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SESSION 14

AN ANALYSIS OF THE JAPANESE DEMAND FOR BEEF AND SOME IMPLICATIONS OF THE 1988 U.S.-JAPANESE BEEF AGREEMENT Biing-Hwan Lin, Hiroshi Mori, William D. Gorman and Neil R. Rimbey INTRODUCTION

Japan is the leading importer of U.S. agricultural commodities, accounting for almost 20 percent of total U.S. agricultural exports in 1987. For the same year, Japan received more than 70 percent of U.S. beef (including edible offals) exports. Since the mid-1970s, Japan and the U.S. have engaged in intensive negotiations regarding Japanese trade barriers on agricultural imports. Beef has been stressed as one of the most urgent issues in this dialogue.

Import quotas and tariffs are the main instruments for restricting beef imports into Japan. Beef imports are subject to an ad valorem tariff of 25 percent and a miscellaneous charge of approximately 10 percent. Import quotas comprise two broad categories--general and special quotas. The former accounts for 90 percent of the total quotas and the latter 10 percent. Ninety percent of the general quota is allotted to the Livestock Industry Promotion Corporation (LIPC)--a quasi-government agency.

In June 1988, the U.S. and Japan reached a new beef trade agreement in which import quotas will be increased by 60,000 mt per year, starting with 214,000 mt in Japanese fiscal year 1987 and reaching 394,000 mt in 1990. Starting with 1991, import quotas will be replaced by additional tariffs. The tariff rate will be 70 percent in 1991, 60 percent in 1992, and settle at 50 percent thereafter. However, the tariff rate after 1992 is subject to negotiations at the ongoing Uruguay round of the General Agreement on Tariffs and Trade (GATT). Also, the LIPC's involvement in beef trade will be discontinued in 1991.

The new trade agreement may provide the U.S. beef industry an opportunity to penetrate the high-valued market niche in Japan. The purpose of the paper is to provide an analysis of this hypothesis. The next section presents the findings of an analysis of the Japanese demand for beef by type of animals. Results suggest that while the new agreement will result in great expansion of beef imports, the extent of increases in imports, however, may not be as much as the prediction generated under the assumption of perfect substitution between domestic and imported beef. Further, increases in imports may have limited effects on the price of domestic beef due to the finding that domestic and imported beef are weak substitutes. The profitability of producing longer-fed beef for the Japanese market is analyzed for a typical feedlot in Idaho. Results indicate that producing longer-fed beef is a promising strategy for the U.S. beef industry to further enhance beef exports to Japan under the new trade agreement.

JAPANESE DEMAND FOR BEEF

There are two beef sectors of domestic cattle, the indigenous Wagyu cattle and fed dairy (Holstein) cattle, which supply roughly two-thirds of Japanese beef consumption. Wagyu cattle are fed high-concentrate diets for as long as 20 months (or almost 40 months in the case of Kobe cattle) and account for roughly 30 percent of domestic beef production. Dairy cattle are fed concentrates for nearly 14 months. The outcome of this extremely long feeding practice is highly marbled and firm beef. Marbling is the most important attribute in the Japanese beef grading system (Jarratt and Longworth, 1987) and is rewarded handsomely.

During past trade negotiations between the U.S. and Japanese governments, literature concerning the Japanese beef market has proliferated. One of the major findings in the literature is the realization that beef in Japan is not a homogeneous product. Therefore, there have been attempts at estimating the Japanese demand for beef of different qualities. Dairy beef and imported beef are aggregated and separated from Wagyu beef in the studies by Ohga and Inaba (1985) and Wahl et al., (1988). In the study by Teal et al., (1987), beef is disaggregated into two categories--high quality (Wagyu plus U.S. beef imported outside the LIPC frozen tender system) and low quality beef. Therefore, Wagyu beef has been treated as a separated good in previous studies. In this study, the procedure suggested by Monke and Petzel (1984) is employed to test if imported beef and dairy beef should be disaggregated.

When two prices behave independently, these two commodities must be modelled in a disaggregated manner. Simple regression can be performed to test if two prices behave independently. Results of regressing pair-wise quarterly prices of imported and dairy beef spanning from the second quarter of 1978 through the first quarter of 1988 are summarized below with t values in parentheses. These results suggest that imported beef behaves independently from dairy beef and thus can be disaggregated.

$$IP = 901.78 + 0.052 DP$$

(3.84) (0.42)

$$R^2 = 0.925, \text{ Adj. } R^2 = 0.923, D-W = 1.44, \text{ Rho} = 0.976$$

$$DP = 1250.4 + 0.1653 IP$$

(5.58) (0.81)

$$R^2 = 0.894, \text{ Adj. } R^2 = 0.891, D-W = 1.13, \text{ Rho} = 0.929$$

where IP and DP are wholesale prices of imported beef and second grade dairy steers (carcass weight basis), respectively.

Data: Quarterly data from the second quarter of 1978 through the first quarter of 1988 was used to estimate the Japanese demand for beef. This sample period is chosen in an attempt to avoid possible structural changes in the Japanese market. It is hypothesized that Japanese demand for beef is affected by prices of beef, pork, processed fish and high-valued fish and expenditure.

Monthly wholesale quantities and prices of domestic beef, pork and chicken are taken from Shokuniku Ryutsu Tokei (Statistical Report on Meat Marketing) and Keiran Shokuchō Ryutsu Tokei (Statistical Report on Hen Egg and Poultry Marketing) published by the Ministry of Agriculture, Forestry and Fisheries (MAFF). The prices of second grade Wagyu and dairy steers and first grade pork are believed to be representative of the respective meats.

Monthly consumption (primal cuts basis) of imported beef is calculated by adjusting imports (beef and veal imports including diaphragm and excluding chilled carcass) for the changes in the inventories of frozen imported beef held by the LIPC and netting out imports into Okinawa. Wholesale prices (primal cuts basis) of imported beef are constructed by using the purveyors' prices of 13 different cuts reported twice weekly in Chikusan Nippo (Livestock Daily). Prices of fish and shellfish are taken from Suisan Butsu Ryutsu Tokei Nempo (Annual Statistics on Fishery Products Marketing) published by the MAFF. Fresh and frozen fish of more than 70 species are disaggregated into high- and low-valued fish according to their average prices during the 1982-1983 period. Quarterly consumption and prices are sum and simple averages, respectively, of monthly statistics. Private consumption expenditure, available from the Economic Research Institute of the Economic Planning Agency, are treated as one of the demand shifters in the analysis. All monetary variables are deflated using the consumer price index rather than the wholesale price index for a lack of suitable wholesale price index for all food items.

Results: The Japanese demand for beef is analyzed using single equation and double-log functional form specification. Results are summarized below with t statistics in parentheses.

$$\ln DQ = -6.10 - 1.45 \ln DP + 1.11 \ln WP + 0.11 \ln IP + 0.19 \ln PP + 0.03 \ln PFP + 0.22 \ln HFP + 1.58 \ln Y$$

(2.61) (6.46) (3.60) (0.91) (2.13) (0.25) (1.54) (10.3)

$$- 0.04 D_2$$

(4.02)

R² = 0.977, Adj. R² = 0.971, D-W = 2.15, Rho = 0.463

$$\ln WQ = -4.95 - 1.79 \ln WP + 0.92 \ln DP + 0.18 \ln IP + 0.74 \ln PFP - 0.19 \ln HFP + 1.67 \ln Y$$

(1.50) (3.57) (2.32) (0.99) (4.15) (0.76) (8.21)

$$- 0.042 D_2 - 0.063 D_3$$

(2.72) (4.51)

R² = 0.970, Adj. R² = 0.962, D-W = 1.35, Rho = 0.928

$$\ln IQ = -13.55 - 1.03 \ln IP + 0.46 \ln WP + 1.30 \ln DP + 0.67 \ln PP - 0.85 \ln PFP - 0.61 \ln HFP + 2.34 \ln Y$$

(2.03) (4.40) (0.74) (3.24) (2.81) (3.51) (2.19) (5.90)

$$+ 0.067 D_2$$

(1.94)

R² = 0.897, Adj. R² = 0.871, D-W = 2.20

where DQ, WQ and IQ are quantities of dairy, Wagyu and imported beef, respectively; DP, WP, IP, PP, PFP and HFP are wholesale prices of dairy beef, Wagyu beef, imported beef, pork, processed fish and high-valued fish, respectively; Y is private consumption expenditure; D_i is dummy variable for the *i*th quarter. It should be noted that imported beef is measured in terms of primal cuts basis and others are measured in terms of carcass weight basis in the above results.

The above results suggest that demand for beef is own-price and expenditure elastic. Dairy beef and Wagyu beef are found to be close substitutes. While the prices of domestic beef appear to greatly affect the demand for imported beef, the price of imported beef has a much smaller effect on the demand for domestic beef. This implies that domestic beef, especially dairy beef, is a close substitute for imported beef but not vice versa; in other words, imported beef of current product characteristics occupies a market niche separated from domestic beef market. These findings suggest that trade liberalization will greatly expand beef imports into Japan but not as much as the prediction generated under the assumption of perfect substitution between domestic and imported beef. Further, increases in imports may have limited effects on the prices of domestic beef due to market segmentation. These findings have important implications for the U.S. beef industry on expanding beef exports to Japan under the new trade agreement.

PROFITABILITY OF PRODUCING LONGER-FED BEEF

The idea of extending the cattle feeding period and marketing them to Japan was first suggested by Mori and Gorman (1985). It has been adopted by only a handful of feedlot operators who export live cattle for slaughtering in Japan, because this is the only viable way longer-fed cattle and beef can be imported into Japan under the current regulations. Since import quotas will be removed and the LIPC will discontinue its function in beef trading in JFY 1991, these changes will facilitate exports of longer-fed beef to Japan.

Cattle are usually fed around 130 days for the U.S. domestic market. In this study, the feeding program is extended from the conventional 130 days to 260 days for a typical feedlot in Idaho. The additional 130 days feeding period is termed the second phase of the extended feeding program. The

conventional feeding program involves feeding 750-pound feeder steers to a finish weight of 1,150 pounds with an average daily gain of 3.07 pounds in weight.

Probable Receipts: Probable receipts for feeding cattle high-concentrate diets for 260 days in Idaho are estimated using the following procedure: first, the wholesale prices of carcasses by breed and grade in the Tokyo wholesale market are used to estimate the probable wholesale price of U.S. longer-fed beef; second, expenses for the wholesale market commission in Japan, miscellaneous import charges, transportation charges between Idaho and Japan and tariff levied by the Japanese government are deducted from the probable wholesale price to derive an FOB carcass price in Idaho; third, slaughtering and processing costs and value of by-products are then factored into the calculations to estimate an Idaho carcass basis price; and finally, the receipts are converted from carcass to live weight basis.

According to Mori and Gorman (1985), cattle fed high-concentrate diets for 260 days might be valued at the weighted average price of 2nd and 3rd grade Wagyu and fed dairy steers. The historical prices of 2nd and 3rd grade Wagyu and dairy steers for the period from 1978 through 1987 and the weights are summarized in Table 1. In 1987, the weighted average price was ¥647 per pound carcass weight, Tokyo.

The tariff rate of 70 percent and the wholesale market commission of 3.5 percent are used in the analysis. Edible beef diaphragm has been imported free of quantity restrictions and under a tariff rate of 15 percent since 1985. Therefore, the ratio of wholesale price to CIF price for diaphragm could be used to estimate the same ratio for beef after 1991. The ratio for diaphragm ranges from 1.18 to 1.95 with an average of 1.40 for the period 1985-1988. The ratio of wholesale to CIF price for beef after 1991 is assumed to be 190 percent using the tariff rate of 70 percent. The air freight rate for chilled carcass is reported to vary between \$0.6/lb to \$1.2/lb. A rate of \$1.0/lb is assumed for chilled carcasses shipped from Idaho to Japan. Therefore, the 1987 FOB carcass price in Idaho is estimated to be \$1.53/lb using an exchange rate of 130 yen/dollar.

$$647/130 (1 - 3.5\%) = (P_{fob} + 1.00) (1 + 70\% + 20\%) \rightarrow P_{fob} = \$1.53/\text{lb.}$$

Slaughtering and processing costs and value of by-products were assumed to be \$0.09/lb and \$0.06/lb carcass weight, respectively. In addition, yearling steers are assumed to reach a finish weight of 1,410 pounds and have a dressing ratio of 62.5 percent. Death loss is, on average, 0.91% for the conventional feeding program and is assumed to be 1 percent for the second phase of the extended feeding program. Using these assumptions, the probable gross receipts for steers fed 260 days in Idaho are estimated to be \$1,308 per head or \$92.77/cwt live weight, as shown below:

$$[1410 \times 62.5\% \times 1.53 - (0.09 - 0.06) \times 1410 \times 62.5\%] (1 - 1\%) = \$1,308/\text{head}$$

Probable Cost: Production costs of the extended feeding program are estimated by using the production costs of the conventional feeding program discussed in the 1987 Idaho Livestock Enterprise Budgets (Smathers, et al., 1988). Using the concept of opportunity cost, the market value of the cattle finishing the conventional feeding program is treated as the cost of the feeder steers (i.e., \$759 per head) of the extended feeding program. Fixed costs and other variable costs of the second phase are assumed to be identical to those of the conventional program, since the extended program is twice the conventional program in duration. These costs are shown in Table 2.

The average feed conversion rate is approximately 7.75:1 for the conventional program. The feed conversion rate for the second phase of the extended program is not known with certainty. A conservative conversion rate of 11.75:1 is assumed in this study. The costs and break-even prices (\$/lb) of the two feeding programs are summarized in Table 2.

Probable Profits and Cautions: By comparing probable receipts and costs of the extended feeding program, the profit for the extended feeding program is estimated to be \$17.19/cwt live weight or \$243/head using the 1987 Tokyo carcass price and an exchange rate of 130 yen per dollar. Therefore, it is clear that producing longer-fed beef for the Japanese market is a promising production and marketing alternative for the U.S. beef industry when the beef import quotas are lifted in 1991.

It should be stressed that the profitability of producing longer-fed beef for the Japanese market depends on the wholesale carcass price in Japan. It is assumed that cattle fed 260 days are valued at the weighted average price of the 2nd and 3rd grade Wagyu and dairy steers. We believe that this assumption is reasonable. It should, however, be tested by additional research.

It is well known that price is determined by demand and supply conditions in free markets. Because the U.S., Australia and other countries such as Canada have the ability to supply grain-fed beef to Japan and the Japanese beef farmers will be heavily subsidized by its government (Yoshioka, 1988), it is important to monitor the future supply of longer-fed beef in Japan in order to predict the probable wholesale price of longer-fed beef in Japan.

In addition to these factors, there are several other crucial considerations which have dramatic impacts on the profitability of these ventures. These factors translate into a higher degree of risk associated with the new endeavor and can be divided into three broad areas.

First, exchange rates between the U.S. and Japan, and Australia and Japan will impact the relative profitability of the strategy analyzed in this case study. It is found that when the exchange rate exceeds 150 yen per dollar, producing longer-fed beef for the Japanese market becomes unprofitable. Therefore, fluctuations in exchange rates will increase the business risk to the feedlot operator, packer, exporter or other player involved in the potential exportation of beef.

Second, shipping costs by air or sea between the U.S. and Japan and Australia and Japan affect significantly relative profit of exporting beef. Third, the risk or chance of not making the grade or standard for higher quality beef in Japan will negatively impact expected prices. Given the fact that longer-fed beef usually implies fatter animals which in turn implies lower yield grade and thus potential price discounts on the U.S. market. Thus, producing for the Japanese market would appear to be closing the door on segment of the domestic market.

SUMMARY

Due to health concerns and price competition from other meats, U.S. beef consumers have registered an increasing preference for leaner beef. As a result of these factors, per capita beef consumption has been on a declining trend. As a reaction to this changing consumption pattern, the U.S. beef industry has engaged in research programs to produce lean beef. Meanwhile, many people believe that liberalized Japanese beef market will provide a drastically expanded export market for U.S. beef and hence offer a partial solution to the marketing problems facing the U.S. beef industry.

During past trade negotiations between the U.S. and Japanese governments, literature concerning the Japanese beef market has proliferated. One of the major findings in the literature is the realization that beef in Japan is not a homogeneous product and may consist of at least three differentiated products-- Wagyu, dairy and imported beef. Substantial price differentials exist between Wagyu, fed dairy and imported beef in Japan. These price differentials represent the Japanese willingness to pay a price premium for marbling-- the most important quality attribute in the Japanese grading system. Because Japanese domestic beef, especially Wagyu beef, and imported beef of current product characteristics have quite distinct differences in marbling, these two types of beef are believed to be weak substitutes.

In this study, the Japanese demand for beef is analyzed by disaggregating beef into three classes--Wagyu, dairy and imported beef. Empirical results suggest that trade liberalization will greatly expand beef imports but not as much as the prediction resulting from the assumption of perfect substitution between domestic and imported beef. In addition, trade liberalization may have limited effects on the price of domestic beef due to market segmentation. This finding suggests an opportunity for the U.S. beef industry to penetrate the high-valued market niche in Japan. Therefore, it is timely to examine the production and marketing strategies for expanding U.S. beef exports to Japan.

The profitability of extending the feeding period from the conventional 130 days to 260 days is examined by using 1987 Idaho feedlot production budgets and wholesale prices of beef carcasses in Tokyo. Results suggest that extending the cattle feeding period is a promising production/marketing strategy for Idaho's feedlots. Because these results are derived from several critical assumptions, future research is still warranted in order to generate the following information: 1) the optimal combination of feed ration, breeds of cattle and the length of feeding program for producing highly marbled beef; 2) the quality and price distribution of highly marbled beef produced in the U.S.; 3) the future domestic and import supply of highly marbled beef in Japan; and 4) price and yield risk associated with producing for the Japanese beef market.

Table 1. Wholesale Prices of Japanese Beef Carcass in Tokyo: 1978-1987

Year	Dairy Steers		Wagyu Steers		Weighted Average
	2nd Grade	3rd Grade	2nd Grade	3rd Grade	
-----¥/lb-----					
1978	575	538	721	613	602
1979	656	614	822	713	689
1980	605	549	839	671	651
1981	564	516	810	642	618
1982	591	536	825	667	639
1983	589	521	810	638	624
1984	581	514	792	628	614
1985	595	538	817	678	640
1986	605	552	848	717	661
1987	585	526	852	709	647
Weight	0.20	0.40	0.25	0.15	

Table 2. Production costs and Break-Even Prices of the Conventional and Extended Feeding Programs: 1987

	Conventional Program	Extended Program
Variable Costs:		
Feeder Steer	\$562.50	\$759.00
Feed Ration	106.11	192.79
Others	<u>40.20</u>	<u>40.20</u>
Total	\$708.81	\$1,049.98
Fixed Costs:	<u>\$15.69</u>	<u>\$15.69</u>
Total Costs (\$/head):	\$724.50	\$1,065.67
Live weight (lbs)	1,150	1,410

Break-Even Prices (\$/cwt) to Cover

Variable Costs:	\$61.64	\$74.47
Total Costs:	\$63.00	\$75.58

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