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**"Distribution of  
Benefits and Costs  
of Commodity  
Checkoff  
Programs"**

## The Domestic Impacts of the Walnut Marketing Board's Marketing Programs

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The Walnut Marketing Board (WMB) was established in 1933 as a federal marketing order representing walnut growers and handlers to promote usage of walnuts through publicity, product promotions, research and education programs. The WMB offers public relations and (non-advertising) promotion programs servicing the domestic walnut market.

The purpose of this article is twofold: (1) to determine the domestic market impacts of the WMB's marketing programs, and (2) to compute a benefit-cost ratio (return on investment) for the marketing activities conducted by the WMB. In this research, the impact of the export marketing activities conducted by the Walnut Commission is not evaluated. Specifically, this research examines whether the domestic marketing activities by the WMB since 1984 had a positive and statistically significant impact on domestic shipments of California walnuts. The impact of all factors affecting domestic walnut demand (where data are available) is measured statistically. In this way, the impacts of other important factors affecting domestic demand are accounted for over time.

This study addresses three important issues relating to the effectiveness of the WMB's marketing programs. The first issue is the degree of demand responsiveness, if any, to the WMB's marketing activities. To examine this issue, a domestic per capita walnut demand equation is estimated to compute the corresponding "marketing elasticity." The marketing elasticity measures the percentage change in domestic per capita walnut demand given a one percent change in the WMB's marketing budget, holding constant all other factors affecting domestic walnut demand. As such, it provides a net measure of the impact of marketing on walnut demand. Statistical tests are performed to determine whether or not the marketing elasticity is positive and statistically different from zero.

The second objective of this study is to measure how much lower total domestic walnut utilization would have been in the absence of the WMB's marketing activities. To address this objective, the estimated demand equation is used to simulate two scenarios over the period 1984-99: (1) a baseline scenario based on historical WMB marketing levels, and (2) a hypothetical "no WMB" scenario, which assumes were no WMB marketing activities. A comparison of these two scenarios provides a measure of the total impact of the WMB's marketing programs on walnut demand.

While a positive impact on domestic utilization is a necessary condition, it does not guarantee that the monetary benefits of the WMB's marketing activities are greater than the costs. Hence, the final and most important objective of this study is to estimate the gain in industry profits due to the WMB's marketing activities and compare these benefits to the marketing costs. To examine this issue, an average benefit-cost ratio (BCR) for the WMB marketing activities is computed. The benefits to the walnut industry of the WMB's marketing programs are measured as the increase in producer surplus (an economic measure

of industry profit) over the study period due to promotion. The costs in the BCR computation are measured by the actual marketing expenditures over the study period. The average BCRs are useful since they provide a measure of the returns (in dollars) to the walnut industry for every dollar invested in marketing.

The economic model used in this study is based on the economic theory of consumer demand. In theory, one expects that marketing activities are beneficial to walnut growers and handlers because they increase walnut demand, resulting in higher sales and revenues. However, there are also other factors that affect domestic walnut demand. In order to distinguish the impact of the WMB's marketing activities on demand for walnuts from the impacts of other factors influencing demand, an econometric framework is adopted. 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 walnut demand. These demand-determining factors (called "determinants") include the price of walnuts, prices of walnut substitutes and complements, population, proportion of women in the workforce, consumer income, consumer tastes and preferences, and the WMB's 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 WMB's marketing activities on domestic walnut demand.

The empirical walnut demand model developed in this study uses time series data for the period of 1980-99. The model can assess how strongly various walnut demand determinants are correlated with domestic walnut utilization (i.e., demand). For example, with the model one is able to determine how important a change in the price of walnuts is relative to a change in the WMB's marketing expenditures regarding their impacts on domestic walnut demand. To compare the relative importance of each factor on shipments, the results from the statistical (econometric) model are converted into demand elasticities. A demand elasticity measures the percentage change in per capita domestic walnut utilization given a one-percent change in a specific demand factor, holding all other factors constant.

The estimated demand equation suggests that the price of walnuts at the grower level is not as important in explaining variations in the per capita domestic demand as was expected. The estimated own-price elasticity was  $-0.08$ , which implies that a one-percent increase in the walnut growers' price would result in only a 0.08 percent decrease in domestic walnut utilization. This result suggests that walnut utilization is not very sensitive to changes in the grower price, which is intuitively plausible since walnuts represent a relatively small portion of consumer's total budget. Ideally, it would have been preferable to have price data at the retail or processor level, but such data were not available.

While the walnut grower's price is not important, the grower price of pecans is found to be an important demand determinant for walnuts. The cross-price elasticity of per capita walnut demand with respect to the price of pecans is estimated at 0.14. That is, a one-percent increase in the pecan price would result in a 0.14 percent increase in per capita walnut demand. This indicates that walnuts and pecans are substitute products since the demand for walnuts is enhanced when the price of pecans increases and causes the quantity demanded of pecans to decrease.

The cross-price elasticity of per capita walnut demand with respect to the price of almonds is estimated at  $-0.08$ . That is, a one-percent increase in the almond price would result in a 0.08 percent decrease in per capita walnut demand. This result indicates that walnuts and almonds are complimentary products since the demand for walnuts is enhanced when the price of almonds decreases and causes the quantity demanded of almonds to increase.

The disposable income elasticity of demand in the United States is equal to 1.12, indicating that a one-percent rise in U.S. disposable income would result in a 1.12 percent increase in per capita demand for walnuts. This implies that walnuts are a "normal good" since demand rises with income.

The proportion of women in the workforce is the most important factor affecting domestic walnut demand. The results indicate that a one-percent increase in the proportion of women

in the workforce would result in a 1.92 percent decrease in per capita walnut demand. This result confirms the hypothesis that an increase in women in the workforce is associated with a decrease in walnut demand, which is likely due to a decline in overall baking in the household.

The coefficient associated with the WMB's marketing programs is positive and statistically different from zero. This means that the statistical evidence supports the notion that the WMB's marketing activities have the effect of increasing the demand for walnuts in the United States. The estimated marketing elasticity is 0.005, which means that a one percent increase in walnut marketing expenditures would result in a 0.005 percent increase in per capita domestic walnut demand. While this elasticity is not large relative to the other demand determinants, it is statistically different from zero and positive. Moreover, two points should be considered. First, one should not expect a huge marketing elasticity since the annual marketing budgets of the WMB is quite small. Second, and related, since the costs of the WMB are relatively small, it does not take a large marketing elasticity to lead to positive net benefits of the program.

The above estimation results indicate that the WMB marketing program has had a positive and significant effect on domestic walnut demand. The estimated demand equation is simulated to determine the market impacts of the WMB. Two scenarios are considered in the simulation:

1. Baseline Scenario – WMB marketing program in effect from 1984-99.
2. No-WMB-Marketing Scenario– WMB marketing program not in effect from 1984-99.

In the no-WMB scenario simulation, all demand determinants except WMB marketing expenditures are set equal to their historic levels. However, the WMB marketing variable is set to zero and the corresponding demand is simulated over time. The difference between the above two scenarios gives the total impact of the WMB marketing effort on the domestic walnut utilization.

The simulation results indicate that the WMB had a major impact on annual walnut utilization in the United States. From 1984-99, the WMB marketing activities increased total walnut utilization by 342.4 million pounds in total, or 21.4 million pounds per year. While these results indicate a positive impact of the WMB marketing on walnut utilization, what remains a key concern is the impact marketing has had on industry producer surplus (i.e., profit) compared with marketing costs.

Previous econometric studies of treenuts have indicated that it is problematic to obtain a reliable estimate of supply response to price. This is due to the relatively long time needed between planting new trees and the nut harvest. Consequently, harvest in any particular year is generally a function of yield, which is influenced by weather conditions and is largely unaffected by price. This makes it difficult to statistically determine any positive correlation between nut production and price. Because of this, an econometric supply model is not developed in this study. Instead, an approach similar to previous studies by Crespi and Sexton; Alston et al.; and Schmit and Kaiser is followed. Under this approach, the supply response is incorporated by repeatedly simulating the model over a wide range of possible supply elasticities (from 0.5 to 3.0) and comparing the BCRs for each one.

The WMB had a positive impact on the walnut growers' price over this period. The average increase in price ranged from just under 3 cents per pound, in the case of an inelastic (supply not sensitive to price) supply response, to just under 0.5 cents per pound, in the case of a very elastic supply response (supply very sensitive to price). The average impact over all supply responses was 1.12 cents per pound. In other words, had there not been a marketing program by the WMB, the average growers' price would have been 1.12 cents per pound, or 2 percent, lower from 1984-99 than it actually was.

The WMB marketing effort had a positive impact on producer surplus over this period as well. The average increase in producer surplus due to the marketing programs of the WMB

ranged from \$7.87 million per year, in the case of an inelastic supply response, to \$1.34 million per year, in the case of a very elastic supply response. The average increase in producer surplus over all supply responses was \$3.25 million per year. Hence, it is clear that the domestic marketing effort of the WMB has had a positive impact on growers' profits since 1984.

How does the gain in producer surplus compare with the costs of the WMB marketing programs? To answer this, an average benefit-cost ratio is computed. A BCR greater than 1.0 implies that the benefits of the WMB exceed the costs. The average BCR for the WMB exceeded 1.0 for every supply response considered in the simulation. For the most in elastic supply response, the average BCR was 9.72. This implies that, on average over the period 1984-99, the benefits of the WMB marketing programs have been almost 10 times greater than the costs. At the opposite end of the spectrum in supply response, the average BCR was computed to be 1.65, implying that the benefits of the WMB were 1.65 times greater than the costs. Given the wide range of supply responses considered in this analysis, and the fact that the BCR was above 1.0 in all cases, there is significance evidence that the WMB's marketing programs have been profitable for the domestic walnut industry. The average BCR over all supply responses was 4.01, i.e., the benefits of the marketing activities of the WMB exceeded the costs by four-fold.

To make allowances for the error inherent in any statistical estimation, a 95 percent confidence interval was calculated for the above average BCR's. The confidence interval provides a lower and an upper bound for the average BCR, within which one can be "confident" 95 percent of the time that the true average BCR lies. The estimated lower and upper bounds for the average BCR for the lowest assumed supply response for the period of 1984-99 are 5.25 and 15.54, respectively. This confidence interval demonstrates that one could be confident 95 percent of the time that the true average BCR for this assumed supply response lies between 5.25, on the low side, and 15.54, on the high side. The lower and upper 95 percent confidence bounds for the average BCR in the highest assumed supply response for the period of 1984-99 are 0.91 and 2.64, respectively. It is important to point out that the average BCR is above 1.0 for all assumed supply responses except the highest one. Hence, it is reasonable to conclude that the above confidence intervals give credence to the previous finding that the benefits of the WMB's marketing programs have been considerably greater than the cost of the programs.

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