An Assessment of the 1988 Japanese Beef Market Access Agreement on Beef and Feed-grain Markets

by

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Abstract

The impact of the 1988 Beef Market Access Agreement on beef and feed-grain markets in the United States, Australia, and Japan is analyzed. The method used is a nonspatial two-commodity, three-country equilibrium model. The results indicate that the agreement will dramatically increase U.S. beef exports but will not significantly alter U.S. feed-grain prices.

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In June 1988, the United States and Japan reached an agreement to liberalize the Japanese beef market. Later in the same month, Japan and Australia signed a similar agreement. Japan is free of foot-and-mouth disease and does not import fresh or frozen meat from regions, such as mainland Europe and South America, that are contaminated with the virus. This limits the Japanese to beef imports from Oceania and the United States. In practice, Australia and the United States dominate the beef market in Japan. Japan is also the largest importer of feed grains from the United States. In the crop year 1987-1988, Japan imported 78 percent of its 22.5 million metric tons (mt) of total feed-grain imports from the United States and 4.5 percent from Australia (FAPRI).

The importance of the liberalization agreement can be gauged by its impact on the relative prices of beef in the United States and Japan. In 1988, wholesale beef prices in Japan were approximately four times that of beef of a similar quality in the United States (*National Provisioner*). By 1993, the Japanese price is projected to be only 1.5 times U.S. levels. The Japanese currently consume only 15 lbs of beef per capita annually (carcass weight equivalent). This is approximately half of the average world beef consumption and less than half of the annual per capita consumption level in Hong Kong--a country with less than half the per capita real income of Japan (USDA 1983). This evidence indicates a large potential for increased beef consumption among the 122 million Japanese consumers.

The magnitude of the negotiated price change raises some interesting modeling problems. For example, one might wonder whether the Australian industry has the capacity to increase beef production to maintain its market share in Japan. This will depend on the degree of price responsiveness of both the beef and feed-grain industries as well as the own-price elasticity of demand for beef in Australia. The U.S. beef industry is several times larger than that of Australia, and although these issues are relevant in the United States, they are not crucial. Of more relevance in the United States is the possible

impact of the agreement on U.S. feed-grain prices. This will be negative to the extent that the decline in Japanese beef production reduces U.S. feed-grain exports to Japan but positive to the extent that American beef producers require more feed grains to meet their new export markets. This impact will depend on how sensitive Japanese beef imports are to changes in Japanese beef prices and on how sensitive U.S. feed-grain demand is to U.S. beef exports. If Australia has the potential to meet the additional needs of the Japanese beef market, it is possible that Australian grass may substitute for U.S. feed grains as the principal input in beef consumed in Japan.

The purpose of this paper is to develop and utilize a model capable of answering the questions just posed. The modeling approach used is an adaptation of the nonlinear, multicountry, multicommodity, nonspatial equilibrium model developed by Hayes, Hertzler, and Van der Sluis.

First, we provide a descriptive overview of the trade patterns and policies of Japan. Second, we describe the recent agreement. Third, we present the conceptual model. In the fourth section, we present the model in symbolic form. A brief description of the data is given in the fifth section. The final section presents the simulated results of both the annual policy changes and the combined effect of those six annual changes.

The Trade Patterns and Policies of Japan

Per capita beef consumption in Japan has increased by 65 percent in the last 10 years. The additional beef supplies required have come equally from increases in domestic beef production and imports. To support its domestic beef industry, the Japanese government has restricted imports through tariffs, quotas, and surcharges. These policies are administered by the Japanese Livestock Industry Promotion Corporation (LIPC). The effectiveness of these restrictions can be gauged from Figure 1. The average price of middle-grade dairy steers in Japan is at least four times greater than the cost, insurance, and freight (CIF) price of equivalent imported beef. These trade restrictions have also

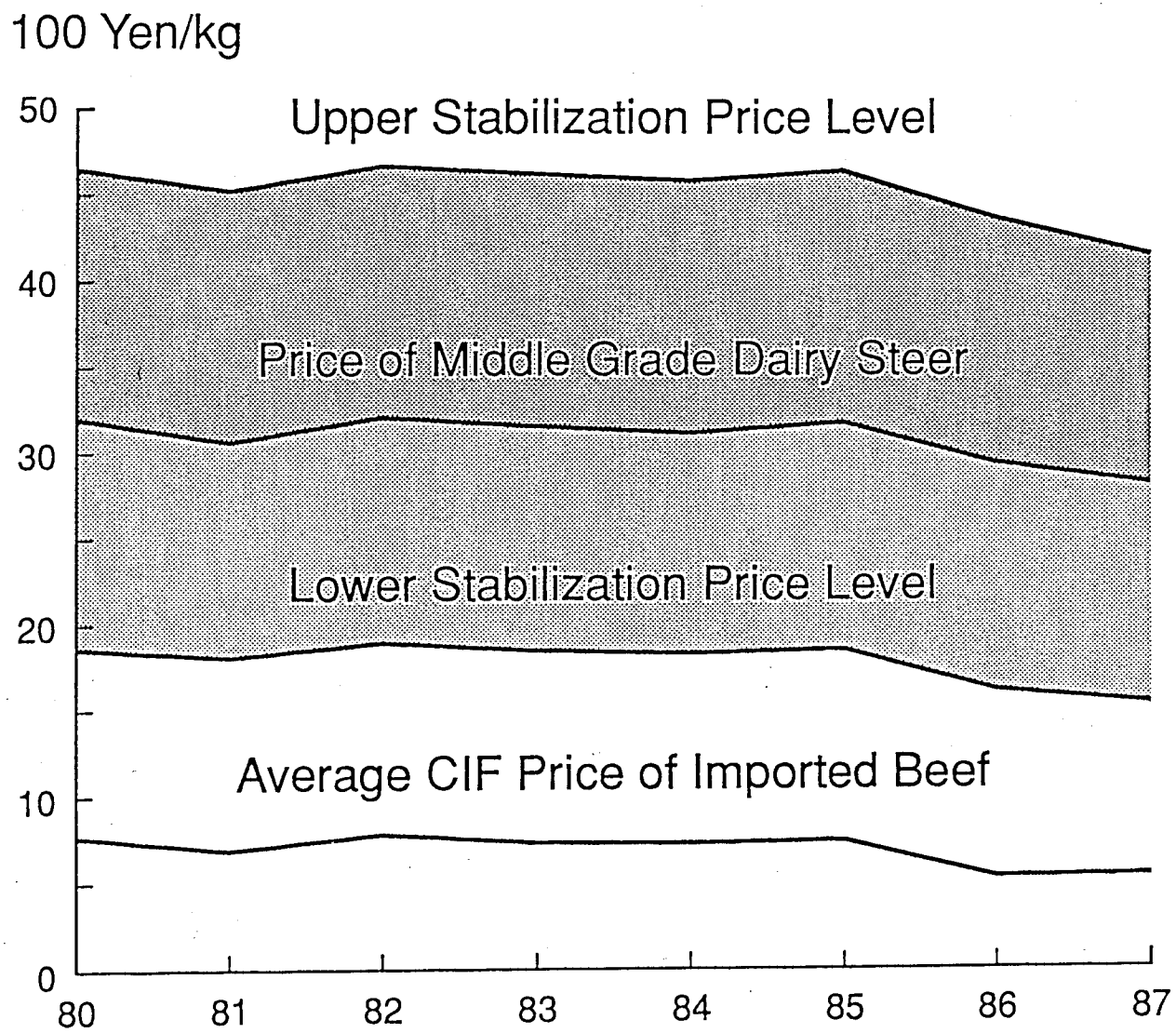

Figure 1. Japanese beef prices and stabilization levels.

Source: *The National Provisioner*, April 9, 1988.

been effective in stabilizing prices. The increase in beef demand caused by population and income growth has pressured the Japanese government to increase the quota (Table 1).

The LIPC generated revenues of $340 million from its quota rights in 1986. The retailing system for imported beef is regulated by the LIPC, which limits market access for exporters and importers. Only 7 percent of retail meat stores are authorized to handle beef. In addition, this beef can be sold only at specific times. These LIPC regulations have caused market failure in the imported-beef market. For example, the LIPC cut prices twice in 1987 and allowed the quota to increase by 46,000 mt, yet wholesale beef prices remained constant (Figure 2). The LIPC has also controlled the number of exporters and countries permitted to export to Japan. In 1977, Australia provided 86 percent of this beef. In that year, the Japanese introduced a new high-quality-beef quota that has been filled almost exclusively by U.S. exporters. Consequently, by 1987 the U.S. market share had risen to 37 percent, while the Australian share had fallen to 55 percent. This high-quality beef comes primarily from U.S. grain-fed choice animals. The Japanese consumer has a strong preference for highly marbled cuts and will pay enormous prices for the high-grade Wagyu or Kobi beef that is used to season other foods. The future makeup of Japanese beef import shares under liberalization has been the subject of much discussion recently. Australia has a cost advantage over the United States in producing grass-fattened beef but is relatively inexperienced at producing high-quality grain-fattened beef. Given the low grain prices in the United States, it seems unlikely that Australia has much of a cost advantage in this product. Little can be learned from an econometric analysis of market shares because of the strong influence of the LIPC in determining these shares.

Australia sells a significant portion of its beef to the United States. This beef is significantly different from that going to Japan. The U.S. consumer eats a larger portion of ground beef than can be economically produced from typical grain-fed carcasses. Consequently, in 1988 the United States imported about 500,000 and 300,000 mt of lean, grass-fattened beef from Australia and New Zealand, respectively. These lean beef

Table 1. Japanese Beef Import Quotas (in metric tons).

Japan Fiscal Years April-March	General Quota			Special Quotas						
	Total	LIPC	Private	Hotel	Oki-nawa	School Lunch	Boiled Meat	DDQ[a]	Grand Total	HQB[b] Import
1960	4,200	--	4,200	00	00	00	00	00	4,200	
1961	3,000	--	3,000	--	--	--	--	--	3,000	
1962	3,000	--	3,000	--	--	--	--	--	3,000	
1963	5,000	--	5,000	--	--	--	--	--	5,000	
1964	3,000	--	3,000	--	--	--	--	--	3,000	
1965	10,100	600	9,500	--	--	--	--	--	10,100	
1966	10,000	5,000	5,000	--	--	--	--	--	10,000	
1967	19,000	6,000	13,000	--	--	--	--	--	19,000	
1968	20,738	2,738	18,000	--	--	--	--	--	21,438	
1969	22,000	5,000	17,000	500	--	--	--	--	23,200	
1970	24,200	12,000	12,200	500	--	--	700	--	25,400	
1971	36,000	22,000	14,000	500	--	--	700	--	37,200	
1972	71,500	57,500	14,000	1,000	4,330	--	1,000	--	77,830	
1973	160,000	146,000	14,000	1,000	6,455	--	2,000	--	169,455	
1974	*	*	*	0	5,650	--	0	--	5,650	
1975	75,000	69,900	5,100	1,000	5,500	1,000	2,500	--	85,000	
1976	80,000	71,000	9,000	1,000	5,500	3,000	7,000	--	96,500	
1977	80,000	73,000	7,000	2,000	5,200	2,200	3,100	--	92,500	6,800
1978	95,000	86,500	8,500	3,000	5,600	3,000	5,400	--	112,000	16,800
1979	116,500	105,600	10,900	3,000	5,800	2,500	6,700	--	134,500	16,800
1980	119,000	106,800	12,200	3,000	5,850	2,250	4,700	--	134,800	20,800
1981	110,000	99,900	11,100	3,000	5,850	2,250	4,700	--	126,800	24,100
1982	119,200	107,280	11,920	3,000	5,850	2,250	4,700	--	135,000	27,400
1983	125,200	112,680	12,520	3,000	5,850	2,250	4,700	--	141,000	30,800
1984	133,200	119,880	13,320	4,000	5,850	2,250	4,700	--	150,000	37,700
1985	141,400	127,260	14,140	4,000	5,850	2,250	4,700	800	159,000	44,600
1986	149,400	134,460	14,940	4,000	6,050	2,250	4,500	1,800	168,000	51,500
1987	194,000	174,600	19,400	4,000	6,250	1,750	6,000	2,000	214,000	58,400

Source: *National Provisioner*, April 9, 1988.
[a]Demand Development Quota.
[b]High-Quality Beef.
*Quotas were suspended between February 1974 and June 1975.

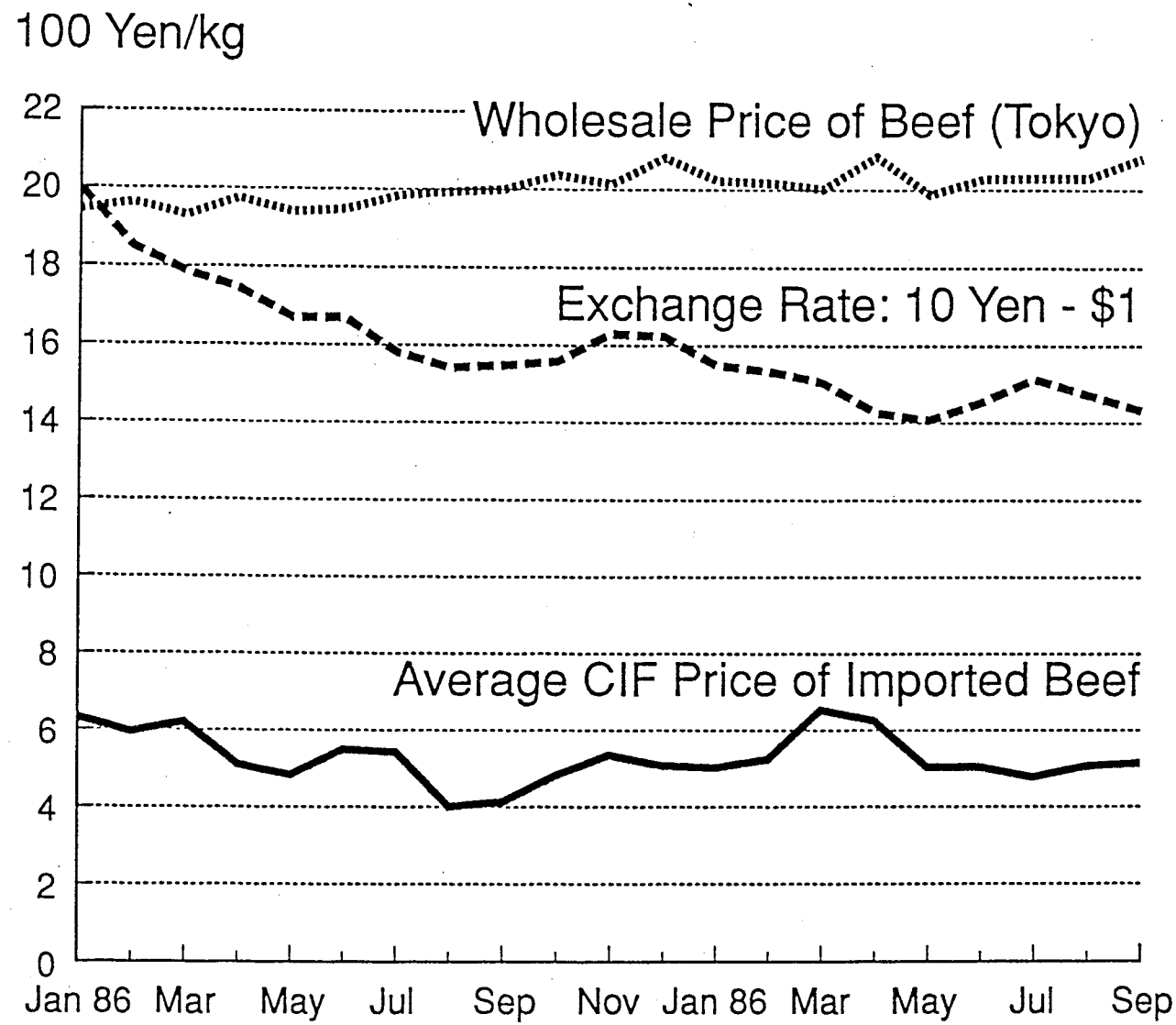

Figure 2. Japanese beef prices and U.S. $/yen exchange rate.

Source: *The National Provisioner*, April 9, 1988.

imports are subject to a quota; however, this quota has not been binding recently. In the analysis presented here, no attempt is made to differentiate between different cuts and qualities of beef. This creates difficulty in modeling U.S. trade because the United States is simultaneously an importer and an exporter. This problem has been somewhat unsatisfactorily resolved by including lean beef imports from Australia and New Zealand as if they were produced in the United States. This assumption will be valid only if lean beef is separable from table cuts in the United States. Recent work by Eales and Unnevehr lends some support to this hypothesis. They found that American consumers allocate meat expenditures between high-quality and low-quality meats from different animals and that hamburger is more substitutable for poultry than for beef table cuts. Thus, ignoring lean beef imports will have an impact on the accuracy of the results similar to ignoring poultry consumption. Currently, a study is being undertaken that expands the model used in this paper by distinguishing two types of beef of interest to beef exporters to Japan: high-quality grain-fed beef produced mainly in the United States and a lower-quality range-fed beef that is predominantly supplied by Australia. With the distinction between the two types of beef traded, the outcome of this study is likely to be considerably more plausible.

The 1988 Beef Market Access Agreement

On June 20, 1988, the U.S. trade representative and the Japanese agriculture minister signed an agreement to liberalize the Japanese beef market. Under the agreement, the Japanese beef import quota will increase by equal 60,000-mt increments until 1991. The private quota, which is not under the control of the LIPC, will increase to 60 percent of the quota in 1990, thus increasing from a 1987 level of 10 percent. Tariffs will remain at 25 percent during the three-year transition period. In 1991, the quota will be removed and the tariff rate will increase to 70 percent, dropping to 60 percent in 1992 and 50 percent thereafter. A provision called the Emergency Adjustment Measure (EAM) allows the Japanese to impose an additional 25 percent ad valorem tariff if imports increase by

more than 20 percent in any one year. This emergency provision expires on April 1, 1994, at which time Japan has agreed to comply with the results of the General Agreement on Tariffs and Trade (GATT) negotiations. Presumably, this will entail a gradual elimination of the 50 percent tariff.

Other equally important provisions of the agreement include the elimination of the LIPC and its regulations, the elimination of discrimination based on whether animals are grass fattened or grain fattened, and the elimination of regulations licensing only certain exporters to compete for the Japanese beef market. The result of these provisions should be the elimination of all nontariff barriers.

The levels of imports (in metric tons) at which the EAM is actuated are 472,800 in 1991, 567,360 in 1992, and 680,832 in 1993. In 1987, total Japanese beef production was 580,000 mt, whereas total imports equaled only 220,000 mt. These figures emphasize the magnitude of the changes under consideration and motivate the modeling technique that follows.

The Conceptual Model

For our purposes, the model should be multicountry with no small-country assumptions. This is essential because, when the restrictions are lifted, it is possible that Australia will capture the entire market. It should be multicommodity, allowing for a trade-off between meat and feed grains. Again, this is important because Australian grass may ultimately replace U.S. feed grains under liberalization. This would occur if the output of the Japanese beef industry is replaced with grass-fattened beef. The model should have demand and supply curves for all commodities in all countries. This is useful because, for example, it allows us to determine whether the increased demand for feed grains in the United States compensates feed-grain producers for lost export markets. If one were interested only in the effects of this agreement on Japan, the most useful approach would be to construct a model of the Japanese livestock sector with equations specified for the demand and supply for all livestock products. This approach is useful in

that one can easily incorporate adjustment lags in demand and supply and determine the cross-price effects of a policy change. Wahl, Hayes, and Williams have completed a study of the Beef Market Access Agreement by using this approach. Their model is adequate for the purposes for which it was built, but it could not be used to model the effects of the agreement on beef markets in the United States and Australia. This would require econometric models of the livestock and feed-grain sectors of all three countries. A second approach would be to examine how the agreement will alter equilibrium values in each of three markets. If one is prepared to ignore the adjustment lags, the class of multicommodity, multicountry nonspatial equilibrium models is suitable for this purpose. The magnitude of the policy change motivates the specification of a nonlinear demand curve. This eliminates the class of linear spatial equilibrium models similar to the model developed by Takayama and Judge under large policy shocks. Linear supply and demand schedules inevitably produce corner solutions, and the changes in elasticities are too large to overlook. These models are typically used to analyze the effect of a one-time policy change.

For our purposes, we need to examine a series of policy changes, each of which will occur under different conditions regarding prices, income, and population. One solution to this problem is to account for shifts in the beef demand curves annually by adjusting for income and population growth and to account for the trade-off between beef on the one hand and pork and chicken on the other. For each year, the sum of all these changes can be modeled as a shift in the demand curve. By using annual estimates of the relevant elasticities, the impact of the negotiated policy change for each year on the relevant markets can be determined. The year-by-year solutions could then be used as the basis for the next year's exogenous and policy-induced changes. This approach would result in a series of equilibrium solutions that would capture some of the market dynamics. If one is careful in interpreting the results, this approach very satisfactorily captures the impact of equilibrium price changes and equilibrium quantity changes, thus enabling welfare analysis.

The Theoretical Model

The theoretical model developed by Hayes, Hertzler, and Van der Sluis does not require the maximization of an objective function; rather, the equilibrium conditions are specified directly and solved by using a nonlinear complementarity algorithm. The following notation is the same as in Hayes, Hertzler, and Van der Sluis except that the meaning of the subscripts has been changed.

The demand and supply curves for feed grains and meats may be expressed as

$$D_{ij} = \alpha_{ij} \prod_{k=1}^{n} P_{ik}^{\beta_{ijk}} \qquad (1)$$

for i = U.S., Australia, Japan
k, j = beef, feed grains

where D_{ij} is the demand for commodity j in country i,
P_{ik} is the price of commodity k in country i,
α_{ij} is a demand shifter that includes income and cross-price effects, and
β_{ijk} is the Marshallian elasticity of price k on commodity j in country i.

The supply curve for beef and feed grains may be expressed as

$$S_{ij} = \gamma_{ij} \prod_{k=1}^{n} P_{ik}^{\delta_{ijk}} \qquad (2)$$

for i = U.S., Australia, Japan
k, j = beef, feed grains

where S_{ij} is the domestic quantity supplied in country i of commodity j,
γ_{ij} is a shifter in country i from commodity k, and
δ_{ijk} is the price elasticity of supply of price k on commodity j in country i.

Notice that both the demand and supply equations can include the cross-price effects of other commodities. We can also write both the demand and supply equation in price-dependent logarithmic form.

$$\begin{bmatrix} \ln P_{i1} \\ \cdot \\ \cdot \\ \cdot \\ \ln P_{in} \end{bmatrix} = \begin{bmatrix} \delta_{i11} & \cdots & \delta_{i1n} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \delta_{in1} & \cdots & \delta_{inn} \end{bmatrix} \begin{bmatrix} \ln S_{i1} - \ln\gamma_{i1} \\ \cdot \\ \cdot \\ \cdot \\ \ln S_{in} - \ln\gamma_{in} \end{bmatrix} \qquad (3a)$$

$$\begin{bmatrix} \ln P_{i1} \\ \cdot \\ \cdot \\ \cdot \\ \ln P_{in} \end{bmatrix} = \begin{bmatrix} \beta_{i11} & \cdots & \beta_{i1n} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \beta_{in1} & \cdots & \beta_{inn} \end{bmatrix} \begin{bmatrix} \ln D_{i1} - \ln\alpha_{i1} \\ \cdot \\ \cdot \\ \cdot \\ \ln D_{in} - \ln\alpha_{in} \end{bmatrix} \qquad (3b)$$

Market-clearing conditions require that the total quantity demanded in each country equal the total quantity supplied.

$$D_{ij} + X_{ij} = S_{ij} + M_{ij} \qquad (4)$$

for i = U.S., Australia, Japan
j = beef, feed grains

where X represents exports and M represents imports.

The assumption of perfect competition ensures that the price in exporting country i plus transportation costs and the tariff equivalent of any trade restrictions must be greater than or equal to the price in importing country m. If this were not the case, profits could be made by exporting meat from country i to country m. We can write this condition as

$$P_{ij} + t_{ijm} + T_{ijm} \geq P_{im} \qquad (5)$$

where i is an exporter,
j is beef, feed grains,
m is an importer,
T_{ijm} represents the tariff equivalent in country m of all trade restrictions used on imports of commodity j from country i, and
t is the cost of transporting commodity j from i to m.

Finally, the worldwide demand for commodity j must equal the worldwide supply.

$$\sum_{i=1}^{n} D_{ij} = \sum_{i=1}^{n} S_{ij} \qquad (6)$$

where i = 1 for Japan, 2 for the United States, and 3 for Australia
j = 1 for beef and 2 for feed grains.

The model allows for substitutability or complementarity in the demand and supply equations for each country. If feed grains were used in the production of beef, the degree of substitution would be measured by δ_{ijk}. If the demand for feed grains was influenced by the price of beef, this degree of substitution would be measured by β_{ijk}.

The only difference between the model used by Hayes, Hertzler, and Van der Sluis and the present model is the calculation of the demand shifter α_{ij}. Once values for the logs of the quantities and prices and the values of the elasticities are provided, the value of ln α_{ij} is given (i.e., the point at which the demand curve intersects the vertical axis when

quantities and prices are expressed in logarithmic form). For our purposes for beef, this term will shift each year in all countries in accordance with the equation:

$$\Delta\alpha_j = \Delta y_j \epsilon_{yj} + \Delta Pop_j * 1 + \Delta P_{pj} \epsilon_{bpj} + \Delta P_{cj} \epsilon_{bcj} \quad (7)$$

where j = Japan, the United States, Australia,
$\Delta\alpha$ = demand shift,
Δy = expected income change,
ϵ_y = income elasticity,
ΔPop = expected population change,
ΔP_p = expected change in price of pork,
ϵ_{bp} = cross-price elasticity of pork on beef,
ΔP_c = expected change in price of chicken, and
ϵ_{bc} = cross-price elasticity of chicken on beef.

The model is driven by the restriction that the equilibrium prices of beef and feed grains equal the marginal costs of producing these commodities in each country plus the respective marginal transportation costs and tariff equivalents. For example, beef prices in Japan are determined as:

$$a_{11} D_{11}^{\,b_{111}} = c_{11} S_{11}^{\,d_{111}} S_{12}^{\,d_{112}} \quad (8)$$

$$a_{11} D_{11}^{\,b_{111}} = c_{21} S_{21}^{\,d_{211}} S_{22}^{\,d_{212}} + t_{21} + T_{21} \quad (9)$$

$$a_{11} D_{11}^{\,b_{111}} = C_{31} S_{31}^{\,d_{311}} S_{32}^{\,d_{312}} + t_{31} + T_{31} \quad (10)$$

$$D_{11} + D_{21} + D_{31} = S_{11} + S_{21} + S_{31} - D_{ROW1} + S_{ROW1} \quad (11)$$

where t_{ij} = transportation costs for commodity j exported to country i,
T_{ij} = tariff equivalents for commodity j exported to country i,
ROW = rest of the world,
i = 1 for Japan, 2 for the United States, and 3 for Australia, and
j = 1 for beef, 2 for feed grains.

Equations (8) through (10) imply the existence of an equilibrium beef price in Japan by simultaneously equating the demanded price in Japan respectively to the domestically supplied price in Japan, (8); the U.S. equilibrium price plus transportation and the tariff equivalent of the quota, (9); and the Australian equilibrium price plus transportation and dollar equivalent of the trade barrier. Equation (11) indicates that world demand must equal world beef supply.

The model is solved by the recently developed Generalized Interactive Nonlinear Optimization (GINO) program developed by Liebman et al. This software can be used to

solve sets of simultaneous nonlinear equations and inequalities. The model itself consists of six domestic price linkage equations where the six inverse domestic demand equations are set equal to the six inverse domestic supply equations, of which (8) is an example; four trade linkage equations represented by (9) and (10); and two quantity linkage equations similar to (11).

In the previously mentioned study currently being undertaken, a limited sensitivity analysis of the elasticities and other parameters included in the model will be added. Because of the difficulty in finding accurate estimates of these elasticities, only the most general conclusions can be drawn from the results.

The Data

In Table 2, the own- and cross-price elasticities of beef and grains are given. All own-and cross-price elasticities of beef and feed grains were obtained from Regier except for the own feed-grain supply elasticity of the United States and Australia, which are within the range of their generally accepted values. In addition, the own beef demand elasticity of Japan was taken from Wahl, Hayes, and Williams.

In column 1 of Table 3, we present the other data used. These numbers were determined as follows. First, the prices and quantities were collected and totaled on a monthly basis from mid-1987 to mid-1988. This time period corresponds to the Japanese fiscal year. The model was then shocked to reflect the additional 60,000-mt quota increase agreed to in the summer of 1988. The quantities of beef produced, consumed, and traded are based on carcass weight. The prices of beef are monthly wholesale data, adjusted to U.S. dollars and averaged over the one-year period 1987-1988. The qualities of meat concern second-grade dairy steers for Japan, yield grade 3 steers (318-363 kg) for the United States, and export-quality bullocks (301-350 kg) for Australia. The 1988 beef prices for those countries were $9,363, $2,239, and $1,453 per mt, respectively (AMLC; Japanese Ministry of Agriculture, Forestry and Fisheries; USDA 1988; IMF). Feed-grain production, consumption, and trade data were obtained from FAPRI, and the Japanese

Table 2. Domestic Demand and Supply Elasticities of Beef and Feed Grains for Japan, the United States, and Australia.

Country	Commodity	Demand Price Elasticities		Supply Price Elasticities	
		Beef	Fdgrns	Beef	Fdrgns
Japan	Beef	-1.55	0	0.50	-0.30
	Feed grains	0.50	-0.60	0	0.25
United States	Beef	-0.70	0	0.30	-0.20
	Feed grains	0.22	-0.40	0	0.30[a]
Australia	Beef	-0.50	0	0.40	-0.20
	Feed grains	0.30	-0.30	0	0.25[a]

[a]Assumed elasticity.

Table 3. The Current Scenarios and the Impact of Japanese Liberalization of the Beef Market in the United States, Australia, and Japan.

	1988	1990	1991	1993
Japan (1,000 metric tons)				
Beef demand	829	946	2,190	2,672
Feed-grain demand	17,991	17,870	14,004	13,547
Beef supply	549	546	428	415
Feed-grain supply	422	422	422	423
United States (1,000 metric tons)				
Beef demand	11,175	11,297	10,988	10,911
Feed-grain demand	165,082	165,816	168,695	170,085
Beef supply	11,507	11,709	12,119	12,482
Feed-grain supply	207,545	208,182	207,772	208,724
Australia (1,000 metric tons)				
Beef demand	612	615	479	483
Feed-grain demand	3,079	3,126	3,689	3,743
Beef supply	1,562	1,606	2,113	2,173
Feed-grain supply	11,304	11,327	11,312	11,347
Japan ($ per metric ton)				
Beef price	9,363.1	9,323.2	5,691.4	5,399.5
Feed-grain price	102.5	103.3	102.8	104.0
United States ($ per metric ton)				
Beef price	2,239.4	2,327.8	2,487.4	2,654.5
Feed-grain price	76.5	77.3	76.8	78.0
Australia ($ per metric ton)				
Beef Price	1,453.4	1,541.8	2,663.4	2,830.5
Feed-grain price	95.5	96.3	95.8	97.0
Japan Imports (1,000 metric tons)				
Beef	280	400	1,763	2,257
Feed grains	17,569	17,448	13,582	13,124
U.S. Exports (1,000 metric tons)				
Beef	333	412	1,131	1,570
Feed grains	42,463	42,366	39,078	38,639
Australia Exports (1,000 metric tons)				
Beef	950	991	1,635	1,690
Feed grains	8,225	8,200	7,623	7,604
Japan Value of Imports (million $)				
Beef	2,622	3,730	10,033	12,188
Feed grains	1,801	1,802	1,396	1,364
U.S. Value of Exports (million $)				
Beef	745	958	2,814	4,168
Feed grains	3,249	3,274	3,001	3,012
Australia Value of Exports (million $)				
Beef	1,381	1,528	4,354	4,784
Feed grains	785	789	730	734
U.S. Tariff Equivalent				
(percent)	251	238	95	75
($)	6693	6564	2773	2315
Australia Tariff Equivalent				
(percent)	541	419	95	75
($)	7655	7526	2773	2315

Ministry of Agriculture, Forestry and Fisheries. The feed grains include: corn, barley, sorghum, oats, rye, millet, and mixed grains. Transportation costs are $431 and $255 per mt of beef and $26 and $7 per mt of feed grains to be shipped from the United States and Australia to Japan, respectively (Van der Sluis). The predicted changes in the prices of poultry and chicken and the cross-price elasticities for three products are taken from Wahl, Hayes, and Williams. Their paper examined the effect of the 1988 Japanese Beef Market Access Agreement on pork and poultry prices in Japan. Predicted future GDP growth rates, income elasticity forecasts, and population projections were obtained from WEFA. The expected annual increases in real per capita income are approximately 3.1 percent per year for Japan, 2.1 percent for the United States, and 1.2 percent for Australia. The income elasticities of demand for beef are 1.9, 0.5, and 0.5 percent for Japan, the United States, and Australia, respectively. Population increases are projected to be around 0.5, 0.8, and 1.3 percent per year for the three countries, respectively.

Results

The results are listed in the last three columns of Table 3. The figures for 1988 are actual values. The model was calibrated so that it provides as solutions the values for 1988 that are known to be true. This was achieved by including actual prices, quantities, and elasticities in (1) and (2) and solving for the values of the shift parameters that equated the prices and quantities in the solution with those known to be true. The tariff equivalents of the Japanese beef quota, tariffs, and surcharges were found by comparing U.S. and Australian beef prices plus the respective transportation costs with the wholesale prices of U.S. and Australian beef prices in Japan. The 1988 tariff equivalent of the quota was calculated to be $6,693 per mt for the United States and $7,655 for Australia. The difference between the two was assumed to reflect quality differences between Australian and U.S. beef.

The figures for 1990 are the solutions when Japanese beef imports are allowed to increase by 120,000 mt, as specified in the agreement. These values were found by

reducing the tariff equivalent of the quota for both Australian and U.S. beef until the solutions indicated that Japanese beef imports would be 400,000 mt. The demand curve was shifted out to reflect income, population, and pork and chicken price changes as specified in (7).

To determine the equilibrium values for 1991, the tariff equivalent for 1991 was reduced by 70 percent. The surge in imports triggered the emergency measures, thus increasing the tariff equivalent to 95 percent. Similarly, the figures for 1993 are the solution values for a 75 percent tariff.

These figures should be interpreted with caution. They are the long-run equilibrium values for any given set of Japanese beef policy instruments. They provide an indication of the value of these concessions to producers in the United States and Australia. They should not be taken as predictions of actual trade flows. For example, beef production in Japan falls in 1991 because Japanese beef prices fall. In reality, however, beef production in Japan will increase initially in 1991 as producers sell off their breeding herds.

Despite the long-run equilibrium nature of our results and their sensitivity to the elasticities used, some general comments can be made. First, the magnitudes of the concessions are surprisingly large. U.S. beef exports increase by almost $3.5 billion. This increases U.S. beef prices by 18 percent. This more than compensates the United States for a $200 million drop in feed-grain exports. Also, U.S. feed-grain producers gain due to the additional domestic demand for feed grains. Australian beef exports increase by 740,000 mt. The increase in Australian exports is less because the smaller beef industry there cannot increase production without a large increase in costs. This implies that the United States will increase its market share in Japan.

Japanese beef consumption increases by 220 percent or by approximately 20 lbs per capita. This increase is not unreasonable given the high per capita income in Japan and the evidence from Hong Kong. Much of the increase in consumption would be at the expense of other meats. For example, Japanese beefburgers currently contain 75 percent pork. The percentage of beef in beefburgers is taken as an indication of their quality.

Any reduction in beef prices would allow for the substitution of beef for pork in beefburgers. The price used to value Japanese imports is the predicted Japanese beef price. This price includes the tariff that will be collected by the Japanese government. Tariff revenues after 1993 will be approximately $4 billion. This is almost equal to the total value of Japanese beef production in 1988 and should be more than enough to compensate Japanese beef producers. It now seems likely that Japanese beef producers will be compensated (Miyazaki). Consequently, the only losers from the agreement are the beef consumers in Australia and in the United States.

Summary and Conclusions

Japan imports almost all its beef and feed grains from the United States and Australia. Recently, Japan agreed to liberalize its beef market. This concession will reduce Japanese beef prices by more than 60 percent, creating an enormous import demand for both Australian and U.S. beef. This agreement will reduce U.S. feed-grain exports but not U.S. feed-grain prices. In the medium term, the Australian beef industry cannot meet the additional Japanese demand without increasing production costs. This is not true in the United States, where the beef herd is larger. Consequently, the U.S. share of the Japanese beef market should increase. If the Japanese abide by the terms of the agreement, the United States might eventually export $3 to $4 billion worth of beef to Japan. This is approximately equal to one-tenth of the value of U.S. beef production in 1988.

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