

assumes that per unit costs are somewhat higher for smaller plants. Thus, median costs for two categories of smaller plants are estimated at \$0.006 and \$0.007.

Weighting these cost figures for the three different size categories of plants yields an overall median estimated cost per pound for compliance of \$0.00525. In terms of economic theory, this cost increase is represented by an upward shift in the supply curve of about one-half cent, as measured along the vertical axis in a supply-demand graph. The total direct cost of compliance is estimated at \$875,000 in the median scenario (\$0.00525 times 166.67 million pounds in the domestic market).

#### *Benefit Estimates*

The witness's economic analysis takes into account three separate demand benefits, which he considers distinct. The first, and largest, of the demand benefits is higher expected long run average demand due to the reduced chance of an aflatoxin event that would cause a major negative shock to demand. The mandatory aflatoxin testing under the marketing order would reduce the chance of a demand-decreasing market disturbance in the U.S.

Witnesses cited a 1996 pistachio aflatoxin case which occurred in Germany as an example of what could befall the U.S. pistachio industry if aflatoxin were not properly regulated. Widespread negative publicity about aflatoxin in foreign pistachios exported to Germany caused sales revenue to decline by 50 percent for a duration of three years or more. Witnesses estimate that a similar event in the United States could cost the industry over \$300 million in gross revenue. Witnesses also pointed out that there were significant additional repercussions on pistachio sales worldwide as word of the German aflatoxin incident spread through the media of other nations, especially in Europe, affecting pistachio sales in those countries.

The witness's analysis assumes that an aflatoxin related market disturbance would cause a more moderate decrease, represented in the median simulation case as a 10 percent decline (18 cents) from the \$1.80 per pound typical base price at the handler level.

By requiring aflatoxin testing for all pistachios destined for the domestic market, the marketing order would make the probability of an aflatoxin event less likely. As a starting point, witnesses argued that without mandatory aflatoxin testing through the proposed marketing order, there is a 5-percent annual probability of an

aflatoxin related market disturbance. If such an incident were to occur, witnesses estimated that its impact would last for 3 years. Implementation of mandatory testing is then assumed to reduce the probability to 1 percent, a decline of 4 percentage points.

Mandatory testing under the marketing order therefore increases expected demand, or willingness to pay for pistachios, by \$0.0216 per pound (4 per cent decline in probability times 18 cents times 3 years).

The witness's analysis includes two additional demand-side benefits. The witness asserts that USDA requirements convey a positive benefit in the market as reflected by the use of this claim in product promotion, labels, and displays. A median increase of \$0.0025 in willingness to pay reflects a reasonably conservative estimate of the higher buyer confidence in pistachios due solely to USDA participation in the pistachio quality testing and certification process. The certification gives additional confidence in the quality of the product.

The third demand benefit is higher buyer perception of quality due to minimum standards. Witnesses assume a similarly small magnitude for this estimated increase in willingness to pay (\$0.003 per pound).

Summing the median parameters for each of these three demand impacts, the increase in willingness to pay for pistachios supplied to the domestic market is a little under 3 cents per pound (\$0.0271). In terms of economic theory, this figure represents an upward shift in the demand curve of nearly 3 cents, as measured along the vertical axis in a supply-demand graph. Most of the impact is from the first benefit, the reduced probability of aflatoxin being found in California pistachios.

Thus the median benefit in terms of increased per unit demand (willingness to pay) is expected to be substantially larger than the estimated median per unit direct cost of marketing order compliance (\$0.0271 versus \$0.00525). Expected or average demand is higher, reflecting the lower probability of an aflatoxin event and the average quality and certification effects in the domestic market. Handlers would face higher costs to comply with the proposed requirements.

#### *Simulation Results*

These figures for increased cost and increased willingness to pay were combined with different demand and supply elasticities in the simulation model developed by Dr. Sumner to assess the net economic impact of marketing order implementation. The

median elasticities used were unitary ( $-1.0$  for demand and  $1.0$  for supply). The supply response that is modeled is a long run supply response (additional planting) due to the permanent change in market conditions resulting from the marketing order. These assumed elasticities are based on other prior econometric estimates for pistachios and other tree nuts. Witnesses cited a 1999 report by Lucinda Lewis of Competition Economics, Inc., "Charting a Direction for the U.S. Pistachio Industry," which found a  $-1.14$  demand elasticity for pistachios. According to the record testimony, the range of elasticities used in the simulation scenarios are consistent with published economic studies of supply and demand for pistachios and other tree nuts.

The simulation model solves a system of supply and demand equations for a new set of industry prices and quantities from marketing order implementation. As stated above, the total direct cost of compliance is \$875,000. In the simulation, there is an upward shift in the market supply curve, representing increased costs to firms in the pistachio market. The magnitude of the price and quantity change from the shift in the supply curve is determined by the higher cost of production (compliance cost) and the elasticity of supply. The resulting computed (simulated) loss to the handler segment of the industry from higher expenses for marketing order compliance is \$490,000.

This \$490,000 differs from the previously stated \$875,000 cost of compliance figure by the amount of an implied price increase and the small equalization effect on the smaller handlers that process 20 percent of the product.

The witness's analysis assumes that with minimum quality requirements the relative position of the smaller firms would improve to match those of other handlers. This is because prior to the new mandatory requirements, these firms are assumed to have fewer quality controls than most other firms, and thus end up selling nuts to the part of the market that buys lower quality nuts at lower prices. The equalization effect resulting from uniform minimum quality specifications is a small positive benefit that offsets some of the cost of compliance for the smaller firms.

On the demand side, the higher willingness to pay is \$0.0216 per pound for the reduced probability of aflatoxin in California pistachios, and \$0.0055 for the two additional demand-side benefits (higher buyer confidence from USDA certification and higher buyer