCR. This is due to what economists refer to as

"diminishing marginal returns" which means as more and more money is spent on an activity, the

marginal or incremental gains from it increase at a decreasing rate. This concept helps explain why the

CBB activity with the lowest expenditures (product enhancement research) had the highest marginal

BCR, while the activity with the highest investment (advertising) had the lowest marginal BCR.

Collectively, the overall marginal BCR for all CBB activities was $11.20. Hence, the CBB has had a

very profitable benefit-cost ratio for its activities over the period 2006-13.

Based on the domestic demand results, an optimal allocation of the eight CBB programs for the

period 2006-13 was derived. The optimal rule is that the share of the fixed total checkoff budget should

equal the elasticity for that activity divided by the sum of all checkoff activity elasticities. So, for

example, the domestic demand elasticity for advertising is equal to 0.018 while the sum of all CBB

elasticities is equal to 0.118. Hence, the optimal share of the CBB budget devoted to advertising over the

period 2006-2013 should have been 15.25% (i.e., 0.018/0.118).

Comparing the optimal solution to the actual budget allocation, the main divergence was that

the model suggests allocating far less to advertising (16%) than the actual allocation (34%). The optimal

model also reduced the budget share of channels marketing from 20% to 15% of the total budget. The

optimal and actual budget allocations for public relations, beef safety research, and new product development were very close suggesting the actual allocation was near optimal for these activities. While the optimal solution recommended reducing advertising and channels marketing, it recommended increasing industry information (by 7 percentage points), product enhancement research (by 6.4 percentage points), and nutritional research (by 5.6 percentage points).