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Impact of National Generic Dairy Advertising on Dairy Markets, 1984-95

by

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- Facilitate the development of new theory and research methodology.

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Preface

Harry M. Kaiser is an associate professor in the Department of Agricultural, Resource, and Managerial Economics at Cornell University, and director of the National Institute for Commodity Promotion Research and Evaluation (NICPRE). The author thanks Don Blayney for providing updated data, and Jennifer Ferrero for technical editing. Funding for this project came from the New York State Milk Promotion Order and from NICPRE.

This report is published as a NICPRE research bulletin. The mission of NICPRE is to enhance the overall understanding of economic and policy issues associated with commodity promotion programs. An understanding of these issues is crucial to ensuring continued authorization for domestic checkoff programs and to fund export promotion programs.

The intent of this bulletin is to provide an updated, independent evaluation of the National Dairy Promotion and Research Board. This report should help farmers, policy makers, and program managers in understanding the economic impacts of generic dairy advertising on the national markets for milk and dairy products. The report should also be useful for current legal debates on the effectiveness of commodity promotion programs in enhancing the profitability of farmers.

Executive Summary

The purpose of this study was to analyze the impacts of generic dairy advertising by the National Dairy Promotion and Research Board on retail, wholesale, and farm dairy markets. A disaggregated industry model of the retail, wholesale, and farm levels with markets for fluid milk, frozen products, cheese, and butter was developed to conduct the analysis. An econometric model of the dairy industry was estimated using quarterly data from 1975 through 1995. The econometric results were then used to simulate market conditions with and without the NDPRB.

The results indicate that NDPRB had a major impact on market conditions at all levels of the dairy industry. For example, over the period 1984-95, on average, the NDPRB had the following market impacts compared to what would have occurred in the absence of this national program:

- An increase in the national farm milk price of 1.93 percent and an increase in milk production of 0.4 percent.
- An increase in dairy producer revenue of 2.34 percent.
- A rate of return of 3.40, i.e., an additional dollar invested in generic advertising resulted in a return of $3.40 in dairy producer revenue.
- An increase in overall demand for milk of 0.51 percent, including a 0.91 percent increase in fluid milk demand, and a 0.48 percent increase in cheese demand. The NDPRB had virtually no impact on butter and frozen product demand.
- An overall increase in retail prices for milk and dairy products. The national advertising program had the largest effect on increasing retail fluid milk prices (5.62 percent). Retail frozen product, cheese, and butter prices increased by 0.73 percent, 0.81 percent, and 0.10 percent, respectively, due to NDPRB advertising efforts.
- An increase in all wholesale prices for milk and dairy products. The national advertising program had the largest effect on increasing wholesale fluid milk prices (4.10 percent). Wholesale frozen product, cheese, and butter prices increased by 1.07 percent, 2.75 percent, and 0.27 percent, respectively, due the NDPRB advertising effort.
- A decrease in government purchases of dairy products under the Dairy Price Support Program. The results indicated that there was a 12.00 percent decrease in cheese purchases, a 1.59 percent decrease in butter purchases, and a 2.01 percent increase in total dairy product purchases by the government due to the NDPRB.

In order to measure more recent impacts of the national advertising program, the average quarterly results for the most recent year were computed. From the fourth quarter of 1994 through the third quarter of 1995, on average, the NDPRB had the following market

impacts compared to what would have occurred in the absence of this national program:

- An increase in the national farm milk price of 2.93 percent and an increase in milk production of 0.62 percent.
- An increase in dairy producer revenue of 3.52 percent.
- A rate of return of 6.43, i.e., an additional dollar invested in generic advertising resulted in a return of $6.43 in dairy producer revenue.
- An increase in overall demand for milk of 0.70 percent, including a 1.72 percent increase in fluid milk demand, and a 0.27 percent increase in cheese demand. The NDPRB had virtually no impact on butter and frozen product demand.
- An overall increase in retail prices for milk and dairy products. The national advertising program had the largest effect on increasing retail fluid milk prices (10.11 percent). Retail frozen product, cheese, and butter prices increased by 1.10 percent, 0.49 percent, and 0.39 percent, respectively, due to NDPRB advertising efforts.
- An increase in all wholesale prices for milk and dairy products. The national advertising program had the largest effect on increasing wholesale fluid milk prices (6.74 percent). Wholesale frozen product, cheese, and butter prices increased by 1.62 percent, 1.78 percent, and 1.12 percent, respectively, due to NDPRB advertising efforts.
- A decrease in government purchases of dairy products under the Dairy Price Support Program. The results indicated no change in cheese purchases, a 2.25 percent decrease in butter purchases, and a 2.25 percent increase in total dairy product purchases by the government due to the NDPRB.

Consequently, it is clear that dairy farmers benefited from the presence of the NDPRB since farm prices and producer revenues were positively impacted. Dairy wholesalers and retailers also benefited from this program since prices and sales were positively effected by the NDPRB advertising effort. Tax payers also benefited because government purchases and costs of the Dairy Price Support Program were lower. The results also suggest that the net benefits of the NDPRB to farmers have become larger in recent years.

Introduction

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. The aim of this program is to increase consumer demand for milk and dairy products, enhance dairy farm revenue, and reduce the amount of surplus milk purchased by the government under the Dairy Price Support Program. Legislative authority for these assessments, which exceed $200 million annually, is contained in the *Dairy and Tobacco Adjustment Act* of 1983. To increase milk and dairy product consumption, the National Dairy Promotion and Research Board (NDPRB) was established to invest in generic dairy advertising and promotion, nutrition research, education, and new product development.

The purpose of this study is to estimate the impacts of the NDPRB generic advertising effort on the U.S. dairy industry. In this study, a previous model by Kaiser (1995) was revised and updated to measure the market impacts of generic milk and dairy product advertising. The model used is based on a dynamic econometric model of the U.S. dairy industry estimated using quarterly data from 1975 through 1995 and is unique from previous models of the U.S. dairy sector in its level of disaggregation. For instance, the dairy industry is divided into retail, wholesale, and farm markets, and the retail and wholesale markets separately include fluid milk, cheese, butter, and frozen products. Econometric results are used to simulate market conditions with and without the national program.

The results of this study are important for dairy farmers and policy makers given that the dairy industry has the largest generic promotion program of all U.S. agricultural commodities. Moreover, since the constitutionality of some commodity promotion organizations (including dairy) are currently being challenged in court, measurements of the economic impacts of generic advertising is particularly important at this time. Hence, a secondary objective of this study is to provide information that will help in future legal debates concerning commodity promotion programs.

The Conceptual Model

The econometric model presented here is similar in structure to the Liu et al. (1990, 1991) industry model, with one importance difference. While Liu et al. (1990, 1991) classified all manufactured products into one category (Class III), the present model disaggregates

manufactured products into three classes: frozen products, cheese, and butter. This greater degree of product disaggregation provides for additional insight into the impacts of advertising on individual product demand, e.g., cheese demand.

In the farm market, Grade A (fluid eligible) milk is produced by farmers and sold to wholesalers. The wholesale market is disaggregated into four sub-markets: fluid (beverage) milk, frozen products, cheese, and butter.[1] Wholesalers process the milk into these four dairy products and sell them to retailers, who then sell the products to consumers.

It is assumed that the two major federal programs that regulate the dairy industry (Federal milk marketing orders and the Dairy Price Support Program) are in effect. Since this is a national model, it is assumed that there is one Federal milk marketing order regulating all milk marketed in the nation. The Federal milk marketing order program is incorporated by restricting the prices wholesalers pay for raw milk to be the minimum class prices. For example, fluid milk wholesalers pay the higher Class I price, while cheese wholesalers pay the lower Class III price.[2] The Dairy Price Support Program is incorporated into the model by restricting the wholesale cheese and butter prices to be greater than or equal to the government purchase prices for these products. With the government offering to buy unlimited quantities of storable manufactured dairy products at announced purchase prices, the program indirectly supports the farm milk price by increasing farm-level milk demand. A conceptual overview of the model is presented in Figure 1.

Retail markets are defined by sets of supply and demand functions, in addition to equilibrium conditions that require supply and demand to be equal. Since the market is disaggregated into fluid milk, frozen products, cheese, and butter, there are four sets of these equations with each set having the following general specification:

$$(1.1) \quad Q^{rd} = f(P^r|S^{rd}),$$

$$(1.2) \quad Q^{rs} = f(P^r|S^{rs}),$$

$$(1.3) \quad Q^{rs} = Q^{rd} \equiv Q^r,$$

where: Q^{rd} and Q^{rs} are retail demand and supply, respectively, P^r is the retail own price, S^{rd} is a vector of retail demand shifters including generic advertising, S^{rs} is a vector of retail supply shifters including the wholesale own price, and Q^r is the equilibrium retail quantity.

The wholesale market is also defined by four sets of supply and demand functions, and equilibrium conditions. The wholesale fluid milk and frozen product markets have the following general specification:

$$(2.1) \quad Q^{wd} = Q^r,$$

$$(2.2) \quad Q^{ws} = f(P^w|S^{ws}),$$

$$(2.3) \quad Q^{ws} = Q^{wd} \equiv Q^w \equiv Q^r,$$

where: Q^{wd} and Q^{ws} are wholesale demand and supply, respectively, P^w is the wholesale own price, and S^{ws} is a vector of wholesale supply shifters. In the wholesale fluid milk supply equation, S^{ws} includes the Class I price, which is equal to the Class III milk price (i.e., the Minnesota-Wisconsin price) plus a fixed fluid milk differential. In the frozen products, cheese, and butter wholesale supply functions, S^{ws} includes the Class III price, which is the most important variable cost to dairy processors. Note that the wholesale level demand functions do not have to be estimated since the equilibrium conditions constrain wholesale demand to be equal to the equilibrium retail quantity. The assumption that wholesale demand equals retail quantity implies a fixed-proportions production technology.

The direct impacts of the Dairy Price Support Program occur at the wholesale cheese and butter markets level. It is at this level that the Commodity Credit Corporation (CCC) provides an alternative source of demand at announced purchase prices. In addition, cheese and butter can be stored as inventories, which represent another source of demand not present with the other two products. Consequently, the equilibrium conditions for the butter and cheese wholesale markets are different than those for the fluid milk and frozen wholesale markets. The wholesale cheese and butter markets have the following general specification:

$$(3.1) \quad Q^{wd} = Q^r,$$

$$(3.2) \quad Q^{ws} = f(P^w|S^{ws}),$$

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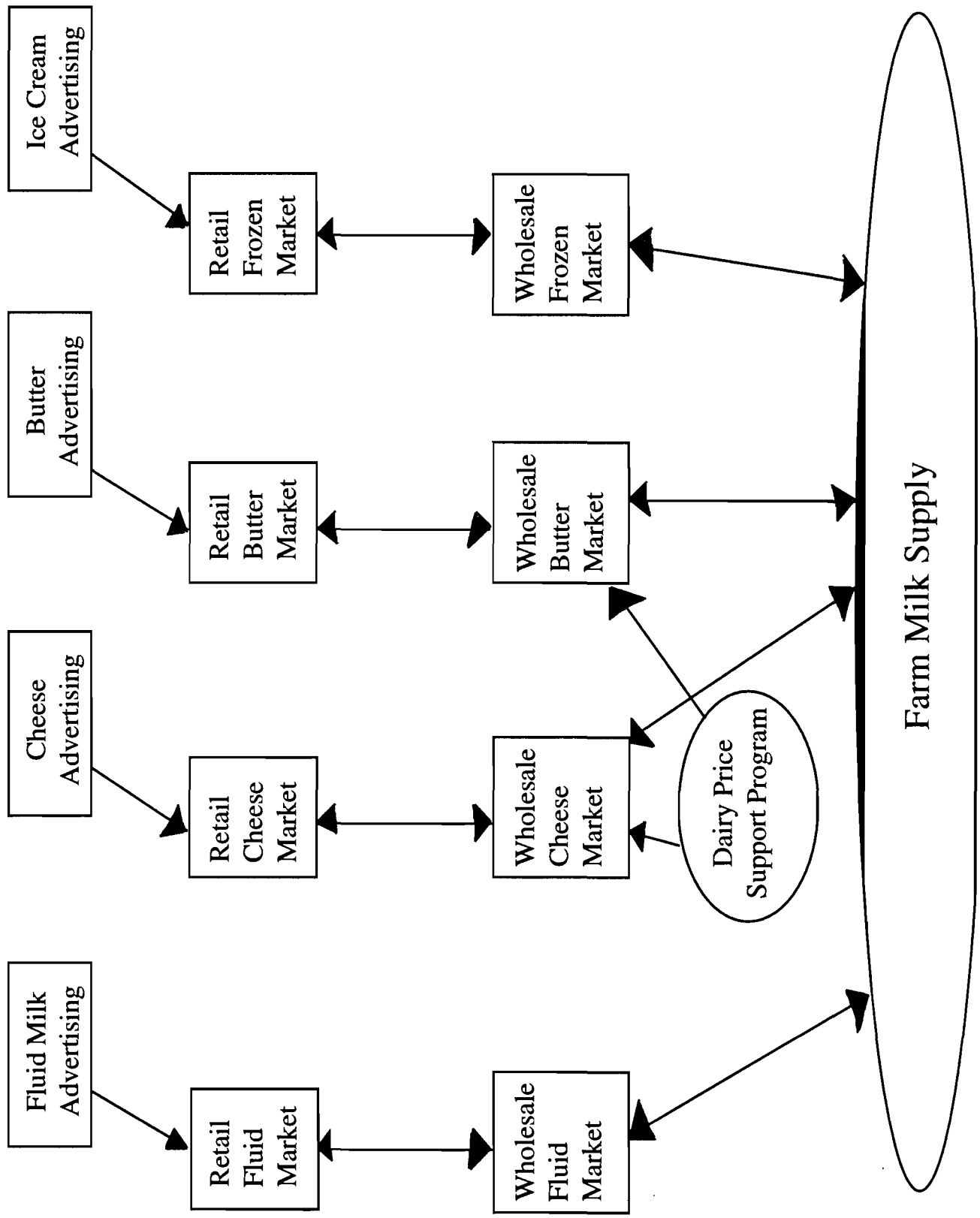
[1] All quantities in the model are expressed on a milkfat equivalent basis. Consequently, nonfat dry milk was not considered in the model.

[2] Most federal milk marketing orders utilize four product classes with Class I being fluid products, Class II being soft dairy products, Class III being mostly hard dairy products, and Class IIIa being nonfat dry milk. A two-class system was used in this study, with all fluid products considered Class I and all manufactured products considered Class II.

Figure 1: Overview of the conceptual dairy industry model.



(3.3) $Q^{ws} = Q^{wd} + \Delta INV + QSP \equiv Q^{w}$,

where: Q^{wd} and Q^{ws} are wholesale demand and supply, respectively, P^{w} is the wholesale own price, S^{ws} is a vector of wholesale supply shifters including the Class III milk price, ΔINV is change in commercial inventories, QSP is quantity of product sold by specialty plants to the government, and Q^{w} is the equilibrium wholesale quantity. The variables ΔINV and QSP represent a small proportion of total milk production and are assumed to be exogenous in this model.[3]

The Dairy Price Support Program is incorporated in the model by constraining the wholesale cheese and butter prices to be not less than their respective government purchase prices, i.e.:

(4.1) $P^{wc} \geq P^{gc}$,

(4.2) $P^{wb} \geq P^{gb}$,

where: P^{gc} and P^{gb} are the government purchase prices for cheese and butter, respectively.

Because of the Dairy Price Support Program, four regimes are possible: (1) $P^{wc} > P^{gc}$ and $P^{wb} > P^{gb}$; (2) $P^{wc} > P^{gc}$ and $P^{wb} = P^{gb}$; (3) $P^{wc} = P^{gc}$ and $P^{wb} > P^{gb}$; or (4) $P^{wc} = P^{gc}$ and $P^{wb} = P^{gb}$. In the cheese and butter markets, specific versions of equilibrium condition (3.3) are applicable to the first regime, which is the competitive case. In the second case, where the cheese market is competitive but the butter market is not, the wholesale butter price is set equal to the government purchase price for butter and the equilibrium condition is changed to:

(3.3b) $Q^{wbs} = Q^{wbd} + \Delta INV_b + QSP_b + Q^{gb} \equiv Q^{wb}$,

where: Q^{gb} is government purchases of butter which becomes the new endogenous variable, replacing the wholesale butter price. For the third case, where the butter market is competitive, but the cheese market is not, the wholesale cheese price is set equal to the government purchase price for cheese and the equilibrium condition is changed to:

(3.3c) $Q^{wcs} = Q^{wcd} + \Delta INV_c + QSP_c + Q^{gc} \equiv Q^{wc}$,

where: Q^{gc} is government purchases of cheese which becomes the new endogenous variable, replacing the wholesale cheese price. Finally, for the last case where both the cheese and the butter markets are not competitive, the wholesale cheese and butter prices are set equal to their respective government purchase prices and the equilibrium conditions are changed to (3.3b) and (3.3c).[4]

The farm raw milk market is represented by the following milk supply equation:

(5.1) $Q^{fm} = f(E[P^{fm}]|S^{fm})$,

where: Q^{fm} is commercial milk marketings in the United States, $E[P^{fm}]$ is the expected farm milk price, S^{fm} is a vector of milk supply shifters. As in the model developed by LaFrance and de Gorter (1985), and by Kaiser (1995), a perfect foresight specification is used for the expected farm milk price.

The farm milk price is a weighted average of the Class prices for milk, with the weights equal to the utilization of milk among products:

(5.2) $P^{fm} =$

$$\frac{(P^{III} + d) * Q^{wfs} + P^{III} * Q^{wfzs} + P^{III} * Q^{wcs} + P^{III} * Q^{wbs}}{Q^{wfs} + Q^{wfzs} + Q^{wcs} + Q^{wbs}}$$

where: P^{III} is the Class III price, d is the Class I fixed fluid milk differential (therefore the Class I price is equal to $P^{III} + d$), Q^{wfs} is wholesale fluid milk supply, Q^{wfzs} is wholesale frozen product supply, Q^{wcs} is

[3] Certain cheese and butter plants sell products to the government only, regardless of the relationship between the wholesale market price and the purchase price. These are general balancing plants that remove excess milk from the market when supply is greater than demand, and process the milk into cheese and butter which is then sold to the government. Because of this, the quantity of milk purchased by the government was disaggregated into purchases from these specialized plants and other purchases. In a competitive regime, the "other purchases" are expected to be zero, while the purchases from specialty plants may be positive. The QSP_c and QSP_b variables were determined by computing the average amount of government purchases of cheese and butter during competitive periods, i.e., when the wholesale price was greater than the purchase price for these two products.

[4] Because the market structure is different under each of these four regimes, using conventional two-stage least squares to estimate equations (1.1) through (4.2) may result in selectivity bias. Theoretically, a switching simultaneous system regression procedure should be applied, which is described in Liu, et al (1990, 1991). However, this procedure was not used here because it was beyond the scope of this project. Applying this procedure to the level of disaggregation of this model's manufactured product market would have been extremely cumbersome, and the costs of doing so were judged to be greater than the potential benefits.

wholesale cheese supply, and Q^{wbs} is wholesale butter supply.

Finally, the model is closed by the following equilibrium condition:

(5.3) $Q^{fm} = Q^{wfs} + Q^{wfzs} + Q^{wcs} + Q^{wbs} + FUSE + OTHER,$

where FUSE is on-farm use of milk and OTHER is milk used in dairy products other than fluid milk, frozen products, butter, and cheese. Both of these variables represented a small share of total milk production and were treated as exogenous.

The Econometric Results

The equations were estimated simultaneously using two-stage least squares and quarterly data from 1975 through the third quarter of 1995. The econometric package used was Micro TSP. All equations in the model were specified in double-logarithm functional form. Estimation results are presented in Table 1 with t-values given in parentheses under each coefficient, and all variables and data sources are defined in Table 2. R^2 is the adjusted coefficient of determination, and DW is the Durbin-Watson statistic.

Table 1. Econometric results for the dairy industry model.

Retail Market

Retail Fluid Milk Demand:

$$\ln (Q^{rfd}/POP) = \underset{(-14.81)}{-2.543} \underset{(-2.00)}{- 0.117 \ln (P^{rf}/P^{bev})} + \underset{(2.47)}{0.116 \ln (INC/P^{bev})} \underset{(-5.26)}{- 0.069 \ln TREND} \underset{(-3.55)}{- 0.014\ DUMQ1} \underset{(-11.73)}{- 0.061\ DUMQ2}$$

$$\underset{(-14.03)}{- 0.055\ DUMQ3} + \underset{(3.09)}{0.003 \ln DGFAD} + \underset{(3.09)}{0.005 \ln DGFAD_{-1}} + \underset{(3.09)}{0.006 \ln DGFAD_{-2}} + \underset{(3.09)}{0.005 \ln DGFAD_{-3}}$$

$$+ \underset{(3.09)}{0.003 \ln DGFAD_{-4}} + \underset{(6.37)}{0.603\ MA(1)}$$

$R^2 = 0.89$; DW = 1.55

Retail Frozen Demand:

$$\ln (Q^{rfzd}/POP) = \underset{(-11.24)}{-3.058} \underset{(-0.64)}{- 0.187 \ln (P^{rfz}/P^{foo})} + \underset{(5.31)}{0.629 \ln (INC/P^{foo})} \underset{(-6.48)}{- 0.00005\ TREND^2} + \underset{(5.24)}{0.079\ DUMQ1}$$

$$+ \underset{(21.10)}{0.318\ DUMQ2} + \underset{(23.42)}{0.354\ DUMQ3}$$

$R^2 = 0.92$; DW = 1.78

Table 1. continued.

Retail Cheese Demand:

$$\ln (Q^{rcd}/POP) = -2.769 - 0.425 \ln (P^{rc}/P^{mea}) + 0.286 \ln (INC/P^{mea}) + 0.00006\ TREND^2 - 0.065\ DUMQ1$$
$$(-7.35)\ (-2.35)\qquad (1.97)\qquad (7.61)\qquad (-7.41)$$

$$- 0.031\ DUMQ3 + 0.002 \ln DGCAD + .004 \ln DGCAD_{-1} + 0.004 \ln DGCAD_{-2} + 0.004 \ln DGCAD_{-3}$$
$$(-3.49)\qquad (1.69)\qquad (1.69)\qquad (1.69)\qquad (1.69)$$

$$+ 0.002 \ln DGCAD_{-4} + 0.362\ AR(1)$$
$$(1.69)\qquad (2.66)$$

$R^2 = 0.96$; DW = 1.90

Retail Butter Demand:

$$\ln (Q^{rbd}/POP) = -2.386 - 0.510 \ln (P^{rb}/P^{fat}) + 0.521 \ln (INC/P^{fat}) - 0.007\ TREND - 0.189\ DUMQ1 - 0.224\ DUMQ2$$
$$(-2.28)\ (-3.72)\qquad (1.24)\qquad (-1.90)\qquad (-6.24)\qquad (-7.44)$$

$$- 0.129\ DUMQ3$$
$$(-4.27)$$

$R^2 = 0.47$; DW = 1.88

Retail Fluid Milk Supply:

$$\ln Q^{rfs} = 0.844 + 0.060 \ln (P^{rf}/P^{wf}) - 0.056 \ln (P^{fe}/P^{wf}) + 0.657 \ln Q^{rfs}_{-1} + 0.021 \ln TREND - 0.051\ DUMQ1$$
$$(4.11)\ (0.74)\qquad (-2.97)\qquad (7.38)\qquad (3.62)\qquad (-8.58)$$

$$- 0.087\ DUMQ2 - 0.050\ DUMQ3$$
$$(-17.63)\qquad (-13.66)$$

$R^2 = 0.95$; DW = 2.31

Retail Frozen Products Supply:

$$\ln Q^{rfzs} = 0.936 + 0.469 \ln (P^{rfz}/P^{wfz}) + 0.072\ DUMQ1 + 0.312\ DUMQ2 + 0.351\ DUMQ3 + 0.520\ AR(1)$$
$$(60.61)\ (1.33)\qquad (5.43)\qquad (20.61)\qquad (26.12)\qquad (5.11)$$

$R^2 = 0.89$; DW = 2.27

Table 1. continued.

Retail Cheese Supply:

$$\ln Q^{rcs} = 0.110 + 0.755 \ln (P^{rc}/P^{wc}) - 0.317 \ln (P^{lab}/P^{wc}) - 0.392 \ln (P^{fe}/P^{wc}) + 0.318 \ln TREND - 0.070 DUMQ1$$
$$(.212) \quad (4.36) \qquad (-1.73) \qquad (-6.72) \qquad (11.97) \qquad (-7.86)$$

$$- 0.026 DUMQ3 + 0.435 AR(1)$$
$$(-3.03) \qquad (-3.63)$$

$R^2 = 0.97$; DW = 2.03

Retail Butter Supply:

$$\ln Q^{rbs} = 0.393 + 0.356 \ln (P^{rb}/P^{wb}) - 0.047 \ln (P^{fe}/P^{wb}) - 0.200 DUMQ1 - 0.223 DUMQ2 - 0.127 DUMQ3$$
$$(1.50) \quad (2.92) \qquad (-0.61) \qquad (-6.61) \qquad (-7.42) \qquad (-4.25)$$

$R^2 = 0.55$; DW = 1.81

Wholesale Market

Wholesale Fluid Milk Supply:

$$\ln Q^{wfs} = 0.374 + 0.078 \ln (P^{wf}/(P^{III}+d)) - 0.010 \ln (P^{fe}/P(P^{III}+d)) + 0.821 \ln Q^{wfs}_{-1} - 0.059 DUMQ1$$
$$(2.36) \quad (2.00) \qquad (-1.09) \qquad (9.50) \qquad (-9.24)$$

$$- 0.094 DUMQ2 - 0.049 DUMQ3 - 0.292 AR(1)$$
$$(-20.79) \qquad (-11.12) \qquad (-2.36)$$

$R^2 = 0.95$; DW = 2.21

Wholesale Frozen Supply:

$$\ln Q^{wfzs} = 0.560 + 0.173 \ln (P^{wfz}/P^{III}) + 0.066 DUMQ1 + 0.305 DUMQ2 + 0.347 DUMQ3 + 0.408 AR(1)$$
$$(3.84) \quad (2.60) \qquad (4.76) \qquad (19.45) \qquad (24.90) \qquad (3.70)$$

$R^2 = 0.90$; DW = 2.17

Wholesale Cheese Supply:

$$\ln Q^{wcs} = 0.237 + 0.022 \ln (P^{wc}/P^{III}) + 1.062 \ln (Q^{wcs})_{-1} - 0.808 \ln (Q^{wcs})_{-2} + 0.709 \ln (Q^{wcs})_{-3} - 0.023 MDP$$
$$(.711) \quad (.141) \qquad (14.62) \qquad (-9.83) \qquad (8.70) \qquad (-1.62)$$

$$- 0.017 DTP - 0.144 DUMQ1 - 0.177 DUMQ3$$
$$(-1.25) \qquad (-10.05) \qquad (-14.37)$$

$R^2 = 0.98$; DW = 2.21

Table 1. continued.

Wholesale Butter Supply:

$$\ln Q^{wbs} = \underset{(5.42)}{0.885} + \underset{(2.05)}{0.081} \ln (P^{wb}/P^{III}) + \underset{(8.14)}{0.650} \ln Q^{wbs}_{-1} + \underset{(3.02)}{0.002} \text{TREND} - \underset{(-2.91)}{0.076} \text{DTP} - \underset{(-2.08)}{0.049} \text{MDP} + \underset{(3.51)}{0.079} \text{DUMQ1}$$

$$- \underset{(-4.11)}{0.145} \text{DUMQ2} - \underset{(-13.33)}{0.378} \text{DUMQ3}$$

$R^2 = 0.92$; DW = 1.74

Farm Milk Market

Farm Milk Supply:

$$\ln Q^{fm} = \underset{(2.82)}{1.254} + \underset{(1.98)}{0.076} \ln (P^{fm}/P^{feed}) - \underset{(-1.80)}{0.040} \ln (P^{cow}/P^{feed}) + \underset{(7.89)}{0.585} \ln Q^{fm}_{-1} - \underset{(-6.19)}{0.390} \ln Q^{fm}_{-2}$$

$$+ \underset{(6.87)}{0.482} \ln Q^{fm}_{-3} - \underset{(-3.31)}{0.030} \text{DTP} - \underset{(-2.54)}{0.023} \text{MDP} + \underset{(11.41)}{0.063} \text{DUMQ2} + \underset{(2.24)}{0.041} \ln \text{TREND}$$

$R^2 = 0.96$; DW = 1.54

The retail market demand functions were estimated on a per capita basis. Retail demand for each product was specified to be a function of the following variables: 1) retail product price, 2) price of substitutes, 3) per capita disposable income, 4) quarterly dummy variables to account for seasonal demand, 5) a time trend variable to capture changes in consumer tastes and preferences over time, and 6) generic advertising expenditures to measure the impact of advertising on retail demand. In all, demand functions, own prices, and income were deflated by a substitute product price index. The consumer price index for nonalcoholic beverages was used as the substitute price in the fluid milk demand equation, the consumer price index for meat was used as the substitute price in the cheese demand equation, the consumer price index for fat was used as the substitute price in the butter demand equation, and the consumer price index for food was used as the substitute price in the frozen product demand equations. To measure the advertising effort of the NDPRB, generic advertising expenditures for fluid milk and cheese were included as explanatory variables in the two respective demand equations.[5] Generic advertising expenditures for butter and frozen products were not included for two reasons. First, the NDPRB has not invested much money into advertising these two products. Second, including generic butter and frozen product advertising expenditures in an earlier version of the model resulted in highly statistically insignificant estimated coefficients.

To capture the dynamics of advertising, generic advertising expenditures were specified as a second-order polynomial distributed lag with both endpoint restrictions imposed. Based on previous research (e.g., Liu et al. (1991), Kaiser (1995)), a lag length of four quarters was chosen. Finally, a first-order moving average error structure was imposed on the retail fluid milk demand equation and a first-order autoregressive error structure was imposed on the retail cheese demand equation to correct for autocorrelation.

Based on the econometric estimation, generic fluid milk advertising had the largest long-run advertising elasticity (i.e., sum of current and lagged

[5]All generic advertising expenditures came from various issues of **Leading National Advertisers**.

Table 2. Variable definitions for the econometric model.

Endogenous Variables:

Q^{rfd} = retail fluid milk demand measured in bil. lbs. of milkfat equivalent,

P^{rf} = consumer retail price index for fresh milk and cream (1982-84 = 100),

Q^{rfzd} = retail frozen dairy product demand measured in bil. lbs. of milkfat equivalent,

P^{rfz} = consumer retail price index for frozen dairy products (1982-84 = 100),

Q^{rcd} = retail cheese demand measured in bil. lbs. of milkfat equivalent,

P^{rc} = consumer retail price index for cheese (1982-84 = 100),

Q^{rbd} = retail butter demand measured in bil. lbs. of milkfat equivalent,

P^{rb} = consumer retail price index for butter (1982-84 = 100),

Q^{rfs} = retail fluid milk supply measured in bil. lbs. of milkfat equivalent, ($Q^{rfs} = Q^{rfd}$),

P^{wf} = wholesale fluid milk price index (1982 = 100),

Q^{rfzs} = retail frozen dairy product supply measured in bil. lbs. of milkfat equivalent,

($Q^{rfzs} = Q^{rfzd}$),

P^{wfz} = wholesale frozen dairy products price index (1982 = 100),

Q^{rcs} = retail cheese supply measured in bil. lbs. of milkfat equivalent,

($Q^{rcs} = Q^{rcd}$),

P^{wc} = wholesale cheese price measured in cents/lb.,

Q^{rbs} = retail butter supply measured in bil. lbs. of milkfat equivalent,

($Q^{rbs} = Q^{rbd}$),

P^{wb} = wholesale butter price measured in cents/lb.,

Q^{wfs} = wholesale fluid milk supply measured in bil. lbs. of milkfat equivalent,

($Q^{wfs} = Q^{rfs} = Q^{rfd}$),

P^{III} = Class III price for raw milk measured in $/cwt.,

Q^{wfzs} = wholesale frozen dairy product supply measured in bil. lbs. of milkfat equivalent,

($Q^{wfzs} = Q^{rfzs} = Q^{rfzd}$),

Q^{wcs} = wholesale cheese supply measured in bil. lbs. of milkfat equivalent,

($Q^{wcs} = Q^{rcs} = Q^{rcd}$),

Q^{wbs} = wholesale butter supply measured in bil. lbs. of milkfat equivalent,

($Q^{wbs} = Q^{rbs} = Q^{rbd}$),

Q^{fm} = U.S. milk production measured in bil. lbs.,

P^{fm} = U.S. average all milk price measured in $/cwt.,

Table 2. continued.

Exogenous Variables and Other Definitions:

POP = U.S. population measured in millions,

P^{bev} = Consumer retail price index for nonalcoholic beverages (1982-84 = 100),

INC = disposable personal income per capita, measured in thousand $,

TREND = time trend variable for the retail and wholesale-level equations, equal to 1 for 1975.1,....,

DUMQ1 = intercept dummy variable for first quarter of year,

DUMQ2 = intercept dummy variable for second quarter of year,

DUMQ3 = intercept dummy variable for third quarter of year,

DGFAD = generic fluid milk advertising expenditures deflated by the media price index, measured in thousand $,

P^{foo} = Consumer retail price index for food (1982-84 = 100),

P^{mea} = Consumer retail price index for meat (1982-84 = 100),

DGCAD = generic cheese advertising expenditures deflated by the media price index, measured in thousand $,

P^{fe} = Producer price index for fuel and energy (1967 = 100),

P^{lab} = average hourly wage in food manufacturing sector ($/hour),

d = Class I fixed price differential for raw milk measured in $/cwt.,

MDP = intercept dummy variable for the Milk Diversion Program equal to 1 for 1984.1 through 1985.2; equal to 0 otherwise,

DTP = intercept dummy variable for the Dairy Termination Program equal to 1 for 1986.2 through 1987.3; equal to 0 otherwise,

P^{feed} = U.S. average price per ton of 16 percent protein dairy feed,

P^{cow} = U.S. average slaughter cow price measured in $/cwt.,

coefficients totaled), which was 0.021 and was statistically different from zero at the 1 percent significance level.[6] This means a 1 percent increase in generic fluid advertising expenditures resulted in a 0.021 percent increase in fluid demand on average over this period. Generic cheese advertising was also positive and statistically significant from zero at the 1 percent significance level and had a long run advertising elasticity of 0.016.

The retail supply for each product was estimated as a function of the following variables: 1) retail price, 2) wholesale price, which represents the major variable cost to retailers, 3) producer price index for fuel and energy, 4) average hourly wage in the food manufacturing sector, 5) time trend variable, 6) quarterly dummy variables, and 7) lagged retail supply. The producer price index for fuel and energy was used as a proxy for variable energy costs, while the average hourly wage was used to capture labor costs in the retail supply functions. All prices and costs were deflated by the wholesale product price associated with each equation. The quarterly dummy variables were included to capture seasonality in retail supply, while the lagged supply variables were incorporated to represent capacity constraints. The time trend variable was included as a proxy for technological change in retailing. Not all of these variables remained in each of the final estimated retail supply equations due to statistical significance and/or wrong sign on the coefficient. Finally, a first-order moving average error

[6]These coefficients are partial advertising elasticities from the structural retail demand equations. They are not the total elasticities from the reduced-form price equations.

structure was imposed on the retail cheese and frozen product supply equations.

The wholesale supply for each product was estimated as a function of the following variables: 1) wholesale price, 2) the appropriate Class price for milk, which represents the main variable cost to wholesalers, 3) producer price index for fuel and energy, 4) average hourly wage in the food manufacturing sector, 5) time trend variable, 6) quarterly dummy variables, 7) lagged wholesale supply, and 8) two dummy variables for the cheese and butter demand functions corresponding to the Milk Diversion Program and the Dairy Termination Program, which were two supply control programs implemented over some of this period. The producer price index for fuel and energy was included because energy costs are important variable costs to wholesalers, while the average hourly wage was used to capture labor costs in the wholesale supply functions. All prices and costs were deflated by the price of farm milk, i.e., Class price. The quarterly dummy variables were used to capture seasonality in wholesale supply, lagged wholesale supply was included to reflect capacity constraints, and the trend variable was incorporated as a measure of technological change in dairy product processing. Not all of these variables remained in each of the final estimated wholesale supply equations due to statistical significance and/or wrong sign on the coefficient. Finally, a first-order moving average error structure was imposed on the wholesale fluid milk and frozen product supply equations.

For the farm milk market, the farm milk supply was estimated as a function of the following variables: 1) ratio of the farm milk price to feed price (16 percent protein content), 2) ratio of the price of slaughter cows to the feed price, 3) lagged milk supply, 4) intercept dummy variables to account for the quarters that the Milk Diversion and Dairy Termination Programs were in effect, 5) a dummy variable for the second quarter, and 6) time trend variable. The 16 percent protein feed price represents the most important variable costs in milk production, while the price of slaughtered cows represents an important opportunity cost to dairy farmers. Lagged milk supply was included as biological capacity constraints to current milk supply.

In terms of statistical fit, most of the estimated equations were found to be reasonable with respect to R^2. In all but two equations, the adjusted coefficient of determination was above 0.88. The two equations that were the most difficult to estimate were the retail butter demand and supply equations. The retail butter demand and supply equations had the lowest R^2 (0.47 and 0.55, respectively).

Validation of Dynamic Simulation Model

To validate the model, a dynamic in-sample simulation was performed from 1984.3 through 1995.3. This period was chosen because it corresponds to the time in which the national generic advertising program was in operation. The results should be judged in terms of how close the predicted endogenous variables are to their historic values. The dynamic simulation was conducted as follows. First, all exogenous variables were set equal to their historic levels for the simulation period. Second, all lagged dependent variables for the first simulation period (third quarter of 1984, denoted as 1984.3) were set equal to their actual levels for the previous period (1984.2) and the system of equations [product specific versions of equations (1.1) through (4.2), as well as (5.5)] was solved simultaneously using the Newton method. Finally, the predicted endogenous variables became the lagged endogenous variables for the subsequent period. This process was repeated until the last period of the simulation (1995.3) was reached.

To measure how close each predicted endogenous variable was to its actual historical level, the Root Mean Square Percent Simulation error (RMSPSE) measure was computed, which is equal to the following formula:

$$RMSPSE = \{(1/n) \sum_{t=1}^{n} ((YS_t - YA_t)/YA_t))^2\}^{1/2},$$

where: YS_t is the simulated value of endogenous variable Y, YA_t is the actual historic value for endogenous variable Y, and n is the number of periods in the simulation.

Table 3 shows the RMSPSE for all of the endogenous variables in the model. Generally, the RMSPSEs for the supply and demand quantities were reasonable. All retail, wholesale, and farm supply and demand quantities had RMSPSEs under 5 percent. With respect to prices, the RMSPSEs tended to be slightly higher, ranging from a low of 3.5 percent for the farm milk price to a high of 9.8 percent for the wholesale butter price. Finally, the RMSPSEs for CCC cheese and butter purchases were 14.4 percent and 13.2 percent, respectively. While this may appear high, the small magnitude of this variable was responsible, i.e., a small deviation from the actual value leads to a large RMSPSE. Based on these results, the model was deemed reasonable for simulation purposes.

Table 3. Root mean square percentage errors for the simulated endogenous variables.

Variable	Root mean percentage square error
Fluid demand/supply	1.3
Frozen demand/supply	4.5
Cheese demand	4.9
Cheese supply	4.6
Butter demand	2.5
Butter supply	4.2
Retail fluid price	3.6
Retail frozen price	5.5
Retail cheese price	4.8
Retail butter price	4.2
Wholesale fluid price	4.6
Wholesale frozen price	5.1
Wholesale cheese price	6.8
Wholesale butter price	9.8
Class III price	3.8
Farm milk price	3.5
CCC cheese purchases	14.4
CCC butter purchases	13.2
Milk supply	1.7

Market Impacts of the NDPRB

To examine the impacts that the NDPRB had on the market over the period 1984.3-1995.3, the model was simulated under two scenarios based on generic advertising expenditures: 1) historic scenario, where advertising levels were equal to actual generic advertising expenditures, and 2) no NDPRB scenario, where quarterly values of generic advertising expenditures were equal to quarterly levels for the year prior to the adoption of the NDPRB, i.e., 1983.3-1984.2. A comparison of these two scenarios provides a measure of the impacts of the NDPRB on the dairy markets. Table 4 presents the quarterly averages of price and quantity variables for two time periods: 1) 1984.3-95.3, and 2) 1994.3-95.3. The last two columns in the table give the percentage change in each variable due to the NDPRB respectively for the life of the program and the most recent year. The results for the longer time period are discussed first.

It is clear from these results that the NDPRB had an impact on the dairy market for the period 1984.3-95.3. For example, the generic advertising effort of the NDPRB resulted in a 0.91 percent increase in fluid sales and a 5.62 percent increase in retail fluid price compared to what would have occurred in the absence of this national program. The increase in fluid sales also caused the wholesale fluid price to increase by 4.10 percent. The increase in advertising expenditures due to the NDPRB also had positive impacts on the retail cheese market. Retail cheese

quantity and price were 0.48 percent and 0.81 percent higher, respectively. The increase in cheese sales caused the wholesale cheese price to rise by 2.75 percent.

Although generic butter and frozen product advertising were not included in the retail demand equations, generic fluid and cheese advertising by the NDPRB had some indirect, but minor impacts on butter and frozen product markets. For example, the retail and wholesale frozen product price increased, on average, by 0.73 percent and 1.07 percent, respectively, due to the NDPRB advertising effort. The increase in frozen product prices were primarily due to the higher Class III milk price manufacturers had to pay under the NDPRB advertising scenario. Advertising by the NDPRB had little impact on retail and wholesale butter prices, but butter supply declined by 0.39 percent under NDPRB advertising. The decline in butter supply was due to a higher average Class III price.

The NDPRB also had an impact on purchases of cheese and butter by the government. The modest increase in cheese demand relative to the increase in wholesale supply due to NDPRB advertising caused cheese purchases by the government to fall by 12 percent, on average, over this period. Likewise, while butter demand did not change, the 0.39 percent decrease in butter supply due to generic advertising by the NDPRB caused butter purchases by the government to decrease by 1.59 percent over the period. Total dairy product purchases by the government were 2.01 percent lower in the NDPRB scenario.

The introduction of the NDPRB also had an impact on the farm market over the previous 11 years. The Class III and farm milk prices increased by 2.03 percent and 1.93 percent under the national program due to an increase of 0.51 percent in total milk demand. Farm supply, in turn, increased by 0.40 percent. Farmers were better off under the NDPRB since producer surplus averaged 2.34 percent higher with the program. One measure of the net benefits of the NDPRB to farmers is the rate of return, which gives the ratio of benefits to costs of the national program. Specifically, this rate of return measure was calculated as the change in producer surplus, due to the NDPRB, divided by the costs of funding this program. The cost of the program was measured as the 15 cents per hundredweight assessment times total milk marketings. In the year prior to the program, farmers voluntarily contributed 6.3 cents per hundredweight. Therefore, the difference in cost due to the national checkoff was assumed to be the difference between 0.0015 times milk marketings (in billion pounds) under the NDPRB scenario minus 0.00063 times milk marketings in the no-NDPRB scenario. The results showed that the rate of return from the NDPRB was 3.40 over the 11 year period. This means that an additional dollar invested in generic advertising would return $3.40 in producer surplus to farmers. The farm level rate of return was lower than estimates of 4.77 by Liu et al. (1990) for the period 1975.1 through 1987.4, 4.60 by Kaiser and Forker (1993) for the period 1975.1 through 1990.4, and 5.40 for the period 1975.1 through 1993.4 by Kaiser (1995).

The last column in Table 4 gives the most recent year impacts of the NDPRB. In general, the most recent year results demonstrate larger market impacts of the NDPRB advertising effort than the 11 year average. For example, generic advertising by the NDPRB in the last four quarters resulted in a 1.72 percent increase in fluid sales and a 10.11 percent increase in retail fluid price relative to what would have occurred without NDPRB advertising. The increase in fluid sales caused the wholesale fluid price to increase by 6.74 percent, on average, over the last year in the simulation. One reason for larger NDPRB advertising impacts on the fluid market in the recent period is due to greater emphasis on fluid advertising in recent years

While the advertising effort of the NDPRB in the last year continued to have a positive impact on the cheese market, the magnitude of impacts were smaller than overall average for the 11 year period. Again, this was due to the increase in fluid milk advertising and decrease in cheese advertising in recent years. Retail cheese sales and price were 0.27 percent and 0.49 percent higher, respectively, due to NDPRB advertising. The modest increase in cheese sales resulted in an average increase of 1.78 percent in the wholesale cheese price as well.

The most recent year's advertising impacts on government purchases were smaller than the 11 year average because purchases were at much smaller levels to begin with. For example, purchases of cheese by the government were predicted to be zero both with and without NDPRB advertising. Butter purchases, however, were 2.25 percent lower with advertising.

The farm market impacts due to the NDPRB were larger in the most recent year than the 11 year period. The Class III and farm milk price increased by 3.04 percent and 2.93 percent, respectively, on average for the past year due to the national program. This was due to an increase in total milk demand of 0.70 percent because of generic advertising. Farm supply, in turn, was 0.62 percent higher in the NDPRB scenario. Farmers were better off under the NDPRB since producer surplus was 3.52 percent higher, and the rate of return was 6.43. Note that the rate of return was

Table 4. Simulated quarterly values for market variables with and without NDPRB, averaged over 1984.3-95.3, and over 1994.3-95.3.

Variable	Unit	1984.3-95.3 Average with NDPRB	1984.3-95.3 Average without NDPRB	1984.3-95.3 Average Percent change	1994.3-95.3 Average Percent change
Fluid demand/supply	bil lbs me	13.59	13.47	0.91	1.72
Frozen demand/supply	bil lbs me	3.16	3.16	-0.16	-0.24
Cheese demand	bil lbs me	12.26	12.20	0.48	0.27
Cheese supply	bil lbs me	12.31	12.26	0.42	0.27
Butter demand	bil lbs me	5.24	5.24	-0.06	-0.21
Butter supply	bil lbs me	6.65	6.67	-0.39	-0.47
Total demand	bil lbs me	34.25	34.07	0.51	0.70
Retail fluid price	1982-84=100	114.94	108.47	5.62	10.11
Retail frozen price	1982-84=100	130.11	129.16	0.73	1.10
Retail cheese price	1982-84=100	123.38	122.38	0.81	0.49
Retail butter price	1982-84=100	95.41	95.31	0.10	0.39
Wholesale fluid price	1982=100	124.94	119.82	4.10	6.74
Wholesale frozen price	1982=100	126.59	125.23	1.07	1.62
Wholesale cheese price	$/lb	2.46	2.40	2.75	1.78
Wholesale butter price	$/lb	1.10	1.09	0.27	1.12
Class III price	$/cwt	12.65	12.39	2.03	3.04
All milk price	$/cwt	13.60	13.34	1.93	2.93
CCC cheese purchases	bil lbs me	0.06	0.07	-12.00	0.00
CCC butter purchases	bil lbs me	1.42	1.44	-1.59	-2.25
CCC purchases	bil lbs me	1.48	1.51	-2.01	-2.25
Milk supply	bil lbs	36.52	36.38	0.40	0.62
Producer surplus	bil $	4.63	4.52	2.34	3.52

almost twice as high for the most recent year than it was, on average, for the past 11 years. Therefore, the results suggest that the net benefits of the NDPRB to farmers have become larger in recent years.

Summary

The purpose of this study was to analyze the impacts of generic dairy advertising by the National Dairy Promotion and Research Board on retail, wholesale, and farm dairy markets. A disaggregated industry model of the retail, wholesale, and farm levels with markets for fluid milk, frozen products, cheese, and butter was developed to conduct the analysis. An econometric model of the dairy industry was estimated using quarterly data from 1975 through 1995. The econometric results were then used to simulate market conditions with and without the NDPRB.

The results indicated that the NDPRB had a major impact on market conditions. Over the life of the national program, the NDPRB had an impact on fluid and cheese markets, government purchases under the Dairy Price Support Program, and farm markets. Selected findings averaged over the period 1984.3-95.3 include: 0.91 percent increase in fluid sales, 0.48 percent increase in cheese sales, 0.51 percent increase in total milk demand, 5.62 percent increase in retail fluid milk price, 0.81 percent increase in retail cheese price, 4.10 percent increase in wholesale fluid price, 2.75 percent increase in wholesale cheese price, 2.03 percent increase in Class III price, 1.93 percent increase in farm milk price, 2.01 percent decrease in government purchases of dairy products, 0.40 percent increase in milk supply, and 3.34 percent increase in dairy producer surplus compared to what would have occurred without NDPRB advertising. The rate of return to NDPRB advertising for the 11 year period was 3.36. More recent findings average over the last year include: 1.72

percent increase in fluid sales, 0.27 percent increase in cheese sales, 0.70 percent increase in total milk demand, 10.11 percent increase in retail fluid milk price, 0.49 percent increase in retail cheese price, 6.74 percent increase in wholesale fluid price, 1.78 percent increase in wholesale cheese price, 3.04 percent increase in Class III price, 2.93 percent increase in farm milk price, 2.25 percent decrease in government purchases of dairy products, 0.62 percent increase in milk supply, and 6.43 percent increase in dairy producer surplus compared to what would have occurred without NDPRB advertising. Therefore, the results suggest the net benefits to farmers have become larger in recent years.

References

Kaiser, H.M. 1995. "An Analysis of Generic Dairy Promotion in the United States." **NICPRE 95-01**. Department of Agricultural, Resource, and Managerial Economics, Cornell University, Ithaca, NY.

Kaiser, H.M., and O.D. Forker. 1993. "Analysis of Generic Dairy Advertising Scenarios on Retail, Wholesale, and Farm Milk Markets." **A.E. Res. 93-3**. Department of Agricultural, Resource, and Managerial Economics, Cornell University, Ithaca, NY.

LaFrance, J.T., and H. de Gorter. 1985. "Regulation in a Dynamic Market: the US Dairy Industry." ***American Journal of Agricultural Economics***, 67:821-32.

Liu, D.J., H.M. Kaiser, O.D. Forker, and T.D. Mount. 1990. "The Economic Implications of the U.S. Generic Dairy Advertising Program: An Industry Model Approach." ***Northeastern Journal of Agricultural and Resource Economics***, 19(1):37-48.

Liu, D.J., H.M. Kaiser, T.D. Mount, and O.D. Forker. 1991. "Modeling the U.S. Dairy Sector with Government Intervention." ***Western Journal of Agricultural Economics***, 16(2):360-73.

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