An Evaluation of California's Mandated Commodity Promotion Programs

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Executive Summary

Mandated commodity promotion programs are important and controversial. In recent years in the United States, such programs have spent on the order of $1 billion per year using commodity "check-offs," a type of tax that is mandatory if approved by a sufficient majority of producers. Proponents of these programs argue that, because of free-rider problems, producers acting individually do not invest in these activities in amounts sufficient to maximize net benefits for the industry (or the nation) as a whole, and that hence there is a case for the government to intervene. The compulsory aspect of these programs has been the subject of much dispute and litigation, including three recent cases heard before the U.S. Supreme Court.

Much of both the promotion activities and the legal disputes have taken place in California, where many such programs operate under authorization from both federal and state law. In the 2003/04 marketing year, the sixty-one active programs in California spent more than $200 million on commodity promotion, research, and other activities, and covered more than 50 percent of California's agricultural production value, including 79 percent of animal products, 73 percent of fruits and nuts, and 43 percent of vegetables.

This paper provides an overview of mandated commodity programs in California, and summarizes and interprets existing evidence on their economic impacts. The analysis draws upon the recent book edited by the authors (*The Economics of Commodity Promotion Programs: Lessons from California*. New York, NY: Peter Lang Publishing, April 2005), which documents the institutional arrangements for the California programs, summarizes the history of recent

litigation, and presents the results of a number of benefit-cost studies of mandated commodity programs in California.

Disputes over the future of these programs are likely to continue, and economists can contribute to the discussion by providing information about the economic consequences of the programs. With the aim of improving the effectiveness of economic analysis of these programs, the paper highlights a number of methodological issues regarding the design and execution of promotion-evaluation studies and develops some guidelines for best practices, while also identifying limitations inherent in the standard approach, which relies upon econometric analysis of aggregate time-series data. These caveats notwithstanding, the overwhelming conclusion from the studies reported and reviewed in the paper is that mandated commodity marketing programs have been very profitable for California's agricultural producers. In every case, the evidence suggests that one can be reasonably confident that the benefits have well exceeded the costs and that it would have been profitable for producers to have increased expenditures on the programs.

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An Evaluation of California's Mandated Commodity Promotion Programs

Mandated commodity promotion programs are important and controversial. In recent years in the United States, such programs have spent on the order of $1 billion per year of funds raised using commodity "check-offs," a type of tax that is mandatory if approved by a sufficient majority of producers. Check-off programs are made possible by government policy through application of the government's coercive taxing powers to collect the funds, exemption of check-off programs from certain types of antitrust regulations, use of government resources to develop and implement the programs, and, in some cases, provision of government funds to support them.

Proponents of these programs argue that, because of free-rider problems, producers acting individually do not find it profitable to fund the activities in amounts sufficient to maximize net benefits for the industry (or the nation) as a whole and that hence there is a case for the government to intervene. The programs are voluntary in the sense that support from a defined majority of relevant producers is required to implement them, but participation is mandatory once a program has been authorized. The mandatory aspect has been the subject of much dispute and litigation, including three recent cases heard before the U.S. Supreme Court.[1]

Much of both the promotion activities and the legal disputes has taken place in California, where many such programs operate under both federal and state law. In the 2003/04 marketing year, the sixty-one active programs in California spent more than $200 million on commodity promotion, research, and other activities and covered more than 50 percent of California's agricultural production value, including 79 percent of California animal products, 73 percent of fruits and nuts, and 43 percent of vegetables (Carman and Alston). An additional sixteen national programs are important for some California commodities.

Economists have a role to play in facilitating better-informed decisions by the industry and policymakers by providing economic analysis that evaluates the design and operation of these programs. This fact has been recognized both by government, which requires regular reviews and benefit-cost assessments for the programs, and by the courts, which have used economic assessments as evidence about the programs, stimulating investment by both the private and the public sector in economic evaluations. A considerable investment has been made in benefit-cost assessments of programs in California and nationally.

This paper provides an overview of mandated commodity programs in California and summarizes and interprets existing evidence on their economic impacts. The analysis draws on the 2005 book edited by Kaiser, Alston, Crespi, and Sexton, which documents the institutional arrangements for the California programs, summarizes the history of recent litigation, and presents the results of a number of benefit-cost studies, all conducted recently and involving quantitative analysis of the benefits and costs of mandated commodity programs in California. In large part, this paper summarizes the lessons from the book in terms of both the methodology of commodity program evaluation and the effectiveness of these programs in stimulating demand and increasing producer incomes. Because of the significant expenditure of funds on these programs, with government support and approval, and the controversy that continues to surround the programs, a review of their effects and an appraisal of the valuation methodology can be beneficial to commodity board leaders, applied economists with a commodity and marketing focus, and policymakers.

A Model for Analyzing the Benefits and Costs of Check-Off-Funded Promotion

The benefit-cost analysis in each case study discussed in this paper rests on a common general conception of a commodity market and how that market is affected both by collection of a check-

off and by use of the funds to enhance demand. This common conception is often expressed in terms of a model of supply and demand, as in figure 1, where S_0 represents the initial market supply of a commodity and D_0 represents the initial market demand. The market equilibrium price is P_0 and equilibrium quantity is Q_0.

Applying some additional assumptions that are standard in much of applied economics, the same supply and demand curves can be used to measure the total variable costs and benefits from consumption. Specifically, these assumptions (known as Harberger's three postulates of applied welfare economics) state that (1) the area beneath the demand curve represents total consumer benefits from consuming the commodity, (2) the area beneath the supply curve represents total variable costs of production, and (3) we can add up benefits and costs across producers and consumers. Hence, for the initial quantity of Q_0, total benefits from consumption are equal to the trapezoidal area $0abQ_0$ and, given consumer expenditure of P_0Q_0 = area $0P_0bQ_0$, consumer surplus is equal to the triangle area abP_0. Similarly, for the initial quantity of Q_0, total variable costs of production are equal to the trapezoidal area $0cbQ_0$ and, given total revenue of P_0Q_0 = area $0P_0bQ_0$, producer surplus is equal to the triangle area P_0bc. The total net benefit in this market is equal to the sum of producer surplus and consumer surplus, the area abc.

Now suppose a check-off of k per unit is collected from producers of the commodity. We can model the check-off as a parallel shift in supply from S_0 to S_1. The check-off generates revenue, R, that is used to finance some activity (promotion, for example) designed to enhance demand. Suppose the expenditure of R results in a shift in demand from D_0 to D_1, reflecting an increase in consumers' willingness-to-pay for the commodity by r per unit for any quantity. As a result of the combined effects of the check-off and promotion, the industry equilibrium shifts from point b to point e, the market price (inclusive of the check-off) increases to P_2, and the

quantity demanded increases to Q_2, which is also the quantity supplied at a producer net price of $P_2 - k$. This represents the final equilibrium, reflecting both the promotion-induced increase in willingness-to-pay of r per unit and collection of the check-off of k per unit that finances the promotion, with the total expenditure on promotion equal to the amount raised by the check-off: $R = kQ_2$. (The equilibrium at price P_1 and quantity Q_1 would apply if the promotion had been financed as a lump sum rather than as a check-off, as is assumed in some studies.)

The implications for consumer, producer, and national welfare can be represented in terms of changes in the respective areas in figure 1, but for clarity only the key elements of figure 1 that are required for the welfare analysis are replicated in figure 2. First, we wish to measure the change in producer surplus between the initial equilibrium at point b (P_0, Q_0) and the final equilibrium reflecting the check-off and the induced demand shift, point e (P_2, Q_2). This producer net benefit can be measured as the area of additional producer surplus associated with the increase in production from Q_0 to Q_2 measured along the supply curve that includes the check-off S_1—in other words, the trapezoidal area P_2ejg.

Most benefit-cost studies of returns to generic commodity promotion take some measure of producer benefits that corresponds to the producer surplus measure just described. Many commodity promotion studies measure only producer benefits because the legislation authorizing the programs often specifies that the program objective is to enhance producer welfare. However, some studies also seek to measure benefits to consumers and the nation. These broader analyses have been hampered by a lack of definitive results in the literature on the appropriate way to measure consumer-welfare impacts. Some studies have assumed that the consumer benefits generated by promotion and by processing research can be reasonably approximated using changes in the standard measure of consumer surplus (e.g., see Alston, Freebairn, and

James 2003). Using this assumption, we can measure consumer net benefits as the area of additional consumer surplus associated with the increase in consumption from Q_0 to Q_2 measured along the final demand curve D_1—in other words, the trapezoidal area $hieP_2$. Finally, combining the producer and consumer benefits yields an estimate of net national benefits from check-off-funded promotion programs compared with an absence of those programs, which is equal to the area *ejghi* in figure 2.

These measures of producer, consumer, and national benefits are all net measures that reflect the costs of the check-off, the benefits from the promotion-induced demand increase, and the distribution of those costs and benefits between producers and consumers. Often, in addition to (or instead of) reporting net measures of this type, studies report a benefit-cost ratio that is equal to the gross benefits from the promotion-induced demand shift divided by the costs of the check-off. Benefit-cost ratios can be computed for producers, consumers, and the nation as a whole. In practice, studies of the returns to check-off-funded promotion programs generally have not measured consumer benefits and thus have not measured national benefits, partly because of uncertainty about the appropriate measure of consumer (and thus national) benefits but also because the authors were interested specifically in benefits to producers. When studies report benefit-cost ratios, generally they refer to the producers' gross gain associated with the promotion (which is best measured as the change in producer surplus, area P_2ejg in figure 2) divided by either (i) the loss of producer surplus associated with collection of the check-off, which is equal to area $P_1df(P_2 - k)$ in figure 1 (in other words, the final producer incidence of the check-off), or (ii) the total expenditures on promotion, which are equal to $P_2ef(P_2 - k) = kQ_2$ in figure 1 and figure 2—in other words, the initial incidence of the check-off that does not take the shifting of the tax into account.

This comparison of total benefits and total costs yields a measure of an *average* benefit-cost ratio (ABCR): comparing the costs and benefits from having the program with a hypothetical alternative of no program. Some studies compute a *marginal* benefit-cost ratio (MBCR) by comparing the costs and benefits associated with a small hypothetical change in the size of the program. The ABCR indicates whether a program was profitable while the MBCR indicates whether it would have been profitable to increase the size of the program ($MBCR > 1$) or reduce it ($MBCR < 1$).

A further dimension for variation among studies is the dynamic structure. In the model shown in figures 1 and 2, the effects of the check-off and promotion all occur within a single period and a comparative-static analysis is appropriate. In some cases, especially in studies using short time periods for the unit of analysis (e.g., monthly rather than annual), the effects of a check-off or promotion in one period may extend to subsequent periods, so it is necessary to model the dynamics of response and to aggregate the measures of benefits and costs over time. The procedures for this aggregation are well established, but getting the dynamics right is not always simple and the models may be difficult to interpret. In most cases of commodity promotion, the dynamic elements of demand response are a minor part of the story, but in some cases they are important enough to warrant a dynamic analysis.

In some settings, measures must take into account real-world market characteristics that complicate the models and the analyses. For instance, for internationally traded commodities it may be important to separate domestic and foreign elements of demand (or supply), not only to represent the consequences of the check-off and promotion for prices and quantities but also to isolate impacts on domestic producers and consumers. In other cases, it may be appropriate to consider implications not only for the commodity under study but also for closely related

commodities (Kinnucan 1996; Alston, Freebairn, and James 2001). In addition, some markets are influenced by government policies that affect the analysis of check-off-funded promotion (e.g., McCutcheon and Goddard, Goddard and McCutcheon, and Alston, Carman, and Chalfant). And in some cases models can be designed to take into account other market distortions, such as the effects of agribusiness firms exercising market power (Suzuki et al., Zhang and Sexton, Kinnucan 2003). These complications notwithstanding, the essential story and conceptual apparatus remain as outlined in figures 1 and 2.

Empirical implementation of this apparatus to quantify benefits and costs of commodity promotion rests on obtaining reasonable measures of the elasticities of supply and demand with respect to prices and the elasticity of demand response to promotion. Most of the studies of check-off-funded programs have used econometric techniques applied to historical data to estimate the key parameters representing demand response to both price and check-off-funded activities but have used other approaches to estimate (or calibrate) at least some of the parameters of supply and demand. The econometric approach is only feasible in an *ex post* analysis in which the consequences of past policies can be observed and measured. In an *ex ante* analysis that measures the future benefits and costs of a policy, noneconometric approaches must be used.

Coverage and Characteristics of the Case Studies

The California promotion evaluation studies cover a broad range of commodities, including almonds, avocados, dried plums (prunes), eggs, raisins, strawberries, table grapes, walnuts, and milk and dairy products. Most of the studies evaluated the impacts of generic advertising or other forms of commodity promotion on domestic or export markets. The case studies include some common methodological elements, but there are also important differences that affect the

interpretation of results and comparability across studies. All of the studies employed (at least implicitly and perhaps with extreme elasticity assumptions) a conceptual model of supply and demand for an agricultural commodity with competitive market clearing as previously outlined. The studies focused on the benefits to agricultural producers (often including first handlers of farm products as well as farmers) as opposed to society more broadly (including consumers and others as well as producers) from enhanced demand generated by collective commodity promotion programs and other activities funded by commodity assessments.

The studies all combined estimates of parameters that measured the size of the shifts in demand induced by the programs with other parameters that represented the supply and demand for the commodity to infer benefits to producers from the shift. The approaches used to estimate these parameters differed among studies. Most of the California case studies used econometric methods to estimate at least some of the parameters, but many of the studies also used assumed or "guesstimated" values for other parameters based on some combination of economic theory, knowledge of the industry and its markets, and reviews of estimates in the literature.

The studies of commodity promotion programs are all *ex post* analyses. They used econometric methods to estimate parameters representing how demand responds to promotion (and sometimes price) and typically used aggregate (market-level) historical time-series data. A few studies (Alston et al. 2005b, Alston et al. 2005c) had access to less aggregative data that they used to buttress the analysis.

Given that check-off assessment rates are typically less than 1 percent of the value of sales, promotion programs can be profitable even if they have only very small positive effects on demand, and it is difficult to identify and measure small effects precisely using econometric analysis of aggregate time-series data because many factors that affect demand are changing

simultaneously. The precision of the estimates of benefits and costs depends on the accuracy of the structure of the model and on the precision of the estimates of the parameters. The studies profiled here varied in the extent to which they paid attention to the role of modeling assumptions and other choices in the analysis, factors that could influence the estimates of demand response to price and promotion and thus potentially affect the precision of the estimates of the benefits to producers. Still, all of the studies that used econometric methods found statistically significant program-induced market impacts.

The studies used different concepts of benefits and benefit-cost ratios, and these differences have important implications for the extent to which the measures are comparable. Some reported ABCRs. In an *ex post* analysis of an existing program, correctly computing this ratio requires a simulation of market outcomes in the absence of the program while accounting for the impacts of both the program and the collection of assessments to fund it. In contrast, some studies reported a MBCR.

A further complication arises when we consider the potential for some of the costs of the assessment to shift to consumers. Some studies measured the ABCR or MBCR using the change in producer surplus as the relevant concept of benefits and total expenditures on programs as the relevant concept of costs. Others used the producer incidence of the assessment required to finance the expenditure rather than the total expenditure as the relevant concept of costs. Table 1 provides a summary of the benefit-cost ratios reported by the California case studies and whether they were based on total program costs (subscript T) or producer incidence of costs (subscript I).

These different concepts of benefit-cost ratios—use of marginal versus average ratios and use of the producers' share of total costs rather than total costs of the program—can result in quite substantial differences in the measures. MBCRs and ABCRs based on the producer

incidence of the assessment are preferred, both because they are conceptually correct for evaluating producer benefits and also because they are not sensitive to the estimated or assumed value for the price elasticity of supply since the benefits and costs change roughly in proportion to one another when the supply elasticity changes. In contrast, ratios based on total program costs are highly sensitive to the supply elasticity (e.g., reducing the supply elasticity from 5.0 to 1.0 causes the benefit-cost ratios to increase by roughly a factor of five).

A rationale for the use of total expenditure rather than producer incidence in the denominator is that the resulting estimate is conservatively low. However, an objective of "conservatism" could be applied in a more informative way by taking a pessimistic interpretation of an unbiased estimate rather than by choosing an approach that is inherently biased to an extent that is not apparent in the estimate alone. Further, as noted, an approach that relies on total expenditure means that the estimate is sensitive to the elasticity of supply, a parameter that is notoriously difficult to estimate and always difficult to interpret; yet it is a parameter that is almost always assumed as part of a study.

The MBCR is less naturally relevant than the ABCR to the question of whether a program pays for itself. The MBCR is, however, the appropriate concept for informing decisions about marginal changes to programs, such as whether the current expenditure is optimal or whether it should be decreased or increased. The assumption of diminishing marginal returns to program expenditures is commonly made but not always built into models. In some cases, then, MBCRs will coincide with ABCRs (if there are constant marginal returns to promotion throughout), while in other cases MBCRs will be less than ABCRs (if there are diminishing returns throughout). On this basis, one might feel comfortable in using the MBCR as a conservatively low estimate of the ABCR. However, as noted by Kinnucan and Zheng, if fixed

costs are important, using diminishing marginal returns is not sufficient to assure that the MBCR is less than the ABCR.

On the other hand, an approximation formula—based simply on elasticities of demand with respect to price and promotion and promotion intensity—can be used to estimate the MBCR with considerably less effort than is required to estimate the ABCR. Specifically, as described by Alston et al. (1998, pp. 35–36) and more recently by Alston et al. (2005b, p. 128) and Kinnucan and Zheng, the MBCR for an increase in promotion financed by a check-off can be approximated using the formula $MBCR \approx \alpha/|\eta|\ V/A = \rho/\iota$, where V is the value of sales or gross revenue, A is the advertising expenditure (such that V/A is the inverse of the advertising intensity ι), α is the elasticity of demand with respect to advertising, and η is the elasticity of demand with respect to price (such that $\rho = \alpha/\eta$ is the price flexibility of demand with respect to advertising). It may be worth reporting MBCRs rather than ABCRs in a context where the ABCR is the relevant concept if the alternative is to have no measure of the benefit-cost ratio.

Main Findings

Here we summarize the main results from twelve case-study evaluations of the demand-enhancement activities of California programs that are reported in detail in the book by Kaiser, Alston, Crespi, and Sexton.

California Table Grapes

The California Table Grape Commission was established in 1968. In recent years, California table grapes have had, in round figures, a farm value approaching $1 billion per year and expenditures on promotion have been around $10 million per year, about two-thirds of which has been directed at the domestic market.

Alston et al. (2005c) report the results of an evaluation of promotion in the "domestic" market (combining the United States and Canada) based on an econometric model of per capita demand using annual data over the period 1968 through 1993. The promotion variable represented the sum of expenditures on advertising, merchandising, and public relations, and this variable entered the models in square-root form to ensure diminishing returns to promotion. Benefit-cost ratios were computed using a range of assumed values for the elasticity of supply and using discount rates of 0 and 3 percent per annum. Using the midpoint of the range of supply elasticities (1.0) and a discount rate of 3 percent and measuring costs as the producers' incidence of the assessments (I), the resulting $ABCR_I$ was 144.9 and the $MBCR_I$ was 80.1. Thus, the benefits were very great relative to producers' costs. The estimates were also quite precise. Additional econometric work using monthly data on domestic markets and models of export demand reinforced the results from the annual aggregate model, allowing further confidence in the conclusions.

Eggs in California

Between 1984 and 2002, the California Egg Commission (CEC) developed and implemented advertising and promotion campaigns aimed at increasing egg consumption and enhancing returns for California egg producers. In 2002, in the face of legal challenges, a referendum was held and 89 percent of the firms voting chose to permanently suspend CEC operations. CEC had an annual budget of about $4 million, with approximately 90 percent of that budget directed toward advertising, public relations, promotion, and education and research. California produces more eggs than any other state in the nation—more than twenty million laying hens produce more than four billion eggs with a total farm value of $282 million per year.

Schmit, Reberte, and Kaiser describe an econometric model of supply and demand in the California egg industry that they used to evaluate the impact of generic egg advertising in the state on producer prices and returns over a ten-year period. Econometric estimation indicated that the generic advertising efforts had a positive impact on producer prices and net profits—the long-run price flexibility of demand with respect to advertising was estimated to be 0.13.

The model was used to simulate the market with existing advertising expenditures and with expenditures 1 percent greater than actual. Using total expenditures (T) as the producer cost measure, a 1 percent change in advertising expenditures resulted in an average increase in producer prices of 0.13 percent (similar to the flexibility estimate since supply is highly inelastic), which implied that the $MBCR_T$ was 6.9. The resulting impact on net returns was evaluated over a 90 percent confidence interval of the advertising parameter estimates, indicating returns exceeded costs to producers over the entire interval.

Dried Plums

The California Dried Plum Board (CDPB), established in 1952, operates under a state marketing order and levies assessments to fund production research and generic promotion of California dried plums (prunes). Annual expenditures on promotion averaged about $3 million during the period analyzed in the study. California is the world leader in dried plum production, accounting for 99 percent of U.S. production and 70 percent of the world's supply. Alston et al. (2005b) studied the economic impacts of industry-financed market development and promotion activities for California dried plums, specifically asking whether CDPB's marketing expenditures directed to the domestic market affected demand for and sales of California dried plums and whether net revenues to producers from the programs increased enough to offset program costs.

The authors constructed and estimated an econometric model of demand for California dried plums using monthly data from September 1992 through July 1996. Estimates of the elasticity of demand for dried plums ranged from –0.3 to –0.5, depending on the model specification. The elasticity of demand for promotions by the leading marketer, Sunsweet Growers, with respect to CDPB promotion was estimated to be about 0.05 and the corresponding elasticity was about 0.16.

To translate these demand shifts into measures of economic return, the authors constructed an equilibrium simulation model of the industry by combining the preferred demand model with a domestic-market residual-supply function that was calibrated to replicate observed industry outcomes. Alternative supply elasticities of 0, 0.5, 1.0, 2.0, and 5.0 were used to reflect a range of lengths of run. Results from the simulation analysis suggested that, over the four-year period analyzed, investments by dried plum growers in CDPB-funded promotion yielded an $MBCR_I$ of 2.65. This result suggests that the industry could have profitably invested even more in promotion during this period.

Avocados

The California Avocado Commission (CAC) is a state marketing order. In 2003, the California avocado crop had a farm value of $373 million and CAC spent almost $10 million on advertising and promotion in 2003/04. Determining the effectiveness of CAC's avocado promotion is difficult given that avocado production is highly variable. Carman and Craft describe an economic model of the California avocado market that incorporates this supply variation, as well as producers' planting responses to demand changes. They used this model to determine the impact of marketing expenditures on the supply and demand for California avocados and,

ultimately, to determine whether the benefits resulting from CAC's marketing expenditures outweighed the cost of the assessments.

Based on their preferred econometric model, Carman and Craft estimated that the price flexibility of demand was –1.3 and the price flexibility of demand with respect to CAC advertising expenditures was 0.13. Carman and Craft looked at both short- and long-run benefits to avocado producers and found that short-run average benefits were about $5 to $6 per dollar expended by CAC. However, over time, because of high returns for avocados that in part resulted from CAC's expenditures, producers responded by planting more acreage. The long-run benefits, after allowing for production responses, were approximately $1.7 of benefit for every dollar spent by CAC. The long-run marginal return was lower, approximately $1.4 per dollar spent by CAC.

Almonds

California produces nearly all of the U.S. supply of almonds and 75 to 80 percent of the world supply. The farm value of the harvest now typically exceeds $1 billion. Insight into the economic effects of litigation against commodity promotion programs can be obtained from the analysis by Crespi and Sexton (2005) of the promotion program undertaken by the Almond Board of California (ABC). During the crop years 1994/95 to 1996/97, ABC's advertising expenditures were curtailed as a result of a lower-court decision. They resumed in 1997, when that order was overturned following the Supreme Court's *Glickman v. Wileman Bros. & Elliot, Inc.* decision. Crespi and Sexton (2005) report that annual promotion expenditures during the three-year period averaged $3.9 million whereas the normal level of expenditures would have averaged $11.2 million. Thus, this suspension provided a natural experiment by which Crespi and Sexton could assess the economic impact on almond producers.

Beginning with an econometric model of U.S. demand for almonds, Crespi and Sexton (2005) first established that advertising by both ABC and Blue Diamond Almonds (the largest almond handler) had positively affected demand for almonds in the United States.[2] The estimated elasticity of almond demand with respect to promotion expenditures was 0.13. Next, using the results of previous studies, they determined a range of probable supply elasticities for California almonds and used those elasticities in a simulation model of the U.S. almond market that took into account the effect of promotion on export markets as well. The implied $MBCR_T$ for the industry ranged from 3.0 to 10.0, depending on the supply elasticity used, indicating that more spending on almond advertising would have been profitable. Next, the authors used their model to perform a hypothetical analysis of the market had the suspension of promotion not occurred. They concluded that the suspension of ABC advertising from 1994/95 to 1996/97 resulted in accrued losses to producers (i.e., foregone profits) ranging from $84 million to $231 million.

Walnuts

The Walnut Marketing Board (WMB), established in 1948 as a federal marketing order representing walnut growers and handlers, promotes use of walnuts through publicity, product promotion, research, and education programs. Expenditures on domestic promotion have run about $1.5 million annually in recent years. The farm value of walnuts in 2002 was $305 million.

Kaiser (2005) reports the results of an analysis of the domestic marketing efforts of WMB using an econometric model of per capita demand for 1980 through 1999. A key finding was that WMB's marketing programs have had a positive and statistically significant impact on per capita walnut demand since 1980. The estimated elasticity of domestic demand with respect to marketing expenditure was 0.005.

The estimated demand equation was used to simulate market conditions with and without WMB efforts. The simulation results indicated that WMB's programs increased annual walnut utilization in the United States by 124,665 tons between 1984 and 1999, or 7,333 tons per year. WMB also had a positive impact on the walnut grower's price that ranged from just under 3 cents per pound in the case of an inelastic supply response to just under 0.5 cents per pound in the case of a very elastic supply response. The $ABCR_T$ computed for WMB's marketing activities exceeded 1.0 for every elasticity of supply response considered in the simulation and ranged from 9.72 for the most inelastic supply response considered to 1.65 for the most elastic supply response, indicating that WMB's marketing programs were profitable for the domestic walnut industry.

Exports of California Raisins

The Raisin Administrative Committee (RAC) conducts export promotion programs in various countries with the principal aim of increasing exports of California raisins. RAC is part of a federal raisin marketing order that has been operating in California since 1949. Most of RAC's export promotion has targeted Japan and the United Kingdom. In the late 1990s, expenditures on export promotion of raisins totaled 274 million yen ($2.5 million based on current exchange rates) in Japan and 832,402 pounds ($1.5 million) in the United Kingdom. In recent years, the farm value of California raisins has ranged from $500 million to $750 million.

Kaiser, Liu, and Consignado evaluated the economic impact of raisin export promotion in Japan and the United Kingdom using an econometric model of per capita import demand in the two countries and annual data from 1965 through 1998. Based on the estimated elasticities of demand with respect to promotion of 0.029 in Japan and 0.133 in the United Kingdom, the statistical evidence indicated that the programs have had a positive impact on demand for

California raisins in both countries. Furthermore, the simulation results indicated that the magnitudes of the impacts were not trivial; they accounted for an increase in sales of 6,107 metric tons per year in Japan and 18,116 metric tons per year in the United Kingdom.

The resulting $ABCR_T$ estimates for markets in Japan and the United Kingdom were 5.1 and 15.3, respectively, and the overall $ABCR_T$ for the two markets combined was 7.3. A 90 percent confidence interval indicates that the lower-bound estimates for the $ABCR_T$ in Japan and the United Kingdom were 4.6 and 14.6, respectively.

Demand Enhancing Strategies for Strawberries

The California Strawberry Commission (CSC), initiated in 1955, had an annual budget of $6.8 million in 2002 for promotion and research activities. The annual value of processed and fresh strawberry production exceeded $1.1 billion in 2002, placing strawberries in the top ten commodities in California in terms of gross value of production. Carter, Chalfant, and Goodhue investigated the impacts of a consumer-oriented advertising campaign by CSC that focused on the health benefits of strawberries. The authors estimated a price-dependent model of weekly demand for strawberries using data from 1990 through 2003. This model is somewhat unique among those used for promotion evaluation in that advertising was measured as the percentage of markets in the United States featuring advertising for a particular week and the advertising was sponsored not only by CSC but also by retailers nationwide.

The authors found that the advertising variable was statistically significant with a price flexibility of 0.16. If one assumes that a 1 percent increase in advertising expenditure has an effect on sales equivalent to that of a 1 percent increase in the share of the national market on ad, one can use the estimated price flexibility with respect to advertising, ρ, along with a measure of advertising intensity, ι, to compute an approximate $MBCR_I = \rho/\iota$ (details on this approximation

formula are presented in the preceding section). Given CSC expenditures on advertising of about $4 million annually and a gross value of sales of about $1.1 billion in 2003, the advertising intensity was about 0.36 percent, implying that the $MBCR \approx 44$ and, thus, that the industry could have profitably invested in more advertising.

Nutrition Education Programs

The Dairy Council of California (DCC) has been operating since 1945. Alston, Chalfant, and James evaluated an industry-funded nutrition education program, *Exercise Your Options* (*EYO*), provided to junior-high-school children in California. The authors used food records completed by students before and after the program, along with food records from a control group, to estimate the effects of learning about nutrition on consumption patterns. Alston, Chalfant, and James found evidence of a statistically significant change toward a healthier diet, including an increase in dairy consumption. They estimated the benefits and costs to the dairy industry associated with the implied increase in demand for milk, taking into account the effects of milk-price policy. The authors' intermediate estimate of the value of benefits was $89,317 over the first thirty days and $62,040 over a subsequent thirty days when assuming that 100 percent of the increase was in the form of fluid milk. The total implied benefit of $151,357 was slightly greater than the cost of the program, $150,126.

Alston, Chalfant, and James also reported a range for the $ABCR_T$ by allowing program benefits to persist for up to twelve months with different rates of decay of program impacts and allowing for different assumptions about the distribution of the demand increase between fluid milk and other products. The $ABCR_T$ ranged from 0.13 to 1.74, increasing both with months of *EYO* persistence and with the fluid-milk share. The authors noted that the measure of benefits to producers (and thus the $ABCR_T$) represented a lower-bound estimate of the social benefits

because it did not account for the implications for social costs of nutrition-related illnesses such as osteoporosis, coronary heart disease, and cancer.

Public Relations Expenditures for Strawberries

The California strawberry industry faced significant scares related to the safety of consuming strawberries in 1996 and 1997 resulting from disease outbreaks that were attributed, incorrectly in one case, to eating strawberries. Richards and Patterson specifically examined the impacts of these health scares on demand for California strawberries and grower profits and the effectiveness of CSC's efforts to counter negative media reports associated with the disease outbreaks—"spin control."

Richards and Patterson developed a dynamic monthly demand system for fresh fruits (strawberries, apples, bananas, grapes, and oranges) that included quantitative measures of both positive and negative media reports associated with consuming strawberries. Their hypothesis that negative information has a stronger impact on demand than offsetting information provided by CSC was supported by the econometric results, in which bad news had almost twice the impact on strawberry demand as the same quantity of good news.

Estimated impacts on producer profits from the 1996 and 1997 health scares depended on assumptions about the price elasticity of supply, and Richards and Patterson provide simulations for supply elasticities ranging from 0.01 (almost perfectly inelastic) to 5.00 (very elastic). For a midrange supply elasticity of 1.0, they estimated that a 10 percent shock in unfavorable media exposure would reduce producer returns by $218.6 million over the long run but that use of defensive media reports ("spin") could reduce those losses to $105.2 million, giving the defensive media efforts a value of $113.4 million. Since CSC spent about $0.25 million countering the 1997 health scare, the analysis suggests that this money was very well spent.

New-Uses Research

The California Dairy Research Foundation (CDRF) provides funds for research and development. CDRF receives approximately three-quarters of its budget from national check-off revenue generated in California and the remaining one-quarter of its budget from national check-off revenue generated in all states.[3]

Balagtas and Sumner reported the results of their evaluation of the economic returns to an ongoing research program at the University of California that has been funded jointly by CDRF and the university. The program is developing new uses for whey protein—a byproduct of cheese manufacture—in the form of films and coatings for both food and nonfood applications. Between 1990 and 2005, the research was projected to have cost a present value of $3.8 million. National and California dairy check-off programs will have contributed $2.23 million, of which approximately 41 percent, or $0.92 million, can be attributed to dairy farms and the rest to processors, marketing firms, and consumers. To estimate the benefits, the authors inferred an estimate of the increase in demand for milk (implied by estimates of the likely adoption of the new whey-based products) that they incorporated into a simulation model of the dairy industry. For a relatively conservative time pattern of technology adoption, the estimated present value of benefits to U.S. producers (net of the $0.92 million invested by producers in the research program) was approximately $126 million. Thus, while total benefits to producers were small relative to total dairy farm revenue—U.S. dairy farm cash receipts were $24.7 billion in 2001—benefits were large relative to the cost of the investment. Nearly 70 percent of the producers' cost of the program was borne by California dairy producers, but the California producers' share of producer benefits was less than 20 percent of total producer benefits, which is approximately proportional to the state's share of milk production. Nevertheless, the $ABCR_T$ for California

producers was high—between 40.0 and 79.0—and the corresponding internal rate of return for California producers ranged from 25 to 29 percent per annum.

Quality Testing and Certification

The value of U.S. production of pistachios grew from almost nothing in 1976 to $333 million in 2002, mostly in California. A federal marketing order was approved in 2004 to mandate quality standards and an inspection program to assure consistency in the quality of California pistachios. The main provisions set standards and require testing for quality and for aflatoxin, a cancer-causing toxin produced by fungi found in many nuts and grains. Proponents argued that the marketing order would increase consumer confidence and reduce the chance of an aflatoxin event in the pistachio market, thereby stimulating demand and enhancing consumer benefits and producer returns.

Alston et al. (2005a) conducted an *ex ante* evaluation of the benefits and costs of the marketing order prior to its approval, looking forward fifty years from its introduction in 2004. They used a stochastic dynamic simulation of the industry under scenarios with and without the proposed marketing order in place to compare the stream of simulated outcomes and the consequences for measures of economic welfare of producers in the industry, consumers, the nation as a whole, and the world. Assessing the implications of the marketing order required incorporating into the simulation a number of parameters representing the odds of an aflatoxin event, the consequences of an event for demand, and the extent to which a marketing order would reduce those magnitudes. Using the baseline parameter values, they estimated the benefit to producers to be $68.9 million in present-value terms. Two-thirds of the benefit, $165.4 million, would accrue to domestic consumers. This is a significant value that is large relative to

the $36.7 million cost of compliance with the program (about 0.5 percent of the current value of domestic sales). The corresponding $ABCR_I$ for California growers was 13.5.

Summary and Synthesis of Findings from the Case Studies

The main findings from the case studies reported here are represented in summary terms in table 1. The first eight case studies reported in table 1 are *ex post* evaluations of advertising or promotion programs based on econometric estimation of demand models, including variables representing expenditures on promotion (or elements of promotion such as advertising). The program expenditures have varied in recent years between $2.4 million and $14 million annually. The program promotion intensities were typically close to 1 percent and generally in the range of 0.5 percent to 2 percent. All of the studies found statistically significant demand responses to price and promotion and the measures of demand response to promotion were generally large (i.e., elasticities ranging from 0.05 to 0.16) relative to the intensities of promotion, indicating a favorable benefit-cost ratio.

The benefit-cost ratios ranged from 0.8 to 144.9, but some of this range reflected different concepts. ABCRs were generally higher than their counterpart MBCRs, and the ratios based on producer incidence of costs were higher than those based on total expenditures. In many contexts, the appropriate measure of profitability is the ABCR based on producer incidence. Consequently, the benefit-cost ratios in table 1 that refer to an ABCR based on total expenditures or to an MBCR tend to understate the profitability of the investments, and the evidence from those studies is more favorable than may be presumed by readers who are not conscious of the different measures. The range is much narrower if we set aside the results from Alston et al. (2005c) on California table grapes, which yielded very high benefit-cost ratios. In the other studies, the range was 0.8 to 80.1 across all of the different concepts of benefit-cost

ratios. Since a benefit-cost ratio greater than 1.0 is sufficient for profitability, the evidence consistently indicates that the programs, on balance, have been highly profitable.[4]

The last four case studies summarized in table 1 refer to evaluations of California programs investing in activities other than promotion with a view to enhancing demand for the relevant farm product. None of these studies entailed direct econometric estimation of demand response to the program expenditure being evaluated, and they involved a variety of different types of data and modeling approaches. The ABCRs reported in these studies express benefits relative to total expenditures on the program activities being evaluated (in part because the activities in question typically use only a fraction of total income from assessments in the relevant industry). The range of outcomes is enormous, but generally the evidence indicates very large benefits relative to program expenditures on research on new uses for whey ($ABCR_T = 40–79$), mandated inspections and quality standards for pistachios ($ABCR_T = 13.5$), and "spin control" for strawberries in the event of a food scare ($ABCR_T = 454$). The exception is the dairy council's nutrition education program, for which the range was smaller ($ABCR_T = 0.13–1.74$) and close to 1.0.

Finally, to provide some context for the results in table 1, corresponding benefit-cost ratios from the literature for other commodity promotion programs are summarized in table 2. We opted to include only studies published since 1990 that reported a benefit-cost ratio for commodity promotion conducted by organizations based in the United States or Canada. The studies reported in table 2 were identified by formally reviewing the contents of a selected set of ten agricultural economics journals and informally assessing other publications and the "gray" literature.[5] Coverage of the relevant literature is comprehensive but not complete in the sense that it leaves out many estimates that have not been published in accessible or appropriate form,

as well as several published studies that evaluated promotion programs but did not estimate a benefit-cost ratio. In table 2, "Median" refers to the reported benefit-cost ratio for studies that reported just one estimate and the midpoint of the range for studies that reported multiple estimates (reflecting different parameter values, modeling assumptions, types of expenditures, or differences in other features of the analysis). Median values range from 1.0 to 44.5 for an *MBCR* and from 1.0 to 29.1 for an *ABCR*. The bulk of the estimates are in single digits but well over 1.0, indicating findings that promotion programs have been profitable and, in the case of marginal measures, that they could have been profitably expanded.[6] Thus, the conclusions drawn from these studies are consistent with those from the California studies.

Conclusion

Mandated marketing programs have been important in California since the middle of the twentieth century but have been particularly so during the past twenty-five years. These programs have undertaken a variety of activities, but much of the growth in recent years, and the lion's share of the expenditures across all of the programs combined, has been in generic promotion programs. It is not surprising, then, that the focus of litigation and of the majority of the economic studies has been on the promotion programs.

The studies reported here used a variety of approaches reflecting various factors. An important dimension of differences among the studies is in the concepts of benefits and costs that were measured and used to compute the ratios. Some studies used a measure of changes in producer gross revenue as a measure of benefits whereas others used a measure of producer surplus (or profit). Producer surplus is more appropriate generally, although gross revenue is a good proxy if costs are approximately constant (alternatively stated, if supply is fixed), as is reasonable to assume for perennial crops in the short run. On the cost side, the main difference

was between studies that estimated the producer incidence of assessments used to finance the program and studies that used the total cost of the relevant activities as the measure of costs (and we note that some studies used the total cost of all program expenditures on all activities as a proxy for expenditures on specific activities).

The ideal measure of the benefit-cost ratio for evaluating whether a program is profitable for growers is the ABCR, in which "benefit" refers to the additional producer surplus (or profit) given by the program activities being evaluated relative to producer surplus without such activities and "cost" refers to the additional expense borne by producers from the assessment used to finance the activities in question. When studies used alternatives to this measure, almost always the implication was a reduction of the ratio. Authors have justified this practice by saying that the estimate was therefore "conservative," but this practice also entails a systematic bias in some of the evidence in the literature and in how it is read and understood since the details of the interpretation are rarely made clear or emphasized. The practice also adds to the difficulty of comparing results across studies.

Even when studies use the same concepts for benefits and costs, there can be problems of comparability. Results can differ among studies because market conditions or assumptions vary such that the true benefit-cost ratios differ or because the studies used different procedures and made different errors. It is important to recognize that errors are inescapable. We can never "know" true values for benefit-cost ratios or the parameters on which estimates of the ratios should be based. At best, perhaps, we can seek to obtain measures that are conceptually sound, statistically unbiased, and reasonably precise. Some of the studies summarized here reported just a single estimate of a benefit-cost ratio, some reported a range of benefit-cost ratios reflecting different parameter values, and some went so far as to use Monte Carlo experiments to generate

probability distributions of benefit-cost ratios.[7] Some studies reported benefit-cost ratios for different (i) types of expenditures, (ii) lengths of run of evaluation, or (iii) concepts of benefits and costs; some computed confidence intervals for upper and lower bounds on the benefit-cost ratios; others reported estimates using a variety of techniques or data sources.

It is important to note, however, that the studies have tended to rely on statistical analysis of aggregate time-series data. This approach has the drawback that the analysis is inherently dated—the evidence is explicitly about the past—which limits its direct applicability to questions about the future. In addition, with such data it is challenging econometrically to isolate and precisely measure the effects of commodity-program expenditures from other factors affecting demand. Further, working with aggregate expenditure data precludes researchers from providing insight into which types of programs are most effective, which regions or target markets are most amenable to promotion activities, and so forth. Stronger reinforcement for the findings might be obtained by using different kinds of data, such as cross-sectional data (e.g., for particular states, cities, or other submarkets), panel data, or data from controlled experiments, but such data often are not available.

These caveats notwithstanding, the overwhelming conclusion from the studies reported and reviewed in this paper is that mandated commodity marketing programs have been very profitable for California's agricultural producers. In every case, the evidence suggests that one can be reasonably confident that the benefits have well exceeded the costs and that it would have been profitable for producers to have increased expenditures on the programs.

In spite of this evidence, disputes over the future of the programs continue. Some producers and handlers oppose the programs on ideological grounds or because they believe that they do not benefit from them. The ideological and legal aspects are beyond the scope of

economic analysis, but economists can contribute to the debate by providing information about the economic consequences of the programs. The value of this information can be enhanced by investing in making estimates of aggregate benefit-cost ratios (i) more meaningful (by measuring appropriate concepts and reporting them clearly and consistently), (ii) precise (by obtaining more and better data and by using the best methods), and (iii) credible (by increasing professional scrutiny and criticism of the estimates). These comments relate primarily to measures of overall program impact. Some issues, however, may depend not only on whether the programs pay but for whom they pay. In addition to more and better information about the aggregate impacts of the programs, it may be appropriate to invest more in measuring the distribution of impacts—a task that is even more difficult to do and that produces results that are likely to be more controversial.

Footnotes

[1] Because of its compelled financing, generic advertising has been challenged as in infringement of participants' First Amendment rights to freedom of speech and association. The U.S. Supreme Court ruled in favor of generic advertising in two of the three cases it has heard on this issue. In *Glickman v. Wileman Bros. & Elliot, Inc.* in 1997, the Court upheld generic advertising of California tree fruit, holding that the regulatory nature of the program gave more latitude to governmental involvement in commercial speech. In *United States v. United Foods* in 2001, the Court ruled against generic advertising of mushrooms on the basis that the mushroom program differed from the earlier fruit case precisely because the mushroom industry was not highly regulated. Most recently in *Johanns v. Livestock Marketing Association et al.* in 2005, the Court ruled that beef promotion is government speech rather than private speech and hence falls outside of First Amendment scrutiny. An extended discussion on the litigation regarding generic advertising programs is available in Crespi.

[2] Combining ABC and Blue Diamond expenditures was appropriate because the industry operated a credit-back program wherein handlers could receive credits against the assessment for qualified promotion programs.

[3] The California Milk Advisory Board (CMAB) and Dairy Management, Inc. (DMI) are each funded by a national marketing assessment, a check-off, of $0.15 per hundred pounds of milk sold.

[4] A referee posed the interesting question of how these returns can persist in competitive industries. Although fully answering this provocative question exceeds the scope of this study, we note that dynamics of adjustment in competitive industries cause *overall* profits to be zero in long-run equilibrium. This result is not inconsistent with particular activities, such as promotion,

being highly profitable. Arbitrageurs cannot "enter" generic promotion; rather, they must enter production of the commodity in an attempt to capture profits from a successful promotion program. High rates of return to promotion are not inconsistent with normal profits to producing the commodity, and if the successful promotion program were eliminated, the industry would experience short-run losses and producers would exit.

[5] The journals surveyed include *Agribusiness: An International Journal*, *Agricultural Economics*, *Agricultural and Resource Economics Review*, *American Journal of Agricultural Economics*, *Australian Journal of Agricultural and Resource Economics*, *Canadian Journal of Agricultural Economics*, *European Review of Agricultural Economics*, *Journal of Agricultural and Applied Economics*, *Journal of Agricultural Economics*, *Journal of Agricultural and Resource Economics*, and *Review of Agricultural Economics.*

[6] We regard the interesting question of why programs have apparently stopped short of the optimal expenditure as beyond the scope of this study. Addressing this question would require consideration of informational constraints on board decision makers, financial constraints imposed on boards, determinants of the distribution of benefits and costs of check-offs and the programs they finance among different types of producers and between producers and others, the related political economy aspects of commodity boards, and so forth. Alston addressed some of these types of issues in the context of check-off-funded agricultural research organizations in Australia; see also Alston, Freebairn, and James (2003, 2004).

[7] The Monte Carlo analyses may be seen as precursors to a recent article by Davis. Davis derives the relationship between statistical significance of estimates of promotion effects in demand models and the statistical significance of the estimates of the net benefits or profits.

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Table 1. Twelve case studies of California commodity promotion programs

Commodity and Organization	Study	Activity	Estimated Benefit-Cost Ratio
California Table Grape Commission	Alston, Chalfant, Christian, Meng, and Piggott	Domestic promotion, U.S. and Canada	$ABCR_I = 144.9$ $MBCR_I = 38.8$ $ABCR_T = 80.1$ $MBCR_T = 21.5$
California Egg Commission	Schmit, Reberte, and Kaiser	Advertising	$MBCR_T = 6.9$
California Dried Plum Board	Alston, Carman, Chalfant, Crespi, and Sexton	Domestic promotion, U.S.	$MBCR_I = 2.7$ $MBCR_T = 0.8$
California Avocado Commission	Carman and Craft	Domestic promotion, U.S.	$ABCR_{T(SR)} = 5.0$ $ABCR_{T(LR)} = 1.7$ $ABCR_{T(LR)} = 2.2$ $MBCR_{T(LR)} = 1.4$
Almond Board of California	Crespi and Sexton	Domestic promotion, U.S.	$MBCR_T = 6.2$

Walnut Marketing Board	Kaiser	Domestic promotion, public relations, education, research	$ABCR_T$ = 1.65–9.72
Raisin Administrative Committee	$ABCR_T$ = 5.1 (Japan) and Consignado	Kaiser, Liu,	Export promotion $ABCR_T$ = 15.3(UK) $ABCR_T$ = 7.3 (Total) $MBCR_T$ = 3.2 (UK) $MBCR_T$ = 0.4 (Japan)
California Strawberry Commission	Carter, Chalfant, and Goodhue		Advertising $MBCR_I$ = 44.0
Dairy Council of California	Alston, Chalfant, and James	Nutrition education	$ABCR_T$ = 0.13 (low) $ABCR_T$ = 1.74 (high)
California Strawberry Commission	$ABCR_T$ = 454	Richards and Patterson to a food scare affecting strawberries	Public relations related
California Dairy Research Foundation	Balagtas and Sumner	New-uses research for whey	$ABCR_T$ = 40 (low) $ABCR_T$ = 79 (high)

Pistachio Marketing Board	Alston, Brunke, Gray, and Sumner	Mandated inspection and quality assurance for pistachios	$ABCR_I = 13.5$

Notes: $ABCR_I$ ($MBCR_T$) refers to the average (marginal) benefit-cost ratio with costs measured using producer incidence (total expenditure). The $MBCR_T$ for California Strawberry Commission advertising was computed using the approximation $MBCR_I = \rho/\iota$, which is the price flexibility of demand with respect to advertising divided by the advertising intensity. The subscript SR refers to short run and LR to long run.

Table 2. Estimated benefit-cost ratios for advertising and promotion for various U.S. commodities[a]

Study[b]	Commodity and Program	Benefit-Cost Ratio[c] Low	Median	High
Studies Reporting Marginal Benefit-Cost Ratios		--------*MBCR*--------		
Halliburton and Henneberry[d]	Almonds – U.S. export promotion	3.7	4.8	5.9
Kinnucan, Duffy, and Ackerman[d]	Cotton – U.S. export promotion		1.1	
Ding and Kinnucan[d]	Cotton – U.S. domestic and export promotion	1.5	2.8	5.1
Kinnucan and Miao (1999)[d,e]	Catfish – U.S. advertising	7.5	13.0	22.6
Kaiser and Schmit[d]	Eggs – U.S. advertising	1.8	4.3	6.7
Gopinath	Hazelnuts – Oregon promotion		26.0	
Kinnucan and Miao (2000)[d,e]	Milk – U.S. advertising	4.4	7.2	11.8
Gopinath and Cornelius	Onions – Idaho-Oregon promotion	1.0	1.0	1.1
Onunkwo and Epperson[d]	Pecans – U.S. export promotion	6.5	6.7	6.8
Crawford et al.	Cotton – U.S. promotion		44.5	
Erikson, Mittelhammer, and Schotzko	Pears – U.S. promotion	3.4	10.4	18.4
Costa et al.	Vidalia onions – U.S. promotion		22.5	
Davis[d,f]	Beef – U.S. promotion		9.8	
Studies Reporting Average Benefit-Cost Ratios		--------*ABCR*--------		
Ward and Forker	Apples – Washington advertising		7.0	
Ward and Lambert[d,e]	Beef – U.S. promotion		6.7	
Weiss, Green, and Havenner	Walnuts – California export promotion		6.0	

Nichols, Capps, Davis, and Bessler	Cotton – U.S. promotion	3.2	3.4	3.5
Kaiser (1997)[d]	Dairy – U.S. advertising		3.4	
Armah and Epperson[d]	Orange juice – U.S. export promotion	5.6	7.6	51.9
Ward	Beef – U.S. advertising	4.9	5.8	6.7
Lenz, Kaiser, and Chung[d]	Dairy – New York State advertising	0.2	1.2	2.7
Le, Kaiser, and Tomek[d]	Red meat – U.S. export promotion		15.6	
Williams[d]	Soybeans – U.S. export promotion and production research	4.3	10.3	12.5
Ferguson, Nakamoto, and Sawada	Papayas – Hawaiian promotion	10.1	21.1	31.2
Davis et al.	Pork – U.S. advertising	4.8	15.5	26.2
Van Sickle and Evans	Tomatoes – Florida promotion	27.2	29.1	30.9
Capps, Bessler, and Williams	Orange Juice – Florida advertising	2.9	4.5	6.1

Notes:

[a] The literature (1990–2005) also includes several estimates for other countries. Marginal benefit-cost ratios have been estimated for Norwegian salmon export promotion (1.3; Kinnucan and Myrland[d,e]), Japanese milk advertising (5.2; Suzuki et al.[d]), Canadian milk advertising (9.3; Kinnucan and Belleza[d]), and Ontario milk advertising (17.5; Venkateswaran and Kinnucan[d,e]).

[b] Studies are listed separately according to whether they reported marginal versus average benefit-cost ratios and then first in chronological (year of study) and then in alphabetical (name of commodity) order within years.

[c] For studies reporting only one value, we listed the value under Median.

[d] Refereed journal article.

[e] These articles reported net returns, meaning that these are benefits net of advertising expenditures. To make these estimates comparable to others in the table, 1 has been added to the number to make it a benefit-cost ratio.

[f] This benefit-cost ratio is based on a "marginal industry profit" rather than the more standard notion of producer surplus.

Figure Titles

Figure 1. A commodity market model of check-off-funded promotion

Figure 2. Benefits and costs of check-off-funded promotion