Basic Mechanisms of US and Japanese Dairy Policies and Milk Market Models

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Introduction

Japanese dairy policy is composed of three basic programs: price supports for manufacturing milk, classified pricing and revenue pooling through prefectural milk marketing boards, and import quotas. In addition, "mandatory" supply management programs implemented voluntarily by producer cooperatives are used to control the milk supply.

U.S. dairy policy is also composed of three basic programs: price supports for manufacturing milk, classified pricing and revenue pooling through milk marketing orders, and import quotas. The U.S. has also occasionally implemented voluntary supply management programs when milk supply was judged to be too out of line with commercial needs. A more recent program is export subsidies, which are used to dispose surplus production onto world markets.[1)]

The objective of this paper is to show the similarities and differences between the dairy programs in the two countries, and their implications for developing milk market models.

Price Supports for Manufacturing Milk

In the U.S., the dairy price support program for manufacturing milk is an "indirect" support price. That is, the government supports the raw milk price through CCC[2)] purchases of storable dairy products at the wholesale level. The CCC purchase price for each dairy product is basically determined by the following formula:

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1) An example of this type of programs is the dairy export incentive program (DEIP). The DEIP was initially introduced primarily to punish the EC's heavy export subsidies. However, the DEIP now has another positive objective to create new foreign markets in order for U.S. dairy farmers to survive after trade liberalization under a new GATT agreement.

2) The commodity Credit Corporation (CCC) is a wholly owned federal corporation within the U.S. Department of Agriculture, subject to the direction of the Secretary of Agriculture.

Purchase price = (support price + make allowance[3])/(yield[4]).

Manufacturers sell their products to the CCC at the determined purchase price whenever the market wholesale price is lower than the government purchase price. As long as the make allowance and yield are accurately reflecting the actual values, the market price manufacturers pay to farmers (M−W price[5]) will be kept at or above the support price. If the support price is higher than a market−clearing level, the M−W price should be similar to the support price. If the support price is much lower than a market−clearing level, the M−W price will always fluctuate above the support price and may exhibit a larger price instability. This has been the case in the years after 1988, when the support price was steadily adjusted downward.[6]

In 1961 the Japanese government introduced an indirect price support system similar to the U.S. price support program. The government sets the stabilization indicative prices (SIP) for designated storable dairy products (butter, skim milk powder, sweetened condensed whole milk, sweetened condensed skim milk), similar to the CCC purchase prices in the U.S.. The LIPC (Livestock Industry Promotion Council) purchases the designated dairy products whenever their market prices fall below 90% of the stabilization indicative prices.[7] Conversely, the LIPC sells stored products to the market whenever the market prices rise above 104% of the stabilization indicative prices.

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3) The make allowance is intended to reflect manufacturing costs for the products purchased by the CCC. If it works as intended, manufacturers who receive the purchase price for their outputs should be able to pay dairy farmers the equivalent of the support price without losing money. However, the USDA make allowance is not a guaranteed margin to manufacturers.

4) Product yield is measured in lbs product/cwt milk.

5) The M−W price is an average price paid for manufacturing grade (Grade B) milk by a sample of plants in Minnesota and Wisconsin.

6) According to the 1985 Food Security Act, the Secretary of Agriculture was mandated to adjust the support price based on forecasted CCC purchases for the calendar year. For 1988 through 1990, the support price was decreased by 50 cents per cwt if annual CCC purchases were projected to be above five billion pounds on a milk fat equivalent basis. This rule was modified slightly by the 1990 Food, Agriculture, Conservation, and Trade Act. Under the new law, the support price cannot be lower than $10.10 per cwt. The support price is increased by 25 cents if CCC purchases are forecasted to be 3.5 billion pounds or less, and decreased by 35 cents if CCC purchases are projected to be greater than five billion pounds provided this adjustment does not lower the support price below $10.10. In addition, farmers are assessed to bay for disposing CCC purchases in excess of seven billion pounds.

7) This purchase is not obligatory. After 1979, due to budgetary constraints, the LIPC has never bought domestic dairy products even if market prices of the designated dairy products were below 90% of the stabilization indicative prices. Instead, the LIPC has provided financial assistance for the manufacturers and milk producers' organizations to hold back their surplus products from the market.

Similar to the U.S. program, the Japanese government also sets the stabilization standard price (SSP) for raw milk for manufacturing based on the stabilization indicative prices for dairy products, make allowance and product yield. The government intends to indirectly support the stabilization standard price for manufacturing milk through purchases by the LIPC.[8)]

The main difference between Japan and U.S. support programs is the U.S. establishes the support price for manufacturing milk first, and subsequently calculates the CCC purchase prices, while in Japan the stabilization indicative prices for dairy products are calculated first, mainly based on the demand/supply situation for dairy products, and then the stabilization standard price for manufacturing milk in calculated from the indicative prices for dairy products.

Therefore, soon after the Japanese program was established, the government found that the stabilization standard price was too low for farmers to survive since it did not reflect farm production costs. There was a large gap between the price manufacturers paid to farmers (the stabilization standard price) and farm production costs. Thus, it was necessary for the Japanese government to compensate for this differential in order to encourage the development of the Japanese dairy industry. Then, in 1966, the stabilization standard price was divided into two prices: the standard purchase price (SPP) manufacturers pay for manufacturing milk, and the guaranteed price (GP) farmers receive (Table 1). The guaranteed price for raw milk for manufacturing is a direct target price within payment quotas.[9)] The national government does

Table 1. Support Prices and Production Costs in 1965 and 1966

	1965 (Before Deficiency Payments)	1966 (After Deficiency Payments)
(Support Prices)	SSP[a)]30.40yen/kg	GP[b)]37.03yen/kg (Deficiency Payment) SPP[c)]31.81yen/kg
(Production Costs)	36.11yen/kg	35.70yen/kg

a) Stabilization standard Price.

b) Guaranteed Price.

c) Standard Purchase Price.

Source: the Japanese Ministry of Agriculture.

8) The government could require manufacturers to buy raw milk at the stabilization standard price or more. However, manufacturers are not obligated to do so.

9) Payment quotas have been effectively used since 1979. Before 1979, payment quotas were just equal to all milk marketed for manufacturing.

not purchase raw milk, but rather pays farmers a deficiency payment equal to the difference between the guaranteed price and the standard purchase price for within payment quotas. Manufacturers are obligated to buy raw milk at the standard purchase price within payment quotas. The standard purchase price is determined by the national government based on the stabilization indicative prices for dairy products, and manufacturers' processing and selling costs. On the other hand, the guaranteed price is determined by the government based on milk production costs.

Although the law authorizing deficiency payments for manufacturing milk is "temporary", the law has been in effect since 1966. It was supposed to be temporary because it was to be terminated if one of two scenarios developed. First, payments for manufacturing milk would stop if the bulk of the Japanese milk supply was sold as fluid milk, although any trigger for stopping payments was not set. The Japanese government originally thought that the growth rate in demand for fluid milk would be much higher than the available supply. This means that the Japanese dairy farmers would have survived as fluid milk suppliers, and most manufactured dairy products would have been provided by imports. Second, payments would have been terminated when the improving productivity in Japanese dairy farming reduced the differential between the farmers' production costs and the manufacturers' payable price. However, neither of these situations has been realized because fluid milk demand has increased less than expected, while milk supply has increased more than expected. High appreciation of the yen canceled the productivity improvement.

Milk Marketing Boards and Orders to Implement Classified Pricing and Revenue Pooling

There is price discrimination between fluid and manufacturing milk in both Japan and U. S. The feasibility of such price discrimination rests on the fact that fluid milk demand is more price−inelastic than manufactured product demand.

In countries where premiums for fluid milk exist, milk marketing typically exhibits at least three common characteristics. First, a national (or regional) monopoly exists that has the ability to set and enforce price differentials. Second, fluid and manufacturing milk markets must be sufficiently isolated from one another to prevent backflow or arbitrage between the markets. Third, producers are paid a weighted average (blend) price depending on raw milk allocations to fluid and manufacturing uses within some limited geographic area.

In 1966 when the deficiency payments were introduced in Japan, the government provided all of the above situations necessary to create some fluid milk premiums. The government designated only one cooperative in each prefecture that could deal with the prefecture's milk supply. The participation to the prefectural marketing boards (the designated cooperatives) was not obligated, but about 95% of milk produced in Japan has been sold through the boards, which in essences gives them monopoly power. Although the government introduced the guaranteed price for manufacturing milk, there is no government support price for fluid milk in Japan. Fluid milk prices in Japan are determined by negotiations between each marketing

board and the processors it supplies. Given the manufacturing milk price, prefectural marketing boards usually obtain fluid milk premiums due to their market power (Figure 1).[10)]

On the other hand, the U.S. government uses a more direct way to obtain fluid premiums: it obligates fluid milk handlers to pay a minimum fluid premium (called Class I differential) through federal and state milk marketing orders, instead of relying on cooperatives to form stronger marketing boards which could maintain fluid milk premiums by themselves. In addition to the minimum premiums, most cooperatives obtain over-order (more than the Class I price) fluid premium payments resulting from negotiations with fluid processors.

The U.S. marketing order system with the minimum Class I differential would be powerful after trade liberalization. Even if the M-W price substantially declined, the U.S. government could attenuate some of the negative effects through maintaining the current minimum Class I price level by making the Class I differential larger. Fluid milk is non-tradable and therefore any supports for fluid milk may be free from the GATT agreement. Because the Japanese government does not have such a direct support mechanism for fluid milk, the extent of fluid milk price decline under GATT would depend upon cooperatives' market power in Japan.

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10) There is some coordination and competition among 47 prefectural boards in Japan. Especially, the competition between Hokkaido and Tofuken (the rest of Japan), which is known as a "Civil War". About 40% of all Japanese milk is produced in the Hokkaido prefecture on the northernmost island. About 80% of Hokkaido's milk production is utilized in manufactured products and over 80% of all manufacturing milk payment quotas have been allocated to Hokkaido. About 90% of Tofuken milk production is used for fluid purposes. Since the mid 1970's, improvements in transportation technology have opened Tofuken fluid milk markets to Hokkaido milk. Competition between Hokkaido and Tofuken has caused Tofuken fluid milk premiums over the guaranteed price to fall short of transportation costs from Hokkaido to the major Tofuken population centers. The premium, net of transportation costs, over the standard purchase price still exists, although it has gradually fallen. Because the Hokkaido board has been selling some of its over-payment-quota milk to manufacturers at the standard purchase price, Tofuken fluid milk prices would equal the standard purchase price plus transportation costs from Hokkaido in a perfectly competitive situation. This situation is yet to be realized. Conflict between Hokkaido and Tofuken is somewhat similar to conflict between the Upper Midwest (M-W), and Northeast and Southern areas in the U.S. Hokkaido gives up sending more milk to Tofuekn because Hokkaido is afraid that too much competition in the fluid milk market will decrease the fluid milk price too much, and it may destroy the deficiency payment system for manufacturing milk, which its farmers greatly depend upon in terms of their incomes.

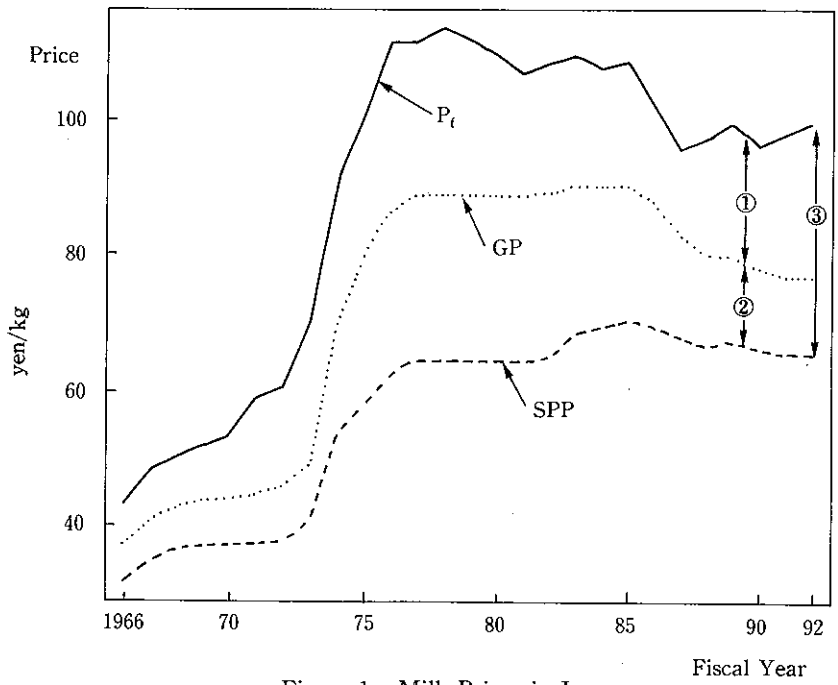

Figure 1. Milk Prices in Japan

Note: P_f= estimated effective fluid milk price (national average)
GP = guaranteed price for manufacturing milk
SPP = standard purchase price for manufacturing milk
① = fluid premium over GP
② = deficiency payment
③ = fluid premium over SPP
P_f is estimated by:

$$P_f = (BP \cdot (Q - FUSE) - GP \cdot PQ - SPP \cdot (Q_m - PQ))/Q_f$$

where BP = blend price
Q = total milk supply
FUSE = on-farm use
PQ = payment quota
Q_m = manufacturing milk supply
Q_f = fluid milk supply

Import Quotas

In Japan, in order to maintain market stability the Deficiency Payment Law provides the LIPC with the exclusive authority to import designated milk products plus several other products (whole milk powder, butter milk powder and whey powder). The law states that "When market prices of the designated products have risen, or are considered to be rising, above the stabilization indicative prices, the LIPC can import the designated products and others under the approval by the Ministry of Agriculture". Imported products are sold to the

domestic market by calling for bids. The differentials between the import and bid prices are LIPC's revenues. Substantial quantities of these products have been consistently imported even when the domestic market prices were below 90% of the stabilization indicative prices. The import quota system applies for several other dairy products. The major exception is natural cheese for which neither the state trading (the LIPC's import monopoly) nor import quota applies.

In the U.S., the import quota system, authorized through Section 22 of the Agricultural Adjustment Act of 1933, has limited imports to be less than 2% of U.S. consumption. Without this law, the U.S. dairy price support program could not operate since the world market prices for storable dairy products are well below the purchase prices for these products. Compared to the Japanese system, the U.S. import quota system has been very effective in limiting dairy imports (Table 2).

Table 2. Dairy Imports as a Percentage of Total Consumption

	US (1991)	Japan (1991)
Butter	0.4 %	17.2 %
Nonfat Dry Milk	0.3 %	34.6 %
Cheese	4.6 %	81.6 %

Source: the U.S. Department of Agriculture, and the Japanese Ministry of Agriculture.

Supply Management Programs

In the 1980's, the U.S. dairy industry began to experience chronic excess milk production relative to commercial needs. This resulted in a tremendous increase in CCC purchases of dairy products and net monetary costs of running this program. To deal with this problem, the government made steady cuts in the support price. Unnecessary increases in the support price in the late 1970's and early 1980's were a large part of the cause of the surplus problem. In addition, the government authorized the use of voluntary supply management for the first time.[11]

11) A mandatory supply control program has never been established in the history of U.S. dairy policy. This is partly because mandatory programs would be a radical departure from past and current dairy policies that allow farmers complete freedom in determining how much to produce (1). In general, U.S. policy provides voluntary programs and the choice is up to farmers whether or not to participate.

In the Dairy and Tobacco Adjustment Act of 1983, and the 1985 farm bill, the government provided a combination of supply management and support price adjustments based on anticipated CCC purchases. Two voluntary supply management programs, the Milk Diversion Program (MDP)[12] in the Dairy and Tobacco Adjustment Act of 1983, and the Dairy Termination Program (DTP)[13] in the 1985 farm bill were implemented. Only the support price adjustments based on anticipated CCC purchases was included in the 1990 farm bill.

Japan also experienced a chronic milk surplus problem (due to the rigidity of the guaranteed price under the situation of increasing production capacity and stagnant milk demand) and budgetary constraints in the late 1970's, almost the same time in the U.S. The government has used payment quotas to reduce the cost of the deficiency payment program since 1979. In response to it, producers' cooperatives installed their own production quota program. The Japanese supply management program is "voluntary" in that cooperatives themselves introduced it. However, the program is mandatory in that rigid quotas have been imposed on each farm using over-quota penalties,[14] although some flexibility has been introduced in order to allocate more to those wishing to expand their quotas. It is interesting that, unlike the U.S., mandatory production quotas have been imposed without any government authorization in Japan. This is due to the existence of prefectural marketing boards and their central council (the Japan Dairy Council) that have the power to regulate the milk supply, which is not the situation in the U.S. The Japanese government, when necessary, implements a dairy cow buyout program by offering an incentive payment per animal for slaughtered cows, in addition to production quotas.

Implications for Building Dairy Industry Models

These programs discussed above should be appropriately taken into consideration in building an empirical model for milk markets in either country. Milk market models could differ depending on research purposes and focal points. Among other things, an important recent focus has been on the degree of imperfect competition in the milk market.

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12) The basic feature of the MDP was cash payments to farmers who signed a contract agreeing to market less milk between January 1, 1984 and March 31, 1985 than they did during a specified base period.

13) Farms participating in the DTP were paid to slaughter or export their entire dairy herds. In addition, participants agreed to remove themselves and their facilities from dairy production for at least five years. Unlike the MDP, producers submitted bids on a dollars/cwt basis for how much the government would have to pay them to participate in the program. The government then selected all the lowest bids until they collectively represented 12 billion pounds of milk based on the previous year's marketings.

14) For each farm, when supply exceeds the quota in a given year, the following year's quota is reduced by the amount of overproduction. In addition, a monetary penalty on excess production was supposed to be imposed. However, this penalty has never been applied because farmers have kept their over-quota production out of markets by making their own manufactured products to avoid the penalty.

As mentioned above, milk markets are not perfectly competitive: there is price discrimination between fluid and manufacturing milk markets reflecting the market power of farmer cooperatives and processors. In other words, fluid milk prices (or premiums) are determined by the degree of competition in the milk market. Therefore, a degree-of-competition measure must be introduced so as to make a fluid milk price premium endogenously determined in the model. Familiar oligopoly models, such as the Cournot, Bertrand, and Stackelberg models, are inappropriate because they assume a specific degree of market imperfection first. We need a more flexible imperfect competition model which can measure the actual degree of market competition. For the Japanese milk market, three imperfect competition models have been developed (2,4, and 7). The Suzuki, Lenz, and Forker (SLF) model (7) is a two-region model which focuses on competition and coordination between Hokkaido and Tofuken (the rest of Japan), and it was used for evaluating the effects of reduced Japanese milk price supports. The second imperfect competition model (4) is a national model and it was developed for evaluating generic milk promotion effectiveness. Kawaguchi and Suzuki (2) developed a spatial imperfect competition equilibrium model for multi-regions. An earlier model by Suzuki and Judson (3) is the most detail model of the Japanese milk market, but it does not explicitly specify imperfect competition.

The assumption of an exogenous fluid milk premium is also inappropriate for U.S. models because over-order premiums are determined in individual negotiations between cooperatives and processors. For the U.S. milk market, an imperfect competition model has been built (5 and 6) and used for evaluating the effects of deregulation and U.S. generic milk advertising effectiveness. To measure the degree of market competition, the effective fluid milk price (the M-W price + the minimum Class I differential + any over-order premium) was estimated and used instead of the minimum Class I (fluid milk) price which most previous models used (Figure 2). Most previous models had internal data inconsistency because they used the minimum Class I price and the all milk price. The all milk price includes over-order premiums.

The basic definition of the degree-of-competition parameter used in the above model is as follows. If one specifies that, under imperfect competition, the role of dairy cooperatives is to allocate their raw milk supply to fluid and manufacturing markets so as to maximize total milk sales revenues, the first order condition is to equate marginal revenues from fluid and manufacturing milk. Under perfect competition, the first order condition is simply expressed as:

(1) $P_f = P_m$,

where P_f is fluid milk price, and P_m is manufacturing milk price. Note that transportation costs are ignored.

At the opposite extreme, the first order condition for monopoly or collusion is:

(2) $P_f(1-1/\varepsilon_f) = P_m(1-1/\varepsilon_m)$.

where $\varepsilon_f = |(\partial Q_f/\partial P_f)\cdot(P_f/Q_f)|$ and $\varepsilon_m = |(\partial Q_m/\partial P_m)\cdot(P_m/Q_m)|$ are price elasticities of fluid and manufacturing milk demand in absolute terms; Q_f and Q_m are aggregate quantity of

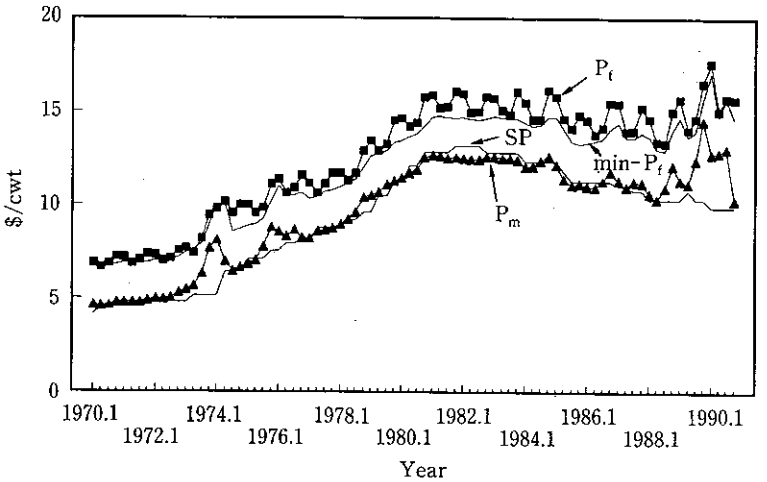

Figure 2. Milk Prices in the U.S.

Note: P_f = estimated effective fluid milk price
min−P_f = minimum Class I (fluid milk) price
P_m = M−W price (market price of manufacturing milk)
SP = support price for manufacturing milk

Areas between P_f and min−P_f lines represent over−order fluid premiums, and areas between min−P_f and P_m lines represent minimum Class I differentials.

P_f is estimated by:

$$P_f = (BP \cdot (Q - FUSE) - P_m \cdot Q_m)/Q_f$$

where BP = blend price (all milk price)
Q = total milk supply
FUSE = on−farm use
Q_m = manufacturing milk supply
Q_f = fluid milk supply

fluid and manufacturing milk demand.

To express an intermediate degree of imperfect competition, a degree−of−competition parameter, $\theta(0 \leq \theta \leq 1)$, is introduced. Then, equality across markets of "perceived" marginal revenue is expressed as:

(3) $P_f(1-\theta_f/\varepsilon_f)=P_m(1-\theta_m/\varepsilon_m)$.

or (4) $P_f+\theta_f \cdot Q_f/(\partial Q_f/\partial P_f)=P_m+\theta_m \cdot Q_m/(\partial Q_m/\partial P_m)$.

The parameter, θ, is considered an aggregate indicator of the degree of market imperfection.

If θ_m can assumed to be zero (because the geographic scope of markets for manufactured milk products is nationwide and therefore the markets are very competitive), one can identify a value of θ_f which satisfies equation (3) or (4), with values of milk price elasticities estimated by demand functions and observations of P_f, P_m, and Q_f.

Estimated θ_f's for both countries are reported in Table 3. The results indicate that the U. S. and Japanese milk markets are neither perfectly competitive nor purely monopolistic. On a scale from 0 to 1, the results of these models imply a small degree of market imperfection, which has been declining over time. It also implies that the Japanese milk market may be less competitive than the U.S. one.[15]

Table 3. Estimated Degree-of-Competition Parameters

Year	US	Japan
1977	0.077 (0.024)[a]	na
1978	0.065 (0.021)	na
1979	0.066 (0.021)	na
1980	0.066 (0.021)	na
1981	0.065 (0.020)	0.16
1982	0.061 (0.019)	0.16
1983	0.059 (0.019)	0.15
1984	0.056 (0.018)	0.13
1985	0.061 (0.019)	0.13
1986	0.057 (0.018)	0.11
1987	0.058 (0.018)	0.09
1988	0.050 (0.016)	0.10
1989	0.044 (0.014)	0.10
1990	0.055 (0.017)	na

a) Figures in parentheses are standard errors.

Source: 5 and 6.

Summary and Conclusions

The basic framework of the U.S. and Japanese dairy policies is very similar. Price supports for manufacturing milk, classified pricing and revenue pooling, import quotas, and supply management are major components of the dairy programs in the two countries. There are also interesting differences in each component.

Concerning price supports for manufacturing milk, the support price for raw milk is a basis for calculating the purchase prices for dairy products, and the support price is indirectly

15) See the original articles listed in the reference section for more detailed explanations of the models and results.

supported by CCC purchases in the U.S. In Japan, the indicative prices for dairy products are the basis for calculating the standard price manufacturers pay for raw milk. The support price for farmers is separately calculated and the differential is directly compensated for by the government in Japan. U.S. producers do not receive direct income payments.

Concerning classified pricing, Japan has cooperatives that can maintain fluid premiums by themselves, while the U.S. government directly supports minimum fluid premiums instead of relying on cooperatives. However, most U.S. cooperatives also obtain over−order (more than the minimum fluid price) premiums.

Concerning import quotas, the U.S. system has been much more effective in limiting imports than that of Japan. In terms of supply management, the U.S. government provided some voluntary programs for farmers' choice, and has never used a mandatory control, while Japanese cooperatives have implemented mandatory programs by themselves.

Because farmer cooperatives exercise some market power in both countries, as evidenced by the existence of fluid premiums, models of the dairy industry should incorporate the degree of competition in the milk market. Some efforts have been made in this regard by Suzuki and his colleagues.

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