Regulation, Market Power, and Advertising Effectiveness

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Using the case of Canadian dairy industry, this paper investigates the farm level effectiveness of generic advertising in two vertically related markets under government regulation and oligopolistic power. Comparative static analysis indicates that an increase in advertising may either increase or decrease the farm level profit when the processing industry is oligopolistic. When advertising leads to an increase in the farm level profit under the oligopolistic processing industry, the size of this effect may be more than, less than, or the same as that under perfect competition. Specifications of the retail demand function play an important role in determining both the direction and magnitude of the effect of advertising on the farm level profit under the oligopolistic processing industry. The simulation results of the Canadian butter industry illustrate that the magnitude of the bias caused by an erroneous assumption regarding the market structure could be significant.

In the past decade the effectiveness of generic advertising has been studied by many agricultural economists (e.g., IDF 1991; Kinnucan, Johnston, and Chang 1992; Forker and Ward 1993; Goddard and Taylor 1994; Ferrero, Ackerman, and Nichols 1996). In these studies, advertising effectiveness is often assessed at the farm level assuming a perfectly competitive downstream industry.[1] As farm outputs serve as raw materials in further processing activities, a consumer demand change due to generic advertising is transmitted to the farm level through a change in the derived demand curve for farm outputs. Thus the market structure of both primary and processing industries becomes important in determining the effectiveness of generic advertising.

While agriculture has long been a prominent example of governmental intervention, the agri-food processing market has increasingly been considered to be imperfectly competitive.[2] It is, therefore, important that government regulation in agriculture and imperfect competition in the processing industry receive simultaneous consideration in quantifying the effect of generic advertising on farmers' welfare. Liu, Sun, and Kaiser (1995), for example, estimated the market power of an oligopolistic U.S. dairy processing industry where there was a government price support program affecting firms' output price. The importance of the processing industry's market structure in assessing advertising effectiveness has recently attracted some attention from generic advertising researchers (e.g., Cranfield 1995, Weerahewa and Goddard 1995, Weerahewa 1996).

As government regulation and market structure vary widely across commodities, we confine ourselves to a specific industry so that provisions of government regulation and market power can be more meaningfully characterized. To this end, the highly regulated Canadian dairy industry is chosen as a case study. The objective of this paper is to propose a general framework to measure the farm level effectiveness of generic advertising when the farm output is controlled and the processing industry is subject to regulated input price and has market power in the output market. We proceed in three major directions. First, to incorporate a wide spectrum of imperfect competition, a conjectural variation model for the processing industry is adopted. The conjectural variation model is particularly suited to the study of the Canadian dairy industry, in which entry by new firms is deferred by institution and the incumbent firms are more likely to interact with one another according to the conjectural variation model. Second, the above model is applied to examine the farm level effects of generic advertising undertaken by the milk marketing board. Third, a simulation model of the Ca-

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nadian butter market is built to show the farm level effects of generic advertising under a different market structure.

Background

Supply management creates the potential for milk producers in Canada to establish monopoly power;[3] however, government regulation prevents the monopoly practice of setting the marginal costs to the marginal revenues to determine the milk price. Milk prices are set according to a cost-of-production formula. Milk production (quota) is then set such that demand is satisfied at the retail price that corresponds to the administered milk price. The Canadian Dairy Commission (CDC) sets the national support price and the total quantity of industrial milk produced in Canada. In addition, the CDC allocates production quotas to the provincial boards.

The above regulations are likely to affect dairy processors through their input markets. The presence of a milk production quota not only causes processing firms to be quantitatively constrained in terms of raw milk usage, but also causes the potential entry of new firms to the dairy industry to be deferred. The latter may facilitate collusion among the processing firms. In addition to domestic regulations, import quotas on dairy products were in place until 1995, when they were replaced by the prohibitive tariffs under new World Trade Organization (WTO) rules. In 1988, Canada imported 143 million dollars worth of dairy products (1.6% of total consumption), primarily European cheeses. Except for these modest imports, foreign competition is virtually eliminated. Closing the border thus creates the opportunity for the Canadian dairy processing firms to exercise market power. The implication is that interaction between governmental regulation and market power is potentially important. Although it is beyond the scope of this paper to explore provisions of specific market power in the Canadian dairy processing industry, this interaction complicates the task of measuring the effectiveness of generic advertising.

Most existing advertising studies of the Canadian dairy industry have assumed a perfectly competitive downstream dairy industry (Goddard and Tielu 1988; Venkateswaran and Kinnucan 1990; Chang and Kinnucan 1990, 1991; Kinnucan and Belleza 1991; Goddard and McCutcheon 1993; Goddard and Tielu 1994). One exception is the work of Weerahewa and Goddard (1995). Using a simulation model, they showed that the processing industry's market structure could have significant effects on measuring the effectiveness of generic advertising for Canadian dairy farmers. In other words, results obtained from previous studies on the effectiveness of generic advertising in the Canadian dairy industry, which assume a perfectly competitive processing industry, could be biased. This is an important result. To improve understanding of the effect of market structure on measuring the effectiveness of generic advertising, a more general theoretical framework that takes both government regulation and market structure into account is in order.

A Conjectural Variation Model for the Dairy Processing Industry

To analyze these issues, a conjectural variation model is developed specifically in the context of the Canadian dairy industry, although the model is also applicable generally. Suppose that the Canadian dairy processing industry has n firms. Each firm produces a specific dairy product (q) and uses two inputs, raw milk (m) and a vector of other nonmilk inputs ($\mathbf{x}$). The following market structure is assumed: a processing firm faces a regulated high price in the raw milk market, possesses market power in the output market, and is competitive in the nonmilk inputs markets. The price of raw milk r is set by the producer's marketing board according to the cost of production formula.

A reasonable assumption for the dairy processing industry is that nonmilk inputs are separable from raw milk in the production process (Bruno 1978).[4] The production function can be written as

$$(1) \qquad q_i = Min\left(\frac{m_i}{\alpha}, f(x_i)\right),$$

where α is a technical coefficient and $f(\cdot)$ is the technical relationship between the dairy product and other nonmilk inputs. The corresponding cost function can be written as

$$(2) \qquad \begin{aligned} C_i^c(r, w; q_i) &= Min(wx_i{:}q_i) + rm_i \\ &= C_i^p(w; q_i) + rm_i, \end{aligned}$$

where $C_i^p(\cdot)$ is a partial cost function, independent of r. The word *partial* means that this cost represents only part of the total cost. The partial cost function has the standard properties of the usual cost function.

The inverse market demand function faced by the ith firm is

$$(3) \qquad p = d(Q,\mathbf{z}),$$

where p is an output price, $\mathbf{z}$ is a vector of other variables affected by demand such as income and prices of substitutes, and Q is a quantity demanded by consumers. In equilibrium, Q also equals output supplied by all firms such that

$$Q = \sum_{i=1}^{n} q_i.$$

The ith milk–processing firm solves the problem:

$$\text{(4)} \quad \underset{(q_i)}{Max}\left[(p - \alpha r)q_i - C_i^p(w;\, q_i) \colon p = d(Q,\mathbf{z});\; Q = \sum_{i=1}^{n} q_i \right].$$

The first-order condition of the ith firm at an optimum is

$$\text{(5)} \quad (p - ar)\left(1 + \frac{\omega_i}{\eta}\right) - \frac{\partial C_i^p(\cdot)}{\partial q_i} = 0,$$

where η is the industry demand elasticity for dairy product s, defined as

$$\eta = \frac{\partial Q}{\partial p}\frac{p}{Q},$$

and ω_i is the ith firm's conjectural elasticity, defined as

$$\omega_i = \sum_{i \neq j}^{n} \frac{q_i}{q_j}\frac{\partial q_j}{\partial q_i}.$$

The interpretation of conjectural elasticity in the model is the expected percentage change in the sales of the output of the rest of the industry after a 1% change in the firm's own sales.

Assuming the aggregate analog of the optimality conditions, equation (5) may be rewritten as

$$\text{(6)} \quad (p - ar)\left(1 + \frac{\omega}{\eta}\right) - \frac{\partial C^p(w{:}Q)}{\partial Q} = 0,$$

where α is the weighted average of individual technical coefficients, ω is the weighted average of the individual conjectural elasticities, and $C^p(w;Q)$ is the industry partial cost function. Equation (6) simply states that for optimality, marginal cost equals "conjectural marginal revenue" (Quirmbach 1988). This condition is referred to as the quasi-supply function, which in turn determines the quasi-derived demand function for raw milk:

$$\text{(7)} \quad M = \alpha Q^*.$$

A suitable definition of the degree of oligopoly power in the industry may be stated as $L = \omega/\eta$. This is a generalization of a composite Lerner's index. It can be demonstrated that L is equal to zero under perfect competition and to $1/\eta$ under complete collusion. Thus, the logical range of the conjectural elasticity is $0 \leq \omega \leq 1$.

Generic Advertising and Its Farm Level Effects

Generic advertising is undertaken by the marketing board on behalf of all dairy farmers. It is important to characterize such collective behavior. While raw milk price is set according to the cost of production formula, the level of quotas is allowed to adjust with changes in demand. The main objective of generic advertising is to increase farmer's revenue through increasing the quantity demanded for raw milk, rather than price.[5] The milk marketing board can best be described as a regulated monopolist whose quantities can be adjusted but whose price is fixed. Following Dorfman and Steiner (1954, p. 826), advertising is defined as "any expenditure which influences the shape or position of a firm's demand curve and which enters the firm's cost function as a fixed cost." Suppose that the marketing board spends a lump sum of money A on generic advertising. Equation (3) can be rewritten as

$$\text{(8)} \quad p = d(Q,z,A).$$

Assuming that an increase in advertising shifts the demand curve outward, $\partial p/\partial A > 0$ for all Q. Consequently this increase will induce changes in the equilibrium levels of price, output, and profit of the processing industry. To facilitate the comparative static analysis later, following Quirmbach (1988) equation (6) is rewritten as

$$\text{(9)} \quad (1 - \omega)p(Q^*) + \omega MR(Q^*) = MC(Q^*),$$

where Q^* is industry output at the optimal solution, $MR(Q^*) = p(Q^*) + Q^* \,\partial p(Q^*)/\partial Q$ and $MC(Q^*) = \partial C^p(Q^*)/\partial Q$. As farm output is used as an input in the processing industry, a shift in consumer demand due to generic advertising is transmitted to the farm level through a shift in the derived demand curve for farm output.

Hence, the decision problem faced by the marketing board is to choose optimal levels of advertising expenditure subject to (7)–(9). Denote $G(M)$ as the cost function of raw milk production. The board's maximization problem is

$$\text{(10)} \quad \underset{(A)}{Max}[rM - G(M) - A{:}p = d(Q^*,z,A);\; M = \alpha Q^*;\; (1 - \omega)p(Q^*) + \omega MR(Q^*) = MC(Q^*)].$$

The first-order condition for optimal advertising is

$$(11)\quad \alpha\left[r-\frac{\partial C(M)}{\partial M}\right]\left[-\frac{(1-\omega)\,p_A+\omega MR_A}{(1-\omega)p_Q+\omega MR_Q-MC_Q}\right]-1=0,$$

where $MR_A = p_A + Qp_{QA}$ and $MR_Q = p_Q + Qp_{QQ}$. Equation (11) gives an optimal advertising investment rule for the marketing board. Note that the term in the second bracket on the right hand side measures the effect of advertising on the optimal Q, denoted $\partial Q^*/\partial A$. As shown in Quirmbach (1988), p_Q and MR_Q are assumed to be negative in equilibrium, while MC_Q is nonnegative (marginal cost is upward-sloping).

The board sets the price of raw milk above marginal cost such that

$$(12)\quad r-\lambda=\frac{\partial G(M)}{\partial M},$$

where λ measures the extent of departure from the marginal cost pricing caused by regulation.[6] Equation (12) is a standard result of a production model under quota (Moschini 1989; Babcock and Foster 1992; Chen and Meilke 1998). λ can thus be interpreted as the rental rate of milk production quota.

Combining equations (11) and (12) yields

$$(13)\quad -\alpha\lambda\frac{(1-\omega)\,p_A+\omega MR_A}{(1-\omega)\,p_Q+\omega MR_Q-MC_Q}-1=0.$$

Equation (13) indicates that the effectiveness of generic advertising is determined by the following factors: (1) the rental rate of milk production quota; (2) the technical coefficient between the dairy product and the raw milk; (3) the conjectural elasticity; (4) the form of the retail demand function; and (5) the slope of the partial marginal cost curve. In particular, the impact of supply control on advertising effectiveness is captured by the rental rate of milk production quota.

To have a positive effect on the farmer's profit, the following must hold:

$$(14)\quad -\alpha\lambda\frac{(1-\omega)\,p_A+\omega MR_A}{(1-\omega)\,p_Q+\omega MR_Q-MC_Q}>1.$$

Given that $\alpha > 0$ and $\lambda > 0$, $\partial Q^*/\partial A$ must be nonnegative to have a positive profit effect. Under perfect competition ($\omega = 0$), equation (14) becomes

$$(15)\quad -\alpha\lambda\frac{p_A}{p_Q-MC_Q}>0.$$

Equation (15) shows that, when the processing industry behaves competitively, an increase in generic advertising undertaken by the marketing board would always lead to an increase in demand for dairy products and thus for raw milk. However, an increase in the demand for raw milk does not necessarily mean a positive profit effect, because for that the sign of (14) must be satisfied as well.

The Importance of Function Form

A more interesting question is whether the above result under perfect competition carries through to a case of imperfect competition. As shown below, whether the perfect competition case carries through to a case of imperfect competition depends on the form of the retail demand function. Under imperfect competition, equation (15) can be reversed. A condition for this to occur is

$$(16)\quad p_{QA}<-\frac{p_A}{\omega Q^*}.$$

This stringent condition cannot be satisfied if advertising is specified in an additive manner, because $p_{QA} = 0$. In other words, when advertising is specified additively, a negative quantity effect of an increase in advertising is automatically ruled out. However, if advertising is specified multiplicatively, a negative quantity effect may occur when there is an increase in advertising. If this occurs, equation (14) shows that the farm level profit will definitely decrease. This result is important since it suggests that under imperfect competition, an increase in advertising may result in a decrease in the demand for raw milk and thus in farm profit. The explanation lies in the fact that output choice in an oligopolistic industry depends on both the demand and the marginal revenue curves. When demand rises, marginal revenue may fall. This possibility does not rise with a perfectly competitive industry because the change in marginal revenue is irrelevant.

Suppose that (16) is not satisfied so that an increase in advertising leads to an increase in the demand for raw milk under imperfect competition, as in the case of perfect competition. The interesting question is whether the effect of an increase in advertising on the demand for raw milk is more or less under imperfect competition than it is under perfect competition. Comparison between (14) and (15) reveals that the answer depends on the relative sizes of p_{QA} and p_{QQ}. These, in turn, depend on the specifications of the retail demand function and advertising. In general, the effect of an increase in advertising on the demand for raw milk could be more than, less than, or the same under imperfect competition as under perfect competition. The implication is that an erroneous assumption regarding market structure could lead to either an overestimation, an underestimation, or no change in the estimation of the effectiveness of generic advertising.

Some economic intuition, however, may help identify the bias associated with market structure on measuring the effectiveness of generic advertising. In most advertising studies, generic advertising is modeled as a demand shift such that $p_{QA} = 0$. When $p_{QA} = 0$, the direction of bias associated with market structure on measuring the effectiveness of generic advertising depends on the shape of the demand function. If the underlying demand function is strictly concave such that $p_{QQ} < 0$, then under imperfect competition an increase in advertising results in a decrease in the demand for raw milk and thus in farm profit. If the underlying demand function is strictly convex such that $p_{QQ} > 0$, then under imperfect competition an increase in advertising results in an increase in the demand for raw milk and thus in farm profit. If the underlying demand function is linear such that $p_{QQ} = 0$, then under imperfect competition an increase in advertising results in no change in the demand for raw milk and thus in the farmer's profit.

However, Quilkey (1986) argues that advertising that seeks to impart knowledge about product attributes and to improve consumers' perceptions about the uniqueness of the product will narrow the range of potential substitutes and tend to make demand less elastic. This implies that $p_{QA} < 0$. When $p_{QA} < 0$, the direction of bias associated with market structure on measuring the effectiveness of generic advertising depends on the shape of the demand function. If the underlying demand function is weakly concave such that $p_{QQ} \leq 0$, then under imperfect competition an increase in advertising results in a decrease in the demand for raw milk and thus in farm profit. However, if the underlying demand function is strictly convex such that $p_{QQ} > 0$, then under imperfect competition an increase in advertising could result in either a decrease or an increase in the demand for raw milk and thus in farm profit.

An Application to Generic Butter Advertising in Canada

The Dairy Bureau of Canada spends about eleven million dollars annually on butter advertising. The farm level profit effect of generic butter advertising in Canada was studied by Chang and Kinnucan (1990), who assumed a competitive market structure. They found that the butter advertising undertaken by the Dairy Bureau of Canada was profitable for producers. Since the Canadian butter industry is not free of government regulation and market power, it is important to examine how the direction and magnitude of farm profit are affected by generic butter advertising under a different market structure. To achieve this end, a synthetic simulation of the theoretical model in the previous section is constructed below.

A long run advertising elasticity for Canadian butter, 0.023, estimated in Chang and Kinnucan (1990), is used. Previous estimates of retail demand elasticity for butter ranged from −.77 in Goddard and Tielu (1994) to −1.46 in Chang and Kinnucan (1990). The demand elasticity −1.0 is used in the simulation.[7] Three types of markets (perfect competition, oligopoly, and monopoly) are considered in the simulation. Zero conjectural elasticity for butter implies perfect competition, while unit conjectural elasticity implies monopoly. The conjectural elasticity estimate for the Canadian butter industry, 0.23, is taken from Rude (1992). The quantity of raw milk supplied at the farm level is a function of the marginal cost of milk production. The farm level milk supply elasticity, 0.7, is adapted from a previous study of the New York market (Liu and Forker 1990).[8] It is well known that the marginal cost under production quotas is not directly observable. The marginal cost is approximated by the difference between the observed raw milk price and the estimated rental rate of production quota. The rental rate of quota is obtained by the difference between the value of unused quota and that of used quota, which equals \$0.065/kg (Chen and Meilke 1998). Blend milk price is \$0.476/kg.

Annual advertising expenditure on butter is estimated at eleven million dollars in 1993. Quantity demanded for butter equals quantity supplied plus beginning stock, minus ending stock and net trade. Quantities demanded, retail prices, beginning stocks, ending stocks, and net imports for butter are obtained from the *Dairy Market Review* (Agriculture Canada 1994). Quantity of raw milk demanded is determined by the level of demand at the retail level, less stocks and net trade, and the conversion factors. Conversion factor 23 is adopted from Dairy Farmers of Canada (1994). The models were calibrated in such a way that base values were equal to the prices and quantities for the dairy year of 1993. The parameters and data

Table 1. Parameter Values for the Canadian Butter Industry

Parameter or Variable	Unit	Butter
Retail demand elasticity	———	−1.0
Conversion factor[a]	———	23.0
Conjectural elasticity	———	(0, 0.23, 1.0)
Advertising elasticity[b]	———	0.023
The rental rate of quota[c]	$/kg	0.065
Milk supply elasticity[d]		0.07
Quantity demanded[e]	tons	84,204 (2.93 kg per capita)
Beginning stock[e]	tons	23,284
Ending stock[e]	tons	13,459
Exports[e]	tons	10,075
Imports[e]	tons	175
Industrial milk price[e]	$/kg	.476
Retail price[e]	$/ton	6,265

[a]Taken from Dairy Farmers of Canada (1994).
[b]Taken from Chang and Kinnucan (1990).
[c]Taken from Chen and Meilke (1998).
[d]Taken from Liu and Forker (1990).
[e]Taken from *Dairy Market Review* (Agriculture Canada, 1994).

required to characterize the Canadian butter market are summarized in table 1.

As demand function form is crucial in determining the impact of different market structures, it is important to consider different types of functional forms in the simulation. Various functional forms have been used in estimating advertising effectiveness, including single equation and equation system approaches. Our simulation focused on the single equation approach. Six types of retail demand functions, including linear, double-log, semi-log, log-inverse, linear-inverse, and inverse-pivot, are identified. The first five have been popular in advertising studies (Venkateswaran and Kinnucan 1990), while the last one was included to illustrate the importance of multiplicative advertising specification. Their likely effects are presented in table 2.

As price elasticity is endogenous to the system, the formulas for price elasticity corresponding to each function were incorporated. The policy experiment was an increase in advertising expenditure for butter by 10%. Base values and results of new equilibrium values are presented in table 3. In order to see the magnitudes of biases caused by an erroneous assumption regarding the processing industry's market structure, the farm level benefit:cost ratio is computed for each functional form under different market structure assumptions. The benefit:cost ratio is defined as the change in the farm level profits from the base solution divided by a 10% increase in advertising costs.

With an increase in advertising, both demand for raw milk and farm profits increase in all scenarios under perfect competition and imperfect competition, compared with the base solution. Estimates of the net returns to producers as measured by the benefit:cost ratios range from 1.35 to 3.42. These estimates are largely consistent with those of Chang and Kinnucan (1990), which ranged from $2.05 to $5.45. Generic advertising expands the demand for milk and is beneficial to farmers. Our focus, however, is how the presence of imperfect competition affects the response of farm profit to an increase in advertising. As expected, the response depends on the form of the demand function. If the semi-log demand function is the correct specification, then by assuming perfect competition in the processing market, the effect of increased advertising on farm profit is overestimated by $0.263 million (comparing $646.128 million profit under oligopoly with $645.865 million profit under perfect competition), and the benefit:cost ratio is inflated by about 13%. If the log-inverse demand function is the correct specification, then by assuming perfect competition in the processing market, the effect of increased advertising on farm profit is underestimated by $.361 million (comparing $646.292 million profit under oligopoly with $646.653 million profit under perfect competition), and the benefit:cost ratio is deflated by about 13%. Under the inverse-pivotal demand function, the overestimation is $.353 million (comparing $645.701 million profit under oligopoly

Table 2. Forms of the Retail Demand Functions Used and Likely Effects

Functions	Function Forms	P_{QQ}	P_{QA}	Bias
1. Linear	$p = \alpha + \beta Q + \gamma A$	0	0	None
2. Log-linear	$\ln p = \alpha + \beta Q + \gamma A$	+	−	Undetermined
3. Semi-log	$p = \alpha + \beta \ln Q + \gamma \ln A$	+	0	Overestimate
4. Double-log	$\ln p = \alpha + \beta \ln Q + \gamma \ln A$	0	0	None
5. Linear-inverse	$p = \alpha + \beta Q + \gamma \frac{1}{A}$	0	0	None
6. Inverse-pivot	$p = \alpha + \beta Q + \gamma \frac{Q}{A}$	0	+	Overestimate

Table 3. Farm Level Effects of a 10% Increase on Advertising Expenditure

	Demand for Butter (tons)			Farm Level Profit ($000)			Benefit:Cost Ratio		
	Perfect Competition (ω = 0)	Oligopoly (ω = .25)	Monopoly (ω = 1)	Perfect Competition (ω = 0)	Oligopoly (ω = .25)	Monopoly (ω = 1)	Perfect Competition (ω = 0)	Oligopoly (ω = .25)	Monopoly (ω = 1)
Base	84204	84204	84204	643845	643845	643845			
Linear	86310	86310	86319	646638	646638	646649	2.54	2.54	2.54
Log-linear	86323	86016	84162	646653	646292	645782	2.55	2.22	1.76
Semi-log	85670	85882	87204	645865	646128	647610	1.83	2.07	3.42
Log-log	85676	85676	85679	645873	645873	645876	1.84	1.84	1.84
Linear-inverse	85257	85257	85262	645331	645331	645337	1.35	1.35	1.35
Inverse-pivot	85270	85541	86374	645348	645701	646712	1.37	1.69	2.60

with $645.348 million profit under perfect competition), and the benefit:cost ratio is inflated by about 23%.

The above results are sensitive to different parameters of conjectural variations. Consider that monopoly is a true market structure. If the semi-log demand function is the correct specification, then by assuming perfect competition in the processing market, the change in farm profit results from an increase in advertising is overestimated by $1.745 million, and the benefit:cost ratio is inflated by about 84%. If the log-inverse demand function is the correct specification, then by assuming perfect competition in the processing market, the change in farm profit of an increase in advertising is underestimated by $.871 million, and the benefit:cost ratio is deflated by about 31%. Under the inverse-pivotal demand function, profit is overestimated by $1.346 million, and the benefit:cost ratio is inflated by about 90%.

As expected, if the linear, log-log, and linear-pivot demand functions are the correct specifications, then by assuming competition in the processing market, the effect on farmer's profit of an increase in advertising will not be biased.

Conclusions

This paper demonstrates the importance of incorporating the appropriate structure of the underlying industries in advertising effectiveness studies. Erroneous assumptions regarding the market structure may produce biased estimates of the effectiveness of generic advertising and lead to incorrect policy recommendations. Comparative static results indicate that an increase in generic advertising may either increase or decrease farm profit under imperfect competition. When a rise in generic advertising increases farm profit under imperfect competition, the size of this effect may be more than, less than, or the same as that under perfect competition. The functional form of the retail demand is found to play an important role in determining both the direction and magnitude of the effect of advertising on farm profit.

The Canadian butter industry is simulated to illustrate the magnitude of the bias caused by an erroneous assumption regarding market structure. Simulation results confirm that the functional form of the retail demand plays an important role in determining both the direction and magnitude of the effect of advertising on farm profit, while the conjectural elasticity plays an important role in determining the magnitude of the effect. When the linear, log-log, and linear-pivot demand functions are the correct specifications, by assuming perfect competition in the processing market, the estimated change in farm profit associated with an increase in advertising will not be biased. When semi-log, long-linear, and inverse-pivot are the true functional forms, the magnitude of bias caused by an erroneous assumption regarding processing market structure is quite large if the conjectural elasticity is large (close to 1) and quite small if the conjectural elasticity is small (0.25). The issue addressed in this paper should be considered in future studies of generic advertising effectiveness in imperfectly competitive industries.

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Notes

1. Suzuki and Kaiser (1997) and Suzuki et al. (1994) investigated the impact of farmers' market power on generic advertising effectiveness.
2. Recent evidence of imperfect competition in the U.S. and Canadian agri-food industries can be found in Schroeter (1988), Schroeter and Azzam (1990), Azzam and Pagoulatos (1990), Rude (1992), Wann and Sexton (1992), Karp and Perloff (1993), and Cranfield et al. (1995).
3. Detailed descriptions of dairy legislation in Canada can be found in Barichello (1981) and Ewing (1994).
4. There has been very limited research on measuring the degree of substitution between raw milk and marketing inputs in the food industry. Wohlgenant and Haidacker (1989) and Wohlgenant (1989) found a significant substitution between raw milk and marketing inputs in the U.S. retail industry. However, using a similar method, Gordon and Hazledine (1995) failed to find a significant substitution between raw milk and marketing inputs in the Canadian retail industry. We are not aware of any statistical evidence on the degree of substitution between raw milk and marketing inputs in the dairy processing industry.
5. In the short run, both price and production are fixed so that current advertising is unlikely to have a significant effect on the current farmer's profit. In the long run, both price and production are allowed to be adjusted. However, since price has already been perceived to be excessively high, any price increase due to demand shift may be politically costly. It is likely that the board would adjust production rather than price.
6. A positive value of production quota established in the quota exchange market in Ontario and Quebec clearly indicates that production quota is binding.
7. However, when for monopoly the conjectural elasticity is 1, equation (6) falls apart in the case of unit demand elasticity. To avoid the problem, we set the demand elasticity at –0.99 instead.
8. Most Canadian studies involving supply-managed commodities borrow supply elasticity estimates from analyses conducted using U.S. data, as the existence of production quotas precludes the possibility of estimating milk supply elasticity using Canadian data. Given the similarities in production practices and input prices in the United States and Canada, supply elasticity estimated using U.S. data can provide a reasonable indication of the responsiveness of the underlying Canadian supply function.