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Do Farmers Get an Equal Bang for Their Buck from Generic Advertising Programs? A Theoretical and Empirical Analysis

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This study presents a theoretical and empirical analysis of the distribution of generic advertising benefits across individual producers. We develop a closed-economy partial equilibrium model that allows for the presence of producer heterogeneity in supply response. Analytical results indicate that producers having less elastic supply response capture more benefits per dollar expended than producers with more elastic supply response. The extent of unequal distribution depends on parameters characterizing industries. The inequality may not be a significant problem for some industries, especially where the firm-level supply elasticities are not substantially different among producers, but it may be an important issue when industries have substantial differences in firm-level supply elasticities and firm sizes, and experience large demand shifts due to advertising programs.

Key words: distribution, farm size, generic advertising benefit, supply elasticity

Introduction

During the past decade, a number of economists have studied the economic impacts of generic advertising and found, in most cases, positive net benefits for producers (see Ferrero et al. for an annotated bibliography of generic promotion research). Agricultural producers generally consider generic advertising profitable and have invested approximately $750 million annually for various generic advertising programs in U.S. agriculture (Forker and Ward). However, a key question remains unanswered in the literature: "Do producers benefit equally from these gains?" This issue is of particular concern to producers because an equal amount of checkoff money is charged for each commodity unit marketed and is collectively invested for the common business objective of increasing consumer demand.

The purpose of this study is to examine the distribution of generic advertising benefits across individual producers. Specifically, we focus on whether the benefit-cost ratios are equal across producers. If they are unequal, producers and policy makers may want to know who benefits more. A theoretical model is developed to determine the size of the firm-level producer gains from generic advertising based on the following logic. Generic advertising increases market demand, and the per unit checkoff assessment charged to

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producers decreases market supply. As a result, individual producers face a new market price, and the size of individual producers' gain is determined by the change in market price and slopes of their own supply functions. This indicates that if heterogeneity exists in supply responsiveness, the distribution of benefits from generic advertising will differ across producers.

The presence of producer heterogeneity in supply response has been addressed in the literature in two general ways: by firm size and by regional locations. Regarding firm size, large firms tend to be more capital-intensive and specialized than small firms, and therefore large firms should be less able to change output in response to a price change in the short run (Marion; Mills and Schumann; Oi). In the long run, however, large firms can more easily accommodate beyond-the-short-run adjustments; with their greater access to capital, they are better able to adjust fixed inputs than small firms (Baumol; Oi). This argument appears well suited for U.S. agriculture where large farms use presumably more capital-intensive and specialized facilities (for example, dairy and hog industries) compared to small farms (Antle; Binswanger; Kislev and Peterson). Recent studies that have empirically estimated supply elasticities by farm size in U.S. agriculture support this argument—i.e., small farms have greater supply elasticity in the short run, while large farms have greater supply elasticity in the long run (Adelaja; Adelaja, Govindasamy, and LoPresti; Tauer).

Agricultural production exhibits regional differences due to climate, land prices, management practices, and other business conditions. These regional variations in production characteristics suggest that producers in different regions may respond differently to changing market prices. There is a large body of literature reporting on the existence of different supply elasticities by region or state in U.S. agriculture. Huy, Elterich, and Gempesaw, for example, estimated supply elasticities for milk and livestock for nine selected regions and found northeastern and midwestern farmers were less responsive in milk production and more responsive in livestock production than their California and Texas counterparts. Chavas, Kraus, and Jesse also reported regional differences in milk supply elasticities. Villezca-Becerra and Shumway examined supply elasticities for 25 individual crop and livestock commodities for four major agricultural states (California, Iowa, Texas, and Florida) and found a wide range of elasticities across the country.

There have been numerous studies in the literature on the distribution of research or promotion benefits in multistage production systems (e.g., Alston and Scobie; Alston, Sexton, and Zhang; Chung and Kaiser 1999; Freebairn, Davis, and Edwards; Holloway; Wohlgenant). While these analyses focused on the distribution of benefits at each level of the food system—such as production, processing, and consumption—no attention has been given to the distribution of advertising benefits among producers. Market equilibrium models, which have been widely used in the literature investigating the distribution of research or promotion benefits, are also applicable to the evaluation of advertising benefits among producers. Because the primary objective of the present study is to examine the distribution of collective advertising benefits to individual participants, we develop a partial equilibrium model that allows for the presence of producer heterogeneity in supply responsiveness.

The article is organized as follows. In the next section, we derive a conceptual model with a graphical illustration. This is followed by a brief discussion highlighting the implications of the analytical results. The conceptual model is then applied to the New

York dairy industry as a numerical illustration. Our summary and conclusions are provided in the final section.

The Model

Figure 1 shows the impact of generic advertising on price, quantity, and welfare measurement in a single perfectly competitive market. For simplicity, no marketing sector is specified, and price and quantity are measured in terms of farm equivalent units in this study. In figure 1(A), the without-advertising situation is depicted with market demand (D_0), market supply (S_0), and initial equilibrium at point A. The market equilibrium price and quantity at this point are P_0 and Q_0, respectively. Suppose the introduction of a checkoff program decreases market supply from S_0 to S_1 and, as a result of effective advertising financed by the checkoff program, market demand increases from D_0 to D_1. In this case, the farm price increases from P_0 to P_1, and quantity increases from Q_0 to Q_1 (note the assumption here that demand increases by more than the decrease in supply), changing producers' surplus from area P_0Ab to area P_1Bd.

Consider two types of producers, producers 1 and 2, in the market. Figure 1(B) illustrates changes in equilibrium points for the two producers corresponding to changes in market equilibrium points in figure 1(A). Supply curves for producers 1 and 2 before assessing checkoff money are represented by S_0^1 and S_0^2, respectively, which correspond to S_0 in the market. Note that the two producers have the same output $Q_0^{1(2)}$ in initial equilibrium A^1, but have different slopes of supply functions.[1] Supply curves for the two producers after assessing checkoff money are represented by S_1^1 and S_1^2, respectively, corresponding to market supply curve S_1 in figure 1(A). As a result of shifts of individual supply and market demand, the equilibrium point for producer 1 moves from A^1 to B^1, with the corresponding change in producer surplus from area $P_0A^1b^1$ to area $P_1B^1d^1$. Similarly, the equilibrium point for producer 2 moves from A^1 to B^2, accompanied by the change in producer surplus from area $P_0A^1b^2$ to area $P_1B^2d^2$. Returns to producers 1 and 2 increase by the areas $P_1B^1I^1r$ and $P_1B^2I^1r$, respectively. In this case, it is clear that producer 2 benefits more than producer 1 in terms of change in producer surplus. A central issue in this study, however, is to investigate who benefits more in terms of benefits per dollar expended, i.e., benefit-to-cost ratio, because equal assessment is charged per unit sales regardless of producer size or location.

To investigate this question in detail, we assume linear market demand and firm-level marginal cost functions as:

(1) $$P = a - \alpha Q \qquad \text{(market demand)},$$

(2) $$MC_i = b_i + \beta_i q_i, \quad i = 1, 2 \qquad \text{(firm } i\text{'s marginal cost)},$$

where a, b_i, α, and β_i are intercept terms and slope coefficients of demand and marginal cost functions. Since the first-order necessary condition of a perfectly competitive firm's

[1] In this case, we assume that both producers have the same size in initial equilibrium to clearly show how an individual firm's supply response affects the returns to advertising at the firm level. In reality, however, individual firms do not necessarily have equal outputs. For example, small producers may be more responsive to price change than large producers, or vice versa. We address this issue later in detail.

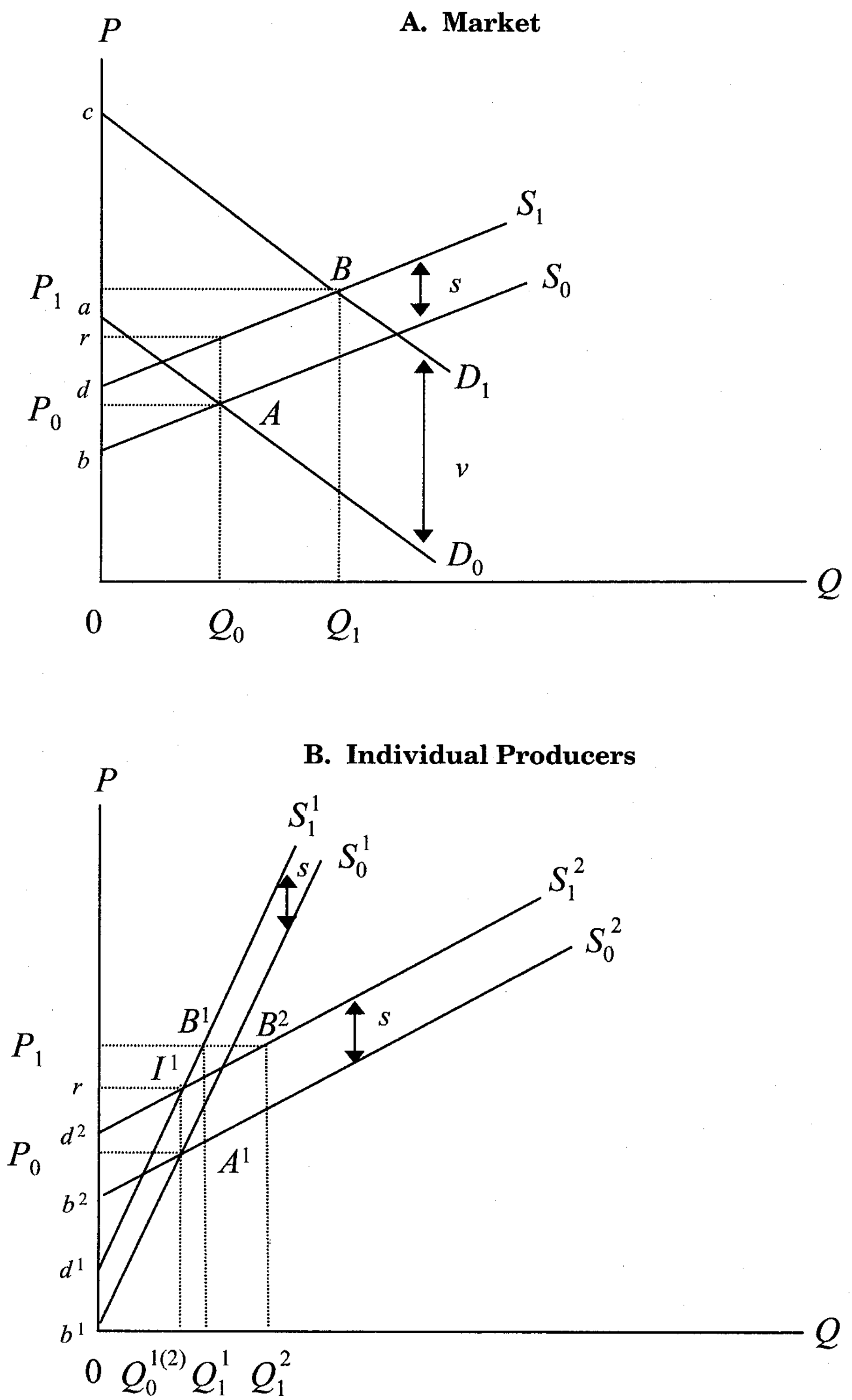

Figure 1. Welfare effects of generic advertising

profit-maximization problem implies $P = MC_i$, aggregating the two marginal cost functions horizontally yields the following market supply function:

$$P = b + \beta Q, \tag{3}$$

where $b = (b_1\beta_2 + b_2\beta_1)/(\beta_1 + \beta_2)$, and $\beta = \beta_1\beta_2/(\beta_1 + \beta_2)$. Then, from equations (1)–(3), the initial equilibrium price and quantity (at both market and firm levels) before a checkoff program can be calculated as:

$$P_0 = \frac{\alpha(b_1\beta_2 + b_2\beta_1) + a\beta_1\beta_2}{D},$$

$$Q_0 = \frac{\beta_1(a - b_2) + \beta_2(a - b_1)}{D},$$

$$q_0^1 = \frac{-\alpha(b_1 - b_2) + \beta_2(a - b_1)}{D},$$

$$q_0^2 = \frac{\alpha(b_1 - b_2) + \beta_1(a - b_2)}{D},$$

where $D = \alpha(\beta_1 + \beta_2) + \beta_1\beta_2$.

Second, we assume that the checkoff assessment increases the marginal cost of each producer by s per unit, and that generic advertising financed by the checkoff fund increases demand, and accordingly price, by v per unit.[2] Then, after implementing a checkoff assessment and generic advertising program, the new equilibrium price and quantity are given by (4)–(7):

$$P_1 = P_0 + \frac{\alpha(\beta_1 + \beta_2)s + v\beta_1\beta_2}{D}, \tag{4}$$

$$Q_1 = Q_0 + \frac{(\beta_1 + \beta_2)(v - s)}{D}, \tag{5}$$

$$q_1^1 = q_0^1 + \frac{\beta_2(v - s)}{D}, \tag{6}$$

$$q_1^2 = q_0^2 + \frac{\beta_1(v - s)}{D}. \tag{7}$$

Finally, given equilibrium prices and quantities, each producer's gain and the corresponding benefit-cost ratio can be estimated as follows:

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[2] A reviewer pointed out that advertising could also change the slope of the demand curve. We concur, and have addressed this issue in a previous study (Chung and Kaiser 1998). However, we believe that the alternative assumptions of demand shift do not change the conclusion of this study because change in the slope of the demand curve would only affect market price and quantity without altering the direction of the unequal distribution.

(8) Producer i's Gain (ΔPS_i)

$$= \int_{P_0+s}^{P_1} \left(MC_i'(Q)\right)^{-1} dP$$

$$= \tfrac{1}{2}\left(P_1 - P_0 - s\right)\left(q_1^i + q_0^i\right)$$

$$= q_0^i \left[\frac{\alpha(\beta_1 + \beta_2)s + v\beta_1\beta_2}{D} - s\right]\left[1 + \frac{\beta_j(v - s)}{2q_0^i \cdot D}\right], \quad i \neq j \qquad \text{[by equations (4), (6), and (7)]}$$

$$= q_0^i \frac{(v - s)\eta P_0 Q_0}{\Omega}\left[1 + \frac{\varepsilon_i(v - s)\eta Q_0}{2\Omega}\right] \qquad \text{[by definitions of } \Omega, \eta, \text{ and } \varepsilon_i\text{];}$$

(9) Producer i's Benefit-Cost Ratio (R_i)

$$= \frac{\Delta PS_i}{sq_1^i} = \frac{q_0^i \dfrac{(v - s)\eta P_0 Q_0}{\Omega}\left[1 + \dfrac{\varepsilon_i(v - s)\eta Q_0}{2\Omega}\right]}{sq_0^i\left[1 + \dfrac{\beta_j(v - s)}{q_0^i \cdot D}\right]}, \quad i \neq j$$

$$= \frac{(v - s)\eta P_0 Q_0}{\Omega s}\left[\frac{1 + \dfrac{\varepsilon_i(v - s)\eta Q_0}{2\Omega}}{1 + \dfrac{\varepsilon_i(v - s)\eta Q_0}{\Omega}}\right]$$

$$= \frac{(v - s)\eta P_0 Q_0}{\Omega s}\left[1 - \frac{1}{2\left(\dfrac{\Omega}{\varepsilon_i(v - s)\eta Q_0} + 1\right)}\right], \quad i = 1, 2,$$

where $\Omega = P_0[(\varepsilon_1 q_0^1 + \varepsilon_2 q_0^2) + \eta Q_0]$, $\eta = (1/\alpha)(P/Q)$, and $\varepsilon_i = (1/\beta_i)(P/q_i)$. Equation (9) shows that the differences in benefit-cost ratios among individual producers depend on their respective supply elasticities. The equation indicates that when an equal amount of checkoff assessment is charged to each producer for each unit of commodity marketed, producers with more inelastic supply functions would benefit more than producers with more elastic supply functions.[3,4] Therefore, if the results from previous studies of supply

[3] As noted earlier, equation (9) was derived for the case where the two farms produce exactly the same output in initial equilibrium. One question raised by a reviewer was whether the result is consistent when the two farms have different sizes of operation in initial equilibrium. Equation (9) clearly shows that firms' initial equilibrium (or size) does not affect our conclusion. Specifically, the conclusion drawn from equation (9) is valid for all three cases: case 1, where the two farms have the same size; case 2, where small farms have more inelastic supply response; and case 3, where large farms have more inelastic supply response. (Graphical and algebraic illustrations for cases 2 and 3 are available from the authors upon request.)

[4] Another interesting question, also asked by a reviewer, is whether the result presented in this study is reproducible by a more generalized approach such as an equilibrium displacement model (EDM) framework. The EDM has been widely used in the literature examining research and promotion benefits (e.g., Alston, Norton, and Pardey; Chung and Kaiser 1999; Wohlgenant). For brevity, we do not present a lengthy discussion of the EDM here, but we were able to show that the EDM produces the same result as that presented in this study. (See the previous studies identified above for the derivation of the EDM in general; the EDM developed for this study is available from the authors upon request.)

Table 1. Values of Variables and Parameters for the New York State Dairy Industry (1993)

Variable/ Parameter	Value	Description
Q (mil. lbs.)	11,557	Annual milk production for the industry [a]
Q_S (cwt)	11,813	Mean of annual milk production for small-sized farms [b]
Q_L (cwt)	51,787	Mean of annual milk production for large-sized farms [b]
P_0 ($/cwt)	13.00	Farm price of milk [a]
η	0.42 [c] or 0.69 [d]	Absolute value of the demand elasticity for milk
ε_S	0.50 or 0.55	Supply elasticity for milk for small-sized farms [b]
ε_L	0.70 or 1.04	Supply elasticity for milk for large-sized farms [b]
v ($/cwt)	0.65, 1.30, or 2.60	Demand-shifting parameter induced by generic advertising
s ($/cwt)	0.15	Supply-shifting parameter induced by checkoff assessment

[a] U.S. Department of Agriculture/Economic Research Service
[b] Tauer
[c] George and King
[d] Liu et al.

elasticities based on firm size are valid, then our results show that smaller firms (with more inelastic long-run supply response) would benefit more than larger firms in the long run. To examine this issue, we next consider an application of the model to the New York dairy industry.

An Application to the New York Dairy Industry

In this section we provide an illustrative application of the theoretical model for the New York dairy industry. The application offers insights as to how distributions of producer gains vary by producer size. New York dairy farmers spend almost $18 million annually on promoting the consumption of fluid milk. The assessment rate is 15¢ per hundredweight (cwt) of milk marketed. We consider the effects of both checkoff assessment (from the cost side) and advertising (from the demand side) on the producer gain. Net producer gains and benefit-cost ratios are assessed for alternative assumptions concerning demand and supply elasticities, and advertising effectiveness.

Table 1 provides a listing of the data and parameters required to apply equations (8) and (9). Price and quantity variables refer to the farm level and represent 1993 conditions. In 1993, New York dairy farmers produced approximately 12 billion pounds of milk. Categorization of small and large farms follows Tauer, who recently estimated supply elasticities by producer size for the New York dairy industry for the period 1985–93. Tauer divided New York dairy farms into two groups: small farms with fewer than 100 cows, and large farms with 100 or more cows (in 1993). The average farm size was 64 cows for small farms and 250 cows for large farms. Based on 1993 statistics, small- and large-sized farms in New York State represented 53.1% and 46.9% of total production, respectively [U.S. Department of Agriculture/Economic Research Service (USDA/ERS)]. Tauer reported that the estimated long-run elasticities of supply for small and large farms were 0.55 and 1.38, respectively.

In general, long-run elasticities are recommended, especially when an analysis is performed for long-term policy applications. However, if all inputs are available with a condition of free entry, the long-run supply elasticity should be infinity. In this case, one cannot derive producer surplus because no rent is left over for fixed inputs (Mishan). To avoid this conceptual problem, we computed intermediate-run supply elasticities with five- and 10-year adjustment periods from Tauer's estimates.[5] Supply elasticities with a five-year time horizon were 0.50 and 0.70 for small and large farms, respectively, and corresponding elasticities with a 10-year period were 0.54 and 1.04.[6] The results are consistent both with the conceptual discussions and with the empirical results presented in the previous section. Demand elasticities for milk are combined elasticities of the fluid and manufacturing demands using the fluid milk utilization ratio of 59% (USDA/ERS). Demand-shifting parameters representing advertising effectiveness were computed as 5%, 10%, and 20% of the farm price of milk (P_0).[7]

Estimates of producer gains and benefit-cost ratios from the 1993 New York dairy industry data are presented in table 2. Although the results are consistent with the conclusions drawn from the conceptual model—i.e., small farms (with more inelastic long-run supply) consistently gain more from generic advertising than do large farms (with more elastic supply)—the differences in benefit-cost ratios between large and small farms are marginal, ranging from 0.01 to 0.15. The differences in benefit-cost ratios were translated into money values and reported as *EB* in the last column of each comparison. *EB* represents the extra benefits that large firms would have obtained if their benefit-cost ratios had been the same as those for small firms. The annual *EB*s for large firms range from $78 to $1,274. Overall, as the difference in long-run supply elasticities increases, the difference in benefit-cost ratios increases (see comparisons I and II, table 2). Also, as advertising effectiveness (v) and demand elasticity (η) increase, the gap in benefit-cost ratios between small and large farms widens.

The empirical results in table 2 indicate that the unequal distribution is not a significant problem in some industries, especially where the firm-level supply elasticities are not substantially different among producers. However, table 2 also reports that the

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[5] A reviewer pointed out the conceptual problem discussed here and suggested using supply elasticities of an intermediate time horizon. The authors appreciate the reviewer's valuable input.

[6] A reviewer noted that the supply curve could be perfectly elastic or horizontal at a given price (constant cost industry), positively sloped (increasing cost industry), or even negatively sloped (decreasing cost industry), depending on how input prices respond as all firms change output. In this study, we assume a positively sloped supply curve because we believe that most agricultural industries are increasing cost industries. If the supply curve is not positively sloped, the distributional effects at the firm level would not necessarily produce the same results.

[7] Demand-shifting parameters (v) can be estimated from a demand equation that includes an advertising expenditure variable. Consider a demand equation with an advertising program as follows:

$$P' = a - \alpha Q + v = a - \alpha Q + \gamma AD,$$

where AD represents advertising expenditures and γ is the corresponding coefficient. Given advertising elasticity (η_{AD}), i.e., $\eta_{AD} = (\partial Q/\partial AD)(AD/Q) = (\gamma/\alpha)(AD/Q)$, we can compute an estimate of v as:

$$v = \gamma \cdot AD = \eta_{AD} \cdot \alpha \cdot Q = \frac{\eta_{AD}}{\eta} \cdot P_0.$$

Then, for example, when the respective elasticities of advertising (η_{AD}) and price (η) are 0.076 (Chung and Kaiser 1998) and 0.42 (George and King), the estimated v becomes 2.35 (an increase in price of approximately 18%).

Table 2. Estimated Producer Gains and Benefit-to-Cost Ratios from Generic Advertising for the 1993 New York State Dairy Industry

Description		COMPARISON I					COMPARISON II				
		ε_S = 0.50		ε_L = 0.70			ε_S = 0.55		ε_L = 1.04		
		ΔPS_S	R_S	ΔPS_L	R_L	EB_L	ΔPS_S	R_S	ΔPS_L	R_L	EB_L
Case 1: η = 0.42	(a) v = 0.65	2,462	1.39	10,809	1.38	78	2,078	1.17	9,140	1.15	159
	(b) v = 1.30	5,692	3.16	25,040	3.13	240	4,802	2.67	21,212	2.63	323
	(c) v = 2.60	12,251	6.66	54,105	6.59	575	10,328	5.63	46,001	5.53	832
Case 2: η = 0.69	(a) v = 0.65	3,197	1.78	14,043	1.77	79	2,790	1.57	12,285	1.55	159
	(b) v = 1.30	7,402	4.09	32,598	4.05	322	6,458	3.57	28,598	3.52	406
	(c) v = 2.60	15,981	8.57	70,725	8.49	666	13,934	7.50	62,384	7.35	1,274

Notes: Average small farm = 64 cows; average large farm = 250 cows. *EB* (last column under each comparison) denotes extra benefits that large farmers would have garnered if their benefit-to-cost ratios had been the same as those of small farmers; i.e., $EB_L = \Delta PS_L^* - \Delta PS_L = (R_S - R_L) \cdot sq_1^L = (R_S - R_L) \cdot \Delta PS_L / R_L$, where ΔPS_L^* represents a hypothetical producer gain for large farmers assuming a benefit-to-cost ratio identical to that of small farmers.

Table 3. Estimated Producer Gains and Benefit-to-Cost Ratios from Generic Advertising Under Alternative Scenarios

Description		SCENARIO I					SCENARIO II				
		ε_S = 0.50		ε_L = 0.70			ε_S = 0.02		ε_L = 3.74		
		ΔPS_S	R_S	ΔPS_L	R_L	EB_L	ΔPS_S	R_S	ΔPS_L	R_L	EB_L
Case 1: η = 0.42	(a) v = 0.87	3,551	2.00	155,940	1.98	1,575	1,640	0.93	72,950	0.91	1,603
	(b) v = 1.74	7,882	4.37	346,780	3.34	3,115	3,621	2.04	163,940	1.98	4,968
	(c) v = 3.48	16,677	9.04	736,570	8.97	5,748	7,584	4.27	353,300	4.02	22,095
Case 2: η = 0.69	(a) v = 0.87	4,612	2.58	202,600	2.55	2,384	2,398	1.36	107,390	1.32	3,254
	(b) v = 1.74	10,251	5.65	451,510	5.61	3,219	5,295	2.99	243,220	2.84	12,846
	(c) v = 3.48	21,755	11.66	962,940	11.56	8,330	11,090	6.25	534,940	5.72	49,566

Notes: Average small farm = 64 cows; average large farm = 2,500 cows. For definition of *EB* columns, see notes to table 2.

unequal distribution could be a significant issue when industries have substantial differences in firm-level supply elasticities and firm sizes, and experience large demand shifts due to advertising programs. Consequently, we reestimated producer gains and benefit-cost ratios under two alternative scenarios. The outcomes of these alternative scenarios are presented in table 3. Scenario I compares benefits of small farms (with an average size of 64 cows) to benefits of large farms (with an average size of 2,500 cows) when the industry faces a higher milk price [$17.45/cwt, Order No. 2 Uniform Price in December 1998 (USDA/Agricultural Marketing Service)] and, as a result, larger demand shifts.[8] The firm-level supply elasticities remain the same as those of the five-year adjustment period in table 2. In scenario II, we consider the 95% confidence interval on supply elasticities of a five-year time horizon (lower bound for small farms and upper bound for large farms), while other conditions remain the same as in scenario I.

The benefit disparity is considerably greater in table 3, and in some cases the amount of unequal distribution is substantial. For example, when we consider case 2(c) under scenario II (i.e., when $\varepsilon_S = 0.02$, $\varepsilon_L = 3.74$, $\eta = 0.69$, and $\upsilon = 3.48$), small farms gain approximately 50¢ more from each dollar spent in generic advertising. In other words, large farms would have gained approximately $50,000 more annual income if their benefit-cost ratios were the same as those of small farms. Furthermore, note that the average size of large farms in table 3 is 2,500 cows. It is not unusual, however, to find large dairy farms with over 2,500 milk cows—particularly in states like California, Florida, and New Mexico. The amount of unequal distribution for these very large dairy farms would be much greater than $50,000.

Summary and Conclusions

Like many commodity programs, generic advertising funded by checkoff programs has been directed at raising the aggregate and average gains of program participants. Accordingly, most studies have evaluated the generic advertising benefits as aggregate or average values. However, unlike government-funded programs, the checkoff program has been mandated to collect the checkoff fund from each producer equally on a per unit basis, and then invest for collective business purposes. Therefore, an important question is: "Do participants benefit equally?" In this study, we have attempted to answer this question both analytically and empirically. Our conceptual model shows that producers having less elastic supply response capture more benefits per dollar expended than producers with more elastic supply response. An empirical application to the New York dairy industry indicates that generic advertising yields more benefits to small farms than to large farms, but that the extent of unequal distribution is marginal.

In summary, the empirical results from the 1993 New York dairy industry data indicate that although the conceptual model clearly shows producers do not benefit equally from the collective advertising programs, the extent of the inequality may not be substantial. However, the limited disparity in the New York dairy industry does not necessarily suggest that inequality in distribution of generic advertising benefits by firm size is always insignificant. It should be noted that those estimates of benefit-cost ratios

[8] Note that demand shift parameters (υ) were calculated as a proportion of farm milk price.

in our analysis depend on parameters characterizing the industry (e.g., industry output, categorization of firms, price, advertising effectiveness, demand and supply elasticities). Therefore, the extent of unequal distribution may be quite significant in some industries where there are highly elastic demand, high advertising effectiveness, and wide variations in firm-level supply elasticities and firm sizes. In these industries, a checkoff fund invested in generic advertising could provide considerable benefits to some producers but substantially less to others.

In contrast to previous literature, we formulated a generic advertising model that focused on the evaluation of advertising benefits to individual producers. This model permits a concise yet coherent method of examining the extent of unequal distribution of advertising benefits across producers. This framework can easily be extended to the assessment of producer-level benefit distribution for various agricultural policies and programs.

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References

Adelaja, A. O. "Price Changes, Supply Elasticities, Industry Organization, and Dairy Output Distribution." *Amer. J. Agr. Econ.* 73(February 1991):89–102.

Adelaja, A. O., R. Govindasamy, and E. LoPresti. "Explaining Differentials in Supply Elasticity." Mimeograph, Dept. of Agr., Food, and Resour. Econ., Rutgers University, New Brunswick NJ, 1998.

Alston, J. M., G. W. Norton, and P. G. Pardey. *Science Under Scarcity.* Ithaca NY: Cornell University Press, 1995.

Alston, J. M., and G. M. Scobie. "Distribution of Research Gains in Multistage Production Systems: Comment." *Amer. J. Agr. Econ.* 65(May 1983):353–56.

Alston, J. M., R. J. Sexton, and M. Zhang. "The Effects of Competition on the Size and Distribution of Research Benefits." *Amer. J. Agr. Econ.* 79(November 1997):1252–65.

Antle, J. M. "The Structure of U.S. Agricultural Technology, 1910–78." *Amer. J. Agr. Econ.* 66(November 1984):414–21.

Baumol, W. J. *Business Behavior, Value, and Growth.* New York: Macmillan Co., 1959.

Binswanger, H. P. "The Measurement of Technical Change Biases with Many Factors of Production." *Amer. Econ. Rev.* 64(1974):964–76.

Chavas, J.-P., A. F. Kraus, and E. V. Jesse. "A Regional Analysis of Milk Supply Response in the United States." *N. Cent. J. Agr. Econ.* 12(July 1990):149–64.

Chung, C., and H. M. Kaiser. "Determinants of Temporal Variations in Advertising Effectiveness." NICPRE Res. Bull. No. 98-03, Cornell University, Ithaca NY, 1998.

———. "Distribution of Gains from Research and Promotion in Multistage Production Systems: Comment." *Amer. J. Agr. Econ.* 81(August 1999):593–97.

Ferrero, J., L. Boon, H. M. Kaiser, and O. D. Forker. "Annotated Bibliography of Generic Commodity Promotion Research" (revised). NICPRE Res. Bull. No. 96-03, Cornell University, Ithaca NY, 1996.

Forker, O. D., and R. W. Ward. *Commodity Advertising: The Economics and Measurement of Generic Programs.* New York: Lexington Books, 1993.

Freebairn, G. W., J. S. Davis, and G. W. Edwards. "Distribution of Research Gains in Multistage Production Systems." *Amer. J. Agr. Econ.* 64(February 1982):39–46.

George, P. S., and G. A. King. *Consumer Demand for Food Commodities in the United States with Projections for 1980.* Giannini Foundation Monograph No. 26, University of California at Berkeley, March 1971.

Holloway, G. J. "Distribution of Research Gains in Multistage Production Systems: Further Results." *Amer. J. Agr. Econ.* 71(May 1989):338–43.

Huy, B., J. G. Elterich, and C. M. Gempesaw, II. "Recent Changes in the Regional Structure of U.S. Dairy Production." *Northeast. J. Agr. and Resour. Econ.* 17(April 1988):36–45.

Kislev, Y., and W. Peterson. "Prices, Technology, and Farm Size." *J. Polit. Econ.* 90(1982):578–95.

Liu, D. J., H. M. Kaiser, O. D. Forker, and T. D. Mount. "An Economic Analysis of the U.S. Generic Dairy Advertising Program Using an Industry Model." *Northeast. J. Agr. and Resour. Econ.* 19(1990): 37–48.

Marion, B. *The Organization and Performance of the U.S. Food System.* New York: Lexington Books, 1985.

Mills, D. E., and L. Schumann. "Industry Structure with Fluctuating Demand." *Amer. Econ. Rev.* 75 (1985):758–67.

Mishan, E. J. "What Is Producer's Surplus?" *Amer. Econ. Rev.* 58(December 1968):1269–79.

Oi, W. Y. "Slack Capacity: Productive or Wasteful?" *Amer. Econ. Rev.* 71(1981):64–69.

Tauer, L. W. "Estimates of Individual Dairy Farm Supply Elasticities." Work. Pap. No. WP 98-08, Dept. of Agr., Resour., and Managerial Econ., Cornell University, Ithaca NY, July 1998.

U.S. Department of Agriculture, Agricultural Marketing Service. "Uniform Price Announcement." USDA/AMS, Dairy Programs, Washington DC, December 1998.

U.S. Department of Agriculture, Economic Research Service. *Dairy Situation and Outlook Yearbook.* USDA/ERS, Washington DC, December 1995.

Villezca-Becerra, P. A., and C. R. Shumway. "State-Level Output Supply and Input Demand Elasticities for Agricultural Commodities." *J. Agr. Econ. Res.* 44(1992):22–34.

Wohlgenant, M. K. "Distribution of Gains from Research and Promotion in Multistage Production Systems: The Case of the U.S. Beef and Pork Industries." *Amer. J. Agr. Econ.* 75(August 1993): 642–51.