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Cooperative Advertising Rent Dissipation

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Abstract *Generic advertising is used by fish producers to accelerate demand growth or to alleviate temporary surpluses. Whether this cooperative promotional venture is profitable depends on a number of factors including industry supply response. A rent-dissipation model applied to the U.S. catfish industry suggests the quasi-rents generated by increased advertising are more than sufficient to cover incremental costs over any reasonable time horizon.*

Key words Aquaculture, collective action, generic advertising, rent dissipation.

Introduction

Despite growing interest in generic advertising among fish farmers and the seafood industry (*e.g.*, Kinnucan and Venkateswaran 1990; Bjorndahl, Salvanes, and Andreassen 1992), important questions remain about the profitability of cooperative advertising ventures. The essential problem, as elucidated by Clement (1963) over 30 years ago and more recently by Jensen *et al*. (1992) and Hayes and Jensen (1993), is that when advertising increases demand, prices rise and producers in competitive markets respond by expanding output. The increase in production depresses price, which dissipates the quasi-rents generated by the original increase in advertising. One possible outcome is that producers may be no better off after the increase in advertising than they were before the increase. The hypothesis that profits from generic advertising may prove illusory in an industry without effective supply control is herewith called the "rent-dissipation hypothesis."

A number of situations that lead to rent dissipation have been recognized in the literature. Most of these involve rents in the context of imperfect competition (*e.g.*, Fudenberg and Tirole 1987) or common property resources (*e.g.*, Bell 1986; Dupont 1991). As an example of the latter, Bockstael, Strand, and Lipton (1992) constructed an optimal control model of the Maryland oyster industry to examine the tradeoffs between capital formation (in response to generic advertising) and subsequent reductions in shellfish stocks. The dynamic nature of increased effort followed by resource depletion suggested an optimal strategy of pulsed generic advertising, although the authors emphasized that profits were likely to be short-lived, with the system tending toward a steady-state equilibrium of zero profits.

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The catfish industry is considered to be relatively competitive and thus not a candidate for wasteful “rent-seeking” activities characteristic of monopoly rent dissipation. Neither are catfish stocks representative of a common property resource. Although the catfish industry has elements of an open access resource in the sense that entry is not restricted, capacity expansion does not lead to depletion of the resource base (fish stocks). In a situation where bioeconomic modeling of stock depletion is not a consideration, dissipation of rents from cooperative advertising may be better modeled in a comparative statics framework. Incorporating key parameters such as demand, supply, and advertising elasticities, as well as the distribution of the advertising “tax” burden along the marketing channel, is more tractable in a static equilibrium model. A comparative static model permits examining the interplay between supply elasticity and quasi-rents generated from increased advertising, holding constant other factors that affect advertising effectiveness, such as processing technology.

To test the rent-dissipation hypothesis, we develop a model of rent dissipation and apply it to the U.S. catfish industry. Catfish producers invest more in cooperative advertising than any other group in the seafood sector, an estimated $2.2 million in 1995 (*The Catfish Journal*, March 1995). Furthermore, catfish producers operate in an industry that has structural features that are similar to other seafood producers, such as unrestricted entry and a concentrated processing sector, so the modeling procedure should be of interest to those interested in cooperative advertising of other seafood commodities.

Promotion of catfish began in earnest in 1987 when feed mills in Mississippi agreed to finance the program with a voluntary levy of $6 on each ton of feed sold. Funds for the national campaign are administered by The Catfish Institute, an industry marketing organization. Some producers and industry observers have argued that such expenditures are excessive considering the lack of supply controls and the capacity for vigorous expansion in response to higher output prices. Others argue that not enough funds are being invested. The model described below attempts to resolve this controversy.

The Model

The model is a partial-equilibrium model that assumes competitive market clearing at all market levels (farm, wholesale, retail). Demand is assumed to be a decreasing function of price and an increasing function of advertising. Supply is assumed to be a non-decreasing function of price. Following Nerlove and Waugh (1961), advertising is treated as an exogenous lump-sum expenditure. For simplicity we assume two market levels: wholesale and farm.

The structural equations defining initial equilibrium are:

$$Q_d = D(P_w, A) \qquad \text{(wholesale demand)} \qquad (1)$$

$$X_s = S(P_f, Z) \qquad \text{(farm supply)} \qquad (2)$$

$$P_w = M(P_f, C) \qquad \text{(farm-wholesale price linkage)} \qquad (3)$$

$$Q_d = kX_s \qquad \text{(market clearing)} \qquad (4)$$

$$R = P_f X_s - \int_0^X S^{-1}(t)dt - \phi A \qquad \text{(farm-level rent)} \qquad (5)$$

where Q_d is the quantity demanded at wholesale; X_s is the quantity supplied at the farm level; P_w is wholesale price; P_f is farm price; A is advertising expenditures; Z is a "supply shifter" (*e.g.*, technology) that lowers the cost of producing the farm-based input; C is a marketing cost variable (*e.g.*, wage rates in processing plants); R is producer surplus (quasi-rent) at the farm level; S^{-1} is the farm-level supply schedule written in inverse form, *i.e.*, price as a function of quantity in equation (2); and k is the number of units of wholesale product per unit of the farm product, *i.e.*, $k = Q_s / X_d$, where Q_s is the quantity supplied at wholesale, and X_d is the quantity demanded at farm. Quantity k is hereafter referred to as the "dressing percentage."

The price-linkage equation (equation [3]) is a quasi-reduced form that reflects the behavior of processors (Hildreth and Jarrett 1955). That the equation depicts accurately the relationship between the wholesale price and the farm price rests on the assumption that forces that cause the two prices to change (*e.g.*, shifts in wholesale demand or farm supply) exert their influences separately rather than in combination (Gardner, p. 404). If this is not the case, a more complicated form of the price-transmission equation may need to be specified (Wohlgenant and Mullen).[1]

The competitive marketing-clearing condition (equation [4]) may be questioned given the high degree of industry concentration at the processor level and collective price bargaining at the farm level (Kinnucan and Sullivan 1986; Kinnucan 1995). Testing for non-competitive pricing, Kouka (1995) found some evidence of oligopoly power at the wholesale level, but cautions "...it is still necessary to prove whether or not conjectural elasticities ... constitute a definitive proof of a departure from perfect competition" (p. 13). Zidack, Kinnucan, and Hatch's (1992) analysis indicated that despite industry concentration at the processor level, benefits from increased consumer advertising were passed back to the farm level. Rapid growth *and decline* in the processing sector (from 14 plants in 1986 to 37 in 1990 to 25 in 1994, Moore 1994) suggest low entry/exit barriers, a condition consistent with a contestable market (Baumol, Panzer, and Willig 1982). These facts suggest that despite monopoly elements in the catfish marketing channel, competitive market clearing is valid, at least for the purposes of this analysis.

The catfish advertising program is funded through a voluntary levy on catfish feed. However, because of tax shifting (Chang and Kinnucan 1991), feed mills pass a portion of the levy on to farmers in the form of higher feed prices. Owing to the lump-sum treatment of advertising expenditures, the farmers' share of the tax levy is represented by the ϕ parameter in the rent equation. The "incidence" parameter ϕ can assume any value between zero and one depending on the degree to which feed mills shift the levy to farmers.

To discover how rents dissipate following an increase in advertising, we solved the model for two reduced forms. One reduced form assumes that catfish processing technology is Leontief, *i.e.*, live catfish and processing inputs are combined in fixed proportions to produce the retail product. This assumption implies that the dressing percentage k in equation (4) is a constant.

The second reduced form assumes that processing technology exhibits constant returns to scale (CRTS). That is, the processing sector's production function is assumed to be linearly homogeneous. Although economic-engineering studies suggest

[1] Equation (3) is consistent with Heien's (1980) markup pricing hypothesis that reflects dynamic inventory adjustment in a marketing industry characterized by constant returns to scale and Leontief production technology at the retail level. Wohlgenant and Mullen's (1987) specifications imply that quantity is a relevant variable in the price-linkage equation, an implication that is inconsistent with previous research (*e.g.*, Zidack, Kinnucan, and Hatch 1992) and our own attempts to model price-transmission in the catfish sector. Lyon and Thompson's (1993) work suggests that the markup model performs at least as well as alternative specifications under a variety of aggregation conditions.

individual firms in the catfish processing sector display increasing returns (Fuller and Dillard 1984), *industry* technology is likely to exhibit constant returns (Diewert). Under CRTS, the k term in equation (4) is permitted to vary with changes in industry output. The two reduced forms permit an analysis of the effect of processing technology on rent dissipation.

To derive the reduced forms, we first expressed equations (1) – (5) in log-differential form:

$$\mathrm{dln}Q_d = -N\,\mathrm{dln}P_w + B\,\mathrm{dln}A \quad (6)$$

$$\mathrm{dln}X_s = E\,\mathrm{dln}P_f + L\,\mathrm{dln}Z \quad (7)$$

$$\mathrm{dln}P_w = T\,\mathrm{dln}P_f + W\,\mathrm{dln}C \quad (8)$$

$$\mathrm{dln}Q_d = \mathrm{dln}X_s + \mathrm{dln}k \quad (9)$$

$$\mathrm{d}R = P_f X_s\,\mathrm{dln}P_f - \phi A\,\mathrm{dln}A \quad (10)$$

where $\mathrm{dln}Y * 100$ is interpreted as the percent change in Y; N is the absolute value of the wholesale-level demand elasticity; B is the advertising elasticity; E is the farm-level supply elasticity; T is the farm-wholesale price-transmission elasticity; L is an elasticity that indicates the effect on farm supply of an increase in Z; and W is an elasticity that indicates the effect on wholesale price of an increase in marketing costs.[2] Given the negative sign in equation (1), N, E, W, L, and B are assumed to be positive. The price-transmission elasticity T in general is expected to be positive and will be less than one if observed price changes are due to retail demand shifts and farm supply is less elastic than the supply of marketing inputs (Kinnucan and Forker 1987, p. 289, fn. 4, and table 4).

In the above system, all endogenous variables except rent (R) are expressed in relative rather than absolute changes. Bearing in mind that in competitive equilibrium $Q_d = Q_s = Q$ and $X_s = X_d = X$, the dressing percentage is $k = Q/X$. Thus, the equilibrium condition (equation [9]) can be rewritten as

$$\mathrm{dln}Q = \mathrm{dln}X + \mathrm{dln}\,(Q/X) \quad (9')$$

Equation (9′) indicates that the relationship between equilibrium quantities at the two market levels depends on the behavior of the dressing percentage, *i.e.*, $\mathrm{dln}\,(Q/X)$. One possibility is that the dressing percentage (average product) is constant. This is consistent with a Leontief processing technology, which implies that $\mathrm{dln}\,(Q/X) = 0$ (Chambers 1988, p. 16). An alternative and less restrictive assumption is that the dressing percentage varies, but in a manner that is consistent with a CRTS processing technology. Under CRTS, and assuming that processing inputs are paid their marginal products, $\mathrm{dln}\,(Q/X) = \mathrm{dln}\,(P_f/P_w)$.[3]

The foregoing assumptions are incorporated into the model by replacing the

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[2] As pointed out by a reviewer, the price-transmission elasticity in general is not a fixed constant but varies with the quantity of product processed and marketed (Wohlgenant and Haidacher, pp. 5–6). However, given the modest increases in quantity induced by advertising (less than 2% for catfish according to Zidack, Kinnucan, and Hatch 1992), the assumption that the transmission elasticity is constant is innocuous for the purposes of this paper.

[3] To see this, let $Q = h(X)$ represent the processing plants' aggregate production function. By Euler's theorem (Chiang 1984, pp. 413–14) if $Q = h(X)$ is linearly homogenous (CRTS), then $Q = (\partial Q/\partial X)X$. Setting $\partial Q/\partial X = P_f/P_w$ (live catfish is paid the value of its marginal product), CRTS implies that $Q/X = P_f/P_w$.

equilibrium condition (9′) with the following alternative expressions

$$\mathrm{dln}Q = \mathrm{dln}X \qquad \text{(fixed-proportions market clearing)} \qquad (11a)$$

$$\mathrm{dln}Q = \mathrm{dln}X + \mathrm{dln}P_f - \mathrm{dln}P_w \qquad \text{(variable-proportions market clearing)} \qquad (11b)$$

Equations (11a) and (11b) form the basis for obtaining reduced-form expressions for dR under fixed and variable proportions. In so doing, because our chief interest focuses on advertising effects, we set $\mathrm{dln}C = \mathrm{dln}Z = 0$.

For fixed-proportions, equations (6), (7), (8), and (11a) are solved simultaneously for $\mathrm{dln}P_f$, which yields:

$$\mathrm{dln}P_f = [B/(E + NT)]\ \mathrm{dln}A \qquad (12a)$$

Equation (12a) indicates the effect of an increase in advertising on farm price. Because N is defined to be positive and $T > 0$ by assumption, equation (12a) yields the hypothesis that an increase in advertising always increases farm price, so long as advertising is effective, *i.e.*, $B > 0$. However, advertising's price enhancement ability depends critically on the elasticity of supply. In particular, price enhancement decreases as supply becomes more elastic, and will be zero if supply is horizontal ($E \rightarrow \infty$). That advertising effectiveness increases as the demand elasticity in equation (12a) gets smaller is consistent with the Dorfman-Steiner (1954) theorem and the Nerlove-Waugh (1961) model.

We next solve for the reduced-form equation for farm price under variable proportions. This entails solving equations (6) – (8) and (11b) simultaneously for $\mathrm{dln}P_f$:

$$\mathrm{dln}P_f = \{B/[E + NT + (1 - T)]\}\ \mathrm{dln}A \qquad (12b)$$

Comparing equations (12a) and (12b), it can be seen that variable proportions, in general, soften the effect of advertising on farm price. That is, so long as $0 < T < 1$, the reduced-form coefficient in (12b) is less than the reduced-form coefficient in (12a), meaning that increases in advertising have a smaller effect on farm price under variable proportions than under fixed proportions. This result is consistent with the fact that under variable proportions the firm is permitted to substitute marketing inputs for the farm-based input as the price of the farm-based input rises due to advertising. This substitution possibility in essence weakens the demand for the farm-based input, which lessens advertising's price effect.[4]

Rent-dissipation equations under fixed and variable proportions are obtained by substituting (12a) and (12b), respectively, into (10), which yields:

$$\mathrm{d}R_F = \{[P_f XB - \phi A(E + NT)]/(E + NT)\}\ \mathrm{dln}A \qquad (13a)$$

$$\mathrm{d}R_V = \{[P_f XB - \phi A(E + NT + (1 - T))]/(E + NT + (1 - T))\}\ \mathrm{dln}A \qquad (13b)$$

Equations (13a) and (13b) represent the effect of an increase in advertising on producer surplus (quasi-rent) under fixed and variable proportions, respectively. The effect in either case can be positive, zero, or negative depending on the relative magnitudes of the two terms on either side of the negative sign in equation (13)'s nu-

[4] Although T theoretically can be negative (see Gardner 1975, p. 404, fn. 10), this is unusual and would imply a negative relationship between increases in advertising and rent if supply is fixed (see equation (12a) or (12b)).

merators. In general, the larger the commodity's value or advertising elasticity and the smaller the producer incidence of the advertising levy, *ceteris paribus*, the more likely that an increase in advertising will generate positive producer rents.

Rent Dissipation

That rents dissipate in response to advertising-induced increases in output is seen by examining the relationship between dR and E in equations (13a) and (13b). For example, consider the reduced-form coefficient for rent under fixed proportions, *i.e.*, $\zeta = \{[P_f XB - \phi\, A(E + NT)]/(E + NT)\}$ in equation (13a). The derivative of this coefficient with respect to E is:

$$\partial\zeta/\partial E = -P_f\, XB/(E + NT)^2 \tag{14}$$

Equation (14) indicates the effect of an increase in the supply elasticity on advertising's rent-enhancement ability under fixed proportions. So long as advertising is effective, *i.e.*, $B > 0$, equation (14) is always negative. Thus, for example, as the farm supply schedule rotates from the vertical to the horizontal, *i.e.*, E increases, the incremental effect of an increase in advertising on producer surplus diminishes and in the limit becomes negative.[5] A similar conclusion obtains under variable proportions.

Because supply becomes more elastic as more time is permitted for producers to adjust inputs in response to changes in price, equations (13a) and (13b) provide a framework for measuring the returns to promotion under differing lengths of run. In particular, consider a situation in which advertising is increased and maintained at the higher level for a period of three years. Assume that advertising carryover is such that the market demand schedule shifts up by its full amount within one year following the advertising increase, *i.e.*, from D to D^1 in figure 1. Assume further that S^1, S^2, and S^3 represent supply schedules pertaining to lengths-of-run, respectively, of one year, two years, and three years. The one-year supply schedule S^1 is vertical, which means that the increase in rent (exclusive of the extra advertising costs) associated with the demand shift is simply the increase in industry revenue, area P^0abP^1 in figure 1. This area (after subtracting incremental advertising costs) is measured by equations (13a) and (13b) by setting $E = 0$. This represents the net producer returns in the first year following the increase in advertising.

The increase in gross producer returns in the second year is indicated by the area P^0acP^2. The second-year returns, owing to the supply response, are smaller than the first-year returns. Suppose the supply elasticity pertaining to S^2 (evaluated at point a) is $E = 0.5$. Setting $E = 0.5$ in equations (13a) and (13b) (and maintaining the other parameters at their original values) provides a measure of second-year net returns. These returns reflect the cost of producing the extra output induced by the increased advertising ($Q^2 - Q^1$) as well as the incremental advertising cost of maintaining demand at D^1 in the second year.

The third-year returns, which are indicated by the area P^0adP^3, are obtained by setting E in equations (13a) and (13b) equal to the supply elasticity that represents

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[5] That an increase in advertising causes a reduction in producer surplus when supply is horizontal is found by taking the limit of equation (13a) or (13b) as E approaches infinity, which yields d$R = -A\phi$ dln$A < 0$. This result follows from the fact that when supply is perfectly elastic, quasi-rents are zero, so increases in advertising cause dollar-for-dollar increases in industry (incidence-adjusted) costs. In other words, with horizontal supply, benefits from advertising, if any, accrue strictly to consumers (*e.g.*, see Alston, Carman, and Chalfant 1994, pp. 149–51).

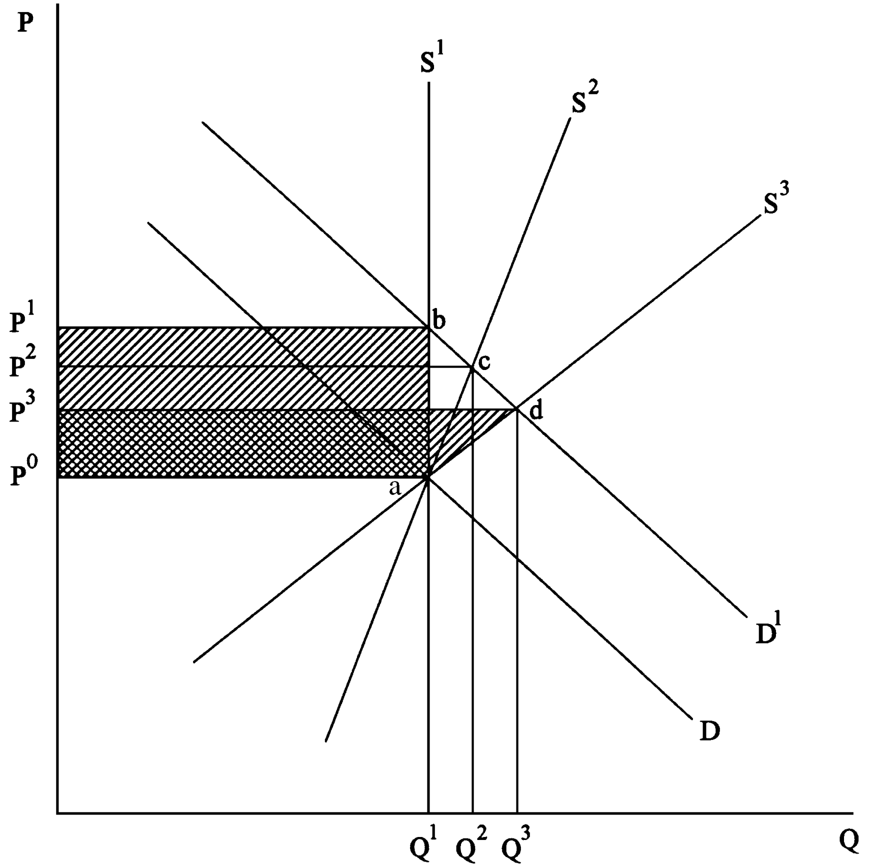

Figure 1. Effect of Supply Response on Generic Advertising Rent Dissipation

producer response over a three-year time horizon. The price-depressing effects of supply response are greatest in the third year, so the net returns are the smallest and may be negative if the increase in producer surplus is not sufficient to cover third-year incremental advertising costs. Total (undiscounted) returns for the three-year period are obtained by adding the returns from each of the three years. In this static framework, a comparison of the year-to-year returns provides insight into the rent-dissipation hypothesis.

Application

Parameterization

To determine the extent of rent dissipation in the catfish industry, equations (13a) and (13b) were parameterized using previously estimated values for the relevant elasticities and baseline values for price, quantity, and advertising as indicated in table 1. The parameters were taken from Zidack, Kinnucan, and Hatch's (1992) study of catfish advertising in which monthly data for the period 1980–89 were used to estimate supply, demand, and price-transmission equations for the wholesale- and

Table 1
Baseline (1994) Values and Model Parameters, U.S. Catfish Industry

Item	Definition	Value
Baseline values:		
P_f	Initial farm price ($/lb.)	0.78
X	Initial production (million lbs. live weight)	439
A	Initial advertising level (million $)	1.625
Parameters:		
B	Advertising elasticity	0.0075
N	Wholesale-level demand elasticity	1.01
T	Farm-wholesale price transmission elasticity	0.68
ϕ	Advertising tax-shifting parameter	0.50, 1.00
dlnA	Percent change in advertising/100	0.10
E	Supply elasticity	0.00, 0.540, 0.730

farm-levels of the market. That study estimated a wholesale-level demand elasticity of –1.01, a price-transmission elasticity of 0.68, and an advertising elasticity of 0.0075.

The foregoing elasticities are largely consistent with estimates based on more recent data. For example, using monthly data for 1986–93, Kinnucan (1995) estimates a wholesale-farm (not farm-wholesale) transmission elasticity of 0.41 and an advertising elasticity of 0.0066. Using annual data for 1977–93, Kouka (1995, p. 11) estimates a demand elasticity of –1.17. It should be pointed out, however, that Kinnucan (1995) estimated a demand elasticity of –0.32, which suggests that catfish demand is becoming less elastic over time. To the extent that this is the case, Zidack, Kinnucan, and Hatch's (1992) estimate of N = 1.01 will produce an overly conservative estimate of producer returns to increased advertising.[6]

The degree to which the advertising tax is shifted from feed mills to catfish farmers depends on the relative slopes of the supply and demand curves at each market level and the nature of the marketing margin (Chang and Kinnucan 1991). For the purposes of this study, we consider two alternative scenarios: catfish producers pay all of the tax (ϕ = 1.00) and the tax is shared equally between producers and mills (ϕ = 0.50). The value of ϕ is unlikely to be less than 0.50 because the demand for catfish feed is expected to be less elastic than the supply of catfish feed.

The baseline (initial equilibrium) values for farm price and quantity were obtained from the USDA's *Aquaculture Outlook* (1995) and refer to average industry values for 1994. The baseline value for advertising was set at $1.625 million, the actual level of industry advertising in 1994 (Allen 1994).

The supply elasticity, the key parameter from the standpoint of testing the rent-dissipation hypothesis, is set at zero for the one-year time horizon, 0.540 for two years, and 0.730 for three years. These elasticity estimates were computed from Zidack, Kinnucan, and Hatch's (1992) table 2, which reports distributed lag estimates of supply response for a 32-month time horizon. In computing these elastici-

[6] To see this, let $\zeta = \{[P_f XB - \phi A(E + NT)]/(E + NT)\}$ in equation (13a). The derivative of this coefficient with respect to N is $\partial\zeta/\partial N = -P_f XBT/(E + NT)^2$, which is always negative for positive B and T. That is, under fixed proportions, advertising-induced increases in rent diminish as demand becomes more elastic. A similar result obtains for variable proportions.

Table 2
Time Stream of Producer Surplus from a Sustained 10% Increase in Generic Advertising Under Fixed and Variable Proportions for Alternative Values of the Tax Shifting Parameter (ϕ), U.S. Catfish Industry, 1994

	Fixed Proportions		Variable Proportions	
Time Period	ϕ = 0.50	ϕ = 1.00	ϕ = 0.50	ϕ = 1.00
	Thousand Dollars			
Year 1	293	211	174	93
Year 2	128	47	85	4
Year 3	100	19	67	–15
Years 1–3	521	277	326	82
Marginal B/C ratio				
First year	1.80	1.30	1.07	0.57
Years 1–3	1.07	0.57	0.67	0.17

ties, we set non-significant coefficients in the distributed lag to zero.[7] The two-year supply elasticity of 0.540 is consistent with Branch and Tilley's (1991) estimated "harvest-response" elasticity of 0.578. For the simulation exercise, all parameters except the supply elasticity and the tax-incidence parameter are held constant at their baseline values. The simulations, based on an assumed 10% sustained increase in advertising, are presented in table 2.

Results

Results confirm the tendency of generic advertising rents to dissipate over time as supply responds to price, but producer returns are sensitive to processing technology and tax incidence. If producers and feed mills share the levy equally, advertising is always profitable for producers, *i.e.*, incremental benefits (quasi-rents) exceed incremental costs throughout the three-year horizon. If, however, producers bear the full incidence and processing technology is characterized by variable proportions, an increase in advertising is profitable only in the first two years. In the third year, advertising rents are insufficient to cover the incremental advertising cost. The third-year loss, however, is modest ($15,000) and is more than offset by gains in the first two years. Overall, therefore, it appears that supply is sufficiently price inelastic—in the "long run," as well as the short run—to render cooperative advertising a profitable venture for the catfish industry, at least for the parameter values reported in table 1.

It is common in the generic advertising literature to report benefit-cost ratios (*e.g.*, Ward and Lambert 1993; Liu, *et al*. 1990; Wohlgenant and Clary 1993). Benefit-cost ratios must be interpreted with caution in that some researchers use *average* rather than *marginal* ratios, or indicate *gross* returns rather than *net* returns. An additional problem is that some reported benefit-cost ratios assume that supply is fixed

[7] When non-significant lagged coefficients are included in the computations, the two-year and three-year supply elasticities are smaller, namely 0.285, and 0.363. We chose to use the larger elasticities because rents are smaller, providing a more conservative test of rent dissipation. The formula used to calculate the elasticities is $E = \delta_1 \sum_i^n \mu_i$ where n is the desired time horizon (*e.g.*, n = 12 for 12 months) and δ_1 and μ_i are parameter values listed in table 2 of Zidack, Kinnucan, and Hatch (1992).

(*e.g.*, Ward and Lambert 1993; Wohlgenant and Clary 1993) while other ratios take into account supply response (*e.g.*, Zidack, Kinnucan, and Hatch 1992). Most reported ratios assume that the farmer bears the full cost of the advertising, *i.e.*, tax-shifting is ignored.

Bearing in mind these caveats, *marginal* benefit-cost ratios are reported in table 2. These ratios measure the *net* marginal return to increased advertising, *i.e.*, the incremental return after all economic costs have been subtracted, including the cost of the additional advertising. The first-year ratios measure “short-run” returns, *i.e.*, returns when supply is fixed. The 1–3 year ratios measure the “long-run” returns, *i.e.*, returns after sufficient time has elapsed for quantity to adjust to the higher price induced by increased advertising. The long-run ratios are calculated by dividing the cumulative net rents indicated in table 2 by the cumulative incremental cost of maintaining the demand schedule at D^1 in figure 1 over the three-year horizon, *i.e.*, \$487,500 (= 3 × \$162,500).

According to these ratios, depending on tax incidence and processing technology, catfish producers realize short-run marginal rates of return of between 57% and 180%. In the long-run, marginal rates of return are smaller, 17%–109%, but still sufficiently large to suggest that the industry is underinvesting in the cooperative advertising program. (In our model, advertising rents are maximized when the marginal B-C ratio is zero.)

That advertising levels appear to be sub-optimal is not surprising given voluntary funding and the related problem of free-riding. With voluntary funding non-participating feed mills (and their farmer-customers) escape the costs, but enjoy the benefits from advertising-induced increases in market price. The *de facto* inability to exclude price-based benefits from free riders means that an incentive exists not to participate in the program. Thus, collective goods such as cooperative advertising tend to be underfunded (Hardin 1982). Still, based on the increased spending planned for 1995 (to \$2.2 million), it would appear that catfish producers are beginning to appreciate the benefits of cooperative advertising enough to fund the program at progressively higher levels.

Conclusions

The major theme of this study is that supply response attenuates the returns that fish producers can expect from cooperative advertising ventures. However, whether the increased output elicited by a successful advertising campaign is sufficient to render cooperative advertising unprofitable is an empirical question that hinges in part on advertising, demand, and supply elasticities and tax shifting. In our model, the profitability of advertising is directly related to the advertising elasticity and inversely related to the supply elasticity, the absolute value of the demand elasticity, and tax incidence, *i.e.*, the extent to which producers bear the burden of the advertising levy.

Because few production alternatives exist for catfish ponds and equipment, asset fixity operates as a natural deterrent to entry or expansion, causing supply response in the catfish industry to be relatively inelastic at the farm level. Furthermore, demand for catfish at the wholesale level is at most unitary elastic and is probably becoming less elastic over time (Kinnucan 1995, p. 124). This combination of elasticities results in sufficient rents from increased advertising to more than offset incremental costs over any reasonable time horizon, at least according to our model simulations. Thus, the rent-dissipation hypothesis as articulated earlier receives no support from the analysis presented here.

Processing technology proved to be an important factor governing producer rents from increased advertising. In particular, Leontief technology produced simulated “long-run” returns that were 75%–230% higher than CRTS technology. This suggests that producers have a stake in the type of technology adopted by processing plants, at least from the standpoint of maximizing benefits from cooperative marketing programs. It also suggests that marketing industry technology has an important bearing on cooperative advertising benefit-cost analysis, an issue worthy of further research.

Despite rejection of the rent-dissipation hypothesis in this study, caution must be exercised in generalizing the findings to other commodities or, indeed, to the catfish industry in the future. For example, potential changes in advertising elasticities over time render such generalizations unreliable.[8] In addition, the catfish industry is distinctive in that a strong growth trend overlays, and perhaps augments, the generic advertising effort. Still, this study suggests cooperative advertising can enhance farm income, provided that supply response is sufficiently muted to limit the increases in output that inevitably flow from price-enhancement endeavors in a competitive industry.

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[8] Recent research suggests that advertising elasticities are "structurally heterogeneous," *i.e.*, subject to change over time due to changes in advertising copy, target audiences, and media mix (Kinnucan, Chang, and Venkateswaran 1993; Kinnucan and Venkateswaran 1994). Thus, care must be taken in projecting the effectiveness of a given advertising program, at least until sufficient econometric evidence has accumulated to define more precisely the behavior of the advertising elasticity over time.

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