JAPANESE BEEF IMPORT POLICY: IMPLICATIONS OF A REDUCTION IN THE PRODUCER SUBSIDY EQUIVALENT*

by

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Abstract

This paper considers the likely dynamic consequences of a reduction in government assistance to Japanese beef producers through a negotiated, progressive reduction in the beef Producer Subsidy Equivalent. The major effect would be a significant increase in beef imports and relatively little effect on domestic beef output.

JAPANESE BEEF IMPORT POLICY: IMPLICATIONS OF A REDUCTION IN THE PRODUCER SUBSIDY EQUIVALENT

Since at least the mid-1970s, Japan and its beef import suppliers, the United States and Australia in particular, have engaged in heated negotiations on the level of the Japanese beef import quota. U.S. negotiators have demanded that Japan completely liberalize beef imports. The Japanese have responded in a piecemeal fashion, increasing the quota by comparatively small amounts in an apparent attempt both to appease U.S. interests and to minimize the opposition of the politically powerful domestic cattle producers. The most recent Japanese concession was an agreement in the fall of 1984 to expand the total beef import quota by 9,000 metric tons (mt) per year for four years, bringing total imports to 177,000 mt by early 1988.

Discussions on the level of the quota beyond 1988 will coincide with more general multilateral discussions on agricultural protectionism worldwide under the auspices of the General Agreement on Tariffs and Trade (GATT). A major focus of the GATT discussions will be progressive reduction of agricultural support. A measure of relative levels of agricultural protection known as Producer Subsidy Equivalents (PSEs) has been recently proposed by the United States as the main vehicle for GATT commitments in agriculture in the upcoming negotiations (OECD). If acceptable to participating countries, a gradual and balanced reduction of PSEs would become the focus of GATT negotiations.

The general dynamic effects of a reduction in the level of Japanese assistance to beef producers (i.e., a reduction in the Japanese beef PSE) between 1988 and 1997 are measured in this study using an annual, simultaneous equations, econometric simulation model of the Japanese livestock industry. First, some discussion of the Japanese beef policy is provided as a background. Next, the econometric model and analytical technique utilized are briefly characterized followed by a simulation analysis of the effects of the beef PSE reduction scenarios. Finally, some implications for current discussions on a new import quota agreement are drawn.

Japanese Beef Policy

The import quota is the main tool of the Japanese government to support the domestic cattle industry and encourage beef production. Through the complicated import quota structure, the government attempts to maintain the established domestic beef target prices. Then through a fine tuning mechanism of purchasing and storing or releasing beef from stocks (the beef price stabilization scheme), the government stabilizes the domestic price of beef around the target within

a politically and socially acceptable range (the upper and lower stabilization prices). As a consequence, Japanese domestic beef prices tend to be higher and more stable than otherwise might be the case.

The extent of protection afforded beef producers in Japan can be measured using the PSE concept. In general, protection of the production of a given commodity in a given country implies a direct or indirect transfer of income from the government and/or consumers to producers of that commodity (Tangermann, Josling, and Pearson). The PSE for a given commodity and country is a measure of that transfer. In other words, the PSE is the cash payment (subsidy) to farmers that would substitute for all direct and indirect government support policies and result in no change in farm income. The PSE is usually calculated as the difference between the domestic and world prices of the commodity of interest times domestic production (which accounts for trade-distorting policies) plus the value of all other government transfers that directly or indirectly support production of that commodity.

The calculated PSE is usually expressed in relation to one of several bases, including domestic output, domestic output valued at domestic prices, or domestic output valued at world prices. In the latter case, if only trade-distorting policies are included, the PSE is comparable to an ad valorem tariff. Some agreement on exactly what policies to include in the calculation of PSEs would have to be reached before they could actually be used as the basis for negotiations. Tangermann, Pearson, and Josling suggest that it is likely that a definition of PSE would be adopted "such that only trade distorting policies would be included, since in international negotiations the principal interest is trade implications rather than income transfers" (p. 5). In this study, therefore, "PSE" includes only the trade-distorting policy transfers to producers expressed as a percent of domestic production valued at world prices.

The Japanese Livestock Industry Model

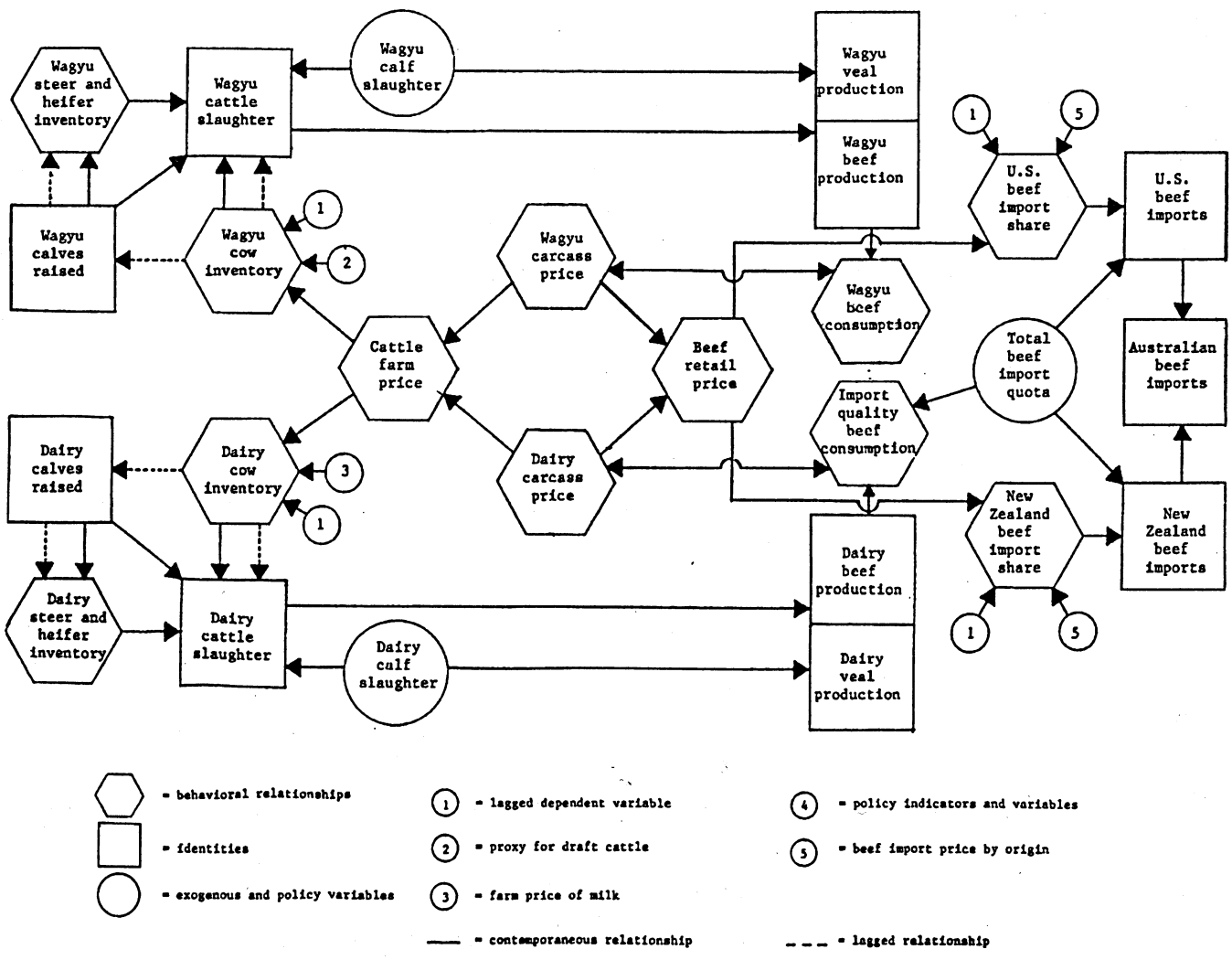
The dynamic effects of a progressive reduction in the Japanese beef PSE over 10 years (1988 through 1997) are measured in this study using an annual, simultaneous equations, econometric model of the Japanese livestock industry. The 70-equation model contains three simultaneous blocks: the Wagyu (native breed) and dairy cattle and beef sector, the hog and pork sector, and the chicken and chicken meat sector. Each block contains two main components: (1) live animal supply (breeding herd, slaughter livestock inventories, animals raised, and imports) and slaughter demand and (2) meat supply (production and imports) and consumption.

The parameters of the behavioral equations were estimated using two-stage least squares and data for 1962 to 1985. The statistical structure of the full model, along with validation statistics,

is discussed elsewhere in detail (Wahl and Williams, 1987b). The model has been further enhanced for this study by incorporating a meat expenditure system on the demand side of the model.

The major economic and biological relationships in the cattle and beef sector block of the model are schematically diagrammed in figure 1. The hog and chicken sector blocks are similar in structure to the cattle block. The three blocks are linked together through the meat expenditure system. The cattle block is somewhat more complicated than the hog or chicken blocks because it includes both the Wagyu and dairy cattle and beef subsectors, substantially increasing the number of equations in the block. Also a market share approach as outlined by Meilke and Griffith is followed to provide some detail on Japanese beef imports by source (right-hand side of figure 1).

Figure 1. Japanese Livestock Industry Model: Wagyu and Dairy Cattle and Beef Sectors



The meat expenditure system in the model follows the Almost Ideal Demand System specification of Deaton and Muellbauer. The price and expenditure elasticities of the demand system are presented in table 1. For comparative purposes, estimates of similar elasticities for the U.S. by Chalfant, who employed a nearly identical estimation procedure, are also presented in table 1. The estimated elasticities for the Japanese meat demand system are, in general, in accordance with a priori expectations. All own-price elasticities are negative while most of the compensated cross-price elasticities are positive. Note that for all meats, the Japanese own-price elasticity of demand is greater than that for the U.S. This is particularly the case for beef and implies (ceteris paribus) that any reduction in the Japanese beef import barrier would lead to a large increase in the quantity demanded of import-quality[1] beef. The estimated expenditure elasticities indicate that both native and import-quality beef are luxury goods in Japan (table 1). The expenditure elasticity of demand for import-quality beef is also greater than that for native-beef. This result is somewhat surprising because native quality beef is much more expensive than import-quality beef. Japanese consumers consider native-quality beef to be a much more desirable commodity than imported beef (Miyazaki). Nevertheless, the import-quality beef expenditure share more than doubled over the sample period while the native beef expenditure share was virtually constant over the same period.

The Japanese expenditure elasticities for both poultry and fish are greater than the pork expenditure elasticity. Again, this is not the case for the United States where poultry has the lowest expenditure elasticity of all meats. The implication is that pork occupies the same position in Japanese spending priorities as poultry does in the U.S. Increased pork consumption is not an automatic consequence of income growth as is the case for beef. Consequently, increased pork consumption in Japan will likely occur only if pork prices fall, regardless of changes in real income. In general, the estimated cross-price elasticities for fish are not significantly different from zero. It may be that the meats and fish groups should be treated as separate commodities in Japan. This possibility is the focus of current research by the authors using the method proposed by Pudney.

The cross-price elasticities (both Marshallian and compensated) of import-quality and native beef indicate that they are substitutes. It is relatively simple to construct an asymptotic likelihood ratio test to determine whether native and import-quality beef are, in fact, perfect substitutes. Consider the results that might be expected in Chalfant's model if the U.S. beef expenditure share was subdivided into beef from the traditional English breeds and beef from the nontraditional breeds. These expenditure shares need not be similar but each would be expected to react in a similar manner to relevant price changes if, in fact, these two beef types are perfect substitutes.

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[1] The term "import-quality beef" is used to refer to the aggregate of imported and domestic dairy beef.

Table 1. Japanese and U.S. Meat Demand and Expenditure Elasticities[a]

Price or Expenditure	--NQ Beef--		---IQ Beef--		----Pork---		--Chicken--		---Fish----	
	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.
NQ Beef	-2.27	--	0.21	--	0.90		0.19	--	0.06	--
IQ Beef	0.57	--	-1.56	-0.37	0.51	0.52	-0.01	0.34	0.09	0.19
Pork	0.96	--	0.14	0.27	-0.80	-0.67	-0.51	0.24	0.06	0.16
Chicken	0.27	--	-0.21	0.08	-0.19	0.10	-0.79	-0.51	0.17	-0.12
Fish	-0.71	--	-0.06	0.02	0.14	0.04	0.32	-0.07	-1.03	-0.23
Expenditure	2.33	--	2.59	1.28	0.29	0.99	0.83	0.21	0.95	0.15

[a]NQ Beef is Native-Quality beef and IQ Beef is Import-Quality Beef. U.S. elasticities from Chalfant. All elasticities are Marshallian measures (Slutsky symmetry and homogeneity imposed).

Also, the prices of these two types of beef would be expected to be perfectly correlated even when the relative quantity supplied of each beef type is changed. If this were not the case, consumers would refuse to purchase the higher-priced of the two beef types which they consider to be identical. Therefore, to test the hypothesis that Wagyu and import-quality beef are perfect substitutes, the price and expenditure coefficients in the native-quality beef equation were restricted to equal those in the import-quality beef equations. The intercept terms were not restricted. Using the asymptotic likelihood ratio test, the null hypothesis of perfect substitutability of native and import-quality beef can be rejected at the five percent level of confidence. This result is of particular relevance for this analysis. The Japanese government has restricted beef imports in order to protect the native beef industry. This policy implies that native and imported beef are close substitutes. This does not appear to be the case. Nevertheless, the estimated cross-price elasticity between native and import-quality beef implies a significant degree of substitutability. Accordingly, the appropriate procedure is to treat native and import-quality beef as separate but related goods in the Japanese livestock industry model. Assuming that changes in the price of imported beef cause an equivalent corresponding change in native beef prices would greatly overestimate the impact of beef import liberalization on the native beef industry in Japan. Such an analysis would implicitly use a cross-price elasticity of demand of infinity while the results of this study indicate that the elasticity is less than one.

Simulation Analysis of A Progressive Reduction in the Japanese Beef PSE

To simulate the likely dynamic effects of a reduction in the Japanese beef PSE on the Japanese livestock industry, a forecast baseline was first established for 1987 through 1997. The

Japanese beef import quota was assumed to continue increasing by 9,000 mt per year as in the current agreement through the end of the forecast period. The primary objective was to determine the likely effects of a reduction in the beef PSE on Japanese native and dairy beef supplies, consumption, and prices as well as the levels of total beef imports and imports by foreign suppliers. What would happen, however, depends crucially on how producers would respond to a reduction in government price support. The typical analytical procedure would be to simply simulate the model over the forecast period assuming some reduction in the level of the PSE. Lucas, among others, however, has questioned this procedure because a policy change alters the underlying structure of a market. Thus, a permanent shift in beef import policy would result in permanent changes in Japanese beef prices so that the responsiveness of beef producers to expected price changes as estimated from historical data would be inappropriate to use for the forecast simulation analysis. This is because beef producers would likely be more responsive to price changes given the changed policy environment than otherwise would be the case. Consequently, the estimated coefficients in the Wagyu and dairy breeding inventory equations were altered to reflect an increase in the respective coefficients of price expectations before simulating a reduction in the PSE level. Because of the extreme nature of the assumed policy shift, the maximum increase possible in the coefficient of price expectation was assumed given biological constraints. (See Wahl and Williams (1987a) for details on the empirical procedures).

Choice of a Japanese Beef PSE Adjustment Path

Although the objective of agricultural trade liberalization talks will be to reduce government subsidization of producers over some specified number of years, how that would actually be accomplished is not clear. The adjustment path chosen is crucial both for modeling purposes as well as for political reasons. Proposals that require most of the adjustment to occur in the years immediately following the agreement, as has been the case in previous GATT negotiations, may well imply politically unacceptable adjustment costs. At the same time, agreements that delay the brunt of the adjustment until the latter years of the agreement would be wasteful to the extent that over production would continue. In addition, these latter agreements may break down when the time to make the adjustments finally arrives.

Several alternative adjustment formulas are available. Perhaps the most intuitive and reasonable from a modeling viewpoint is the Constant Absolute formula in which the PSE is reduced by 1/X of the initial PSE level in each year, where X is the number of years over which the PSE is to fall to zero. Unfortunately, this concept may not appeal to trade negotiators because the measured level of PSEs in each year would depend on both domestic policies and world price levels.

A second alternative is the Swiss formula considered in the Tokyo Round of the GATT negotiations (Tangermann, Josling, and Pearson). This formula can be written as:

$$(1) \quad PSE_t = a(PSE_{t-1})/(a+PSE_{t-1})$$

where PSE_{t-1} is the PSE level in the previous year, PSE_t is the PSE level which must be achieved in a given year, and a is the negotiated coefficient of adjustment. The formula allows for annual changes in world price levels.

A third alternative is a modification of the Swiss formula which combines the features of the first two alternatives:

$$(2) \quad PSE_t = \frac{R}{X} a\,(PSE_{t-1})/(\frac{R}{X} a + PSE_{t-1})$$

where X is the negotiated length of the adjustment period and R is the number of years remaining in the agreement. This formula allows for a wide range of adjustment paths. The advantage of the modified formula is that a target date by which zero producer protection must be achieved can be stipulated.

PSE Reduction Simulation Results

Recalling that the PSE as defined here is comparable to an ad valorem tariff, the import quota in the model was first replaced by its tariff equivalent, i.e., the properly defined PSE. Progressive reduction of the PSE, therefore, implied a gradual narrowing of the percentage difference between the predicted world price of beef (the weighted average CIF price of imported beef) and the predicted internal Japanese price of dairy beef (i.e., the dairy steer carcass price) over a 10-year period. Imports are endogenously determined in this case as the difference between the domestic demand and supply of import-quality beef.

The forecasts of many of the exogenous variables in the model were based on the 10-year forecast of the Food and Agricultural Policy Research Institute (FAPRI). The simulated values of selected variables for the three alternative PSE reduction paths are presented in figures 2 through 5. In general, the Swiss formula (with the adjustment coefficient term set at .5) resulted in the most dramatic changes in the model variables because of the large decline in the PSE required by that formula in the first years of the assumed agreement period (1988 through 1997).

In the baseline, the dairy breeding herd continues the growth pattern of the late 1970s, growing by 2% to 3% annually until the early 1990s and then leveling off somewhat in the final years of the forecast (figure 2). This is due largely to two factors. First, the baseline projection

Fig 2: Dairy Cattle Breeding Herd

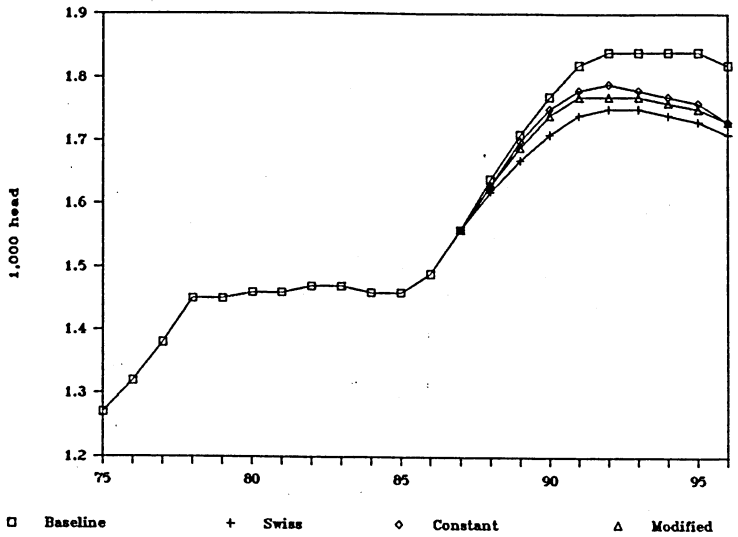


Fig 3: Import-Quality Beef Consumption

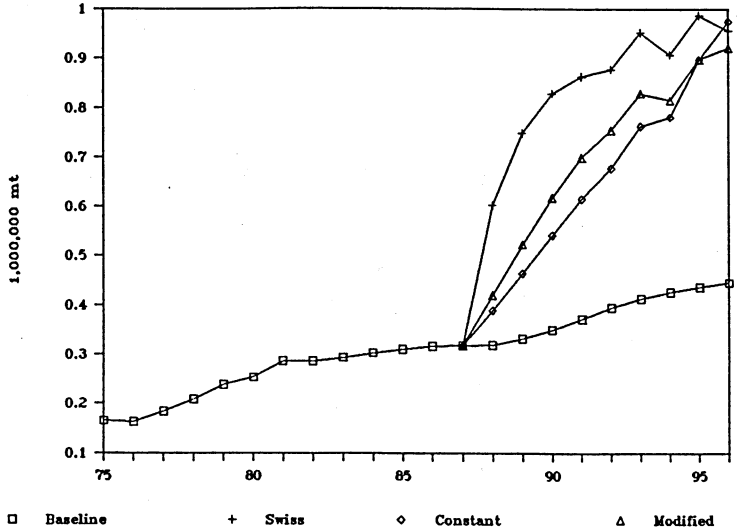


Fig 4: Wagyu Cattle Breeding Herd

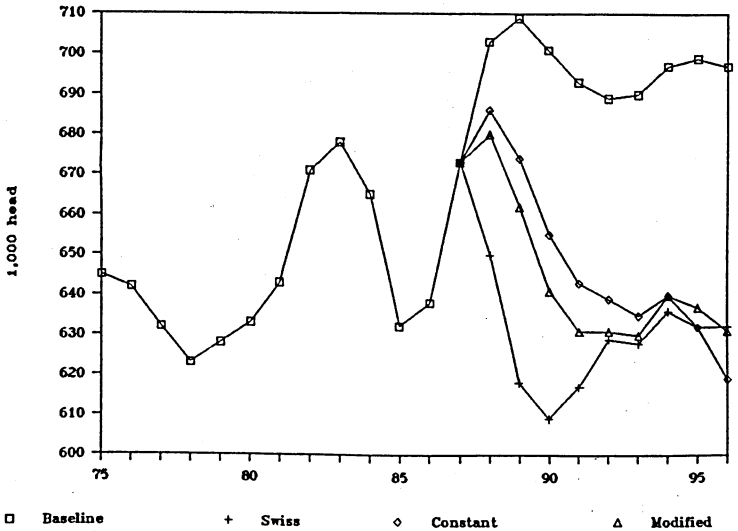
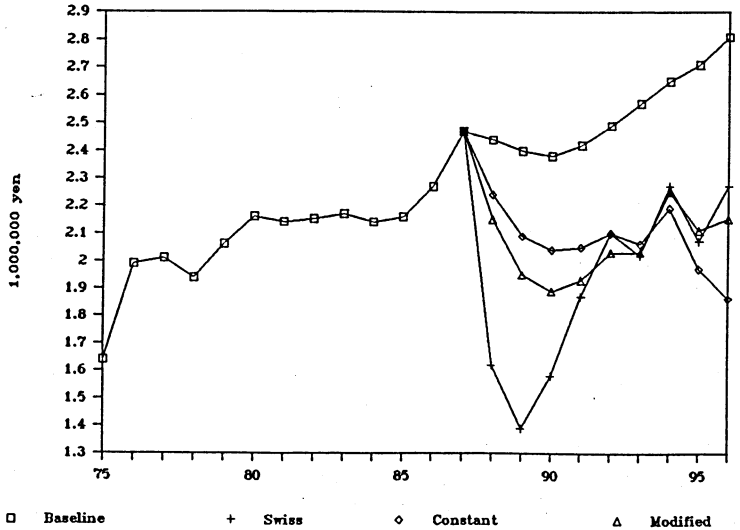


Fig 5: Wagyu Steer Carcass Price



suggests that the profitability of milk production will continue to rise as the highly protective Japanese milk producer support policy maintains milk prices at a relatively high and increasing level. Second, current and projected declines in world feedgrain prices are expected to give a further boost to the real profitability of milk production in Japan. The reduction in the dairy beef price over the forecast period is dramatic, reflecting a relatively high level of protection to beef producers before the implementation of the PSE reduction. Nevertheless, the dairy breeding herd and dairy beef output continue to increase although at a 2% to 3% lower rate than in the baseline. This occurs despite the assumption of maximum responsiveness of dairy beef producers to beef price changes in the price expectations formulation. In essence, the model assumes that Japanese dairy beef producers know at the time of the PSE reduction agreement that beef prices will decline in the future. Consequently, dairy steer fatteners would bear the burden of the reduction in the price of beef. Because 90% of the revenues of dairy calf producers comes from milk production, however, the predicted increase in the profitability of milk production dominates the reduction in profitability of dairy steer fattening.

The simulated increase in the consumption of import-quality beef is large under all PSE reduction schemes as expected given the large estimated own-price elasticity of demand for beef as discussed earlier (figure 3). By the end of the PSE reduction period, the consumption of import-quality beef is more than twice the level of the baseline projection. Although imports tend to replace domestic production of import-quality beef to some extent, the tradeoff is much smaller than might be expected. Consequently, the additional consumption of import-quality beef above the baseline is about equal to the increase in imports.

The biggest effect of the simulated PSE reductions is on beef imports. Beef imports would likely grow, rapidly with the Swiss formula and more slowly with the other two formulas, to about 1.1 million tons by 1996, more than 400% above the baseline and more than 600% above the 1986 level. Imports from the U.S. grow over the forecast period about in line with imports from Australia as a result of the PSE reductions, with the U.S. gaining slightly in import share. The simulated increase in beef imports could be viewed as the increase in the beef import quota that would be necessary in order to meet PSE reduction targets as specified in the three formulas used. That is, a beef import quota of about 1.1 million tons would reduce domestic dairy beef prices to the beef import price level. The additional imports would not likely displace feedgrain imports to a large extent inasmuch as the domestic beef industry would be relatively unaffected by the PSE reduction. This would be the case as long as the Japanese milk PSE remains unaffected. As a corollary, a reduction in the very high Japanese milk PSE would likely do more to reduce domestic production of beef than a reduction of the beef PSE.

The beef PSE reduction affects the Wagyu industry in the model only through the estimated cross-price elasticity between import-quality and Wagyu beef. Because this elasticity is relatively large (0.57), the simulated decline in the dairy steer carcass price as a result of the PSE reductions has a significant impact on the Wagyu industry. With the Swiss PSE reduction formula, the Wagyu steer carcass price is over 40% lower in 1989 than otherwise would have been the case, inducing a decline in the Wagyu breeding herd to about 13% below the baseline forecast by 1990 (figure 4). The reductions in the Wagyu carcass price and, hence, in the Wagyu breeding herd are more modest using the Constant Absolute or the Modified Swiss formulas. Wagyu beef output initially increases as farmers reduce the size of their breeding herds, placing further downward pressure on Wagyu prices. After the initial declines, both the Wagyu breeding herd and the carcass price tend to rebound to some extent regardless of the formula used. A continuing consumer preference for native-quality beef combined with declining supplies puts some upward pressure on prices and arrests the decline in Wagyu inventories and beef output. By the end of the forecast period, the formulas tend to converge so that the final effect is to reduce the Wagyu breeding herd by about 9% and Wagyu prices by about 15% to 20% below what otherwise would have been the case (figure 5).

The effects of the PSE reduction on the hog and chicken sectors is significant. Sow inventories, for example, drop to 38% below the baseline by the end of the forecast period. This occurs because pork prices are 25% below the baseline at the end of the period. The simulated drop in the pork price is large enough to reduce the profitability of pork production despite the sharp expected decline in world feedgrain prices. This implies that Japanese pork producers could be as (if not more) affected by the reduction in the protection of beef producers than domestic producers of import-quality beef might be. This is one of the more interesting and significant results of the analysis. Pork output drops by a greater percentage as a result of the reduction in the beef PSE than beef output.

Summary and Implications for Current Negotiations

This paper utilizes dynamic simulation analysis to consider the likely consequences of a reduction in the level of government assistance to Japanese beef producers through a negotiated, progressive reduction in the beef Producer Subsidy Equivalent (PSE). Using a simultaneous model of Japanese livestock markets, a forecast baseline through 1997 was first established assuming that the import quota continues to increase by 9,000 mt per year as in the 1984 agreement. Three formulas for reduction of the beef PSE over ten years were selected from among the many available (the Swiss formula, a constant absolute reduction of one-tenth per year, and a modified Swiss formula). and alternatively imposed on the model over the forecast period. The simulated changes

in the values of the model variables from their baseline values in each case are the measured effects of the alternative PSE reduction schemes. The analytical results lead to a number of conclusions and implications for current negotiations.

First, larger own-price elasticities for all meats in Japan than in the United States imply that a reduction of protection to beef producers in Japan would result in a significant increase in per capita meat consumption in Japan.

Second, because the income elasticities of demand for both dairy and Wagyu beef in Japan are also relatively high, expected increases in Japanese real incomes will put upward pressure on beef prices unless the present rate of increase in the beef import quota is increased. In other words, the current rate of increase in beef imports may not be sufficient in coming years to keep beef prices from increasing significantly in Japan.

Third, Wagyu and dairy beef are not perfect substitutes in Japan. Treating them as such will lead to overestimates of the impact of any reduction of beef producer price support on the Japanese beef industry. At the same time, however, there is a significant and growing degree of substitutability between the two types of beef in Japan. Considering them as completely unrelated commodities would lead to the erroneous conclusion that beef import liberalization would have no impact on the Wagyu industry. In fact, because of the high level of support provided to milk producers in Japan, beef import liberalization would tend to reduce Wagyu beef output by more than dairy beef output. Wagyu beef production would likely be about 20% lower at the end of the PSE reduction period than would otherwise be the case.

Fourth, a reduction of assistance to Japanese beef producers could increase beef imports into Japan by more than 600% over the 1986 level by the end of a 10-year period of adjustment. This would require an annual increase in the beef import quota of almost 100,000 mt per year, over ten times the current annual rate of increase, to meet a typical progressive PSE reduction target. Beef consumption would increase by almost the full amount of the increase in imports because of the relatively small decline in domestic beef production.

Fifth, Japanese dairy cattle producers are much more responsive to changes in the prices of milk and feedgrains than they are to changes in the prices of dairy beef. The projections of low world feedgrain prices and an increasing level of milk support in Japan would likely lead to an increase in dairy beef production even under a PSE reduction scheme that reduces dairy beef prices significantly. An agreement to liberalize the Japanese milk market through a reduction in the extremely high milk PSE in Japan would likely have a greater impact on Japanese beef production than would an agreement to simply reduce support for beef producers. As a corollary, a trade

liberalization agreement that allows the Japanese to retain their dairy support programs would lead to a more immediate and even perhaps a greater increase in beef imports besides being more politically acceptable in Japan. This is because a reduction in the milk PSE would force significant amounts of import-quality of beef onto the market, reducing the need for imports to meet consumer beef demand.

Sixth, the increase in milk cow numbers in the baseline forecast may result in an worsening milk oversupply problem in Japan by the early 1990s. Surprisingly, a negotiated reduction in support to beef producers in Japan would not help reduce the oversupply by much.

Seventh, one major result of a reduction in the Japanese beef PSE could likely be the impact on the hog and chicken sectors. Pork production, for example, is 40% lower than the baseline forecast by 1996 as a result of the simulated beef PSE reductions. Consequently, negotiators deliberating a reduction in the Japanese beef PSE would need to consider the entire livestock industry as an interrelated system in order to correctly project the outcomes of the reduction.

Finally, the specification of the adjustment path deserves serious consideration in trade negotiations. The rapid reductions in tariffs agreed to during previous multilateral trade talks are unlikely to be politically acceptable in agriculture. This is because the adjustment costs that would likely occur as a result of trade liberalization are greater in agriculture than in the non-agricultural markets liberalized in previous agreements. Any measure of protectionism that is based on the difference between world and domestic prices will increase if world prices fall, rendering the agreed-upon adjustment path more difficult to achieve as a result of volatile world prices, despite the best efforts of the country. To avoid this problem, the formula used to project a PSE adjustment path should automatically adjust the target to changes in the level of world prices.

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