An Economic Analysis of Market Impacts of the National Watermelon Promotion Board

Dr. Harry M. Kaiser
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Executive Summary

The National Watermelon Promotion Board (NWPB) has been in operation since June of 1989 and conducts promotion campaigns, consumer education, and industry information activities designed to increase consumption of watermelons in the United States. Funded by a 3-cent per cwt. assessment on growers and handlers of domestic watermelons, and a 6-cent per cwt. assessment on imports, the NWPB raises about $1.8 million annually for promotional efforts to provide information to consumers to enhance demand. Since the 1996 Farm Bill, all federal checkoff promotion programs must be evaluated so that their return to investors can be determined. Accordingly, the purpose of this research study is twofold: (1) to determine the domestic market impacts of the NWPB's demand enhancement programs, and (2) to compute a rate of return on investment (ROI) for the promotion activities conducted by the NWPB. Specifically, this research examines whether the domestic watermelon promotion activities of the NWPB have had a positive and statistically significant impact on domestic watermelon demand and on grower profits.

Both per capita watermelon consumption and prices have been increasing over time. Per capita consumption has increased from 13.8 pounds in 2000 to 15.1 pounds in 2011, which represents a 9.4% increase. At the same time, farm watermelons prices have grown by 44.5% since 2000, while retail prices have increased by 20.7% since 2003. This increase in watermelon demand (as reflected in both quantity and price) is critical to the health and vitality of the watermelon industry.

Two of the most important substitutes for watermelons are cantaloupes and honeydew melons. Over the past 11 years, the increase in per capita consumption of watermelons has come at the expenses of these two commodities. While watermelon consumption increased 9.4% over this period, cantaloupe consumption fell 23.4% while honeydew melons decreased 34.8%. An alternative way to look at this is to consider market share of watermelons, which constituted 50.7% in 2000. By 2011, this market share had increased to 60.2% of the three commodities.

One factor that has likely contributed to growth in per capita consumption of watermelons is the promotion efforts of the NWPB, which is the focus of this study. The growth in per capita consumption since 2000 is crucial to the overall health and viability of the U.S watermelon industry. This is evident in the fact that from 2000 through 2010 the increase in per capita consumption has been accompanied by a positive trend in grower revenue. In 2000, total grower revenue was $270.7 million. By 2010, total revenue grew to $442 million, an increase of 63.3%. Clearly, it behooves the industry to market watermelons effectively, since growth in consumption is so beneficial to grower revenues.

Monthly retail scanner data on watermelon prices and volume sold, and cantaloupe and honeydew melon volume sold since 2007 are combined with monthly NWPB marketing and communications expenditure data to estimate a retail watermelon demand function. These data are further decomposed on a U.S. regional basis to look at cross-sectional variation as well as changes over time. Specifically, the data are divided into eight separate regions including: California (CA), Great Lakes (GL), Mid South (MS), Northeast (NE), Plains (PL), South Central (SL), Southeast (SE), and West (W). The econometric model uses statistical methods with these time series and cross sectional data to measure how strongly various retail watermelon demand factors are correlated with retail watermelon prices in the U.S. The following factors are included as explanatory variables of the retail watermelon price: quantity of watermelons sold, quantity of cantaloupe sold, quantity of honeydew sold, current and lagged promotion expenditures by the NWPB, and regional indicator variables for the eight regions specified above. To compare the relative importance of each factor on disappearance, the results from the statistical (econometric) model are converted into price "flexibilities." A price flexibility measures the percentage change in the retail watermelon price given a 1% change in a specific demand factor, holding all other factors constant. For example, a price flexibility coefficient of -0.75 means that a 1% increase in quantity available would decrease the retail price by 0.75% when holding all other demand factors constant. Determining the statistical significance of this variable is therefore of crucial importance in the analysis that follows.

All the explanatory variables in the estimated retail watermelon demand model are statistically significant and collectively explain over 84% of the variations in the retail watermelon price over time for the eight regions. The results show that the quantity of watermelons sold in the market is negatively related with the retail watermelon price. Specifically, a 10% increase in the quantity of watermelons available in the market results in a 1.41% decrease in the retail price of watermelons, holding all other demand factors constant. This inverse relationship between price and quantity reflects the law of demand, i.e., people buy more when the price decreases, and less when the price increases. Both honeydew melons and cantaloupes are found to be substitutes for watermelons. The price flexibility coefficients show that a 10% increase in the quantity of honeydew melons decreases the retail price of watermelons by 0.41% when all other demand factors are held constant. A 10% increase in the quantity of cantaloupes decreases the retail price of watermelons by 0.65% when holding other factors constant.

Most importantly, the statistical results indicate that NWPB domestic promotion programs have a positive and statistically significant impact on increasing retail watermelon demand. Generic watermelon promotion has a five-month carry over effect on the retail watermelon price with a cumulative price flexibility coefficient of 0.098. That is, a 10% increase in NWPB promotion results in an increase in retail watermelon price of almost 1% over 5-months when holding constant all other demand factors. Because there is error inherent in any statistical model, a 99% confidence interval is computed for NWPB promotion expenditures. This interval can be interpreted as the range of possible values where one can be confident that the true population price flexibility coefficient could be expected to fall 99% of the time. The 99% confidence interval for the NWPB promotion price flexibility coefficients is (0.091, 0.106). Since the lower bound of this confidence is still above zero, this adds credence to the notion that the NWPB is positively impacting retail watermelon demand.

The estimated retail demand model is used to simulate market conditions with and without the NWPB. Specifically, two scenarios are simulated over the time period 2007.1 – 2011.12: (1) baseline scenario, where the retail watermelon price is simulated based on all explanatory variables sets to their historical levels, and (2) no-NWPB scenario, which is the same as the baseline except NWPB promotion expenditures are set to 1% of the historical levels. A comparison of the simulated retail watermelon prices between these two scenarios provides a measure of the impact of the NWPB's impact on retail prices over this five-year time period. In addition, using the price spreads between historical retail and farm watermelon prices, one can estimate the impact of NWPB promotion efforts on the farm price. Over the period 2007 through 2011, the retail price averaged 33.77 cents per pound with the NWPB and 27.05 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average retail price of watermelons would have been 6.72 cents per pound lower than it actually was. That is, the NWPB had the impact of increasing the retail watermelon price by 20%. Hence, retailers of watermelons clearly benefit from the NWPB's promotion efforts over the past five years.

A more important question is how do the stakeholders of the NWPB benefit from these promotions? Over the entire period, the farm price averaged 13.2 cents per pound with the NWPB and 10.5 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average farm price of watermelons would have been 2.7 cents per pound lower than it actually was.

If we assume that the retail and farm pounds of watermelon are equivalent, one can multiply the increase in the farm price due to the promotions by the NWPB by retail U.S. sales (quantity) to derive the gain in total dollar sales at the farm-level. Over the five-year period 2007-2011, the results indicate that the NWPB promotion effort resulted in an increase in total farm sales of watermelons of $255.67 million. The total cost of the watermelon checkoff program over this period was $8.9 million. Therefore, the rate of return on investment (ROI) from the NWPB promotion is equal to:

$$ROI = (255.67 - 8.9) / 8.9 = 27.73.$$

In other words, each dollar invested in NWPB promotion returned $27.73 in net farm revenue to the U.S. watermelon industry.

Questions often arise about the accuracy of such estimates of ROIs in economic evaluations of commodity promotion programs. The resulting ROIs are generally quite large because promotion expenditures are exceedingly small relative to product value so only a small demand effect is needed to generate large positive returns. For example, average NWPB promotion expenditures in 2010 were a mere 0.37% of the farm value of watermelon. Still, this relatively small investment in watermelon promotion increased net revenue by more than $50 million per year over the past five years. Therefore, the resulting ROI is quite large.

How does the ROI estimated above compare to that for other marketing checkoff programs? Table 4 (in the body of the text of the report) lists the estimated ROIs for 21 selected food

commodities. The median average ROI from these studies is 6.0. Hence, the 27.73 estimated here for the NWPB is substantially higher than the median for these selected studies.

To make allowances for the error inherent in any statistical estimation, a 99% confidence interval is calculated for the above ROI. The confidence interval provides a lower bound for the average BCR: one can be "confident" 99% of the time that the true average ROI lies above this limit. The 99% confidence interval for the NWPB ROI is (25.50, 29.97). Since the lower bound of this 99% confidence interval is substantially higher than one we can be very confident that the true ROI for the NWPB is larger than one.

The main implication of this study is that the watermelon industry is getting a very high return from the domestic promotion efforts of the NWPB. The estimated ROI indicates that it would be profitable, from an industry standpoint, to increase the level of domestic promotion of watermelons. Indeed, compared with other commodities, the returns to generic watermelon promotion are substantially higher than the median result.

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This independent evaluation is carried out by Dr. Harry M. Kaiser, who is the Gellert Family Professor of Applied Economics and Management at Cornell University. Dr. Kaiser is a national and internationally renowned expert in the economics of generic advertising and promotion programs. Dr. Kaiser has extensive experience in doing over 100 economic evaluation studies of domestic and international checkoff programs. In fact, he has conducted eight studies in the past one-and-one-half years alone, including: (1) 2011 economic evaluation of the U.S. Meat Export Federation export promotion activities, (2) 2011 evaluation of the national dairy farmer checkoff program (COP), (3) 2011 evaluation of the national fluid processor COP, (4) 2011 evaluation of domestic generic raisin promotion, (5) 2010 evaluation of raisin export promotion, (6) 2010 evaluation on the U.S. Highbush Blueberry Marketing Council's promotion activities, (7) 2010 evaluation of U.S. wheat export promotion, and (8) 2010 evaluation of the New York State fluid milk promotion order.

Trends in the Watermelon Consumption

Both per capita watermelon consumption and prices have been increasing over time. For instance, Figure 1 shows the positive trend in consumption since 2000. Per capita consumption has increased from 13.8 pounds in 2000 to 15.1 pounds in 2011, which represents a 9.4% increase. At the same time, farm and retail watermelons prices have increased as reflected in Figures 2 and 3. Farm prices have grown by 44.5% since 2000 (Figure 2), while retail prices have increased by 20.7% since 2003 (Figure 3), which is the most recent year of data in this report. This increase in watermelon demand (as reflected in both quantity and price) is critical to the health and vitality of the watermelon industry.

Figure 1. U.S. per capita watermelon consumption.

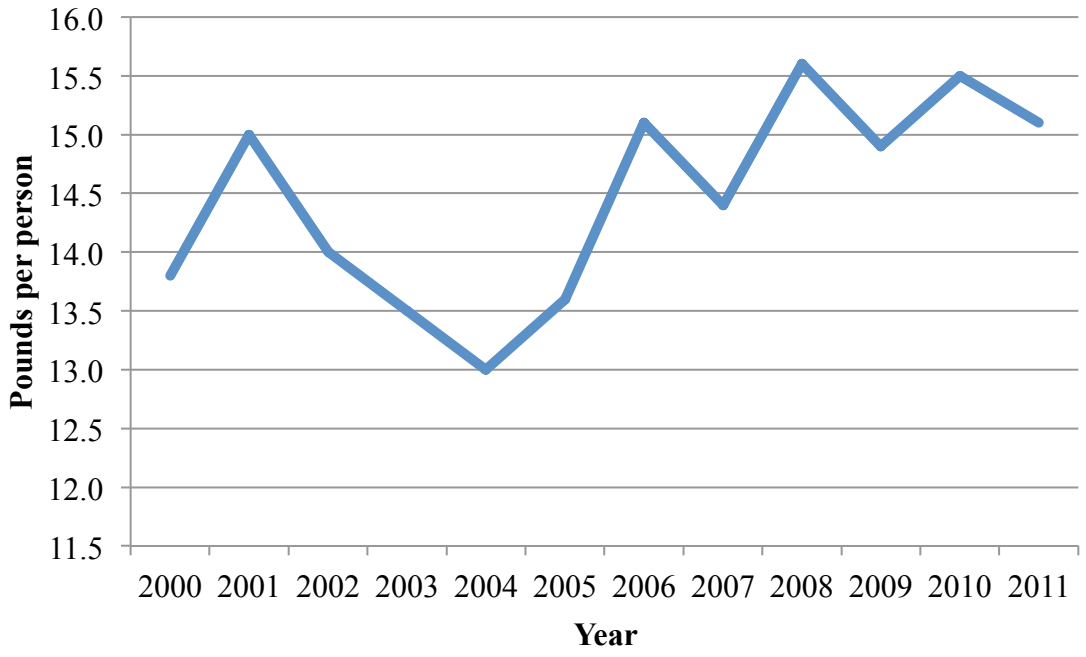
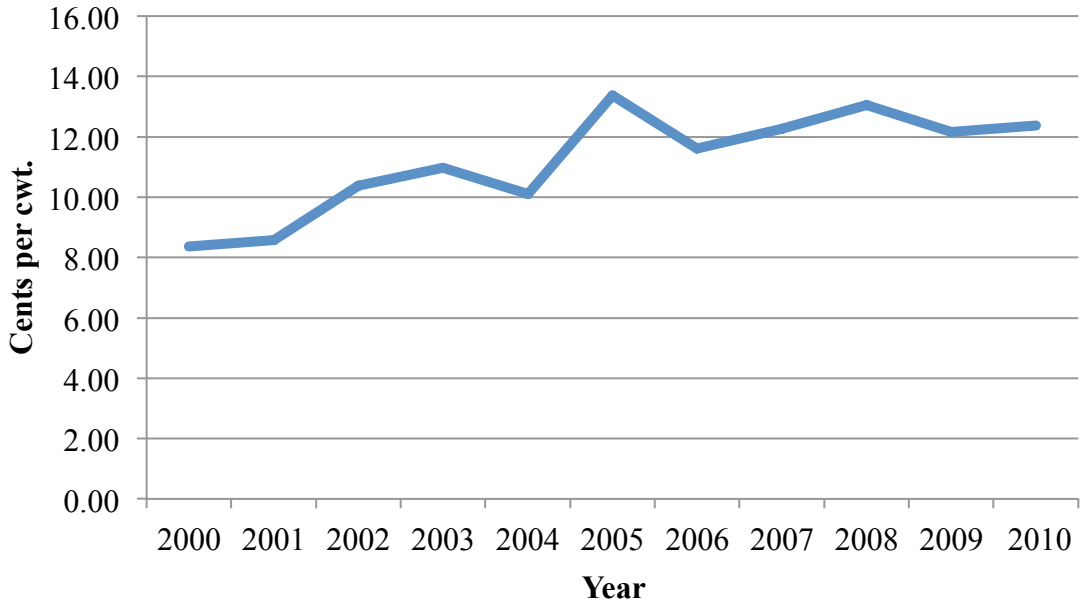
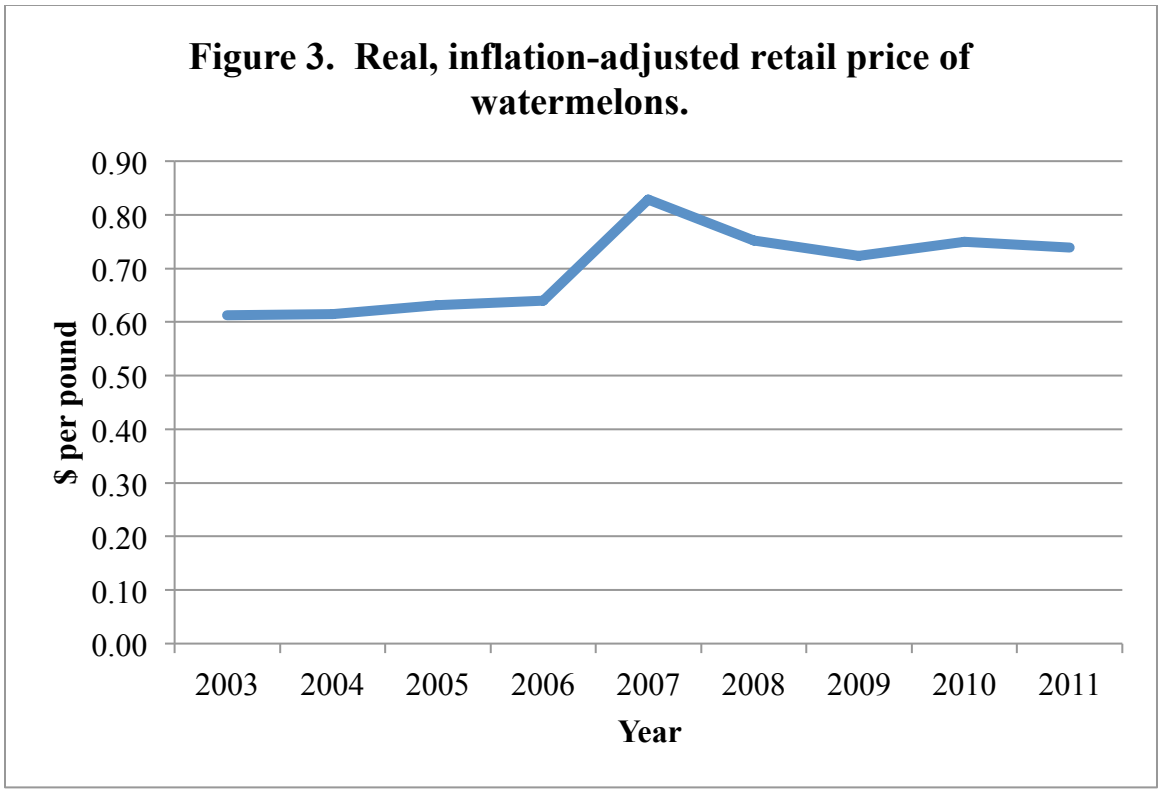


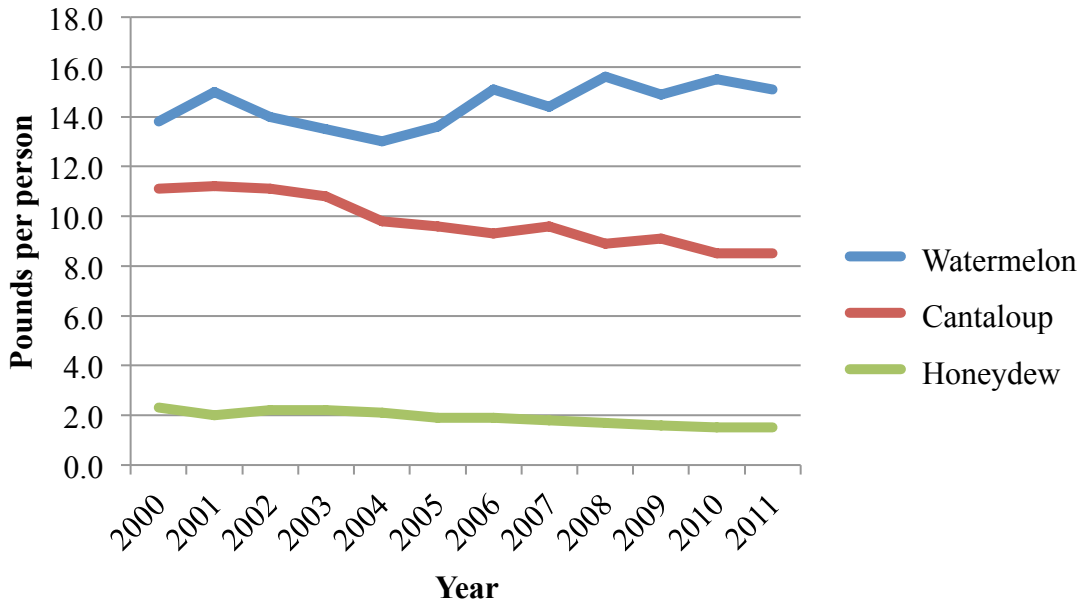
Figure 2. Real, inflation-adjusted, farm-level price of watermelons.





Two of the most important substitutes for watermelons are cantaloupes and honeydew melons. Over the past 11 years, the increase in per capita consumption of watermelons has come at the expenses of these two commodities. The increase in market share of watermelons is shown graphically in Figure 4, which displays per capita consumption of watermelons, cantaloupes, and honeydew melons since 2000. While watermelon consumption increased 9.4% over this period, cantaloupe consumption fell 23.4% while honeydew melons decreased 34.8%. An alternative way to look at this is to consider market share of watermelons, which constituted 50.7% in 2000. By 2011, this market share had increased to 60.2% of the three commodities.

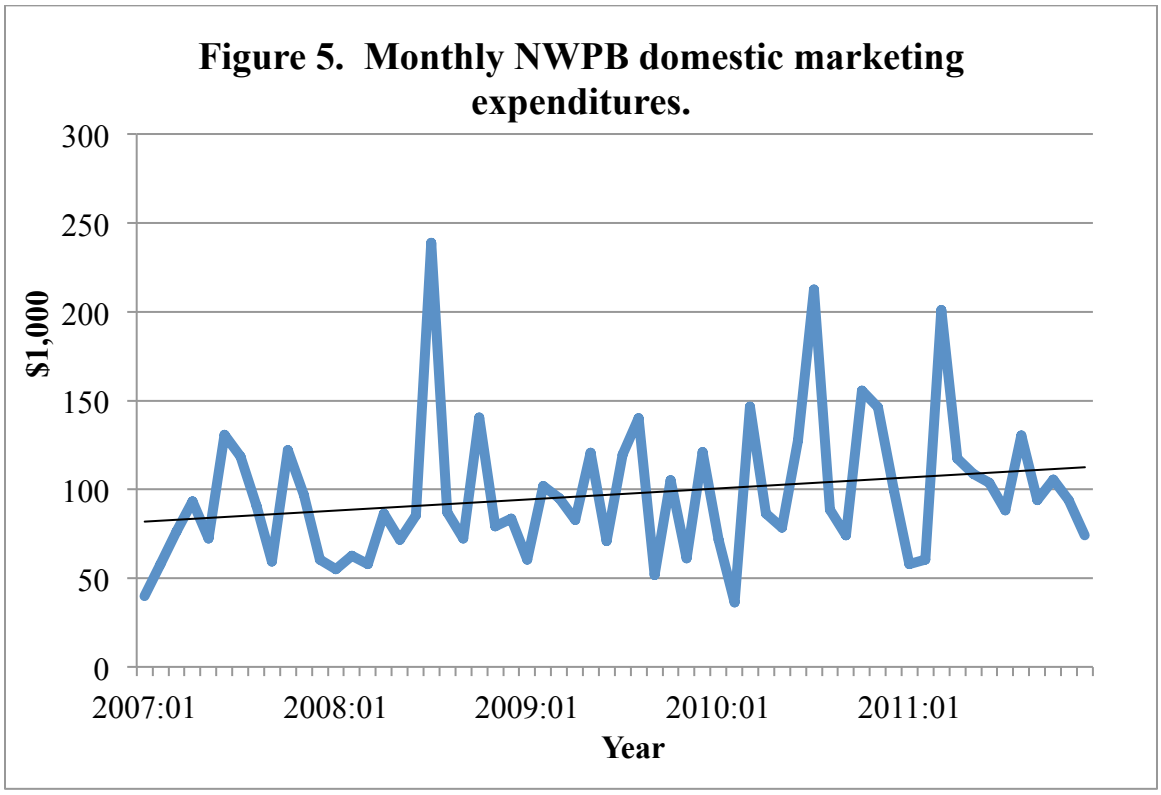
Figure 4. U.S. per capita waterlelon, cantaloup, and honeydew melon consumption.



One factor that has likely contributed to growth in per capita consumption of watermelons is the promotion efforts of the NWPB. Figure 5 shows domestic marketing expenditures on generic watermelon promotion since 2007, which have increased slightly over time.

The growth in per capita consumption since 2000 is crucial to the overall health and viability of the U.S watermelon industry. This is evident in Figure 6, which displays real watermelon grower total revenue (in 2005 dollars) from 2000 through 2010. The increase in per capita consumption that has occurred since 2000 has been accompanied by a positive trend in grower revenue. In 2000, total grower revenue was $270.7 million. In 2010, total revenue grew to $442 million, an increase of 63.3%. Clearly, it behooves the industry to market watermelons effectively, since growth in consumption is so beneficial to grower revenues. To disentangle the

impact of domestic marketing by the NWPB from other demand factors, we need to turn to more sophisticated statistical models from a field of economics called econometrics, which is the focus of the next section of this report.

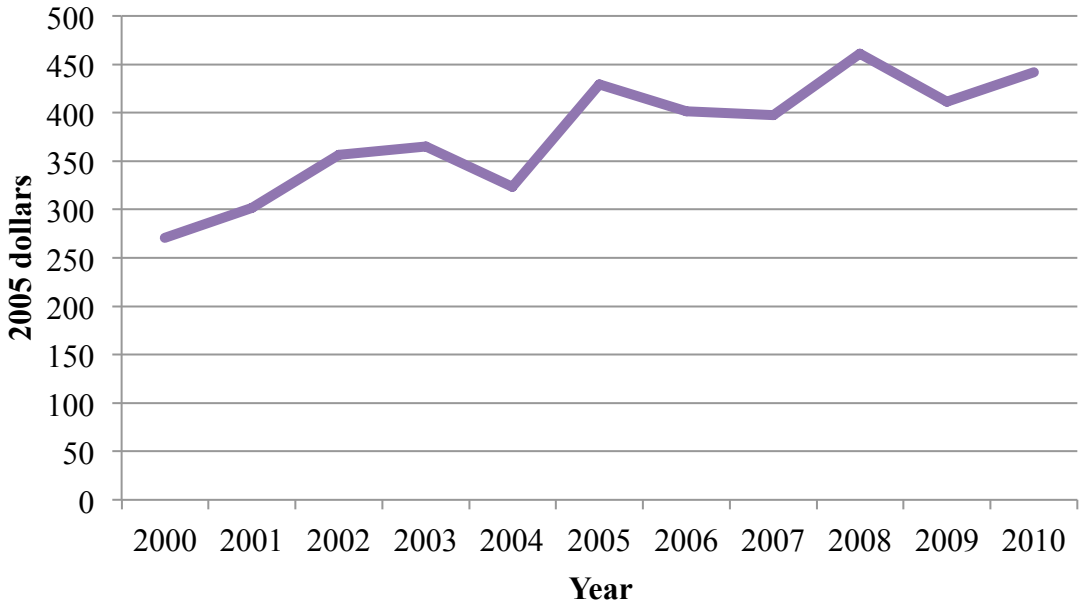


Methodology

This study quantifies the relationship between the promotion efforts of the NWPB and the domestic demand for watermelons. The export market is ignored since the focus is solely on the NWPB, which devotes most of its services to the domestic market. The model is based on the economic theory of consumer demand. In theory, one expects marketing activities to be beneficial to watermelon growers and handlers because they increase watermelon demand, resulting in higher prices and revenues. However, there are also other factors that affect domestic demand.

In order to distinguish the impact of the NWPB's marketing activities on watermelon demand from the impacts of other factors influencing demand, an econometric framework is adopted.

Figure 6. Inflation adjusted gross revenue for U.S. watermelon growers.



The econometric approach quantifies economic relationships using economic theory and statistical procedures with data. It enables one to simultaneously account for the impact of a variety of factors affecting demand for a commodity. Since watermelons are perishable and have seasonal production, the demand model is estimated using the retail price as being dependent on quantity of watermelons available. In addition to quantity of watermelons available, other demand factors affecting the retail watermelon price include consumer demographics, available quantities of two important substitutes, cantaloupes and honeydew melons, and generic marketing expenditures. By casting the economic evaluation in this type of framework, one can filter out the effect of other

factors and, hence, quantify directly the net impact of the NWPB's promotion activities on retail watermelon demand.

In this study, monthly retail scanner data on watermelon prices and volume sold, and cantaloupe and honeydew melon volume sold since 2007 are combined with monthly NWPB marketing and communications expenditure data to estimate the demand function. Similar to Ward's 2008 study, these data are further decomposed on a U.S. regional basis to look at cross sectional variation as well as changes over time. Specifically, the data are divided into eight separate regions including: California (CA), Great Lakes (GL), Mid South (MS), Northeast (NE), Plains (PL), South Central (SC), Southeast (SE), and West (W).

The econometric model uses statistical methods with these time series and cross sectional data to measure how strongly various retail watermelon demand factors are correlated with retail watermelon prices in the U.S. For example, with this approach one can measure how important a change in quantity of watermelons is on impacting the retail watermelon price relative to a change in NWPB promotion in affecting retail watermelon price.

As mentioned above, the retail price of watermelons is used as the dependent variable in the econometric model, and the following factors are included to ascertain the extent, if any, of their impact on watermelon demand in the United States.

1. Quantity of watermelons sold. Reflecting the so-called law of demand, we expect there to be a negative relationship between quantity demanded and price. Higher quantity available in the market results in a lower retail price.
2. Quantity of cantaloupe sold. This variable is expected to be negatively related to watermelon price, indicating that cantaloupe and watermelons are substitute products.

That is, an increase in demand for cantaloupes results in a decrease in price for watermelons.

3. Quantity of honeydew sold. This variable is expected to be negatively related to watermelon price, indicating that honeydew and watermelons are substitute products. That is, an increase in demand for honeydew results in a decrease in price for watermelons.
4. Current and lagged promotion expenditures by the NWPB. Since promotion has a carry-over effect, we expect that both current and lagged values of these expenditures will have a positive impact on the watermelon price.
5. Regional indicator variables for the eight regions specified above. These variables are included to capture demographic differences in each of the region and their impact on the retail watermelon price.

To compare the relative importance of each factor on disappearance, the results from the statistical (econometric) model are converted into price "flexibilities." A price flexibility coefficient measures the percentage change in the retail watermelon price given a 1 percent change in a specific demand factor, holding all other factors constant. For example, a price flexibility coefficient of -0.75 means that a 1% increase in quantity available would decrease the retail price by 0.75% when holding all other demand factors constant. Determining the statistical significance of this variable is therefore of crucial importance in the analysis that follows.

The retail demand model for watermelons can be expressed mathematically as:

$$PW_{it}/CPI_t = \beta 0 + \beta 1\ QWAT_{it} + \beta 2\ QHDEW_{it} + \beta 3\ QCANT_{it} + \beta 4\ SEASDUM_t$$

$$+ \beta 5\ PDL(\ln(WMPROM_i/CPI_t)) + \sum_{j=6}^{13} \beta j\ REGDUM_i$$

where: PW_{it} is the retail watermelon price in region i in month t, CPI_t is the Consumer Price Index for all items in month t, $QWAT_{it}$ is quantity of watermelons sold in region i in month t, $QHDEW_{it}$ is quantity of honey dew melons sold in region i in month t, $QCANT_{it}$ is quantity of cantaloupes sold in region i in month t, $SEASDUM_t$ is a seasonal indicator variable equal to 1 for May through September and zero otherwise, $WMPROM_i$ is the expenditures on marketing and communications by the NWPB in month t, ln is the natural logarithm operator, and $REGDUM_i$ are regional indicator variables for the either regions of the U.S.

To account for inflation over this five-year period, the retail watermelon price is deflated by the Consumer Price Index for all items. Hence, the dependent variable in the demand equation is the real, inflation-adjusted, retail price of watermelons. The seasonal indicator variable is included as it is expected that the retail price to be lower during the growing season for watermelons, from May through September. The regional indicator variables are included to control for differences in demographics as well as percent of seedless watermelons sold in each region. The model includes all but one regional indicator variable, the South Central, and therefore the estimated coefficients indicate the difference in retail prices of each region relative to the South Central.

Real, inflation-adjusted domestic promotion expenditures are used as a measure of the NWPB marketing efforts. It is well documented in the literature that advertising and promotion programs have a "carry-over effect" on demand, i.e., past, as well as current advertising has an effect on current demand. To capture this carry-over effect, current and various lagged generic

watermelon marketing and communications expenditures are included in several specifications of the model and the lag-length that provides the best statistical fit is chosen for the final model. Specifically, the model was specified as a second-degree polynomial distributed lag (PDL) without any endpoint restrictions imposed. The model is then solved a final model is chosen based on the best statistical fit. To model the well-known concept of "diminishing returns to promotion," the promotion expenditures are transformed by taking the natural logarithm, which has the property reflecting diminishing returns.

Econometric Results

The retail watermelon demand model is estimated in logarithmic form with monthly data from 2007 through 2012.1 and the eight regions of the United States. The estimation results are presented in Table 1. The R-squared indicates that the explanatory variables explain over 84% of the variations in the retail watermelon price over time for these regions. The estimated coefficients are consistent with economic theory and all estimated coefficients are statistically significant at the 5% significance level or better. An auto-regressive AR(1) process is used in estimating the model to correct for auto-correlation. Several econometric diagnostic tests performed indicate no statistical problems with the model. All of the regional dummy variables are significantly significant and positive indicating that all regions have a significantly higher retail watermelon price than the South Central region.

The estimated price flexibilities are presented in Table 2. Recall that a price flexibility gives the percentage change in the retail watermelon price given a 1% change in an explanatory variable, holding all other explanatory variables constant. The results show that the quantity of watermelons sold in the market is negatively related with the retail watermelon price.

Table 1. Estimated econometric retail demand for watermelons.

Dependent Variable: PW/CPI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
QWAT	-3.14E-09	4.57E-10	-6.874102	0.0000
QHDEW	-2.28E-08	1.14E-08	-2.000299	0.0461
QCANT	-3.34E-09	1.42E-09	-2.356552	0.0189
DUMCA	0.138798	0.072226	1.921736	0.0553
DUMGL	0.144890	0.062954	2.301515	0.0218
DUMMS	0.239864	0.079445	3.019243	0.0027
DUMNE	0.297157	0.051982	5.716568	0.0000
DUMPL	0.124330	0.065116	1.909370	0.0569
DUMSE	0.463162	0.072531	6.385705	0.0000
DUMW	0.185789	0.066830	2.780044	0.0057
SEADUM	-0.176295	0.019964	-8.830507	0.0000
PDL01	0.015949	0.001981	8.051310	0.0000
PDL02	0.007998	0.005258	1.520958	0.1290
AR(1)	0.682413	0.037589	18.15448	0.0000

Weighted Statistics

R-squared	0.848220	Mean dependent var	0.811330
Adjusted R-squared	0.843588	S.D. dependent var	0.343500
S.E. of regression	0.129737	Sum squared resid	7.170347
Durbin-Watson stat	1.680440		

Unweighted Statistics

R-squared	0.835704	Mean dependent var	0.770111
Sum squared resid	7.286675	Durbin-Watson stat	1.621485

Inverted AR Roots .68

Lag Distribution of (LOG(WMPROM)/CPI)	i	Coefficient	Std. Error	t-Statistic
* . |	0	-0.01203	0.01437	-0.83719
. * |	1	0.00496	0.00484	1.02325
. * |	2	0.01595	0.00198	8.05131
. *|	3	0.02095	0.00574	3.65144
. * |	4	0.01996	0.00669	2.98525
. * |	5	0.01298	0.00477	2.71757
	Sum of Lags	0.06276	0.00297	21.1029

Specifically, a 10% increase in the quantity of watermelons available in the market results in a

1.41% decrease in the retail price of watermelons, holding all other demand factors constant. This inverse relationship between price and quantity reflects the law of demand, i.e., people buy more when the price decreases, and less when the price increases.

Table 2. Price Flexibility Coefficients

Retail watermelon price with respect to:	Coefficient
Watermelon quantity	-0.141
Honeydew melon quantity	-0.041
Cantaloupe quantity	-0.065
Marketing and communications	0.098

Both honeydew melons and cantaloupes are substitutes for watermelons. The price flexibility coefficients show that a 10% increase in the quantity of honeydew melons decreases the retail price of watermelons by 0.41% when all other demand factors are held constant. A 10% increase in the quantity of cantaloupes decreases the retail price of watermelons by 0.65% when holding other factors constant. These results are somewhat comparable to the 2008 Ward study, which also found cantaloupes (-0.1954 price flexibility coefficient) and honeydew melons (-0.0536 price flexibility coefficient) to be substitutes for watermelons.

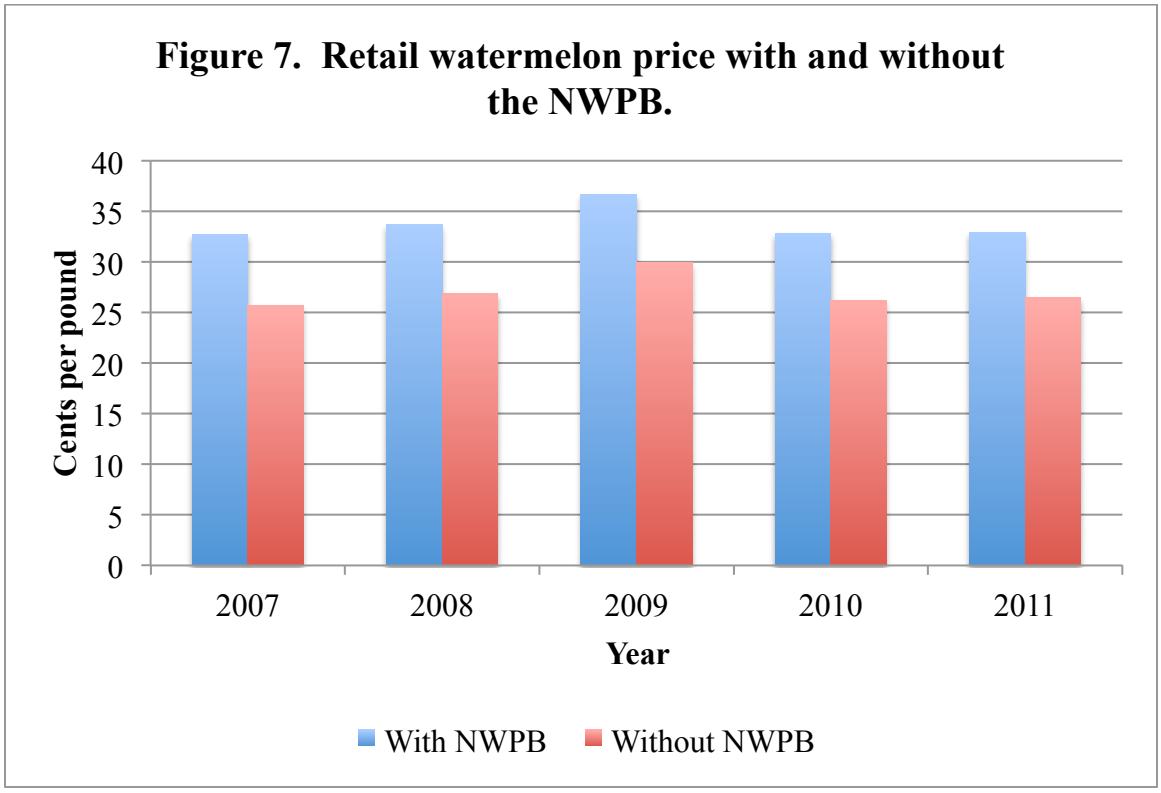
The statistical results indicate that NWPB has a positive and statistically significant impact on increasing retail watermelon demand. Generic watermelon promotion has a five-month carry over effect on the retail watermelon price with a cumulative price flexibility coefficient of 0.098. That is, a 10% increase in NWPB promotion results in an increase in retail watermelon price of almost 1% over 5-months when holding constant all other demand factors.

Ward (2008) found a one-month carry-over effect and a cumulative price flexibility of 0.173 using similar data over the period 2003.1-2007.6. The current results suggest a longer carry-over effect, with the maximum effect of NWPB promotion occurring in three months after the campaign begins.

Because there is error inherent in any statistical model, a 99% confidence interval is computed for NWPB promotion expenditures. This interval can be interpreted as the range of possible values where one can be confident that the true population price flexibility coefficient could be expected to fall 99% of the time. The 99% confidence interval for the NWPB promotion price flexibility coefficients is (0.091, 0.106). Since the lower bound of this confidence is still above zero, this adds credence to the notion that the NWPB is positively impacting retail watermelon demand.

Simulation Analysis

The estimated retail demand model is used to simulate market conditions with and without the NWPB. Specifically, two scenarios are simulated over the time period 2007.1 – 2011.12: (1) baseline scenario, where the retail watermelon price is simulated based on all explanatory variables sets to their historical levels, and (2) no-NWPB scenario, which is the same as the baseline except NWPB promotion expenditures are set to 1% of the historical levels. A comparison of the simulated retail watermelon prices between these two scenarios provides a measure of the impact of the NWPB's impact on retail prices over this five-year time period. In addition, using the price spreads between historical retail and farm watermelon prices, one can estimate the impact of NWPB promotion efforts on the farm price. Using this information, similar to the report by Ward, one can estimate a rate of return on investment.



Over the period 2007 through 2011, the NWPB checkoff revenue totaled $8.9 million. Figure 7 presents the estimated impact of those expenditures on the retail watermelon price for 2007 through 2011. In Figure 7, the retail prices under both scenarios are averaged over the entire year and for all eight regions. In addition, the retail prices have been scaled down to reflect an average retail-to-farm price margin consistent with the farm price being 39% of the retail price (see below for discussion). In the graph, the blue bar represents the retail price with the promotion program of the NWPB and the red bar is the average price without the promotion programs. Over the entire period, the retail price averaged 33.77 cents per pound with the NWPB and 27.05 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average retail price of watermelons would

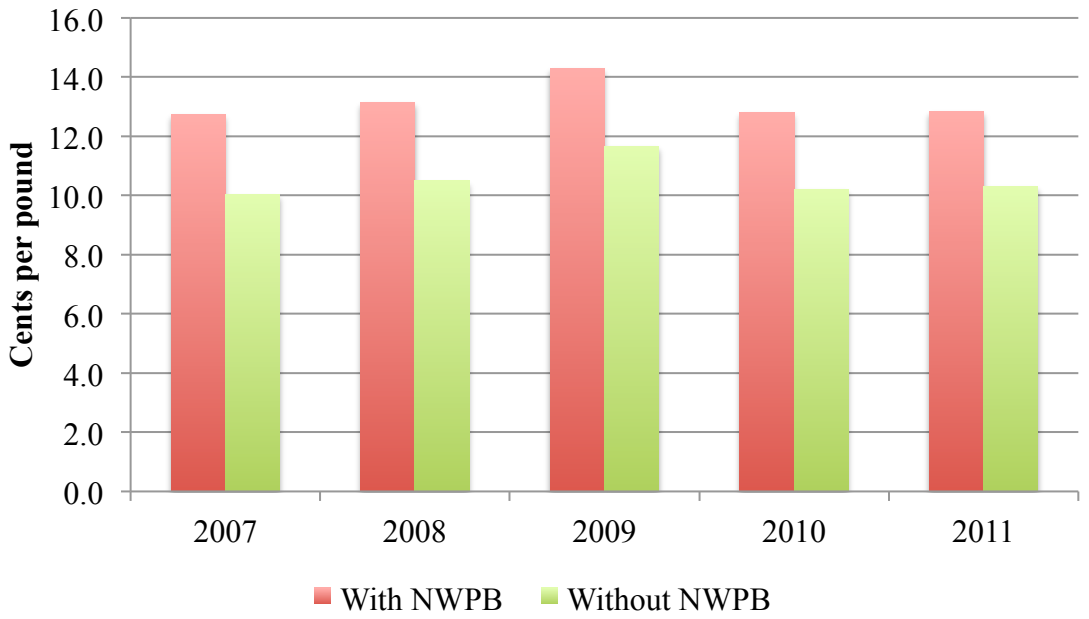
have been 6.72 cents per pound lower than it actually was. That is, the NWPB had the impact of increasing the retail watermelon price by 20%. This result is just slightly higher than the 17.9% impact that Ward found on retail watermelon prices in his previous study of the NWPB. Hence, retailers of watermelons clearly benefit from the NWPB's promotion efforts over the past five years.

A more important question is how do the stakeholders of the NWPB benefit from these promotions? Ideally, one could model the linkage between the farm and retail watermelon prices, but unfortunately the historical data on retail prices that provide an adequate series for such a model are unavailable. Instead, the same procedure that Ward used in his study that links the price spreads between FOB and retail prices is used. The weekly FOB pricing is the national average for all price points tracked by the AMS Market News Portal. When comparing FOB to retail prices in recent weeks, the farm watermelon price is about 26% of retail price when looking at Cut/Mini/Whole watermelons. This percentage goes up to 39% when comparing FOB to the weighted retail price of just Mini and Whole watermelons. Based on conversations with the NWPB staff, we concluded that the fresh cut segment seems to skew the numbers a bit when retail is doing all of the value-add in store and it therefore made more sense to ignore that segment and focus solely on Mini and Whole watermelon sales compared to FOB pricing. As alluded to above, this conversion was actually made on the retail prices in Figure 7 to keep the farm price consistent with USDA published grower prices. In other words, the farm prices in Figure 8 are 39% of the retail prices in Figure 7.

Over the entire period, the farm price averaged 13.17 cents per pound with the NWPB and 10.55 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average farm price of watermelons would have been

2.62 cents per pound lower than it actually was. This 20% increase in the farm price is slightly higher than the 17.9% impact that Ward found on farm watermelon prices in his previous study of the NWPB.

Figure 8. Farm watermelon price with and without the NWPB.



If we assume that the retail and farm pounds of watermelon are equivalent, as Ward did, one can multiply the increase in the farm price due to the promotions by the NWPB by retail U.S. sales to derive the gain in total dollar sales at the farm-level. Over the five-year period 2007-2011, the results indicate that the NWPB promotion effort resulted in an increase in total farm sales of watermelons of $255.67 million. The rate of return on investment (ROI) from the NWPB promotion is equal to:

ROI = (255.67 – 8.9) / 8.9 = 27.73.

In other words, each dollar invested in NWPB promotion returned $27.73 in net farm revenue to the U.S. watermelon industry.

This estimate is significantly higher than the 10.6 estimate by Ward in the previous study of the NWPB for two reasons. First, the farm price impact estimated in the current study is slightly higher (20% vs. 17.9% from the Ward study). More importantly, Ward's analysis used only the six "in-season" months of the calendar from May through September and therefore the quantity of watermelons is significantly lower than the full 12-month figure used here. Hence, the estimated revenue impact of the NWPB in the Ward study is substantially lower as well.

Questions often arise about the accuracy of such estimates of ROIs in economic evaluations of commodity promotion programs. The resulting ROIs are generally large because promotion expenditures are exceedingly small relative to product value so only a small demand effect is needed to generate large positive returns. For example, average NWPB promotion expenditures in 2010 were a mere 0.37% of the farm value of watermelon. Still, this relatively small investment in watermelon promotion increased net revenue by more than $50 million per year over the past five years. Therefore, the resulting ROI is quite large.

How does the ROI estimated above compare to that for other marketing checkoff programs? Table 3 lists the estimated ROIs for 21 selected food commodities. The median average ROI from these studies is 6.0. Hence, the 27.73 estimated here for the NWPB is substantially higher than the median for these selected studies.

To make allowances for the error inherent in any statistical estimation, a 99% confidence interval is calculated for the above ROI. The confidence interval provides a lower bound for the average BCR: one can be "confident" 99% of the time that the true average ROI lies above this limit. The 99% confidence interval for the NWPB ROI is (25.50, 29.97). Since the lower bound

of this 99% confidence interval is substantially higher than one we can be very confident that the true ROI for the NWPB is larger than one.

Conclusions and Implications

The purpose of this report was twofold: (1) to determine the domestic market impacts of the NWPB's demand enhancement programs, and (2) to compute a rate of return on investment (ROI) for the promotion activities conducted by the NWPB. Monthly retail scanner data on watermelon prices and volume sold, and cantaloupe and honeydew melon volume sold since 2007 were combined with monthly NWPB marketing and communications expenditure data to estimate a retail watermelon demand function. Similar to Ward's 2008 study, these data were further decomposed on a U.S. regional basis to look at cross-sectional variation in eight separate regions: California (CA), Great Lakes (GL), Mid South (MS), Northeast (NE), Plains (PL), South Central (SC), Southeast (SE), and West (W). Based on this retail demand model, several conclusions were evident on the impacts of the NWPB generic promotion programs:

- Two major drivers of watermelon demand are the volume of cantaloupe and honeydew supplies in the market, with each having a negative impact on the retail price of watermelon. This negative impact indicates that honeydew and cantaloupes are substitutes for watermelon. The average price flexibility coefficients were -0.065 for cantaloupes and -0.041 for honeydew indicating a 10% increase in volume of cantaloupes (honeydew), holding everything else constant, would decrease the retail watermelon price by 0.65% (0.41%).

- The National Watermelon Promotion Board's domestic promotion programs have a positive and statistically significant impact on watermelon demand. Generic watermelon promotion has a five-month carry over effect on the retail watermelon price with a cumulative price flexibility coefficient of 0.098. That is, a 10% increase in NWPB promotion results in an increase in retail watermelon price of almost 1% over 5-months when holding constant all other demand factors. The current results suggest a longer carry-over effect, with the maximum effect of NWPB promotion occurring in three months after the campaign begins.

- Generic watermelon promotion had a significant impact on retail watermelon prices. From 2007 through 2011, the retail price averaged 33.77 cents per pound with the NWPB and 27.05 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average retail price of watermelons would have been 6.72 cents per pound lower than it actually was. That is, the NWPB had the impact of increasing the

retail watermelon price by 20%.

Table 3. Estimated Generic Promotion Elasticities and ROIs for Selected Commodities from Single Equation Studies.

		Promotion Elasticity	Average ROI	Marginal ROI
Author(s)	State Generic Programs:			
Alston et al. (1997)	California Table Grapes	0.160	44.9	38.8
Alston et al. (1998)	California Dried Plums	0.050	NA	2.7
Crespi and Sexton (2005)	California Almonds	0.130	NA	6.2
Carter et al. (2005)	California Strawberries	**0.160**	NA	44.0
Schmit et al (1997)	California Eggs	**0.130**	NA	6.9
Carman and Craft (1998)	California Avocados	**0.130**	5.0	1.7
Williams et al. (2004)	Florida Orange Juice	.127-.428	2.9-7.0	NA
Author(s)	Federal Generic Programs:			
Kaiser (1997)	All Dairy Products	.016-.021	3.4	NA
Schmit and Kaiser (2004)	Fluid Milk	0.04	NA	NA
Ward (1996)	Beef	0.028	5.7	5.7-9.7
Davis et al (2000)	Pork	0.110	NA	16.0
Schmit and Kaiser (1998)	Eggs	0.006	NA	.54-6.33
Kaiser (2005)	Blueberries	0.043	4.46-13.22	NA
Murray et al. (2001)	Cotton	0.022	3.2-6.0	NA
Kaiser (2005)	Walnuts	0.005	1.65 - 9.72	NA
Kaiser et al. (2003)	Raisins	.029-.133	5.1-15.3	.42-3.19
Ward (2008)	Honey	0.082	6.02-7.91	NA
Capps and Williams (2008)	Lamb	0.044	NA	44.5
Ward (2008)	Watermelons	**0.165**	10.6	NA
Richards and Patterson (2007)	Potatoes	.013-.464	6.5	NA
Williams (1999)	Soybeans	.0156-.073	1.7-7.9	NA
Median		0.045	6.0	6.3

NOTE: Promotion elasticities in bold are price flexibility coefficients, and are not included in the mean and median calculations.

• The farm price averaged 13.2 cents per pound with the NWPB and 10.5 cents per pound without the NWPB. In other words, had there not been any promotion by the NWPB over the last five years, the average farm price of watermelons would have been 2.7 cents per pound

lower than it actually was.

• Over the five-year period 2007-2011, the NWPB promotion effort resulted in an increase in total farm sales of watermelons of $255.67 million or $52.1 million per year. In other words, each dollar invested in NWPB promotion returned $27.73 in net farm revenue to the U.S. watermelon industry.

The main implication of this study is that the watermelon industry is getting a very high return from the domestic promotion efforts of the NWPB. The estimated ROI indicates that it would be profitable, from an industry standpoint, to increase the level of domestic promotion of watermelons. Indeed, compared with other commodities, the returns to generic watermelon promotion are substantially higher than the median result.

References

Alston, J.M., H.F. Carman, J.A. Chalfant, J.M. Crespi, R.J. Sexton, and R.J. Venner. *The California Prune Board's Promotion Program: An Evaluation*. Giannini Foundation Research Report no. 344, 1998.

Alston, J.M., J.A. Chalfant, J.E. Christian, E. Meng and N.E. Piggott. *The California Table Grape Commission's Promotion Program: An Evaluation.* Giannini Foundation Monograph no. 43, November 1997.

Carman, Hoy F. and R. Kim Craft. "Evaluation of Avocado Promotion by the California Avocado Commission. in *Commodity Promotion: Lessons from California*. Harry M. Kaiser, Julian M. Alston, John M. Crespi, and Richard J. Sexton (editors). pp 137-167, Peter Lang Publishing, Inc. New York City, 2005.

Carter, Colin A., James Chalfont, and Rachael E. Goodhue. "The Red Edge: Demand-Enhancing Strategies for California Strawberries." in *Commodity Promotion: Lessons from California*. Harry M. Kaiser, Julian M. Alston, John M. Crespi, and Richard J. Sexton (editors). pp 225-254, Peter Lang Publishing, Inc. New York City, 2005.

Crespi, John M. and Richard J. Sexton. "Evaluating the Effectiveness of California Almond Promotion: How Much Did the Litigation Cost Producers?" in *Commodity Promotion: Lessons from California*. Harry M. Kaiser, Julian M. Alston, John M. Crespi, and Richard J. Sexton (editors). pp 167-190, Peter Lang Publishing, Inc. New York City, 2005.

Davis, G. C., O. Capps, Jr., D. A. Bessler, J. H. Leigh, J. P. Nichols, E. Goddard. *An Economic Evaluation of the Pork Checkoff Program*. College Station: Texas A&M University, 2000.

Kaiser, Harry M. "An Economic Analysis of Domestic Impacts of the Walnut Marketing Board's Marketing Programs." in *Commodity Promotion: Lessons from California*. Harry M. Kaiser, Julian M. Alston, John M. Crespi, and Richard J. Sexton (editors). pp 191-208, Peter Lang Publishing, Inc. New York City, 2005.

Kaiser, Harry M. "Impact of National Dairy Advertising on Dairy Markets, 1984-95." *Journal of Agricultural and Applied Economics.* 29(1997):303-14.

Kaiser, Harry M. *An Economic Analysis of Domestic Market Impacts of the U.S. Highbush Blueberry Council*. Report Prepared for the U.S. Highbush Blueberry Council, 2005.

Kaiser, Harry M., Donald J. Liu, and Ted Consignado. "An Economic Analysis of California Raisin Export Promotion." *Agribusiness: An International Journal*. 19(2003):189-202.

Murray, B. C, R. H. Beach, W. J. White, C. Viator, N. Piggott, and M. Wohlgenant. *An Economic Analysis of the Cotton Research and Promotion Programs*. Research Triangle Institute Project No. 8024. Final Report. September 2001.

Nuckton, Carole Frank, Ben C. French, and Gordon A. King. "An Econometric Analysis of the California Raisin Industry." *Giannini Foundation Research Report No. 339*, Division of Agriculture and Natural Resources, California Agricultural Experiment Station. December 1988.

Richards, Timothy J. and Paul M. Patterson. *Evaluation of Grower-Funded Value-Added Activities by the United States Potato Board*. Report Prepared for the United States Potato Board, 2007.

Schmit, Todd M. and Harry M. Kaiser. "Decomposing the Variation in Generic Advertising Response Over Time." *American Journal of Agricultural Economics*, 86(2004):139-153.

Schmit, Todd and Harry M. Kaiser. "Egg Advertising, Dietary Cholesterol Concerns, and U.S. Consumer Demand." *Agricultural and Resource Economics Review*. 27(1998):43-52.

Schmit, Todd, J. Carlos Reberte, and Harry M. Kaiser. "An Economic Analysis of Generic Egg Advertising in California, 1985-95." *Agribusiness: An International Journal*. 13(1997):365-73.

Ward, Ronald W. *The Beef Checkoff Impact on U.S. Beef Demand*. UF # NCA 96.1, University of Florida, April 1996.

Ward, Ronald W. *Measuring the Impact from Generic Promotions on the Demand for Honey*. Report Prepared for the National Honey Board, 2008.

Ward, Ronald W. *The National Watermelon Board: An Evaluation of Their Program Impact on the Demand for Watermelons*. Report Prepared for the National Watermelon Promotion Board, 2008.

Williams, Gary W. "Commodity Checkoff Programs as Alternative Producer Investment Opportunities: The Case of Soybeans." *Agribusiness: An International Journal*. 15(1999):539-552.

Williams, Gary W., Oral Capps, Jr., and David A. Bressler. "Florida Orange Grower Returns from Orange Juice Advertising." TAMRC Consumer and Product Research Report No. CP-01-04, Department of Agricultural Economics, Texas A&M University, 2004.