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Dynamic market impacts of generic dairy advertising ☆

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Abstract

Generic advertising of fluid milk and cheese represents the principal promotional activity undertaken with the $370 million per year provided by dairy farmers and fluid milk processors. This article describes a stock-flow-feedback simulation model that includes 17 intermediate and final dairy products, short-term and long-term milk supply response and government policies that influence the impacts of generic advertising on net revenues for dairy farmers. Permanent increases in generic advertising expenditures increase net revenues for dairy farmers, with a cumulative net benefit to cost ratio of 2.8. Permanent decreases produce a larger reduction in net revenues and indicate a net benefit to cost ratio larger than 4.5. Spending a larger proportion of existing generic advertising funds on cheese rather than fluid milk would also markedly increased dairy farmer net revenues. Generic advertising increases net revenues for dairy farmers even when industry supply response and government regulation are accounted for.

Keywords: Generic advertising; Dairy; System Dynamics; Simulation models

Dairy farmers pay a mandatory assessment of 15 cents per hundred pounds of milk marketed in the continental United States to fund a national demand expansion program. This assessment generally ranges between 0.75 and 1% of the price farmers receive for their milk, and most of the money supports generic advertising of fluid milk (e.g., Got Milk?) and cheese (e.g., Behold the Power of Cheese) products. The aims of generic milk and dairy product advertising are to increase consumer demand for fluid milk and dairy products, enhance dairy farm revenues, and reduce the amount of surplus milk purchased by the government under the Dairy Price Support Program. Legislative authority for these assessments dates back to the *Dairy Production and Stabilization Act* of 1983. More recently, fluid milk processors began their own generic fluid milk advertising program (e.g., the Milk Mustache print media campaign) funded by a mandatory $0.20 per hundred pounds processor check-off on fluid milk sales. These two programs represent the two largest generic advertising programs in the United States, raising $370 million per year.

Generic advertising differs from traditional branded advertising in several important ways. First, although branded advertising is an individual firm's activity, generic advertising is a collective effort by all firms within an industry. Second, branded advertising attempts to differentiate a firm's product from its competitors; generic advertising is not geared at product differentiation and is most successful for products with homogeneous characteristics such as basic commodities. Third, the goal of generic advertising is to increase overall demand for a commodity, whereas branded advertising is primarily firm market share driven. A final distinction is that dairy generic advertising's ultimate goal is to increase both the quantity and price of a raw input (milk) through shifts in the demand curve for dairy products requiring that input.

The long-run effectiveness of the program in increasing demand and the price of milk will depend critically on the nature of the milk supply response. For example, if the long-run supply curve for the industry is perfectly elastic, any increase in demand due to generic advertising will not increase price or producer surplus. In contrast, demand increases with an upward sloping long-run supply curve increase both price and producer surplus

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under effective generic advertising. Consequently, modelers must explicitly link supply response to demand and price increases due to advertising to evaluate the impact of generic dairy advertising.

Because dairy is the largest generic advertising program, numerous studies on the economic impacts of generic dairy advertising exist (see Ferrero et al. (1996) for an annotated bibliography). This research falls into two broad categories. The first category of research is positive in nature, evaluating the economic impacts of generic advertising on dairy markets. The majority of this research indicates that generic advertising increases overall market sales and prices at farm, wholesale and retail market levels, and that the benefits of generic advertising substantially outweigh the costs. Kaiser (2006) found a benefit-cost ratio of 4.32 for fluid milk and cheese advertising by dairy farmers. The second line of research is normative in nature, investigating optimal allocation issues. Studies include optimal spatial allocation of advertising by markets (Liu and Forker, 1990), allocation of advertising over time (Vande Kamp and Kaiser, 2000), allocation of advertising across products (Kaiser and Forker, 1993), allocation of advertising by media type (Pritchett et al., 1998) and allocation of expenditures by marketing and research activity (Chung and Kaiser, 1999). All these studies use econometric methods, optimization, or a combination of both. No previous studies of the impacts of generic dairy advertising employ stock-flow-feedback models that include explicit balancing of dairy component (e.g., fat, protein, lactose) to assess market impacts.

Two characteristics of US dairy markets create challenges for researchers interested in modeling the impacts of generic dairy advertising. First, the US dairy industry is highly regulated. Milk pricing at the farm, dairy processor and retail levels depends on federal and state milk marketing orders (which regulate minimum prices that must be paid to farmers), the Dairy Price Support Program (which provides a farm-level price floor and safety net through government purchases of selected dairy products), and import tariffs (which complement other price-related policies by dramatically limiting imports of some dairy products). Properly incorporating the impacts of these regulations on prices is essential for sound evaluation of generic advertising. Second, raw milk is a commodity that has many components with different end uses. Modeling all the possible uses for these components and the associated component-based pricing structure of the regulated market is a complicated process. Nearly all previous studies of generic advertising's impacts deal with these issues through simplifying assumptions about milk components and a high degree of aggregation for dairy products. They therefore omit potentially important linkages that could affect the accuracy of predicted model outcomes (Bishop et al., 1994). These two characteristics of the dairy market make the use of a model with disaggregated representation of dairy products, components and price regulations policy instruments quite appealing.

Accordingly, this paper has four objectives. The first is to examine the dynamic market impacts of increases and decreases in generic advertising expenditures for both fluid milk and cheese in a multiple-product dynamic simulation model. The analysis also allows the computation of a cumulative benefit–cost ratio to assess the effectiveness of generic advertising in a dynamic context. The second objective is to determine the allocation of fluid milk and cheese expenditures that maximizes net revenues received by dairy farmers for a given level of generic advertising expenditures. A third objective is to demonstrate the applicability of a systems modeling approach to the evaluation of generic advertising. A final, broader, objective is to contribute to understanding of how generic advertising influences product markets.

1. Model description

A causal diagram illustrates a number of the differences between the impacts of generic and branded advertising (Fig. 1). The diagram depicts a number of balancing (B) and reinforcing (R) feedback processes associated with the impacts of generic advertising. In contrast to branded advertising, the ultimate objective of generic advertising is to increase net revenues for input suppliers (dairy farmers in this case). The mechanism for this is as follows. Generic advertising expenditures increase sales of the advertised products, which decreases inventories (a physical stock, depicted with a box in Fig. 1), increases their price, increases the net margin earned from them and stimulates additional production. Increases in production of the advertised product increase the demand for the raw input (milk) needed as an input. Increased raw input use for the manufacture of advertised products (in this case, fluid milk and cheese) decreases the availability of the raw input to manufacture non-advertised products (e.g., butter, dried milk). This reduces the available supply of non-advertised products, increasing their price. As noted above, minimum raw input price regulation exists in the US dairy industry; the minimum price paid to farmers is calculated as a function of product prices and product for which the raw input is used. An increase in the price of non-advertised products increases the minimum regulated price. The price increase for advertised products also contributes to increases in the minimum regulated price. A higher minimum regulated price increases the net revenues earned by raw input suppliers (the objective), but also increases input costs for all products. The input cost increase increases the prices of all products, which will have a dampening effect on demand.

Fig. 1 facilitates discussion of the principal balancing and reinforcing processes at work in the US dairy industry. The term balancing loop (B) implies that an initial change in one of the variables in the loop will ultimately result in pressure for that variable to move in the direction opposite the change, all other things being equal. In contrast, a reinforcing loop (R) indicates than an initial change will be reinforced through the feedback process. More formally, feedback loop polarity is $\mathrm{SGN}(\varphi X_1^{\mathrm{Output}}/\varphi X_1^{\mathrm{Input}})$ where SGN is the sign function, X^{Output} is the value of a variable X after one feedback cycle in response to an initial change in the value of X^{Input} (Sterman, 2000).

Conceptually, three feedback processes have an important impact on the ultimate effectiveness of generic advertising to achieve its objective of increasing input supplier net revenues (Fig. 1). The production response loop is a typical market response: increased profitability of advertised production results in additional supplies, increasing inventories and reducing price relative to what would have occurred in the absence of a production response. The second feedback process (the regulated