

Agricultural Market Structure, Generic Advertising, and Welfare

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This analysis begins with a definition and discussion of productive advertising. Then, following Dixit and Norman, persuasive advertising is used to study the welfare effects of generic advertising by marketing orders. The study first examines horizontal competition when the competing advertiser is a monopoly, and results show that the socially optimal level of advertising for a competitive marketing order is positive only if advertising raises monopoly output. Next, advertising choices of a marketing order which sells its output to a monopolistic distributor are considered. If the distributor is a monopolist, then marketing order advertising raises welfare. This finding is in marked contrast to the results for the horizontal case studied by Dixit and Norman.

Key words: advertising, market structure, welfare

Introduction

Generic advertising has been a common feature of agriculture for many decades. Presumably, interest in the United States heightened after the Great Depression as effective ways to stimulate agricultural demand were sought (Forker). Early empirical work by Nerlove and Waugh concluded that advertising for oranges had been an effective strategy for the agricultural sector. Since then, a large number of empirical studies have considered the effects of advertising on demand and production (e.g., Ward and Lambert; Wohlgenant). From the producer side, some of the specific issues related to advertising include: (a) whether advertising levels maximize industry profit (e.g., Nerlove and Waugh), (b) the distribution of benefits from advertising across firms and products (e.g., Chung and Kaiser; Ward and Lambert; Kinnucan and Miao; Zhang and Sexton), and (c) the strategic effects of competition in advertising levels (e.g., Alston, Freebairn, and James).

There is a much smaller body of research evaluating the welfare effects of advertising (e.g., Alston, Chalfant, and Piggott). One of several possible reasons for this paucity is the difficulty of modeling what advertising is and how it affects utility, choice, and hence welfare (Liu; Pope; Dixit and Norman 1980). Advertising can be characterized in three principal ways: as information, as persuasion, or as a complement in consumption of the good. Each of these has clear implications for what surpluses enter into a welfare calculation. All of these approaches seem likely to yield relevant insights into how advertising should be evaluated (Bagwell).

Advertising as *pure persuasion* has a long tradition in economics. The modern treatment of persuasive advertising is found in an influential article by Dixit and Norman (1978). In their model, advertising merely indexes tastes. Dixit and Norman allow for the welfare effects of advertising to be evaluated using either pre- or post-advertising tastes. However, advertising has no direct effect on welfare. Advertising changes tastes, but the pre- and post-advertising preferences are not comparable, because, in effect, they represent two distinct individuals, and standard theory does not allow for interpersonal comparisons. All welfare effects are a result of the indirect effects of advertising on prices and quantities.

In contrast, the *informative* view holds that advertising provides information about the existence, availability, or quality of a good, and must be treated differently (see von der Fehr and Stevik). Informative advertising has an added potential for improving welfare by either informing consumers about the existence or characteristics of a good or by leading to lower prices. Studying a market in which advertising messages inform consumers about the existence of firms, Butters found the equilibrium level of advertising is socially efficient. In contrast, Stahl concluded the Nash equilibrium level of advertising in an oligopoly is less than socially optimal, since firms cannot capture the full benefit of advertising when the output is homogeneous.

Advertising that is fundamentally uninformative can also inform consumers about the quality of new or unfamiliar goods. This case is made by Milgrom and Roberts, who build on the earlier concepts of Nelson. Advertising can signal high quality, because only high-quality goods will inspire the repeat purchases necessary to rationalize the advertising expense.

Finally, there is the *complementary* view in which advertising changes demand by acting as a complement in the consumption of the advertised good. Advertising enhances consumption of the good, perhaps by adding to the prestige of being a consumer. In this case, a consumer possesses a stable set of preferences, and advertising expenditures enter directly into the utility function as an additional argument (see Stigler and Becker; Fisher and McGowan; Nichols; Becker and Murphy). This approach allows for standard welfare analysis.

A lively and instructive debate, which still continues, begins with Dixit and Norman's original "Advertising and Welfare" article (1978). Shapiro's response argues for the informative view, while Fisher and McGowan's response argues for the complementary view. See also the rejoinders (Dixit and Norman 1979, 1980). Below, we demonstrate how competing views can be drawn together. In our view the issue is by no means resolved, and it seems likely that most advertising has elements of each. After defining productive advertising, it is shown that when persuasive advertising has social value, it will more generally have value when it is productive. This approach allows us to focus on the search for cases when persuasive advertising has social value.

This analysis considers two conceptual extensions of the basic approach to determine if there is greater scope for welfare enhancement. First, when a marketing order is competing with a monopolist, might a second-best argument suggest that optimal advertising be greater than zero? An application of this stylized model might apply, for example, to milk competing strategically with soft drinks. Thus, we consider two Nash-Cournot competitors in advertising: one that produces monopolistically in the output market, and an industry which produces competitively. These competitors are referred to here as the monopolist and the marketing order, respectively.

A second extension considers a vertical structure with an upstream firm or industry (marketing order) and a downstream firm (processor or distributor). We examine the impact of distributor market power on the socially optimal level of advertising. Thus, the first extension is what might be called “horizontal competition,” and the latter extension is “vertical competition.”

Throughout, homogeneous firms are assumed, and therefore the possibility of important distributional effects is ignored (Chung and Kaiser). Dynamic entry and exit issues which clearly affect the private profitability of advertising in the long run are not considered. Initially it is assumed marketing order advertising is financed using lump-sum taxes, adding a brief extension to ad valorem financing at the end of each section. This has the conceptual advantage of decoupling the effects—possible benefits and distortions—of taxation from those of advertising because the lump-sum tax is non-distortionary.

We conclude that when a marketing order is horizontally competing with either another marketing order or a monopolist, advertising is not socially viable except in the monopoly case, when increased marketing order advertising raises the output of the monopolist. This may not be the most common case, but it does seem reasonable that, on occasion, generic advertising leads to an increase in a branded output. On the other hand, in a vertical structure, we find there is greater scope for socially welfare-enhancing advertising by a marketing order because of the downstream firm’s market power. In this case, the level of advertising chosen by the marketing order is too low. Because the Dixit and Norman approach is generally thought to be biased against the social value of advertising, these results provide ample scope for the social viability of generic advertising when advertising is also productive.

Basic Notation, Strategy, and Welfare

The marketing order’s problem occurs in two stages. In the first stage, the marketing order acts as agent for the firms in choosing the level of advertising which maximizes industry profits. The marketing order acts knowing that the firms will choose output independently. In the second stage, each firm chooses output taking prices as given.

Assume there are two markets for substitute goods, in addition to the numéraire good y , with inverse demand curves $P_1(Q_1, Q_2, A_1, A_2)$ and $P_2(Q_1, Q_2, A_1, A_2)$, where Q and A are market output and advertising, respectively. Let $C_k(Q_k)$, $k = 1, 2$, be the industry cost function excluding advertising. The cost function of an individual representative competitive firm in industry k is denoted $c_k(q_k)$. Assume also that $C_k(Q_k)$ and $c_k(q_k)$, $k = 1, 2$, are strictly convex.

Following Dixit and Norman, let consumer j ’s demand be generated by the utility function:

$$(1) \quad U^j = y^j + u^j(q_1^j, q_2^j, A_1, A_2) \equiv y^j + u^j(\mathbf{q}^j, \mathbf{A}).$$

This is the quasi-linear utility function, which simplifies welfare analysis by eliminating income effects, thus rationalizing the use of consumer surplus as a welfare measure. Though likely not in the class of functions which globally describes the consumer behavior for food, this utility function does allow one to focus on other issues beyond income effects. Income I^j is comprised of an endowment e^j and a profit distribution Π^j .

Consumption of the numéraire good is specified as $y^j = I^j - \sum_k P_k q_k^j$. Utility maximization subject to the budget constraint yields inverse and direct demand functions in vector form:

$$(2) \quad \mathbf{P} = u_q^j(\mathbf{q}^j, \mathbf{A}) \quad \text{and} \quad \mathbf{q}^j = g^j(\mathbf{P}, \mathbf{A}).$$

Persuasive Advertising and Welfare

The formulation of Dixit and Norman suggests using either pre- or post-advertising preferences to evaluate welfare. Let $\bar{\mathbf{A}}$ denote the advertising standard at which welfare is evaluated. Then the welfare function, given $\bar{\mathbf{A}}$, is written as:

$$(3) \quad W(\mathbf{A}; \bar{\mathbf{A}}) = \sum_j \left(u^j(g^j(\mathbf{P}, \mathbf{A}); \bar{\mathbf{A}}) - \mathbf{P}g^j(\mathbf{P}, \mathbf{A}) \right) + \sum_j e^j + \Pi_1(\mathbf{P}, \mathbf{A}) + \Pi_2(\mathbf{P}, \mathbf{A}).$$

The marginal effect of A_k on welfare is:

$$(4) \quad W_{A_k}(\mathbf{A}; \bar{\mathbf{A}}) = \sum_j \left(u_q^j(\mathbf{q}^j, \bar{\mathbf{A}}) - \mathbf{P} \right) \left(g_p^j \frac{dP}{dA_k} + g_{A_k}^j \right) + \frac{\partial(\Pi_1 + \Pi_2)}{\partial A_k} - Q_1 \frac{dP_1}{dA_k} - Q_2 \frac{dP_2}{dA_k}, \quad k = 1, 2.$$

If welfare is evaluated at post-advertising preferences (this is presumed, in the large, to be the most prejudiced toward the social desirability of advertising), then $u_q^j(\mathbf{q}^j; \bar{\mathbf{A}}) = \mathbf{P}$ for any \mathbf{A} , and (4) becomes:

$$(5) \quad W_{A_k}(\mathbf{A}; \bar{\mathbf{A}}) = \frac{\partial(\Pi_1 + \Pi_2)}{\partial A_k} - Q_1 \frac{dP_1}{dA_k} - Q_2 \frac{dP_2}{dA_k}, \quad k = 1, 2.$$

Thus, the marginal effect of advertising on welfare consists of the impact on profits in the economy and an impact due to the effect on the consumer's prices. Equation (5) makes clear at once the virtues and vices of persuasive advertising. One prominent virtue is that everything is very measurable from standard surplus and profit function estimates. This is true regardless of market structure. The main vice flows from the standard assumption underlying persuasive advertising. Advertising molds tastes: it does not inform or even entice the consumer in the sense that one would pay ex ante for more advertising.

Productive Advertising and Welfare

We define advertising to be productive for q^j if $\partial U^j / \partial A = \partial u^j / \partial A > 0$. That is, the utility function is stable over quantities of goods and advertising and holding quantities of consumption fixed, and increased advertising increases utility or welfare. This may imply a goods-advertising indifference curve having the usual convexity properties. This property does not imply cardinality unless one attaches some quantitative meaning to $\partial U^j / \partial A$. An example used by Dixit and Norman (and others) is similar to utility over

characteristics: i.e., $z_i^j = f_i^j(\mathbf{A}, q^j)$ and $u^j = u^j(z_1^j, z_2^j)$, where z_i^j represents the j th characteristic for the i th person. Thus, characteristics are produced by goods, and utility is defined over characteristics.

This is an eminently reasonable and simple way to represent the impact of advertising on image creation when it shows popular people consuming or endorsing the product. However, to include information, f_i should be viewed as random and u^j should be thought of as expected utility (Pope). Rather than commit to any particular formulation, we merely write $u^j(q^j, \mathbf{A})$, which suggests the essential feature of productive advertising: advertising raises utility even when the quantity consumed remains constant. Hence, preferences occur over advertising as with any other good.

In this case, it makes sense to calculate the effects of possessing different levels of advertising just as it would to calculate Hicksian equivalent and compensating surplus for differing levels of any other good. Thus, it is appropriate to inquire about a consumer's willingness to pay for differing levels of advertising because there is stable preference map over (q, \mathbf{A}) bundles. Analogous to equation (3), where ordinary surplus is appropriate, will be:

$$(6) \quad W(\mathbf{A}) = \sum_j (u^j(g^j(\mathbf{P}, \mathbf{A}); \bar{\mathbf{A}}) - \mathbf{P}g^j(\mathbf{P}, \mathbf{A})) + \sum_j e^j + \Pi_1(\mathbf{P}, \mathbf{A}) + \Pi_2(\mathbf{P}, \mathbf{A}),$$

and the marginal effect of advertising in the k th industry on welfare is given as

$$(7) \quad W_{A_k}(\mathbf{A}) = \sum_j \left[(u_q^j(q^j, \bar{\mathbf{A}}) - \mathbf{P}) \left(g_p^j \frac{dP}{dA_k} + g_{A_k}^j \right) + \frac{\partial u^j}{\partial A_k} \right] + \frac{\partial(\Pi_1 + \Pi_2)}{\partial A_k} - Q_1 \frac{dP_1}{dA_k} - Q_2 \frac{dP_2}{dA_k}, \quad k = 1, 2.$$

The first part of the bracketed term vanishes from optimization over q , leaving the envelope result analogous to (5):

$$(8) \quad W_{A_k}(\mathbf{A}) = \left[\sum_j \frac{\partial u^j}{\partial A_k} \right] + \frac{\partial(\Pi_1 + \Pi_2)}{\partial A_k} - Q_1 \frac{dP_1}{dA_k} - Q_2 \frac{dP_2}{dA_k}, \quad k = 1, 2.$$

What is apparent from contrasting (6)–(8) with (3)–(5) is that productive advertising adds the additional term [square bracketed in (7) and (8)]. Note, like all envelope results, this term is a partial derivative evaluated at the optimal level of q^j for all $j = 1, \dots, N$, but it arises from the fact that if q^j were constant, then changing advertising would change the level of utility. Also note, because it is measured in utils, it is not directly measurable. One could in principle consider a willingness to pay for a given level of \mathbf{A} , and calculate a compensating or equivalent surplus. This would have all the difficulties of eliciting any public good's value. However, comparing (8) with (5) reveals the key contrasting effect: in productive advertising, a person is willing to pay ex ante for advertising if $\partial u^j / \partial A_k$ is positive and prices are constant. For example, if the “got milk” slogan is productive, a person is willing to pay ex ante for the message (or campaign) “got milk” (perhaps celebrities producing or endorsing the slogan make this more reasonable). If one is not willing to pay ex ante for such an advertising message for any initial condition, then it seems the Dixit and Norman approach is the appropriate choice.

The term involving the productive effect of advertising $[\sum_j (\partial u^j / \partial A_k)]$ vitiates the conventional advantages of the quasi-linear utility function. It can be any magnitude, but is positive when advertising is productive. This term implies observable behavior does not generally measure welfare even in the quasi-linear case, even approximately. Hence, some form of compensating or equivalent variation should be used to measure welfare. These measures will depend on the form of the indirect utility function (or, equivalently, the expenditure function). For these reasons, in this study, the following strategy is adopted: the term $[\sum_j (\partial u^j / \partial A_k)]$ is ignored, and we consider cases in which persuasive advertising might increase welfare. From (8), if welfare is increased in the persuasive case, then *a fortiori* welfare will increase when advertising is productive.

Persuasive Advertising and Horizontal Market Structure

Initially, to create a benchmark from which to judge other structures, we assume industries 1 and 2 are both competing marketing orders, such that $P_k = C'_k(Q_k)$, $k = 1, 2$, for any level of $\mathbf{A} = (A_1, A_2)$. The marginal impacts on profits are denoted by:

$$(9) \quad \begin{aligned} \frac{\partial \Pi_1}{\partial A_1} &= Q_1^* \frac{dP_1}{dA_1} - 1, & \frac{\partial \Pi_1}{\partial A_2} &= Q_1^* \frac{dP_1}{dA_2}, \\ \frac{\partial \Pi_2}{\partial A_1} &= Q_2^* \frac{dP_2}{dA_1}, & \frac{\partial \Pi_2}{\partial A_2} &= Q_2^* \frac{dP_2}{dA_2} - 1. \end{aligned}$$

Inserting the results from (9) into (5) yields:

$$(10) \quad W_{A_k}(A_1, A_2; \bar{\mathbf{A}}) = -1, \quad k = 1, 2.$$

Note, expression (10) was obtained by assuming only that consumers maximize utility subject to their budget constraint and competitive firms maximize profit by choosing output. Thus, a marginal increase in advertising by either industry reduces welfare. This conclusion holds for all values of \mathbf{A} . Hence, as expected, the socially desirable level of advertising is zero (Cardon and Pope).

Consider now the case where industries are assumed to maximize with respect to advertising. Assume advertising and output decisions are made in two stages, with advertising occurring first. Second-stage output decisions are made by independent firms to maximize firm profits, taking prices and first-stage advertising choices as given. This leads to

$$(11) \quad P_k(\mathbf{Q}, \mathbf{A}) = C'_k(Q_k)$$

for the industry and, for the firms, $P_k = c'_k(q)$, $k = 1, 2$. Solving yields the optimal industry output $Q_k(\mathbf{A})$, $k = 1, 2$. In the first stage, by backward induction, each industry solves for Nash-Cournot levels of advertising using first-order conditions:¹

¹Second-order conditions at the optimal output include that $\partial\{Q_k dP_k/dA_k - 1\}/\partial A_k < 0$. Second-order conditions are satisfied if, marginally, outputs and prices respond positively to increased advertising and there is a diminishing marginal effect of advertising on price.

$$(12) \quad \frac{\partial \Pi_k}{\partial A_k} = (P_k - C'(Q_k)) \frac{dQ_k}{dA_k} + Q_k \frac{dP_k}{dA_k} - 1 = 0, \quad k = 1, 2.$$

Given marginal cost pricing, (12) reduces so that each marketing order solves

$$(13) \quad Q_k \frac{dP_k}{dA_k} - 1 = 0, \quad k = 1, 2.$$

For each industry, the best reply is $A_k^*(A_{-k})$, $k = 1, 2$, where A_{-k} is the advertising level of the other industry. Assume each industry's profit function is concave in own-advertising such that a unique Nash-Cournot equilibrium is obtained. Since each firm maximizes Π_k over A_k , the direct marginal effect of advertising on firm or industry profit is zero, or $\partial \Pi_k / \partial A_k = 0$, $k = 1, 2$. Inserting the cross-profit marginal effect from (9) into (5), it follows that $W_{A_k} = -Q_k dP_k / dA_k = -1$, $k = 1, 2$. Thus advertising is socially excessive at the private optimum.

This model serves as a useful backdrop from which to expand consideration to two main cases which form the core of our analysis. First, we inquire whether providing for one of the industries to be a monopolist gives greater rationale for society to sanction advertising of otherwise competitive products. Throughout, the first firm is the monopolist and the second is the competitive industry with a marketing order.

Our goal in this section is to use the model of changing tastes, developed by Dixit and Norman, in order to determine whether a second-best argument implies greater scope for the social viability of advertising by a marketing order. Because firms are presumed to choose outputs to maximize profits while consumers maximize utility, it is necessary to first characterize the monopolist's optimal output choice. As with the marketing order, we assume a monopolist chooses both output and advertising levels, and we solve the monopolist's problem sequentially.

Begin with the second stage where advertising is considered fixed. The monopolist chooses Q_1 to maximize profit:

$$\Pi_1(Q_1, Q_2, A_1, A_2) = P_1(Q_1, Q_2, A_1, A_2)Q_1 - C_1(Q_1) - A_1.$$

The familiar first-order condition is:

$$(14) \quad \frac{\partial \Pi_1}{\partial Q_1} = P_{Q_1}Q_1 + P_1 - C_1'(Q_1) = 0,$$

where C_1' denotes marginal cost. Solving (14) leads to the monopolist's optimal output $Q_1^*(A_1, A_2)$. In contrast, the competitive firms in market 2 choose their output independently so that for each firm $P_2 = c_2'(q)$, which implies an aggregate output $Q_2^*(A_1, A_2)$ consistent with $P_2(Q, A) = C_2'(Q_2^*)$.

Moving to the first stage, the monopolist and marketing order have respective profits of

$$\Pi_1(A_1, A_2) = P_1(Q_1^*, Q_2^*)Q_1^* - C_1(Q_1^*) - A_1$$

and

$$\Pi_2(A_1, A_2) = P_2(Q_1^*, Q_2^*)Q_2^* - C_2(Q_2^*) - A_2.$$

These lead to the following marginal effects:

$$(15) \quad \frac{\partial \Pi_1}{\partial A_1} = [P_1 - C_1'(Q_1^*)] \frac{\partial Q_1^*}{\partial A_1} + Q_1^* \frac{dP_1(Q_1^*, Q_2^*, A_1, A_2)}{dA_1} - 1,$$

$$(16) \quad \frac{\partial \Pi_1}{\partial A_2} = [P_1 - C_1'(Q_1^*)] \frac{\partial Q_1^*}{\partial A_2} + Q_1^* \frac{dP_1(Q_1^*, Q_2^*, A_1, A_2)}{dA_2},$$

$$(17) \quad \frac{\partial \Pi_2}{\partial A_1} = [P_2 - C_2'(Q_2^*)] \frac{\partial Q_2^*}{\partial A_1} + Q_2^* \frac{dP_2(Q_1^*, Q_2^*, A_1, A_2)}{dA_1},$$

$$(18) \quad \frac{\partial \Pi_2}{\partial A_2} = [P_2 - C_2'(Q_2^*)] \frac{\partial Q_2^*}{\partial A_2} + Q_2^* \frac{dP_2(Q_1^*, Q_2^*, A_1, A_2)}{dA_2} - 1.$$

In turn, these marginal effects are simplified using (14) and assuming marginal cost pricing in market 2:

$$(19) \quad \frac{\partial \Pi_1}{\partial A_1} = Q_1^* \left[\frac{\partial P_1}{\partial Q_2^*} \frac{\partial Q_2^*}{\partial A_1} + \frac{\partial P_1}{\partial A_1} \right] - 1,$$

$$(20) \quad \frac{\partial \Pi_1}{\partial A_2} = Q_1^* \left[\frac{\partial P_1}{\partial Q_2^*} \frac{\partial Q_2^*}{\partial A_2} + \frac{\partial P_1}{\partial A_2} \right],$$

$$(21) \quad \frac{\partial \Pi_2}{\partial A_1} = Q_2^* \frac{dP_2}{dA_1},$$

$$(22) \quad \frac{\partial \Pi_2}{\partial A_2} = Q_2^* \frac{dP_2}{dA_2} - 1.$$

Assume Π_1 and Π_2 are respectively concave in A_1 and A_2 , such that a unique Nash equilibrium in advertising levels exists. Given this assumption, the monopolist optimizes over A_1 by setting (19) equal to zero, while the marketing order does the same with (22). The unique Nash equilibrium is the simultaneous solution of these two first-order conditions. Note the difference between total and partial derivatives of price with respect to advertising.

To evaluate the welfare effects of advertising, use (5) and impose the new monopolist/competitive marketing order structures. For the marketing order, use the expressions from (16) and (18) to obtain:

$$(23) \quad W_{A_2}(A_1, A_2; \bar{\mathbf{A}}) = [P_2 - C_2'(Q_2^*)] \frac{\partial Q_2^*}{\partial A_2} + [P_1 - C_1'(Q_1^*)] \frac{\partial Q_1^*}{\partial A_2} - 1.$$

Hence, the social desirability of advertising hinges crucially on the output levels chosen by the monopolist and the marketing order. If it is assumed each competitor is choosing the profit-maximizing level of output, then the first term vanishes, leaving:²

² Equation (24) can be written as $W_{A_2} = (\epsilon_{Q_2 A_2} P_2 Q_2) / (\epsilon_{Q_1 P_1} A_2) - 1$, where the ϵ 's denote elasticities. For example, $\epsilon_{Q_1 P_1}$ is the price elasticity for the monopolist.

$$(24) \quad W_{A_2}(A_1, A_2; \bar{\mathbf{A}}) = \left[P_1 - C_1'(Q_1^*) \right] \frac{\partial Q_1^*}{\partial A_2} - 1 = -Q_1^* \left[\frac{\partial P_1}{\partial Q_1} \frac{\partial Q_1^*}{\partial A_2} \right] - 1.$$

Evaluation of this derivative requires signing the bracketed term. If the monopolist's demand curve is downward sloping, and if increasing the marketing order's advertising reduces the monopolist's output, then the bracketed term is positive. Thus, $W_{A_2} < 0$ for all values of A_1 and A_2 . This result occurs because if the monopolist is maximizing profit by choosing output, it is already producing lower than the socially desirable output, and advertising by the marketing order exacerbates this condition.

On the other hand, if the marketing order increases the monopolist's output, then clearly there is room for the social desirability of generic advertising. For example, if generic advertising raises the output for a branded alternative in the same industry, then the bracketed term in (24) is negative and the marginal social benefit (MSB) of advertising is positive. When $MSB > 1$ for some level of advertising, there is scope for the social desirability of advertising by the marketing order—because generic advertising raises the monopolist's output, thus providing a benefit to society.

The above results are summarized in the following proposition.

- **PROPOSITION 1.** *Assume that advertising is persuasive, and let welfare be evaluated at post-advertising preferences. Given consumer utility maximization and profit-maximizing outputs: (a) the socially optimal level of advertising by the marketing order is zero if increased advertising marginally reduces the level of output by the monopolist, and (b) the socially optimal level of advertising by the marketing order may be positive if increased advertising marginally increases the level of output produced by the monopolist. That is, $\partial Q_1^*/\partial A_2 > 0$ is a necessary but not sufficient condition for the social desirability of advertising by the marketing order.*

It is apparent, in the Dixit and Norman framework, that advertising generally does not represent aggregate demand enhancement, but represents transfers from consumers to producers. The exception is when the socially incorrect level of the good is being produced and price exceeds marginal cost. In this second-best case advertising can, in some situations, lead to increased monopolistic output, and hence improved social welfare.

The results above cannot change substantively when advertising is evaluated at the profit-maximizing levels. In this case, $\partial \Pi_2/\partial A_2 = 0$. Consequently, using (5) and (20),

$$(25) \quad W_{A_2} = \left[P_1 - C_1' \right] \frac{\partial Q_1}{\partial A_2} - Q_2 \frac{dP_2}{dA_2} = -Q_1^* \left[\frac{\partial P_1}{\partial Q_1^*} \frac{\partial Q_1^*}{\partial A_2} \right] - Q_2 \frac{dP_2}{dA_2}.$$

Note, at the profit-maximizing level of advertising by the marketing order, $Q_2^*(dP_2/dA_2) = 1$. If generic advertising raises own-price and lowers the quantity sold by the monopolist, then $W_{A_2} < 0$. Thus, at the profit-maximizing level of advertising, it follows that the generic advertising is socially excessive whenever generic advertising lowers the monopolist's output. If, on the other hand, advertising by the marketing order raises the monopolist's output, then additional generic advertising may raise social welfare. When advertising is productive, it can be socially beneficial even when increased advertising by the marketing order decreases the output of the monopoly.

In this section it was discovered that persuasive advertising by a marketing order can be socially beneficial only if it increases the monopolist's output. The key factor is the presence of a markup over marginal cost. We next determine whether significant alterations to these conclusions occur if ad valorem taxes (the check-off) are collected to pay for the advertising.

Adding Ad Valorem Financing

Consider the case of an ad valorem industry tax which is used to directly finance advertising in the marketing order. Let t be the tax or check-off rate. In keeping with most literature on taxation, we consider an ad valorem formulation. Specific taxes or assessments can always be converted to ad valorem equivalents. Hence, letting P_2^d be the demand price, $P_2^s = (1 - t)P_2^d$ is the supply price. The marketing order chooses advertising to maximize industry profits, and the tax rate t adjusts to cover the expense. The marketing order's profit when market 1 is a monopolist is given by:

$$\Pi_2 = (1 - t)P_2^d(Q_1, Q_2, A_1, A_2)Q_2 - C_2(Q_2),$$

where $t = A_2/P_2^d Q_2$. Ignore any administrative costs and promotion or research activities other than advertising. The optimal quantity produced by the marketing order solves

$$(26) \quad (1 - t)P_2^d(Q_1, Q_2, A_1, A_2) - C_2'(Q_2) = 0,$$

and that for the monopolist in market 1 solves

$$(27) \quad \frac{\partial \Pi_1}{\partial Q_1} = P_1(Q_1, Q_2, A_1, A_2) + Q_1 \frac{\partial P_1}{\partial Q_1} - C_1'(Q_1) = 0.$$

Solving yields the respective optimal quantities, $Q_1^*(A_1, A_2)$ and $Q_2^*(A_1, A_2)$.

The marketing order's solution for the optimal level of advertising, and hence its optimal tax rate t , is characterized by

$$\frac{\partial \Pi_2}{\partial A_2} = [(1 - t)P_2^d - C_2'] \frac{\partial Q_2^*}{\partial A_2} + (1 - t)Q_2^* \frac{dP_2^d}{dA_2} - P_2^d Q_2^* \frac{dt}{dA_2} = 0$$

and, using (26),

$$(28) \quad \frac{\partial \Pi_2}{\partial A_2} = (1 - t)Q_2^* \frac{dP_2^d}{dA_2} - P_2^d Q_2^* \frac{dt}{dA_2} = 0$$

$$(29) \quad = -1 + \varepsilon_{Q_2 A_2} + \frac{\varepsilon_{P_2 A_2}}{t} = 0,$$

where

$$\begin{aligned} \frac{dt}{dA_2} &= \frac{1}{P_2^d Q_2^*} \left[1 - t \frac{d(P_2^d Q_2^*)}{dA_2} \right] = \frac{1}{P_2^d Q_2^*} \left[1 - \varepsilon_{Q_2 A_2} - t Q_2^* \frac{dP_2^d}{dA_2} \right] \\ &= \frac{1}{P_2^d Q_2^*} \left[1 - \varepsilon_{Q_2 A_2} - \varepsilon_{P_2 A_2} \right], \end{aligned}$$

and $\epsilon_{Q_2 A_2}$ and $\epsilon_{P_2 A_2}$ are, respectively, the elasticities of output and price with respect to advertising. Holding price and output constant, an increase in advertising requires a higher tax rate. However, advertising also raises revenue for a given tax rate, and so the total effect is ambiguous. (It is clear $dt/dA_2 > 0$ near $t = 0$.)

Using (5), (16), and (28), the marginal effect of advertising on social welfare is:

$$(30) \quad \begin{aligned} W_{A_2} &= -tQ_2^* \frac{dP_2^d}{dA_2} - P_2^d Q_2^* \frac{dt}{dA_2} + (P_1 - C_1') \frac{\partial Q_1^*}{\partial A_2} \\ &= \epsilon_{Q_2 A_2} - 1 - t' \frac{\epsilon_{Q_1 A_2}}{\epsilon_{Q_1 P_1}}, \end{aligned}$$

where $t' = P_1 Q_1 / A_2$.

Two alternative representations of (30) are also useful:

$$(31) \quad \begin{aligned} W_{A_2} &= \left[P_1 - C_1'(Q_1^*) \right] \frac{\partial Q_1^*}{\partial A_2} + Q_2^* \left[\frac{dP_2^s}{dA_2} - \frac{dP_2^d}{dA_2} \right] \\ &= \left[P_1 - C_1'(Q_1^*) \right] \frac{\partial Q_1^*}{\partial A_2} + \left[\epsilon_{Q_2 A_2} - 1 \right]. \end{aligned}$$

The first term is a marginal external or cross-effect (cost or benefit) of advertising; the second bracketed term is the net marginal benefit of advertising. Suppose the external advertising effect is negative: $\partial Q_1^* / \partial A_2 < 0$. Because the markup term is positive, a necessary condition for $W_{A_2} = 0$ for some $A_2 > 0$ is that the term $\epsilon_{Q_2 A_2} - 1$ be positive—i.e., the supply price rise is larger than the demand price rise (in absolute value). Alternatively, if the external advertising effect is positive and there is an inelastic own-quantity response to advertising ($\epsilon_{Q_2 A_2} - 1 < 0$), then advertising by the marketing order is socially beneficial.

Given that advertising raises own-price and $dt/dA_2 \geq 0$, then a necessary condition for any positive level of advertising to be welfare improving is $\partial Q_1^* / \partial A_2 > 0$, as noted in proposition 1. As intuition suggests, if a wedge is placed between demand and supply prices, there will be an additional loss due to this distortion [compare (25) and (30)]. The only possibility for welfare to be enhanced with additional advertising when $\partial Q_1^* / \partial A_2 \leq 0$ is if advertising has a large marginal impact such that $dt/dA_2 > 0$.

If some positive level of persuasive advertising is socially beneficial, it is instructive to ask whether the profit-maximizing level is the socially optimal level. Inserting expressions for $d\Pi_1/dA_2$ and $d\Pi_2/dA_2$ into (5) yields:

$$(32) \quad W_{A_2} = -t' \frac{\epsilon_{Q_1 A_2}}{\epsilon_{Q_1 P_1}} - \frac{\epsilon_{P_2 A_2}}{t}.$$

The second term is clearly negative, and the first is negative if there are cross-advertising effects such that $\epsilon_{Q_1 A_2} < 0$. In this case, advertising is socially excessive. However, as noted in proposition 1, advertising could be socially optimal if the cross-effects were positive. This is the necessary condition for the maximization of social welfare.

Summarizing this section, little changes qualitatively with the change from lump-sum to ad valorem financing in terms of marginal welfare effects. Taxes add a distortion to

the market. Marginally, this distortion may fall as advertising increases. Clearly, it does affect the profit-maximizing level of advertising as well as the quantitative welfare calculations.

Next, we consider another leading case in which a downstream processor or distributor has market power. This case is generally thought to be applicable to agricultural markets. Whether monopsonistic or monopolistic, generally too little is produced and generic advertising may help increase demand and increase welfare.

Generic Advertising in a Vertical Relationship

The case of horizontal Nash-Cournot competition was considered in the previous section. Here, we examine the welfare effects of advertising in a vertical structure. There are two firms: an upstream producer, and a downstream processor or distributor. Call the downstream firm the distributor. The upstream industry is a marketing order producing competitively with many independent firms, while the downstream firm is a monopolist. Advertising is chosen by a marketing order, which is just an organization to coordinate joint advertising and it is assumed to have no control over output decisions. In the first "stage," the marketing order chooses advertising level, A . It does so anticipating (rationally) the following: (a) the distributor will choose output (or price) in a way that maximizes the distributor's profits, and (b) each independent member of the marketing order will produce at marginal cost.

Zhang and Sexton analyze a similar case. They use a conjectural variations model to parameterize the distributor's market power as a buyer (monopsony) and as a seller (monopoly). Results from simulations suggest both types of market power reduce both profits and advertising expenditures of the marketing order. Zhang and Sexton do not, however, consider the implications of market power for social welfare.

For simplicity, assume a single downstream distributor with both monopsony and monopoly power. Let $P^d(Q, A)$ be market demand, with P^d the price received by the distributor, and assume $P_Q^d < 0$ and $P_A^d > 0$. Let P^u be the price the distributor pays an upstream firm for each unit, and let $C(Q)$ be upstream industry cost, so that $C'(Q)$ is upstream supply. Since the upstream industry is competitive, $P^u(Q) = C'(Q)$, which represents the supply of Q . Note that advertising does not directly affect the inverse demand function upstream. Higher prices upstream are obtained only by increasing production and moving up the supply curve of the marketing order. Given this behavior, the downstream firm's profits are represented by:

$$(33) \quad \Pi^d = P^d Q - P^u Q.$$

Though this is a simple representation of the distributor's profit, more general models do not yield additional insights. The model in (33) yields the familiar first-order condition:

$$(34) \quad P^d - \underbrace{\left(P^u + Q \frac{\partial P^u}{\partial Q} \right)}_{MC^d} + Q \frac{\partial P^d}{\partial Q} = 0,$$

where MC^d is the marginal factor cost to the downstream firm. Rewrite (34) as:

$$(35) \quad P^d - P^u = Q \left(\frac{\partial P^u}{\partial Q} - \frac{\partial P^d}{\partial Q} \right).$$

The solution to (35) represents the quantity purchased by the distributor and resold in the market.

Now consider the marketing order's advertising choice. Industry profits are denoted by:

$$\Pi^u = P^u Q - C(Q) - A.$$

The first-order condition, using $P^u = C'(Q)$, is:

$$(36) \quad (P^u - C'(Q))Q'(A) + Q \frac{dP^u}{dA} - 1 = Q \frac{dP^d}{dA} - 1 = 0.$$

The downstream firm does not choose advertising, but the effect of A on profit is specified as:

$$(37) \quad \begin{aligned} \frac{d\Pi^d}{dA} &= (P^d - P^u)Q'(A) + Q \frac{dP^d}{dA} - Q \frac{dP^u}{dA} \\ &= \left(P^d - P^u - Q \frac{\partial P^u}{\partial Q} \right) Q'(A) + Q \frac{dP^d}{dA} \\ &= -Q \frac{\partial P^d}{\partial Q} Q'(A) + Q \frac{dP^d}{dA}. \end{aligned}$$

Note that $dP^u/dA = (\partial P^u/\partial Q)Q'(A) = C''(Q)Q'(A)$.

Assuming, as before, that preferences are evaluated at post-advertising levels,

$$(38) \quad W_A = -Q \frac{dP^d}{dA} + \frac{d\Pi^u}{dA} + \frac{d\Pi^d}{dA}.$$

Evaluating at the level of advertising chosen by the marketing order yields $d\Pi^u/dA = 0$, and so

$$(39) \quad \begin{aligned} W_A &= -Q \frac{dP^d}{dA} + \frac{d\Pi^d}{dA} = -Q \frac{dP^d}{dA} - Q \frac{\partial P^d}{\partial Q} Q'(A) + Q \frac{dP^d}{dA} \\ &= -Q \frac{\partial P^d}{\partial Q} Q'(A). \end{aligned}$$

Assuming a downward-sloping final market demand and a positive marginal response to advertising, this derivative will be positive, implying the marketing order's level of advertising is too low.

- **PROPOSITION 2.** *Let welfare be evaluated at post-advertising preferences and the profit-maximizing levels of output and advertising, final demands be downward sloping, and let output respond positively to advertising ($Q'(A) > 0$). Then generic persuasive advertising should be expanded in order to maximize social welfare.*

The conclusion of proposition 2 is striking in terms of the usual negative results of persuasive advertising: advertising is excessive. Here, the profit-maximizing level

of advertising by the marketing order is not socially excessive, but is too low. This result can be stated more sharply and generally by altering the assumed behavioral response.

Consider the socially optimal amount of advertising. Using (39) and $d\Pi^d/dA$ and $d\Pi^u/dA$, the marginal effect of advertising on social welfare is:

$$\begin{aligned}
 (40) \quad W_A &= -Q \frac{dP^d}{dA} + Q \frac{dP^u}{dA} - 1 - Q \frac{\partial P^d}{\partial Q} Q'(A) + Q \frac{dP^d}{dA} \\
 &= Q \left[\frac{\partial P^u}{\partial Q} - \frac{\partial P^d}{\partial Q} \right] Q'(A) - 1 \\
 &= [P^d - P^u] Q'(A) - 1.
 \end{aligned}$$

Thus, presuming $[P^d - P^u] Q'(A) > 1$ for small values of A , the social optimum, given profit-maximizing outputs, will involve positive amounts of advertising.³ Another way to state the result is: if it pays privately for the marketing order to advertise, then it follows that the socially optimal quantity of advertising is greater than zero. This result follows from the fact that $W_A = d\Pi^u/dA - Q(\partial P^d/\partial Q)Q'(A) > 0$ when Π^u is increasing in advertising. Proposition 3 states this result.

- PROPOSITION 3. *Let welfare be evaluated at post-advertising preferences and the profit-maximizing levels of output. If market conditions are such that advertising would be profitable to the marketing order, then the socially optimal level of advertising is positive.*

The reason advertising has social value here is that the monopolist is producing too little and yet is free-riding off of the marketing order's advertising. The marginal social benefit of the advertising is the marketing margin times the change in output due to the advertising. The marginal social cost of advertising is 1.

Adding Ad Valorem Financing

We conclude by extending the upstream-downstream analysis to include ad valorem financing. As earlier, the tax rate, t , is assumed to be equal to A/P^uQ . Starting with the case where the marketing order chooses advertising and output levels to maximize profit, it immediately follows that the expression for the marginal effect of advertising on social welfare is identical to (34). This is because the consumer effect just involves final price P^d , the marginal effect of advertising on the upstream firm is zero by assumption, and the impact on the downstream firm is as described earlier. Hence, proposition 2 still holds with lump-sum or ad valorem financing.

The more interesting and complex case is when profit-maximizing output choices are assumed, but not necessarily profit-maximizing advertising levels. Using (39) and expressions for $d\Pi^u/dA$ and $d\Pi^d/dA$ gives:

³ Note that when the upstream industry or the marketing order chooses the level of advertising to maximize profit, $-Q(A)(\partial P^u/\partial Q)Q'(A) - 1 = 0$, and proposition 3 is obtained.

$$\begin{aligned}
 (41) \quad W_A &= -Q \frac{dP^d}{dA} - Q \frac{\partial P^d}{\partial Q} Q'(A) + Q \frac{dP^d}{dA} + (1-t)Q \frac{dP^u}{dA} - P^u Q \frac{dt}{dA} \\
 &= -Q \frac{\partial P^d}{\partial Q} Q'(A) + (1-t)Q \frac{dP^u}{dA} - P^u Q \frac{dt}{dA}.
 \end{aligned}$$

The first term in (41) is unambiguously positive if advertising increases output (given downward-sloping demand). It measures the net marginal benefit (spillover effect) of advertising to the downstream firm. The second two terms give the net effect (net of consumers) of advertising on the upstream firm. Advertising raises revenue if price increases, but only by a factor of $(1-t)$, due to the taxes. However, increased advertising may lead to increased taxes. Additional advertising must raise the tax rate, t ; if the marginal effect of advertising raises the downstream firm's revenue by less than (more than) $(1/t)$, then $dt/dA > (<) 0$ [see (32)]. If $dt/dA < 0$, implying advertising has a large marginal effect on the upstream firm's revenue, then $W_A > 0$, and the socially optimal quantity of advertising is positive.

Conclusion

In the long run, with entry and exit both domestically and abroad, the potential of advertising to increase industry profits raises many questions, particularly under constant long-run industry marginal cost. However, we take for granted that in the short run, advertising by a marketing order might be profit maximizing or at least profit improving. Because of the unique and controversial nature of advertising, it does not follow that advertising is socially desirable or that the profit-maximizing advertising level is socially optimal. Indeed, under the persuasive case and horizontal competition, the socially optimal level of persuasive advertising is zero.

Using this as a backdrop and applying the approach of persuasive advertising to the case where a competitive industry (agricultural marketing order) competes with a monopoly, generic advertising tends to move resources toward the monopolized good, and thus may be socially beneficial. This conclusion is true even when the monopolist and the marketing orders compete on advertising in the usual Nash-Cournot sense. In proposition 1, it is shown that advertising may be socially beneficial even if purely persuasive when increased marketing order advertising leads to an increase in the output of the monopolist.

In the upstream-downstream case, a marketing order's output is an input to a processor or distributor which has market power. In this case, the monopolist is producing too little output, thereby directly affecting both the price and quantity sold by the competitive agricultural industry (marketing order). We show in this case (proposition 2) that the profit-maximizing level of persuasive advertising by the marketing order is too small from a social welfare point of view. This result is extended to a characterization of the social welfare optimum, which of course implies advertising has social value and should be encouraged (proposition 3). Thus, a strong case is developed for the social benefit of advertising regardless of one's view of what advertising is. The results are essentially unchanged when funding is switched from lump sum to ad valorem. The optimal tax or other incentive structure to enable the social optimum to be achieved is left for future research.

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