Issues in evaluating generic promotion in the food chain

Ellen W. Goddard,
John W. Freebairn,
Garry R. Griffith

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Ellen W. Goddard, John W. Freebairn and Garry R. Griffith*

Abstract

Some issues in the evaluation of generic promotion have received relatively little attention. The agricultural economics literature on brand versus generic advertising is often simple empirically and has not related well to the burgeoning marketing literature on brand/private label strategies. Conversely, that literature does not often consider the implication of the strategies for any but consumers, processors and retailers. Thus, there is a significant gap in terms of branding strategy implications for farmers, in spite of the fact that many farm groups and co-operatives feel that this should be their main marketing goal. This issue becomes more relevant for exporting countries such as Australia given the requirement for country-of-origin labelling in the most recent US Farm Bill. In this paper we review the generic promotion literature, develop a conceptual framework for examining some of the issues of generic and brand advertising in agricultural industries, and provide an example using a simple synthetic model.

Key words: generic promotion, brand promotion, private label, market power

Introduction

The generic advertising literature is rife with discussions of the implications of generic advertising for farmers (who pay) and for consumers (who respond). Marketing channels are often assumed to be competitive or non-competitive affecting the return to advertising for farmers or prices paid by consumers. As well, there are a number of studies in the agricultural economics literature that attempt to model the impact of brand versus generic advertising on aggregate product sales. Conversely in the marketing literature there are numerous studies that look at the implication of branded versus private label products on consumer demand, retailer and manufacturer profits with no link back to the farm market level (for example, Cotterill et al. 2000). Cotterill et al. (2000) have enriched that literature significantly by adding a structure on the consumer demand relationships through specifying 1- or 2-stage demand systems. Realistically however, in the markets for a number of commodities there are agents at all marketing levels making decisions which affect returns/costs for all market participants. The decision to make or sell private label products versus branded products is not made uniquely by retailers, nor is the decision to advertise a brand or generic strategy.

Sometimes the same agents are paying for both activities. In the case of eggs in Australia, under past regulated marketing regimes, state marketing authorities paid for branded product development, brand advertising and generic advertising simultaneously. Under regulation eggs were marketed by statutory authorities, and in some cases the marketing authorities developed brands of eggs with particular attributes or production practices. As well the various state authorities conducted generic promotion for eggs (advertising and other forms of promotion) and advertising for the industry-developed brands of eggs. As the industry deregulated, the brands were turned over initially to producer run co-operatives and ultimately sold to private interests. Generic advertising has until recently played little role in the

* Professor, University of Alberta, Canada; Professor, University of Melbourne, Australia; Principal Research Scientist, NSW Agriculture, Australia, and Adjunct Professor, University of New England, Australia. The authors gratefully acknowledge the financial assistance of the Rural Industries Research and Development Corporation.
Contact: garry.griffith@agric.nsw.gov.au

deregulated industry strategy. In the last couple of years the major retailers have been aggressively pursuing a strategy of developing private label or generic store brand eggs and the shelf space devoted to branded eggs has declined. At the same time, deregulation in the industry lost the home for generic advertising and it is not clear what the optimal industry response might be. Recently the egg industry has proposed the reintroduction of generic advertising.

The economic implications of investing in generic advertising, at a time when the egg industry is deregulated, with privately owned brands and increasing market share for store brands under contract, need to be examined. In this paper we review the generic promotion literature, develop a conceptual framework for examining some of the issues of generic and brand advertising in agricultural industries, and provide an example using a simple synthetic model.

The Literature

The literature that relates to this issue surrounds a number of different issues:

1. market power issues related to the games played by processors and retailers (in this case the processors may be the co-operatives owned by farmers or private interests) around pricing and other promotional variables;
2. consumer/ farmer welfare from the introduction of private label or branded products and resulting competitive interactions;
3. consumer demand for brands of individual products (quality attributes of different types of eggs, for example); and
4. consumer response to generic versus brand marketing strategies.

Why introduce private label?

Sometimes the implications of how the introduction of private label products will affect various participants as well as the determination of appropriate marketing strategies depends on the reasons why the private label products were introduced in the first place. As well, there are issues as to whether the introduction of a private label product is equivalent to the introduction of any other branded line of product. Private labels are often seen in the literature as a lower quality alternative to a branded product, although in some cases, private label products are introduced as the premium line of products in a particular category. In the case of milk and eggs, private label are likely to be a ‘generic’ line of product, priced below branded products. The other conflicting issue about private label products is who actually makes them. In some cases the retail stores produce and market their own line of private label products or deal with a completely independent processor to produce the products. In other cases they contract the already existing brand manufacturers to produce the private label brands as well as their own brands.

Many reasons have been proposed for the introduction of private label products by retailers; varying from fragmentation of national brand consumers through cable television to free riding on national brand success, to cost, profit and reputation considerations by retailers (Mills 1995). Mills (1995) proposed a model of manufacturer/retailer interaction to determine retail brand prices. In his model manufacturers of national brands sell product (produced at marginal cost c) to retailers at price w who sell to consumers at P1. Retailers can also purchase/make private label product (substitutable) at marginal cost c and sell it at P2. Manufacturers choose w assuming a reaction from retailers, and retailers, based on w, choose to make/acquire private label products and choose retail prices P1 and P2. Mills draws the following conclusions out of his analysis:

> "If w is low enough retailers won't bother with private label, if w is high enough retailers won't sell national brands. If w is in the range where both products are offered to consumers, retailers pass on all mark-ups in w to consumers, affecting volume of sales of national brands (since there is now a substitute). Manufacturers can only affect the brand's share of sales, cannot affect total unit sales as they could previously under a monopoly position. The manufacturer's profit diminishes where retailers have a private label and retailer profit increases (profit increase greater than manufacturer loss). No consumer is injured by the emergence of private label. All consumers who buy private label and some who buy national brands would abstain all together in the absence of private label. Consumers who would buy national brand with or without private label now get branded product at a lower price."

Mills also addresses the issue of whether the introduction of private label by the retailer is the same as the introduction of another national brand by an independent manufacturer. In fact, he shows it is not the same due to the "double marginalisation" resulting from manufacturer and retailer actions[1]. Kadiyali et al. (1999) show that "line extensions" are an important competitive strategy of many food manufacturers, in their case, yoghurt. They present the competitive reaction effects of a single firm introducing a new variety of product in a given category and show that the relationships between the two firms in the industry can change, including changing the pricing of the firms from cooperative to price leadership, leading to higher prices, higher margins and profits for both firms. The actions regarding competing products of manufacturers can provide very different results from the introduction of private label by retailers.

What is the nature of the competitive interactions in price and other marketing variables?

In attempting to determine the overall impact of the introduction of private label for various marketing chain participants, one of the most important aspects is how the various manufacturers /retailers behave towards each other competitively. This will affect the overall availability of product in the marketplace, prices and demands for raw farm products. In the literature the competitive interaction is usually considered to be on the price charged for the product (brand and private label, for example), promotion for each product, or on price promotions (couponing or sales, for example). Putsis and Dhar (1998) categorize both the types of interaction possible and the various empirical attempts to establish the type of interaction in the marketplace. In their terminology, competitive interaction effects are classified as symmetric or asymmetric. Symmetric refers to responses by rival firms in a coordinated manner to an initial action by one firm. For example, a cooperative promotion by one firm might result in decreased promotion by another firm; whereas a non-cooperative response might suggest an increase in promotion by one firm would result in increased promotion by the other firm. Independent responses would suggest neither firm responds to the actions of the first firm. Asymmetric interaction between firms might be of the Stackleberg leader-follower manner where one firm responds to the action of the other firm but the other firm makes no responses to actions of its rival. A final form of interaction suggests that one firm may respond cooperatively to the actions of the other firm but the other firm takes non-cooperative reactions to the actions of it's rival.

Around a particular marketing variable, advertising, Chen, Roayaei and Sheldon (1993) have summarized the possible reactions as follows:

[1] Two vertically linked monopolists each mark up, resulting in lower volume sold, and lower profit which across the two monopolists is not being maximized. A single integrated monopolist would make higher profits with lower consumer prices and higher sales.

Predatory advertising

- focused on market share
- if Firm A increases then Firm B will also increase

Cooperative advertising

- overall market increase
- if Firm A's advertising is a perfect substitute for Firm B's then if Firm A increases Firm B will decrease.

A number of papers have focused on the relationship between advertising responses and sales responses to advertising. In the simplest possible case a firm might choose to invest a fixed proportion of their sales in advertising. The critical modeling aspect associated with the advertising/sales decisions by a firm has to do with the simultaneity of the two actions. Modelling the impact of advertising on sales and not allowing for the simultaneity of the two decisions will bias the estimates. This was first investigated by Bass:

- Bass (1969) – regular and filter cigarettes
  Sj = f(Aj, Ao, Y, Pc)
  Aj = f(Sj, Ao), where S = sales, Ao advertising of the other type
- Bass and Parsons (1969) – supermarket goods
  R(good) = f(Agood, Aother, Rgood(t-1), Rother(t-1))
  Agood = f(Rgood(t-1), Aother(t-1),Agood(t-1))
  R(other) = f(Agood, Aother, Rgood(t-1), Rother(t-1))
  Aother = f(Rgood(t-1), Aother(t-1),Agood(t-1))

The interesting things about the Bass and Parsons (1969) study is that there is a direct attempt to account for not only the advertising/sales simultaneity but also the reaction function of the firm to advertising expenditures by other agents. Schmalansee (1972) had some conceptual problems with the Bass approach. He pointed out, for example, that "if price and marginal cost are unchanged and if the elasticity of sales with respect to advertising is constant, as assumed in Bass (1969, logarithmic specification) profit maximization requires a constant ratio of advertising to sales" (p.120). The exclusion of lagged variables makes the identification of parameters suspect.

Schmalansee (1972) in deriving an optimal advertising rule for an oligopolistic firm, where price and type of product are given, assumed that the firm chooses advertising expenditure to maximize profits taking into account rival advertising responses. His Optimal Investment Rule is:

$$Ai/Ri = (1/\eta QiPi)(\eta QiAi + \eta QiA0\ \eta A0Ai)$$

This optimal advertising rule is very similar to that developed by Dorfman and Steiner (1954), with the exception that the advertising elasticity includes an additional term allowing for the advertised good's response to other good advertising, multiplied by the other good's advertising elasticity in response to the change in advertising for good i.

Schmalansee (1972) estimates empirical models of the type:

$$S = a_1A + b_1X + c_1$$
$$A = a_2S + b_2Z + c_{2,}$$

where S is sales, A is advertising expenditure, and X and Z are other explanatory variables. He emphasizes the importance of lags in the advertising/sales linkages and the possibility that advertising decisions are formed on the basis of expected rather than actual sales.

The measures that are of importance are the responses in brand (private label) sales to a marketing variable that may be of interest (again usually in the literature, the variables of price, promotion or price promotions). This response is composed of at least two parts - first the demand response to the change in the marketing variable, and second, the demand response to the rival reaction to the change in the original marketing variable (in the case of price, the cross price elasticity times the reaction elasticity). In the case of more than one marketing variable the literature refers to the fact that there may be 'simple' as opposed to 'multiple' reactions. Lambin, Naert and Bultz (1975) identified the optimum behaviour in an oligopoly for firms who can vary price, advertising and product quality. However their analysis illustrates the responses by rival firms to a change in one of three marketing variables by exclusive response in that one marketing variable (a simple reaction).

- Lambin, Naert, Bultez (1975) – reaction functions for firm who sets price, advertising expenditures, product quality index
  Example reaction function:
  - $P_t = K_P p_t^{\rho P,p} . s_t^{\rho P,s} . x_t^{\rho P,x}$
    - Pt = price set by other firm in reaction
    - p_t = price set by initial firm, s_t=advertising by initial firm
    - ρP,p = reaction elasticity for other firm price in response to initial firm price
    - ρP,s = reaction elasticity for other firm advertising in response to initial firm price
    - ρP,x = reaction elasticity for other firm quality in
    - response to initial firm price
  - similar equations for the other reaction variables, advertising and quality although in each of those cases the advertising, quality variables respond with a lag to changes in the other firms' activities.

Leeflang and Wittink (1992) explore the possibility of multiple competitive response where a firm's action with respect to one market variable could be responded to by rival firms varying one or more of the set of market variables, not necessarily the same one that was initially varied. Their analysis is extended in Leeflang and Wittink (2001) where they develop competitive reaction functions for price and four non-price promotion variables (refund, bonus, feature etc.):

Change in promotion variable 1 for firm 1 = F (change in promotion variable 1 for firm 2; lagged endogenous variable, change in all other promotion variables, firm 2)

Putsis and Dhar (1998) and Cotterill, Putsis and Dhar (2000) discuss the various approaches to empirically estimating the competitive interactions presented above.

The approach to determining the outcome of competitor interactions in a particular marketplace stems from original research by Baker and Bateman. Their approach reduces the number of estimable parameters, in the case of merger analysis, to just the demand relationships for the two merger proposing companies and an aggregate of other firm's activities. However the entire approach rests on rigorous demand estimation of the consumer response to price and all other non-price variables for the

particular brand as well as other brands in the product market[2]. The real strength of the approach lies in the linkage between brand level marketing actions and market power considerations.

The first method "requires specifying, a priori, the various forms of competitive interaction possible and by using non-nested hypothesis tests ascertain which type of competition best fits the data" (termed a menu approach). Conjectural variation approaches are a second type of analysis which can be applied to the data, where each firm's first-order conditions are derived as a function of the conjectures each firm has about it's rivals actions; these first order conditions and demand functions are then estimated directly.

For example, take demand functions of the following form,

Qi= a0+a1*p1+a2*p2+a3*ADV1+a4*ADV2,

and first order conditions

P1 = -(Q1/(∂Q1/∂P1))-(MC1+ADV1)

and solve. The term ∂Q1/∂P1 will equal (a1+a2*(∂p2/∂p1)). The latter term ∂p2/∂p1 equals the conjectural variation parameter and it can be estimated directly from the data. There will be a different conjectural variation parameter for every competitive interaction variable - which could include promotion and price promotions.

Cotterill, Putsis and Dhar (2000) propose a third alternative, the reaction function approach. Here, the first order conditions are solved for each firm, expressing each decision variable as a function of a rival's decision variables as well as demand and cost-shift variables. This latter approach relies on being able to derive explicit reaction functions from the demand and cost relationships specified in the firm's behavioural model. The more complex the demand relationships are assumed to be, the more intractable the problem of deriving explicit functional forms for the reaction functions. Cotterill, Putsis and Dhar (2000) assume that the reaction functions can be approximated by a Taylor series expansion, an approach that does not allow the cross equation restrictions from the demand equations to be imposed on the reaction functions.

Empirical approaches to these various model specifications have included linear, log–linear, or log-log demand functions and reaction functions estimated simultaneously. Recently Cotterill in a number of publications has proposed the use of formal demand systems. He uses most frequently the linear or non-linear version of an AIDS demand system (in one case a Rotterdam demand system), plus an expenditure equation, as the basis for the demand relationships. On some occasions the demand system proposed is a multiple or two stage system with expenditure on product category also an endogenous variable in the system. This latter approach significantly enhances the complexity of the research models and estimation procedures.

None of the analysis conducted to date in the literature refers to the possibility of generic level promotion. In fact much of the empirical research explicitly constrains the effects of promotion variables to shifting among brands (brand switching). Putsis and Dhar (2001) refer to the fact that other researchers have developed models where the effects of price promotions are asymmetric (price

[2] To a great extent, the marketing literature avoids the debate about how the marketing variables fit into the consumer choice problem (see for example Dixit and Norman 1978, Stigler and Becker 1977, Becker and Murphy 1993).

promotions for national brands pull sales from private label but the reverse is not true) or among periods (purchase acceleration) but do not allow for increased category expenditure. Putsis and Dhar undertake an analysis of the impact of various forms of promotion on category expenditure and find that, given the specific category, market and type of promotion, promotions can impact on category expenditure. This area of research implies another potential response of one manufacturer to promotion by another manufacturer: "where category expenditure elasticities are high, competitive promotion by different players may not lead to ruinous competition but rather an increase in demand and profitability. …. If retail promotions can have a significant impact on overall category revenue, retailers should favour strategies that increase category size over those that simply increase market share."

Apart from any discussion about the impact of generic promotion, the marketing literature in this area has a lot to offer to the issues in this research. Cotterill (2001) has quite cogently provided a discussion of the various "cost pass through rates" that occur in a market where the processors and retailers are few in number and competing with each other in the sale of various branded products. He assumes a market where the demand functions facing the retailers for two products (branded and private label, for example can be expressed as follows:

$$q_1 = a_0 + a_1p_1+a_2p_2$$
$$q_2 = b_0 + b_1p_1+b_2p_2$$

The processor level demand equations can be derived from the retail demand equations through the type of conjectures the processors have about how retailers will price. These conjectures could be Vertical Nash (linear retail mark ups) or Vertical Stackleberg (conjectures developed from the first order conditions of the retailer). These interactions, basically driven by the demand parameters because of an assumption of constant marginal costs, lead to various different outcomes in terms of cost pass through in the marketing chain. These are presented in Table 1.

It is of interest that he uses increases in farm costs as an example of one price shock in the system. In a perfectly competitive market the cost pass through should be equal to 1. Depending upon the type of interaction those same pass throughs in a concentrated market can be much smaller. Clearly the same implication could hold for the revenue/profit pass through associated with activities such as generic advertising. The competitive interactions are likely to be very important.

What do we know about generic versus brand level consumer response?

The agricultural economics analysis of generic promotion has recognized the importance of including other types of promotion if the measured response to generic advertising is to be robust. However the empirical approaches undertaken by various authors do not seem that rigorous. Examples of analysis of brand versus generic effects include studies where the aggregate consumption of a particular food commodity such as milk or beef is regressed on a number of explanatory variables including generic advertising and brand advertising. These studies are briefly summarized in Table 2. Although the list is not exhaustive the approach is quite clear. What is focused on is the effect of both types of advertising on aggregate sales of commodities.

In few cases have the possibilities of interactive effects or of size of market versus market share effects been tested explicitly. In considering the impact of generic advertising it has become increasingly obvious that the advertising of related products must be considered. For food products this could include the advertising of branded food products, restaurant advertising (particularly fast food) and generic advertising from farm groups. The underlying questions remaining are two: how do these

various advertising effects interact with each other resulting in changes in food consumption patterns and how do the various advertising agents respond to changes in other agent's advertising activities in the marketplace. A related question is whether or not there is interest in the impact of the various types of advertising at the firm level or only at the aggregate consumption level. In agricultural economics we are often concerned more with beef consumption then we are with beef sales from a particular firm. However, if there is a competitive response by a firm to a generic or restaurant advertising campaign that is symmetric and cooperative or asymmetric and non cooperative then the ultimate effects of the campaign on all sellers of the product may be entirely different. It may be necessary to model the firm level responses explicitly to properly capture the market level impacts. Carey and Bolton (1996) considered the idea of generic advertising from a somewhat different aspect than that of the traditional agricultural economics approach. The analysis in their paper is focused on the demand for individual brands of a product, where a particular firm may choose a brand specific or a generic approach to advertising depending upon their particular market goals. If we assume competing firms produce identical products then a brand advertising campaign is aimed at giving an implied differentiation to the individual firm's product. A firm might undertake brand advertising if consumers lack information about their preferred bundle of characteristics of a particular product, usually this type of advertising is 'informationles particular product, usually this type of advertising is 'informationless' or persuasive in nature. A firm might follow a generic advertising strategy if consumers are unaware of actual characteristics of the product, or there are potential new users out there in the marketplace, often termed informative advertising. Carey and Bolton develop a model of brand versus generic advertising choices for an individual firm, given responses by competitive rival firms. Clearly the generic advertising effect may have large spillover impacts for the products of other firms.

Summary

The marketing and agricultural economics literature provides many clues to the effects of the introduction of private label (additional brands) products, including food products, on manufacturer (processor), retailer and consumer. It has little to say about the implications of that on farmers. The marketing literature contains many examples of estimating the price/quantity outcomes for individual brands and total quantities under conditions of competitive interactions between manufacturers and retailers on price and other forms of promotion variable. Farmer funded activities are usually not included as one form of competitive interaction in such analysis, in spite of the fact that food products are often analyzed. The agricultural economics literature contains a number of references on the impact of generic and aggregated brand advertising on aggregate disappearance of various food products. Although on occasion the food products are disaggregated into component parts (pork into bacon, ham, pork chops, for example) there are no examples of disaggregating the products into individual brands, as the marketing literature does, and aggregating back towards total consumption with the brand level responses to price and promotion variables clearly identified. Zhang, Sexton and Alston (1999) examined the impact of branded food advertising on farmers and concluded that "farmers may gain or lose from brand advertising by downstream processing firms. Farmers are most likely to lose when advertising takes place in relatively unconcentrated processing industries and is relatively more effective at creating brand identity than at expanding demand in total".

Conceptual Model To Look At The Interaction Of Brand/Private Label Strategies And Farmer Funded Generic/Brand Advertising

No Advertising

We develop a model of 2 goods related in demand, produced from a homogeneous farm product. One example could be branded versus private label goods sold in a supermarket. The marketing channel is simplified to have just two levels, retail and farm. The model does not allow for storage or trade. The quantities and prices (qi, Pi for i = 1, 2) are jointly endogenous and determined competitively. The equations for inverse demand and supply, for i = 1, 2 are:

(1) $P_i = d_i(q_1, q_2)$ For example, $P_1 = q_1 - b_1q_1 + c_1q_2$, and $P_2 = q2 - b_2q_2 + c_1q_1$ (with symmetry.
(2) $P^p = s_i(Q)$ $P^p = h_1 + g_1 (Q)$
(3) $Q = q_1 + q_2$

where P^p is the producer price which differs from P_1 by a marketing margin, $P_1 = P^p + mq_1$, representing additional marketing costs associated with the branded product. P^p is the same as P_2 assuming no marketing costs for the private label product.

If the branded and private label products are produced/sold by different agents, assumed to behave competitively (AR = MC), then reaction functions can be derived for q_1 and q_2 as:

Product 1, $P_1 = P^p + mq_1$
Product 2, $P_2 = P^p$

Reaction functions, $$q_1 = \frac{a_1 - h_1 + (c_1 - g_1)\, q_2}{(b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h_1 + (c_1 - g_1)\, q_1}{(b_2 + g_1)}$$

If the branded/private label products are each produced by an independent firm, assumed to maximize profits (MR = MC), then reaction functions can be derived for q_1 and q_2 as:

$$q_1 = \frac{a_1 - h_1 + (c_1 - g_1)\, q_2}{(2b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h2 + (c_1 - g_1)\, q_1}{(2b_2 + g_1)}$$

If the branded/private label products are produced by 1 firm, assumed to maximize profits (MR = MC) for each product, then reaction functions can be derived for q_1 and q_2 as:

$$q_1 = \frac{a_1 - h_1 + (2c_1 - g_1)\, q_2}{(2b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h2 + (2c_1 - g_1)}{(2b_2 + g_1)}$$

It is also possible that the industry at the farm level could classify production into two components, a certain quality to allow sales to the branded market and another quality to allow sales on the private label market. Assuming that the farm level disaggregation is compatible with the retail sales (and does not result in an additional product being sold at the retail level) then the supply relationships could be:

$P^p_1 = h_1 + g_1q_1 \qquad P_1 = P^p_1 + mq_1$

$P^p_2 = h_2 + g_2q_1 \qquad P_2 = P^p_2$

If these branded/private label products are produced/sold by different agents, assumed to behave competitively then reaction functions can be derived for q_1 and q_2 as:

$$q_1 = \frac{a_1 - h_1 + (c_1 - g_1)\, q_2}{(b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h_2 + (c_1 - g_2)\, q_1}{(b_2 + g_2)}$$

If the branded/private label products are produced/sold by 1 agent, assumed to maximize profits, then reaction functions can be derived for q_1 and q_2 as:

$$q_1 = \frac{a_1 - h_1 + (2c_1 - g_1)}{(2b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h_2 + (2c_1 - g_2)}{(2b_2 + g_2)}$$

Including Advertising

The reaction functions presented above present the possible equilibrium conditions under a number of different scenarios. The question that remains for the farm group is how and in what form they should advertise. There are a number of possible impacts : generic advertising may affect sales of branded and private label products equally; brand advertising may affect sales of one product positively, but not affect sales of the other product; brand advertising may affect sales of one product positively and the other negatively resulting in no effect on overall market sales or Q; or it is also possible that generic advertising may affect sales of one product more than another.

Additional considerations concern how the farm level advertising is funded. Two possibilities (illustrated in Alston, Freebairn and James 2001) are:

1. that advertising expenditures (A) be funded either as a lump sum where (in the absence of marketing costs) $P^p = P_1$ and A does not depend directly on price or quantity.

2. that advertising expenditure (A) be funded as a per unit check off where $P^p = P_1 – T$, $P^p = P_2 – T$ and $A = TQ$.

Generic Advertising

The introduction of generic advertising into the two demand equations could be illustrated as follows:

$$P_1 = a_1 - b_1q_1 + c_1q_2 - \frac{d_1}{A}$$

$$P_2 = a_2 - b_2q_2 + c_1q_1 - d_1$$

A

Note that for the sake of this example the advertising effects, in terms of quantities are assumed to be equal.

If advertising is funded as a lump sum payment, then $P_1 = P^p + M$, $P_2 = P^p$ and the reaction functions for q_1 and q_2 (homogenous farm product, different agents, competitive behaviour) can be derived as:

$$q_1 = \frac{a_1 - h_1 - d_1/A + (c_1 - g_1)q_2}{(b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h_1 - d_1/A + (c_1 - g_1)q_1}{(b_2 + g_1)}$$

If advertising is funded as a per unit check off (T), then $P_1 = P^p + M + T$, $P_2 = P^p + T$ and the reaction functions for q_1 and q2 (homogenous farm product, different agents, competitive behaviour) can be derived as:

$$q_1 = \frac{a_1 - h_1 - d_1/A + (c_1 - g_1)q_2}{(b_1 + g_1 + m + T)}$$

$$q_2 = \frac{a_2 - h_1 - d_1/A + (c_1 - g_1)q_1}{(b_2 + g_1 + T)}$$

Brand Advertising Funded by Farmers

The introduction of brand advertising into the two demand equations could be illustrated as follows:

$$P_1 = a_1 - b_1q_1 + c_1q_2$$

$$P_2 = a_2 - b_2q_2 + c_1q_1 - \frac{d_3}{A}$$

Note that for the sake of this example the advertising effect, d3, in terms of aggregate quantity is assumed equal to d_1 plus d_2.

If advertising is funded as a lump sum payment, then $P_1 = P^p + M$, $P_2 = P^p$ and the reaction functions for q_1 and q_2 (homogenous farm product, different agents, competitive behaviour) can be derived as:

$$q_1 = \frac{a_1 - h_1 + (c_1 - g_1)q_2}{(b_1 + g_1 + m)}$$

$$q_2 = \frac{a_2 - h_1 - d_3/A + (c_1 - g_1)q_1}{(b_2 + g_1)}$$

If advertising is funded as a per unit check off (T), then $P_1 = P^p + M + T$, $P_2 = P^p + T$ and the reaction functions for q_1 and q2 (homogenous farm product, different agents, competitive behaviour) can be derived as:

$$q_1 = \frac{a_1 - h_1 + (c_1 - g_1)q_2}{(b_1 + g_1 + m + T)}$$

$$q_2 = \frac{a_2 - h_1 - d_3/A + (c_1 - g_1)q_1}{(b_2 + g_1 + T)}$$

Empirical Example

For illustrative purposes a synthetic model can be used to highlight possible impacts under different marketing strategies and market structures. Base level data and elasticities can be assumed. The various equations can be derived assuming the following values:

Product 1: own price flexibility = -0.95, cross price flexibility = 0.5
Product 2: own price flexibility = -0.80, cross price flexibility = 0.55 (symmetry imposed on coefficients)
Farm Product: own supply elasticity = 1.0
Prices: P1 = 16.5, P2 = 15, Pf = 15, m= 0.0125
(1.5 difference between price of product 1 and product 2 due to additional marketing costs borne by the retailer)
Quantities: Q1 = 120, Q2 = 80, Q = 200.

The derived equations and reaction functions can be used to provide the solution values as follow in Table 3. Again for illustrative purposes the base model shown in Table 3 illustrates the market solution values for farm price, quantity and producer surplus for the case in which there is only one aggregate demand curve. Farmers supply a homogeneous product and the solution in case 1 represents a competitive retail sector, while the solution in case 2 represents a monopolistic retail sector. Farm price, quantity and producer surplus are all lower under the monopolistic solution. If the retail industry disaggregates the demand into two products, produced from the same homogeneous farm product, and there are two agents operating at the retail level, one producing product 1 and the other producing product 2, then the results as if they behave competitively are in case 3 and the results as if they behave as a duopoly are in case 4. Farm prices, quantity and producer surplus are higher if there are two products produced from the homogeneous farm production, by different agents, than if there was only an aggregate demand and a monopoly seller. Under the assumption that farmers can disaggregate production into two categories (range-free or farmed eggs, for example) and that these correspond to the categories developed by the retailer, then the solutions in case 5 represent competitive behaviour on the part of retailers and those in case 6 represent duopoly behaviour. Farmers can receive somewhat higher prices under this scenario but the overall quantity sold is lower, resulting in lower producer surplus.

The model can be supplemented by adding generic advertising and looking at the impact of changing advertising expenditure levels. In this case it can be assumed that generic advertising affects the demand for each retail product by the same magnitude (purely for illustrative purposes the advertising elasticities, at equilibrium, are equal to 1.78). The advertising expenditure is assumed to be funded by a lump sum payment, reducing the aggregate producer surplus. The base model is calibrated with initial advertising expenditure of 10 (which is doubled in later scenarios).

There is nothing too surprising about the results presented in Table 4. Prices, quantities and farmer welfare are lower in the duopoly scenario than with a competitively behaved retailing sector. Responses to advertising are equally smaller in the market power scenario than in the competitive

scenarios. Responses to advertising are more muted in the per unit levy/check off scenario than in the lump sum funding scenario.

A different advertising scenario could have the farmers deciding to advertise a special brand of their product (Table 5). This has been seen in the egg industry where farmers/cooperatives developed a particular brand of eggs supplied by the enrolled producers, and advertised that brand of eggs. Often this activity is accompanied by some advertising of a generic nature as well. The brand advertising will be assumed to focus on the higher valued product from a farm perspective (product 2). The advertising expenditure is assumed to be 10 units and the quantity response (in terms of Q) is assumed to be the same as in the generic advertising case. In the generic advertising case the quantity impact was felt equally for each good, in this case the quantity impact is captured entirely by the demand for product 2. The results are smaller across the board in terms of farm price, quantity and producer surplus changes resulting from increasing the branded advertising budget. The other relativities, lower prices/quantities with duopoly, lower responses to advertising with per unit levy/checkoff than with lump sum funding, are maintained. It is also worth noting that the producers who produce for the product 1 market receive much smaller gains under this scenario than with the generic scenario, in spite of the fact that they contribute at the same rate.

The results from the simulation above illustrate a fact that is well known. If there is market power in the marketing chain, farmers can capture less of the benefit from an activity such as advertising. However, there is a distinct possibility that the marketing activities of the retailers (branding and marketing product 1) interact directly with the advertising activities of the farmers (either generic or brand). It is possible that:

- the generic advertising activity, which affects the demands for each product, actually reduces the marketing costs of branding product 1 (m). As generic advertising increases, the amount invested by retailers in marketing product 1 goes down, reducing the price wedge between farm and retail price for that product, and
- the brand advertising activity, which affects the demand for product 2, actually increases the marketing costs of branding product 1 (m). As farmer funded brand advertising for product 2 increases, retailers are forced to spend more on marketing product 1, increasing the price wedge between farm and retail price for that product.

These scenarios are only a couple of the possible combinations of activities. Responses by retailers will vary with market structure. As well it would be possible to derive explicit reaction functions for the responses by retailers to farm level activity and vice versa. For current purposes it is assumed that in case 1, an increase in generic advertising expenditure reduces marketing costs of the retailer for product 1 by 20 per cent; and in case 2, an increase in brand advertising expenditure increases marketing costs of the retailer for product 1 by 20 per cent. Results from simulating base and increased advertising expenditure for generic and brand (exclusively for the cases of lump sum advertising spending) are illustrated in Table 6.

The results suggest what might reasonable be expected. If the farmer investment in advertising results in a reduction in other marketing costs, particularly for a branded product, then the gain to farmers from generic advertising is higher than it would have been, in the absence of a marketing cost response. If, on the other hand, the farmer funded advertising results in an increase in marketing costs, for the branded product 1, than farmers do not stand to gain as much from advertising as they would in the absence of a marketing cost response.

Conclusion

The marketing and agricultural economics literature point to the need to understand the nature of competitive interaction effects if the overall impact of farmer funded activity on farmer groups is to be understood. There are potential consumer surplus gains from the introduction of private label products, such as eggs or milk, by retailers. However there is a dynamic game being undertaken between retailers/processors (sometimes farmer cooperatives and multinationals) which can dramatically impact on the benefits and distribution of benefits across producer groups. The analysis is complicated by the fact that the models examined to date do not include the ability to trade or store the products of interest or other closely related products. Empirical measurement of the relevant supply/demand elasticities for products at the brand/private label level and the responses to various types of promotion variable, as well as the reaction relationships, are critical to the analysis. Reaction variables must be included across promotion types as well as simple reactions.

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Cost Pass Through Rate Equations For Two Processors and Two Retailers:

Cost Pass Through Rates		Vertical Nash	Value if, Retail Monopolies a_2 and $b_1 = 0$	Vertical Stackelberg	Value if, Retail Monopolies a_2 and $b_1 = 0$	Vertical Coordination	Value if, Retail Monopolies a_2 and $b_1 = 0$
Effect of Farm Price Change on Retail Price of 1	$\frac{dp_1}{dm}$	$\frac{(3a_1 - 2a_2)b_2}{9a_1b_2 - 4a_2b_1}$	$\frac{1}{3}$	$\frac{(4a_1 - 3a_2)b_2}{16a_1b_2 - 9a_2b_1}$	$\frac{1}{4}$	$\frac{b_2(2a_1 - a_2)}{4a_1b_2 - a_2b_1}$	$\frac{1}{2}$
Effect of Farm Price Change on Retail Price of 1	$\frac{dp_2}{dm}$	$\frac{(3b_2 - 2b_1)a_1}{9a_1b_2 - 4a_2b_1}$	$\frac{1}{3}$	$\frac{(4b_2 - 3b_1)a_1}{16a_1b_2 - 9a_2b_1}$	$\frac{1}{4}$	$\frac{a_1(2b_2 - b_1)}{4a_1b_2 - a_2b_1}$	$\frac{1}{2}$
Effect of Firm 1 Specific Cost Change on Retail Price 1	$\frac{dp_1}{dm_1}$	$\frac{3a_1b_2}{9a_1b_2 - 4a_2b_1}$	$\frac{1}{3}$	$\frac{4a_1b_2}{16a_1b_2 - 9a_2b_1}$	$\frac{1}{4}$	$\frac{2a_1b_2}{4a_1b_2 - a_2b_1}$	$\frac{1}{2}$
Effect of Firm 1 Specific Cost Change on Retail Price 2	$\frac{dp_2}{dm_1}$	$\frac{-2a_1b_1}{9a_1b_2 - 4a_2b_1}$	0	$\frac{-3a_1b_1}{16a_1b_2 - 9a_2b_1}$	0	$\frac{-a_1b_1}{4a_1b_2 - a_2b_1}$	0
Effect of Firm 2 Specific Cost Change on Retail Price 1	$\frac{dp_1}{dm_2}$	$\frac{-2a_2b_2}{9a_1b_2 - 4a_2b_1}$	0	$\frac{-3a_2b_2}{16a_1b_2 - 9a_2b_1}$	0	$\frac{-a_2b_2}{4a_1b_2 - a_2b_1}$	0
Effect of Firm 2 Specific Cost Change on Retail Price 2	$\frac{dp_2}{dm_2}$	$\frac{3a_1b_2}{9a_1b_2 - 4a_2b_1}$	$\frac{1}{3}$	$\frac{4a_1b_2}{16a_1b_2 - 9a_2b_1}$	$\frac{1}{4}$	$\frac{2a_1b_2}{4a_1b_2 - a_2b_1}$	$\frac{1}{2}$

Table 2: Previous Studies on the Impact of Brand and Generic Advertising

Study	Year	Products	Structure	Variable Definition
Hall and Foik	1983	Yoghurt	Single Demand Equation	Generic and aggregated brand advertising are separate variables
Powers	1989	Oranges	Single Demand Equation	Grocery store advertising is a variable
Jones and Ward	1989	Fresh and Processed Potato Products	Single Demand Equations for fresh, chips, dehydrated and frozen potatoes	Aggregated brand advertising and generic advertising are separate variables
Kinnucan and Clary	1995	Cheese	Fishbein/Ajzen model of awareness, beliefs, attitudes and behaviour	Generic and aggregated brand advertising are separate variables in behaviour equations
Brester and Schroeder	1995	Meats – beef, pork etc.	Single Stage Demand system	Aggregated brand advertising and generic advertising are separate variables
Brown and Lee	1997	Orange Juice Brands and other juices	Two Stage Demand System	Generic advertising affects 1st stage, brand advertising affects brand expenditure share
Kaiser and Liu	1998	Milk, cheese	Single demand equations for milk and cheese	Aggregated brand advertising and generic advertising are separate variables

Table 3: Results - Base Model (no advertising)

Model Description	P_F	P_{F1}	P_{F2}	Q	Producer Surplus (Q)	Producer Surplus (q_1)
(1 demand, 1 supply)						
1: competition at retail	15			200	1500	
2: monopoly at retail	9.9			133	656	
(2 demands, 1 supply)						
3: competition at retail	15			200	1500	900
4: duopoly at retail	12.6			168.5	1064	606
(2 demands, 2 supplies)						
5: competition at retail		15	15	200	1500	900
6: duopoly at retail		12.1	13.3	167.6	1055	584

Table 4: Results - Generic Advertising on Both Products

Model Description	P_F	P_{F1}	P_{F2}	Q	Producer Surplus (Q)	Producer Surplus (q_1)
Lump sum advertising						
(2 demands, 1 supply)						
1: competition retail	15			200	1490	894
2 * advertising	25.4			338.5	4278	2404
2: duopoly retail	12.64			168.5	1054	600
2 * advertising	21.36			284.8	3023	1651
(2 demands, 2 supplies)						
3: competition retail		15	15	200	1490	900
2 * advertising		24.2	26.7	336.2	4229	2350
4: duopoly retail		12.1	13.3	167.4	1045	584
2 * advertising		19.7	23.3	282.2	2986	1558
Per unit levy advertising						
(2 demands, 1 supply)						
5: competition retail	15			200	1500	900
2 * advertising	23.8			318	3781	2140
6: duopoly retail	11.5			152	874	504
2 * advertising	18.2			242	2199	1218
(2 demands, 2 supplies)						
7. competition retail		15	15	200	1500	900
2 * advertising		22.9	24.9	315.9	3750	2114
8. duopoly retail		11.1	11.9	152.2	870	498
2 * advertising		17.1	19.6	240	2184	1174

Table 5: Results - Brand Advertising on Product 2

Model Description	P_F	P_{F1}	P_{F2}	Q	Producer Surplus (Q)	Producer Surplus (q_1)
Lump sum advertising						
(2 demands, 1 supply)						
1: competition retail	15			200	1490	894
2 * advertising	25.3			337	4230	1704
2: duopoly retail	12.64			168.5	1054	600
2 * advertising	21.1			282	2957	1331
(2 demands, 2 supplies)						
3: competition retail		15	15	200	1490	900
2 * advertising		19.3	31.9	324.6	4182	1493
4: duopoly retail		12.1	13.3	167.4	1045	584
2 * advertising		16.6	26.5	274	2958	1107
Per unit levy advertising						
(2 demands, 1 supply)						
5: competition retail	15			200	1500	900
2 * advertising	25.3			337	4248	1711
6: duopoly retail	12.6			168.4	1063	605
2 * advertising	21.1			282	2973	1340
(2 demands, 2 supplies)						
7. competition retail		15	15	200	1500	900
2 * advertising		19.3	31.9	324	4199	1502
8. duopoly retail		12.1	13.3	167.4	1054	589
2 * advertising		16.6	26.5	274	2974	1115

Table 6: Results - Generic + Brand Advertising, marketing cost response

Model Description	P_F	P_{F1}	P_{F2}	Q	Producer Surplus (Q)	Producer Surplus (q_1)
Lump sum advertising,generic						
(2 demands, 1 supply)						
1: competition retail	15			200	1490	894
2 * advertising	25.5			341	4324	2437
2: duopoly retail	12.7			169.1	1064	607
2 * advertising	21.6			288	3082	1690
(2 demands, 2 supplies)						
3: competition retail		15	15	200	1490	900
2 * advertising		24.4	26.8	338	4278	2387
4: duopoly retail		12.2	13.3	168	1055	591
2 * advertising		20	23.5	285	3047	1599
Lump sum advertising,brand						
(2 demands, 1 supply)						
5: competition retail	15			200	1490	894
2 * advertising	25.1			334	4196	1682
6: duopoly retail	12.6			167	1044	594
2 * advertising	21.0			279	2906	1301
(2 demands, 2 supplies)						
7. competition retail		15	15	200	1500	900
2 * advertising		19	32	184	4137	1464
8. duopoly retail		12	13.2	166	1034	577
2 * advertising		16.4	26.3	271	2903	1073