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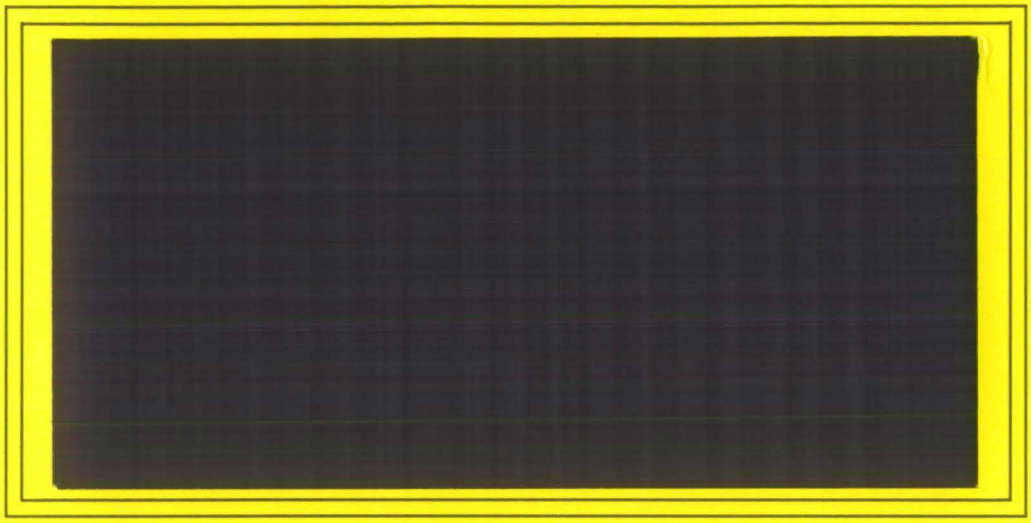

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TOTAL IMPORTS AND IMPORT PATTERNS OF BARLEY INTO JAPAN: Implications of the 1988 Japanese Beef Market Access Agreement*

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ABSTRACT

A two-stage budgeting procedure was employed to analyze (1) the Japanese import demand for barley and (2) allocation of Japanese barley imports between North America (Canada and the United States) and Australia. It was found that the import demand for barley was price inelastic and corn was a substitute for barley. Japanese barley imports were also influenced by size of the cattle herd and the number of cattle slaughtered. Price competition played a significant role in import allocation and budget shares of the two suppliers were proportional to total import expenditure. Starting in April 1991, import quotas and the involvement of the Livestock Industry Promotion Corporation (a quasi-government agency) in the Japanese beef trade will be replaced with higher tariffs and direct negotiations between traders. These changes promise easier access to the Japanese beef market and have been predicted to exert adverse impacts on the Japanese cattle industry. Different responses of the Japanese cattle industry under trade liberalization were assumed and were combined with the estimated econometric models to forecast Japanese barley imports in total and by country of origin. The effect of a reduced price for North American barley was also investigated as reduced total imports under trade liberalization may intensify price competition.

INTRODUCTION

Japan is the leading export market for Canadian barley, importing more than 800 thousand metric tons, valued at $125 million in 1988[1/]. Canada, Australia, and the United States were almost the exclusive suppliers of barley imported into Japan, accounting for, respectively, 60, 30, and 10 percent of the market during the period from 1976 to 1988 (Table 1). Canada and Australia were stable suppliers while U.S. exports of barley to Japan were often sporadic, especially for the periods before 1980 and since 1985.

Barley imported into Japan is used as a feed grain mainly by the cattle industry (Coyle, 1983, p.43). The Japanese cattle industry has been protected by import quotas, a 25 percent ad valorem tariff, and the involvement of the Livestock Industry Promotion Corporation (LIPC), a quasi-government agency which controls about 80 percent of the import quotas. In June 1988, the United States and Japan reached the 1988 Japanese Beef Market Access Agreement which was accepted by Australia in July 1988. Under the agreement, import quotas and the involvement of the LIPC will be replaced with higher tariffs and direct negotiations between Japanese importers and exporters starting in April 1991. These changes promise foreign suppliers easier access to the Japanese beef market and have been predicted to impose appreciable damage to the Japanese beef industry. If the Japanese cattle industry contracts in response to this trade liberalization, the Japanese demand for feed grains, mainly corn and barely, will decline. A reduced import demand for barley is also likely to intensify price competition among major suppliers.

A recent study suggests prices of U.S. feed grain (including corn, barley, sorghum, oats, rye, millet, and mixed grains) should not be adversely affected by the Beef Market Access Agreement (Van der Sluis and Hayes 1990). The reduction in U.S. feed grain exports to Japan will be offset by increased domestic use to expand beef production for export to Japan. Corn is the major feed grain in the United States as well as the primary U.S feed grain export to Japan. Canada has supplied very little beef to Japan as compared to Australia and the United States, and hence is not expected to increase its beef exports to Japan under the 1988 agreement. A contraction in the Japanese cattle industry and hence the reduced demand for feed grain is, therefore, of particular significance to the Canadian barley industry.

The study was motivated by the lack of analytical research on the Japanese import demand for barley. The objectives of the study were twofold. The first objective was to investigate factors affecting the Japanese import demand for and import patterns of barley. A two-stage budgeting procedure was employed to estimate total import demand and the allocation of imports among major suppliers. The second objective involved predicting the Japanese total imports and import patterns of barley under two scenarios; when Japanese beef producers face stiff competition starting in April 1991, and if prices of imported barley are changed.

METHODOLOGY

Since the development of the Armington model for analyzing international trade flows of differentiated products, the assumption of a weakly separable utility function has been widely employed to justify a two-stage budgeting procedure for import decisions In the first stage, total import expenditure is allocated among broadly defined groups of goods. The second stage then determines the allocation of group expenditure among different suppliers. Recent applied trade analyses utilizing the two-stage budgeting procedure include Haden (1990) and Alston et al. (1990). In the context of Japanese barley imports, factors affecting Japanese total barley imports are considered in the first stage and factors affecting barley imports by country of origin are addressed in the second stage. Specifically, the import demand for barley can be specified as

(1) BM = f(PB, PC, CATTLE, SLAUGHTER, Z)

BM is total barley imports into Japan, PB is the price of imported barley, PC is the price of imported corn, CATTLE is the beginning inventory for the Japanese cattle herd, SLAUGHTER is the number of cattle slaughtered during the period, and Z is a vector of other demand shifters, such as seasonal dummies.

Barley and corn are the main ingredients in the finishing ration used by the Japanese cattle industry. Even though imported corn is less expensive than imported barley, barley is still an important component of the finishing ration for cattle. Barley is known for better performance than corn in producing a white color fat, which is highly valued in the Japanese beef market. Import demand for barley is therefore affected by the prices of imported barley and corn. The price of barley is expected to have a negative sign and the price of corn a positive sign.

The cattle industry is the main user of imported barley in Japan. Thus, import demand for barley and the number of cattle should have a positive relationship. Size of the cattle herd has been surveyed twice a year (February and August) by the Japanese government. Semiannual data (April to September is the first half of the Japanese fiscal year) were constructed from quarterly data for barley imports. Under this procedure, the cattle herd size for the preceding February (August) represents the beginning cattle inventory for the first (second) half of the year. The number of cattle slaughtered during a period reduces the demand for barley. Japanese domestic production of barley is excluded from both the first- and second-stage modelling, because it is used for human consumption. The use of imported barley for human

consumption is prohibited in order to prevent imports from undermining the price support program for the domestic barley[2/].

The second-stage budgeting decision involves the allocation of total barley imports among different suppliers, namely Australia, Canada, and the United States. The decision was modelled by the almost ideal demand system (AIDS) developed by Deaton and Muellbauer (1980). The AIDS model is developed from price-independent generalized logarithmic consumer preferences and expresses an exporting country's share of the Japanese total import expenditure as:

$$(2) \quad W_i = \alpha_i + \sum_i \gamma_{ij} \ln P_j + \beta_i \ln(X/P)$$

W_i is ith country's share of the Japanese import expenditure on barley, P_j is the landed price of country j's barley, X is Japanese total import expenditure on barley, and P is a nonlinear function of prices, such that

$$(3) \quad \ln P = \alpha_0 + \sum_i \alpha_i \ln P_i + 1/2 \sum_k \sum_j \overset{*}{\gamma}_{kj} \ln P_k \ln P_j$$

When the above nonlinear price equation is replaced by the Stone geometric price index, $\ln P^* = \Sigma W_i \ln P_i$, the AIDS model becomes the linear/approximate almost ideal demand system (LA/AIDS) which can be written as:

$$(4) \quad W_i = \alpha_i + \sum_i \gamma_{ij} \ln P_j + \beta_i \ln(X/P^*)$$

Adding-up, homogeneity, and symmetry conditions, respectively, can be expressed as:

$$\Sigma \alpha_i = 1, \ \sum_i \gamma_{ij} = 0, \text{ and } \Sigma \beta_i = 0;$$

$\sum_j \gamma_{ij} = 0$; and

$\gamma_{ij} = \gamma_{ji} \quad \forall$ i and j

Uncompensated demand price and expenditure elasticities can be calculated from parameter estimates of (4) using the following formulas (Chalfant 1987; Green and Alston 1990),

Expenditure Elasticity: $1 + \beta_i + W_i$

Price Elasticity: $\eta_{ij} = -\delta_{ij} + \gamma_{ij}/Wi - \beta_i/W_i[W_j + \sum_k W_k \ln P_k(\eta_{kj} + \delta_{kj})]$,

$\delta_{ij} = 1$ for i = j; and = 0 for i $\neq$ j.

MODEL ESTIMATION

Data Sources

With the exception of the cattle herd size, quarterly data for all variables were collected for the period from the first quarter of 1975 (1975:1) to the first quarter of 1989 (1989:1). Quantities and values of barley and corn imports into Japan by country of origin were taken from *Japan Exports & Imports, Commodity by Country* published by the Ministry of Finance, Japan. Prices of imported barley and corn were derived by taking the ratio of import values to quantities. Size of the cattle herd (dairy and Wagyu which is an indigenous breed) and the number of cattle slaughtered were taken, respectively, from *Livestock Statistics* and *Meat Distribution Statistics*, published by the Ministry of Agriculture, Forestry, and Fisheries, Japan.

Because the cattle herd size is reported for February and August in Japan, the import demand for barley was estimated using semiannual data, with the period

from April to September being regarded as the first half of a year. Quarterly data were used to estimate the second-stage LA/AIDS model.

First-Stage Import Demand Equation

Unlike the LA/AIDS model whose functional form is exactly specified from the chosen consumer preferences, the import demand function is specified on an ad hoc manner without referring to any utility function. Therefore, the functional form for the import demand equation becomes an empirical issue. The Box-Cox flexible, extended by Zarembka (1974), double-log, and linear functional forms all produced similar results in terms of the log-likelihood function. Results of the double-log functional form were:

$$(5)\ \ln BM = \underset{(2.43)}{6.39} - \underset{(0\ 177)}{0.504} \ln PB + \underset{(0.166)}{0.700} \ln PC + \underset{(0.526)}{1.149} \ln CATTLE - \underset{(0.324)}{0.486} \ln SLAUGHTER$$

$$- \underset{(0.061)}{0.114} DS - \underset{(0.064)}{0.42134} D82$$

$R^2 = 0.814$, $\bar{R}^2 = 0\ 748$, $\rho = -0.545$, D-W = 2.16, n = 24.

Numbers in parentheses are standard errors, DS is the seasonal dummy variable (equal to 1 for the first half of the year), D82 is a dummy variable (equal to 1 for the second half of 1982) included to capture the effect of poor barley production in Australia, ρ is the coefficient used for correcting the first-order autocorrelation problem, and n is the number of observations.

All parameter estimates have signs consistent with *a priori* expectations With the exception of SLAUGHTER, all variables were statistically different from 0 at a 5 percent probability level. The Japanese import demand for barley was found to be price inelastic with an elasticity of -0.50, and to be

positively affected by the price of imported corn with a cross-price elasticity of 0.70. It is known that cattle sectors in Japan or elsewhere exhibit long term cycles such that the herd size gradually builds up (contracts) when producers are optimistic (pessimistic) about market conditions. Consequently, the finding that the beginning herd size (CATTLE) had a coefficient exceeding 1.0 is reasonable. An increase in the number of slaughtered cattle reduced the demand for barley, as expected There was a seasonal import pattern in favor of the second half of the year after the North American barley crop is harvested. The dummy variable D82 was created to capture the effect of poor barley production in Australia.[3/]

Second-Stage Import Allocation Equation

Quarterly data from 1976 to 1988 were used in modelling the second-stage of the Japanese barley import decision. As mentioned before, Australia, Canada, and the United States were the major suppliers of barley imported into Japan. The United States was combined with Canada (termed North America) in the estimation for two reasons: 1) during the periods from 1976 to 1981 and since 1985 U.S. barley exports to Japan were often sporadic and small in volume on a quarterly basis and 2) the two markets could be regarded as one by Japanese importers because of similar production and marketing seasons and geographic proximity as compared to the Australian market. Because Japan imported very little barley from other sources, only imports from Australia, Canada, and the United States were considered. Because the expenditure shares of the North America and Australia sum to 1.0, only one of the two LA/AIDS equations can be estimated and parameters of the other equation can be derived by using the adding-up property of the demand system. Parameter estimates are invariant to which equation is excluded from the estimation. Another property of a two-

equation AIDS model is that the symmetry condition is implied by the homogeneity condition since the adding-up condition is imposed automatically. The homogeneity condition failed to be rejected using a F test, and the imposition of the homogeneity condition generated the following empirical results:

$$(6)\quad W_{na,t} = \underset{(1.347)}{0.208} - \underset{(0.511)}{1.026}\ln P_{na,t} + \underset{(0.511)}{1.026}\ln P_{au,t} + \underset{(0.105)}{0.018}\ln(X/P) + \underset{(0.129)}{0.396}W_{na,t-1}$$

$$- \underset{(0.046)}{0.104}D_1 - \underset{(0.046)}{0.035}D_2 - \underset{(0.047)}{0.019}D_3$$

$R^2 = 0.335$, $\bar{R}^2 = 0.246$, Durbin-h = -0.06, n = 52

$W_{na,t}$ and $W_{na,t-1}$ are North American shares of the Japanese expenditure on barley imports in period t and t-1; P_{na} and P_{au} are the landed prices of barley from North America and Australia, respectively; X is the Japanese expenditure on barley imports; and P is the Stone price index for imported barely.

Because quarterly data were used in the estimation, a dynamic LA/AIDS model was specified by including the lagged expenditure share, as discussed in Haden (1990). The coefficient of the lagged budget share was different from zero at a 1 percent probability level, suggesting the adjustment to changes in prices was partial within the period. The expenditure variable (X/P) had a coefficient not significantly different from zero, suggesting that a change in total import expenditure did not affect its allocation between North America and Australia or the underlying utility function for the Japanese barley imports was homothetic. The two price coefficients were different from zero

at a 5 percent probability level. The own-price had a negative coefficient, implying that a decrease in the price of North American barley would increase the North American share of the total Japanese import expenditure. An increased expenditure at a lower price indicated a larger percentage change in imports from North America than the percentage change in price; that is, the demand was price elastic. The mean own- and cross-price elasticities for North American barley were, respectively, -2.48 and 1.48 in the short run and -4.11 and 2.45 in the long run.

EFFECTS OF THE BEEF TRADE AGREEMENT

During the past two decades, three multilateral agreements on the Japanese beef imports have been reached between Japan, Australia, and the United States. During the often heated and tense trade negotiations, literature on the Japanese demand and supply of beef and the effect of trade liberalization proliferated (Hayami 1979; Anderson 1983; Ohga and Inaba 1985; Ohga 1989; Wahl et al. 1989; Hayes et al. 1990; Mori and Lin 1990). It has been recognized that the assumption of substitutability between Japanese (dairy and Wagyu) beef and imported beef is crucial in analyzing the effect of trade liberalization (Dyck 1988). Dairy beef and imported beef have been assumed to be perfect substitutes in the studies by Ohga and Inaba, Wahl et al., and Hayes et al., while imperfect substitution between these two types of beef has been suggested by Mori and Lin and Ohga.

Other factors further complicate the analysis of the effect of trade liberalization on the Japanese cattle industry. Some of the factors are:

- Japanese beef producers' economic behavior may differ drastically under different trade regimes;
- beef imports into Japan are influenced greatly by, among other factors, exchange rates which are highly volatile;
- price support and subsidy programs available to the Japanese beef producers;
- price support programs for milk production because dairy beef, a joint-product of the dairy industry, accounts for over 60 percent of the Japanese beef production;
- Japanese policy pertaining to the exportation of Wagyu genetic materials; etc.

Consequently, a wide range of predictions on the effect of trade liberalization has been generated in the literature. For example, Wahl et al. found that different economic behaviors of the Japanese beef producers greatly influenced the size of the Japanese cattle industry under trade liberalization (see Figures 5 and 6 in Wahl et al., pp. 356-357).

Obviously, sensitivity analysis is warranted in analyzing the effect of trade liberalization. This study is concerned with the effect on the Japanese cattle herd size and hence the demand for barley. Accordingly, it was assumed that the Japanese cattle industry will undergo liquidation at different rates starting in April 1991. The herd size and the number of slaughters under different liquidation rates were calculated using the following two formulas:

$$\text{BIRTH RATE}_t = (\text{SLAUGHTER}_t + \text{CATTLE}_t) \div \text{CATTLE}_{t-1} - 1$$

$$\text{SLAUGHTER RATE}_t = \text{SLAUGHTER}_t \div \text{CATTLE}_{t-1}$$

BIRTH RATE measures the percentage increase in herd size due to births and SLAUGHTER RATE measures the percentage of the herd size that is usually slaughtered.

Birth and slaughter rates were found to be seasonal on a semiannual basis, and their mean values for the period from 1976 to 1987 were, respectively, 17.34 and 14.27 percent for the first half of the year; and 14.33 and 15.33 percent for the second half. The slaughter rate starting from April 1991 was assumed to be zero, 10, 20, 30, and 40 percent above the historical rates while the birth rate was assumed to continue its historical rates. The herd sizes and slaughter numbers for the period from 1988 to 1997 under different liquidation rates (Table 2) and the prices of imported barley and corn that prevailed during the second half of 1987 were fitted into equation (5) to predict the Japanese total barley imports for the period from 1989 to 1995. The forecasted total barley imports and assumed prices were then fitted into equation (6) to predict North American barley exports to Japan, as shown in Table 3.

When the ratio of the number of slaughters to the herd size followed its historical level, it was predicted that the cattle herd size in Japan would start building up. The building-up of the herd, also predicted by Ohga and Inaba and by Wahl et al., was probably caused by the huge yen appreciation after 1985. This yen appreciation deflated feed costs while the price of domestic beef was rising. Consequently, a upward trend in the Japanese import demand for barley was predicted. When the Japanese cattle industry was assumed to liquidate its herd under trade liberalization, the demand for

barley imports was reduced gradually in the initial stage and declined at an increasing rate by the end of 1995. Apparently, the liquidation rate of the Japanese cattle industry under trade liberalization plays a major role in determining future barley imports into Japan. If indeed the Japanese cattle industry contracts and the import demand for barley declines under trade liberalization, price competition in the Japanese imported barley market is likely to intensify.

Results of the dynamic LA/AIDS modelling indicated that price competition was important in determining the Japanese barley imports by country. A decrease in the landed (or CIF) price of North American barley measured in the Japanese yen could be a result of lower FOB (free-on-board) prices measured in dollars or an appreciation of the yen relative to Canadian and U.S. dollars. The two estimated econometric models were utilized to examine the effect of a 10 percent decrease in the price of North American barley. The price decrease scenario was analyzed in three steps:

1) the dynamic LA/AIDS model was simulated to forecast the North American share of the Japanese barley import expenditure under new prices;

2) the forecasted quantity shares (calculated from the budget shares) were used to derive the average price (total value over total quantity) of imported barley from all sources on a semiannual basis which was then used in the import demand equation to predict total barley imports; and

3) total barley imports were multiplied by the simulated import shares from the first step (calculated on a semiannual basis) to generate North American barley exports to Japan.[4/]

Results of the analysis (Table 3) indicated that a 10 percent decrease in the price of North American barley would, on the average from 1989 to 1995, increase the Japanese barley imports from all sources by 5 percent and from North America by more than 33 percent.

CONCLUSIONS

The 1988 Japanese Beef Market Access Agreement stipulates that import quotas and the involvement of the Livestock Industry Promotion Corporation, a quasi-government agency which controls about 80 percent of the import quotas, be replaced with higher tariffs starting in April 1991. As a result, it has been predicted that the trade agreement is likely to have adverse impacts on the Japanese cattle industry. It is, however, difficult to predict the effects of trade liberalization because impacts are dependent upon many economic and policy factors.

A two-stage budgeting procedure was employed to estimate the Japanese import demand for barley and the allocation of imports among major suppliers (North America and Australia) The Japanese import demand for barley was found to be price inelastic and was affected by the price of corn, which is a substitute for barley in cattle feeding. Additionally, size of the cattle herd and the number of cattle slaughtered were major determinants of Japanese barley imports.

The allocation of barley imports between North America and Australia was modeled by employing a dynamic linear approximate/almost ideal demand system

(LA/AIDS). It was found that the demand for North American barley was quite price elastic and that North American and Australian barley were close substitutes in Japan. Further, the allocation of total Japanese barley imports between North America and Australia was found to be proportional to total imports, provided that prices of barley by country of origin are constant.

The predicted total barley imports were then combined with the results of the LA/AIDS model to forecast semiannual North American barley exports to Japan through the year 1995. Since impacts of the 1988 Japanese Beef Market Access Agreement on the Japanese cattle sector are uncertain, several herd liquidation scenarios were analyzed. Additionally, it was estimated that a 10 percent reduction in the price of North American barley would increase the Japanese total imports by 5 percent and increase imports from the North America by more than 33 percent. Price competition in the Japanese barley import decision is likely to intensify when the total import demand is reduced resulting from the beef trade liberalization.

Table 1. Japanese Barley Imports and Import Shares: 1976-1988

Year	Import Volume All Sources	Share Canada	Share U.S.	Share Australia
	1,000 mt	%	%	%
1976	1,415	65.10	7.30	27.60
1977	1,365	62.98	3.94	33.09
1978	1,263	60.94	4.84	34.22
1979	1,436	58.24	0.99	40.77
1980	1,381	48.82	9.31	41.87
1981	1,529	59.54	19.24	21.23
1982	1,269	71.82	19.01	9.17
1983	1,458	69.77	19.69	10.54
1984	1,530	44.37	27.00	28.63
1985	1,568	57.93	8.92	33.15
1986	1,311	58.89	4.67	36.43
1987	1,207	58.26	0.00	41.74
1988	1,310	61.14	5.54	33.33

Source: *Japan Exports & Imports, Commodity by Country*, Ministry of Finance.

Table 2. Japanese Herd Size and Total Slaughter (1,000 head) under Different Liquidation Rates

	Herd Size at Liquidation Rate					Slaughter at Liquidation Rate				
Year	zero	10%	20%	30%	40%	zero	10%	20%	30%	40%
1988	4780	na[a/]	na	na	na	1405	na	na	na	na
1989	4872	na	na	na	na	1432	na	na	na	na
1990	4965	na	na	na	na	1459	na	na	na	na
1991	5060	4952	4844	4737	4631	1488	1624	1759	1892	2022
1992	5157	4899	4651	4411	4181	1516	1607	1689	1762	1826
1993	5257	4847	4465	4108	3775	1545	1590	1622	1641	1649
1994	5357	4796	4287	3825	3408	1575	1574	1557	1528	1488
1995	5460	4745	4116	3563	3077	1606	1557	1495	1423	1343

a/ Liquidation of the cattle herd is assumed to take place starting from April 1991 when import quotas and the involvement of the LIPC are replaced with higher tariffs.

Table 3. North American Barley Exports (1000 Metric Tons) to Japan: 1988-1995

Year[a/]	Liquidation Rates					Price ↓
	0%	10%	20%	30%	40%	10%
1988:1[b/]	394	na[c/]	na	na	na	na[d/]
1988:2	422	na	na	na	na	na
1989:1	414	na	na	na	na	552
1989:2	468	na	na	na	na	623
1990:1	425	na	na	na	na	566
1990:2	472	na	na	na	na	628
1991:1	432	412	395	380	367	575
1991:2	477	451	428	408	390	635
1992:1	438	410	385	363	343	583
1992:2	482	448	416	389	364	642
1993:1	443	407	375	346	321	590
1993:2	489	444	405	371	340	651
1994:1	449	404	365	330	300	598
1994:2	495	441	395	354	318	659
1995:1	455	401	355	315	280	605
1995:2	501	438	384	337	297	667
Average (semiannual) 1991-1995	466	426	390	359	332	620

a/ Japanese fiscal year on a semiannual basis with 1989:1 spanning from April to September, 1989.
b/ 1988:1 and 1988:2 are actual figures.
c/ Different liquidation rates were assumed under trade liberalization starting from 1991 only.
d/ Price ↓ 10% is a 10 % price reduction from the conditions underlying the zero rate of liquidation.

ENDNOTES

1. These import statistics were taken from *Japan Exports & Imports, Commodity by Country*, Ministry of Finance, Japan. Import values were calculated using an exchange rate of 104.13 yen per Canadian dollar.

2. After clearing through Custom, imported barley is transported to designated processing plants where barley is crushed or flaked, mixed with fish meal, and then sold directly to cattle producers. Barley is imported duty free into Japan and its processing and sale are subsidized by the Japanese government to promote beef production.

3. An alternative approach for modelling outliers is to employ the robust estimation techniques such as the minimization of the absolute deviations--MAD (Judge et al. 1988, chapter 12). The sample of 24 observations was found too small when the MAD model was estimated using the SHAZAM package (White 1978). The sample was expanded with two additional observations for 1975, and the linear model produced high t values, and signs identical to and elasticities similar to those in equation (6). The only noticeable difference was the mean elasticity for CATTLE in the MAD model was less than one. Because statistical properties of some goodness-of-fit statistics, such as R^2 and t, are not well defined in the MAD model, results of equation (5) are reported. Additionally, beef imports into Japan were prohibited in 1974 and 1975. The sample period starting with 1976 was deemed more stable than its expanded counterpart even though the double-log model produced similar results when the sample was expanded.

4. If the expenditure variable had non-neutral effects on the allocation of import expenditure by source, a third step should be carried out by a simulation of the LA/AIDS model with the predicted import expenditure. Because the expenditure variable was found not to statistically differ from zero, a change in total import expenditure would not alter the simulated share distribution obtained in the first step.

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