

## **The Derived Demand for Imported Cheese into Japan by Country**

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### **The Derived Demand for Imported Cheese into Japan by Country**

Japan is one of the largest importers of dairy products in the world. It ranked 9<sup>th</sup> among all importing countries in total dairy products imported (in milk equivalent pounds), and currently ranks 5<sup>th</sup> in imports of cheese. At present, Japan's share of world dairy imports is about 3 percent, which is about what its share has been for the last two decades. For individual dairy products, Japan's share of world imports in cheese, skim milk, and whey are about 6, 4, and 4 percent respectively (FAO Statistics, 1999).

As diets in Japan became more westernized and the health benefits of milk consumption became more known, consumption of dairy products in Japan rapidly increased. As a result, daily per-capita consumption has grown faster than any other staple food. However, when compared to developed European countries and the U.S., per-capita consumption is still relatively low. At present, daily per-capita consumption of milk is about 114g, which is roughly one third of per-capita consumption in England and less than half of per-capita consumption in the U.S. (Japan Dairy Council, 1999).

Although per-capita dairy consumption in Japan is low when compared to developed western countries, the rate of growth in per-capita consumption has been phenomenal. According to FAO Statistics per-capita consumption in all milk consumed annually has increased from 26.05 kg per person in 1961 to 86.05 kg in 1997. The largest growth occurred in the 1960's when per-capita consumption increased by 8.56 percent per year on average, primarily driven by a 50 percent average annual increase in skim milk. In this recent decade growth has slowed to some degree. Since 1991, growth in per-capita consumption of all milk consumed decreased by .63 percent per year; however, growth in per-capita cheese consumption has increased by 5.67 percent per year for the same period.

The major goal of this paper is to provide the U.S. dairy industry with empirical estimates of the sensitivity (elasticities) of Japan's derived demand for imported cheese differentiated by source country of production with respect to price changes and total import changes. These estimates will then be used to assess the relative competitiveness of cheese imported from the U.S. to cheese imported from other source countries. Past studies that assessed the demand for imports differentiated by source country of production have used a utility or consumer approach to obtain import demand equations. However, given that imported dairy products are purchased by firms, and that a significant amount of transformation and/or value added takes place after goods reached the importing country, this study will estimate demand from a production approach where imports are inputs into production processes.

Specific goals are: (1) To econometrically estimate the derived demand for imported cheese in Japan; (2) To utilize the empirically estimated import demand parameters to provide empirical measures of the sensitivity of demand to changes in total imports, own price, and the prices of cross country substitutes; and (3) To project future derived demand given export subsidy reductions mandated by the World Trade Organization.

## Methodology

The econometric model that will be used to estimate the derived demand for imported cheese into Japan is the differential factor allocation model (DFAM), this model is

$$\bar{f}_{it} D x_{it} = \theta_i D X_t + \sum_{j=1}^n \pi_{ij} D w_{jt} + \varepsilon_{it} . \quad (1)$$

$Dx_t = \log(x_t) - \log(x_{t-1})$  and  $Dw_t = \log(w_t) - \log(w_{t-1})$  are the log change in quantity and price respectively from period  $t-1$  to  $t$ , where  $x_i$  and  $w_i$  are respectively the quantity and price of

Japan's imported cheese from source country  $i$ .  $\bar{f}_{it} = (f_{it} + f_{it-1})/2$ , where  $f_i$  is the  $i$ th factor share of total cost.  $DX$  is the finite version of the Divisa input index, where  $DX_t = \sum_{i=1}^n \bar{f}_{it} D x_{it} \cdot \pi_{ij}$ 's are the price coefficients and  $\theta_i$  is the marginal share of the  $i$ th input in marginal cost. Both are parameters to be estimated.

A key feature of the DFAM is that production theory can be tested or imposed upon the system to determine if the data is consistent with theory. The properties, homogeneity and symmetry are imposed and tested, and negative semi-definiteness is checked by inspection of the eigen values of the price coefficient matrix. The homogeneity property in the DFAM model is satisfied when  $\sum_j \pi_{ij} = 0$ . Symmetry is satisfied when  $\pi_{ij} = \pi_{ji}$  (Washington, 2000).

When applied to the estimation of the derived demand for cheese imports into Japan, equation (1) is the  $i$ th derived demand equation for imported cheese into Japan from exporting country  $i$ , where  $i \in (\text{US, Australia, New Zealand, EU, ROW})$ . ROW is the rest of the world, which in this instance is an aggregation of all imports of cheese into Japan not imported from the US, Australia, New Zealand, or the EU. The Divisa input index is now an index of total cheese imports into Japan.  $f_i$  is the total cost of cheese from source country  $i$  divided by the total cost of all cheese imported into Japan.  $w_i$ 's are the prices for imported cheese charged by the exporting countries.  $x_i$  is the quantity of cheese imported into Japan from the  $i$ th exporting source.

Estimation of the system of equations represented by equation (1) will be accomplished using the LSQ procedure in the econometric program package Time Series Processor (TSP), version 4.4. The LSQ procedure in TSP when estimating the seemingly unrelated regression problem uses the multivariate Gauss-Newton method to estimate the parameters in the system. This procedure generates parameter estimates, standard errors, and probability values; also, a

goodness of fit measure for each equation ( $R^2$ ), the Durbin Watson statistic for each equation, and the log likelihood function value for the system. (Hall and Cummins, 1998)

Since the DFAM is a singular system due to the adding up constraint, an equation must be deleted from the system when using the LSQ procedure. The equation deleted is the ROW equation, which is the least important equation to the system. However, parameter estimates for this equation are recovered by re-estimating the system with another equation deleted and this one replaced. This is possible because parameter estimates are invariant to the equation deleted when using maximum likelihood estimation (Barten, 1969).

The system goodness of fit measure used is the measure presented by Bewley (1986):

$$R_w^2 = 1 - \frac{1}{1 + W^* / (T - k)(n - 1)} \quad (2)$$

where  $W^*$  is the Wald statistic that forces all the coefficients in the system to zero.  $T$  is the number of observations,  $n$  is the number of equations in the full system, and  $k$  is the number of regressors in each equation. The Wald statistic for the hypothesis test that forces all the coefficients to zero is generated using the ANALYZ procedure in TSP.

The test for AR(1) in the DFAM model is accomplished using the likelihood ratio (LR) test where the DFAM with AR(1) imposed is the unrestricted model and the DFAM without AR(1) is the restricted model. In this study, the estimate of the autocorrelation parameter  $\rho$  will be obtained using full information maximum likelihood estimation where  $\rho$  will be common across equations. This procedure is found in Berndt and Savin (1975), Green et al. (1978) and Beach and MacKinnon (1979). If autocorrelation can not be rejected, then the autocorrelated DFAM will be used to test for economic properties and forecasting.

The DFAM allows for homogeneity, symmetry, and negative semi-definiteness to be tested, imposed, or checked. The homogeneity property is satisfied when  $\sum_j \pi_{ij} = 0$ , which implies that  $\pi_{in} = -\pi_{i1} - \pi_{i2} - \dots - \pi_{in-1}$ . Imposing this restriction on equation (1) yields (Theil, 1971)

$$\bar{f}_{it} D_{it} = \theta_i DX_t + \sum_{j=1}^{n-1} \pi_{ij} (D w_{jt} - D w_{nt}) + \varepsilon_{it} . \quad (3)$$

Equation (3) will be estimated using the LSQ procedure in TSP. The resulting log likelihood value will be obtained from the estimation procedure and used in a LR test to determine if the homogeneity constraint is valid. For this test, the homogeneity-constrained model is the restricted model that will be compared to the unconstrained system.

The symmetry constrained ML estimator can be obtained using the LSQ procedure in TSP as well. This is accomplished by first imposing homogeneity and then restricting the symmetric parameters equal. For example, the  $i$ th price coefficient in the  $j$ th equation will be restricted to equal the  $j$ th price coefficient in the  $i$ th equation. Once these restrictions are imposed, estimates are obtained using the LSQ procedure. The log likelihood value of this estimation will be used to verify the symmetry property, where the symmetry constrained system is the restricted model and the homogeneity-constrained system is the unrestricted model.

The property of negative semi-definiteness is validated by inspection of the eigenvalues of the price coefficient matrix. This property is verified when all of the eigenvalues are less than or equal to zero. If any values are questionable, judgement will be made based on the standard errors of the price coefficient estimates.

Mean –based elasticities will be calculated using the constrained parameters resulting from the estimation procedure. These elasticities are as follows.

$$\varepsilon_{xw} = \frac{Dx_i}{Dw_j} = \frac{\pi_{ij}}{f_i}. \quad (4a)$$

Equation (4a) is the conditional own and cross price elasticity. This will be evaluated at the mean factor share. Equation (4a) is the percentage change in the quantity demanded of an imported dairy product from the  $i$ th source country resulting from a 1 percent change in the price of that same product from source country  $j$ .

$$\varepsilon_{xX} = \frac{Dx_i}{DX} = \frac{\theta_i}{f_i}. \quad (4b)$$

Equation (4b) is the Divisa index elasticity, which reflects the effects of a change in the Divisa index on imports from the various source countries. Given that this index is proportional to total imports, this elasticity reflects the effects of total import changes on source-specific imports.

Objectives of this study are to project future derived demand for dairy products in the selected international markets, and to simulate the effects of trade liberalization. Given the left-hand side of equation (1), quantity forecasts are not easily obtained. There are two methods for obtaining quantity forecasts with the DFAM. The first method is a model-based approach, which uses the estimated model as a mean of forecasting future quantities. The model-based forecasting equation for the DFAM is

$$x_{it} = \exp \left[ \frac{\theta_i DX_t + \sum_{j=1}^n \pi_{ij} (\log w_{it} - \log w_{it-1})}{\frac{w_{it} x_{it}}{\sum_{i=1}^n w_{it} x_{it}} + \frac{w_{it-1} x_{it-1}}{\sum_{i=1}^n w_{it-1} x_{it-1}}} + \log x_{it-1} \right]. \quad (5)$$

Use of equation (5) requires that the Divisa index and prices are exogenous, where the only unknowns are the individual quantities. Given prices, the Divisa index, and all lag values,

equation (5) results in a system of  $i$  equations with  $i$  unknowns which can be solved for the  $x$ 's using the SOLVE procedure in TSP. This procedure uses a Gauss-Seidel algorithm.

The second method is the elasticity based approach, similar to the approach used by Kastens and Brester (1996). The elasticity-based forecasting equation for the DFAM is

$$x_{i,t} = \left( \sum_{j=1}^n \varepsilon_{ij} \left[ \frac{w_{jt} - w_{jt-1}}{w_{jt-1}} \right] + \varepsilon_i [DX_t] \right) x_{it-1} + x_{it-1} \quad (6)$$

where  $\varepsilon_{ij}$  and  $\varepsilon_i$  are the price and Divisa elasticity respectively evaluated at the mean. Both procedures will use results from the estimation procedure where the economic properties of homogeneity and symmetry are imposed.

The first step in the forecasting and simulation procedure is to determine which of the two approaches is most accurate in terms of forecasting. To determine which method is best, each of the DFAM systems are estimated using all except the last 5 years of the data sets. Using both model-based and elasticity-based forecasting methods to forecast the remaining years, the precision of each of these methods determined which of the two procedures to use in forecasting and simulating future periods.

Future imported quantities of imported dairy products resulting from trade liberalization are simulated until the year 2003, which is the first half of the new World Trade Organization (WTO) implementation period. The policy that will be investigated is the further reduction in export subsidies permitted to the EU. Although the U.S. subsidizes dairy exports, subsidized exports to Asian countries overall have been negligible.

In order to assess the effects of subsidy reductions on the quantity of imported cheese demanded by Japan, we must first know how subsidy reductions affect the price that an individual exporting country charges. Since export subsidies are a policy exclusive to the



exporting country, the importing country only realizes a lower price for the products exported under subsidy. Since we are assuming that imported products are differentiated by country of origin, we can view the EU-cheese market as a separate market when analyzing the effects of export subsidy changes. When subsidies are reduced, this results in a fall in the total exported, thereby increasing the world price of EU-cheese. The increase in the world price is the only change realized in the Japanese market for EU-cheese. This indicates that a reduction in export subsidies can be simulated in the DFAM by increasing the price of the subsidized commodity. However, what is still needed is the effect of a subsidy reduction on prices. Gardner (1987) shows that the elasticity of demand price with respect to a 1 percent change in a producer subsidy payment is

$$\frac{\% \Delta P}{\% \Delta V} = \frac{-1}{1 - \eta / \varepsilon} \quad (7)$$

where  $P$  is the demand price,  $V$  is the subsidy payment,  $\eta$  and  $\varepsilon$  are the own price demand and supply elasticity respectively. Applying equation (7) to export subsidies, it becomes the percentage change in the world price of the subsidized product resulting from a 1 percent change in export subsidy payments. The resulting change in price will then be used in either of the two forecasting procedures to assess the changes in import demand.

## **Data**

The Commodity Trade Statistics section of the United Nations provided the data used in this study. Imported quantities are in metric tons and values are in \$1000US. Source countries are the U.S., Australia, New Zealand, and the EU. The time period for the data set was from 1962 to 1998. The value of imports was on a cost, insurance, and freight (CIF) basis, which include the cost of the product, the insurance paid, and the transportation cost. Commodity prices

were calculated by dividing the value of the commodity imported by the quantity, which results in a per-unit cost per kilogram measure. The rest of the world quantities and values were calculated by subtracting from the total quantity and value imported the quantity and value from the U.S., Australia, New Zealand, and the EU.

## **Empirical Results**

The first step in the estimation procedure was to test for the presence of autocorrelation in the system. Since estimation of the DFAM requires that we take the first difference of the log of the variables, this is often a correction for autocorrelation; however, autocorrelation may still exist. A likelihood ratio (LR) test was used to test for the presence of AR(1) in the estimated system. This test required that the DFAM be estimated with and without AR(1) disturbances where the autocorrelated version of the DFAM was the unrestricted model and the DFAM without autocorrelation was the restricted model. Results indicate that the hypothesis of no autocorrelation could not be rejected at any reasonable significance level.

In addition to autocorrelation, LR tests were also used to test if the data satisfied the economic properties, homogeneity and symmetry. The results of these tests are summarized in Table 1. LR tests indicate that the property of homogeneity was rejected by at least the .05 significance level. However, Laitinen's test for homogeneity, which is a more precise test, indicated that homogeneity could not be rejected. Given the homogeneity constraint, symmetry could not be rejected at the .05 significance level.

The property of negative semidefiniteness was verified by inspection of the eigen values of the price coefficient matrix. This property is validated when all of the eigen values are less

Table 1 Likelihood ratio test results for economic constraints

Country/Product	Model	Log-likelihood Value	LR*	$P[\chi^2_{(j)} \leq LR^*] = .95$
Japan Cheese	Unrestricted	367.369		
	Homogeneity	362.395	9.948	9.49(4) <sup>a</sup>
	Symmetry	356.428	11.934	12.60(6)
Laitinen's Test				
		W* <sup>b</sup>	$P[T^2 \leq W^*] = .95^c$	
Japan Cheese	Homogeneity	4.027	12.133	

<sup>a</sup> The number of restrictions are in parenthesis.

<sup>b</sup> W\* is the Wald statistic for the homogeneity constraint.

<sup>c</sup> T<sup>2</sup> is the Hotelling's T<sup>2</sup> statistic.

than or equal to zero. All eigen values were non-positive. Eigen values that had zeros up to the fifth decimal place were considered to be zero.

Table 2 displays the fully constrained (homogeneity and symmetry imposed) parameter estimates for Japan's derived demand for imported cheese. All own-price parameter estimates are negative as to be expected, and the estimates for the U.S., New Zealand, and the EU are significant by at least the .05 significance level. All of the estimates for the marginal factor shares are highly significant for each equation and are all positive indicating that as total imports increase, imports from each source country should also increase as well. Of all the cross-price coefficients, only two are not significantly different from zero. These are the U.S.-ROW and the Australia-EU coefficients. Both cross-price coefficients indicate that US cheese and cheese from other sources, and Australia and EU cheese are substitutes in Japan. All other cross-price coefficients indicate little to no relationship in other cheese imports.

Table 2 DFAM parameter estimates for Japan imports of cheese

Exporting Country	Price Coefficients, $\pi_{ij}$					Marginal Factor Shares, $\theta_i$
	U.S.	Australia	New Zealand	EU	ROW <sup>a</sup>	
U.S.	-.0246 (.0068) <sup>b***</sup>	.0044 (.0202)	.0007 (.0187)	-.0099 (.0117)	.0293 (.0169)*	.0243 (.0061)***
Australia		-.1752 (.1151)	.1162 (.0965)	.1405 (.0640)**	-.0860 (.0757)	.3449 (.0356)***
New Zealand			-.2121 (.1007)**	.0153 (.0470)	.0798 (.0702)	.1766 (.0242)***
EU				-.1950 (.0976)**	.0490 (.0830)	.1937 (.0530)***
ROW					-.0722 (.1145)	.2605 (.0414)***
System R <sup>2</sup> = .81						

<sup>a</sup> ROW= rest of the world.

<sup>b</sup> Asymptotic standard errors are in parentheses.

\*\*\* Significant level = .01

\*\* Significant level = .05

\* Significant level = .10

Divisia index and price elasticities evaluated at the mean are presented in Table 3. The Divisia index elasticities for the U.S. Australia, New Zealand, EU, and the ROW are 0.855, 1.224, 0.727, 0.674, and 1.636 respectively. These elasticities indicate that as imports of total cheese into Japan increases, imports from the ROW should increase by the larger percent when compare to the percentage increase in imports from all other sources. Second in terms of percentage increase would be the U.S. Own-price elasticities for the U.S., Australia, New Zealand, EU and the ROW are -0.867, -0.621, -0.873, -0.678, and -0.453 respectively. All own-price elasticities, with the exception of Australia and the ROW are significant. These elasticities indicate inelastic demand for imported cheese in Japan, with the demand for ROW cheese being

Table 3 Japan Divisia and price elasticities of the derived demand for imported cheese

Exporting Country	Divisia Import	Conditional Own-Price	Elasticities				
			Conditional Cross-Price				
			U.S.	Australia	New Zealand	EU	ROW <sup>a</sup>
U.S.	.855 <sup>b</sup> (.213) <sup>c</sup>	-.867 (.239)		.156 (.711)	.024 (.660)	-.347 (.411)	<i>1.034</i> (.594)
Australia	1.224 (.126)	-.621 (.408)	.016 (.071)		.412 (.342)	.498 (.226)	-.305 (.268)
New Zealand	.727 (.099)	-.873 (.414)	.003 (.077)	.478 (.397)		.063 (.193)	.329 (.288)
EU	.674 (.184)	-.678 (.346)	-.034 (.040)	.489 (.223)	.053 (.163)		.170 (.289)
ROW	1.636 (.422)	-.453 (.719)	.184 (.106)	-.540 (.476)	.501 (.440)	.308 (.521)	

<sup>a</sup>ROW = rest of the world.

<sup>b</sup>*Italics* indicates that the elasticity was significant by at least .10.

<sup>c</sup>Asymptotic standard errors are in parentheses.

the most inelastic. The own price elasticities for the U.S. and New Zealand are more elastic than the elasticities for Australia and the EU. This indicates that as prices increase, the percentage decrease in quantities imported from Australia and the EU will be smaller when compared to the U.S. and New Zealand.

Cross-price elasticities indicate a high degree of substitutability between cheese from the U.S. and the ROW (1.034). The U.S. is also a substitute for the ROW but to a lesser extent (.184). Cross-price elasticities also indicate that Australia and EU cheeses are substitutes as well, both elasticities are about .500 (Table 3).

Japan's derived demand for imported cheese was re-estimated using all except the last five observations of the data set (1994-1998). Once new estimates were obtained, the model and

Table 4      Percentage difference in the actual quantities and forecasts for Japan cheese imports: 1994-1998

Model-Based						
Year	U.S.	Australia	New Zealand	EU	ROW <sup>a</sup>	Overall Average
<b>Percent</b>						
1994	16.5	1.3	2.3	2.6	13.6	
1995	34.4	7.5	0.6	11.5	40.9	
1996	56.3	6.6	10.6	4.1	45.0	
1997	61.6	6.5	15.1	13.9	41.8	
1998	66.4	1.8	15.4	8.5	41.6	
Average	47.0	4.7	8.8	8.1	36.6	21.1
Elasticity-Base						
1994	18.8	1.5	2.2	1.9	12.7	
1995	37.5	6.7	1.0	11.8	26.9	
1996	57.8	6.2	11.1	4.3	24.3	
1997	63.3	6.5	15.5	13.6	20.0	
1998	67.9	1.0	16.4	6.8	13.9	
Average	49.1	4.4	9.2	7.7	19.5	18.0

<sup>a</sup> ROW = rest of the world.

elasticity based forecasting equations were used to forecast imported quantities for the remaining years. This was done to determine the precision of each of the forecasting methods. Table 4 displays the results of the forecasting procedure where the absolute percentage differences in the actual and forecasts values is included. The elasticity approach improved forecast by 3 percent on average when compare to model-based forecasts. For the remainder of this section, forecasts for the Japan-cheese system are done using elasticities since this approach is the better of the two approaches.

Out of commitment to the Uruguay Round (UR) General Agreement on Tariffs and Trade (GATT), the EU has agreed to reduce export subsidy expenditures by 36 percent during the

period 1995 to 2000. The question thus arises, how will import quantities change given the continuation of this policy or that new trade policy is more aggressive. Equation (7) was used to assess the percentage change in demand price resulting from a percentage change in a producer subsidy payment. Zhou et al. (1998) indicates that the own-price supply elasticity for the EU is .65 for all milk produced and the own-price demand elasticity for cheese and dry milk is -0.40. Using these elasticities in equation (7), the elasticity of the cheese demand price with respect to a subsidy payment is -0.619. A 36 percent reduction over a six-year period is a 6 percent per year reduction on average. Using -0.619, a 6 percent subsidy reduction results in a 3.7 percent increase in the demand price per year. A 72 percent subsidy reduction over a six-year period results in a 7.43 percent per year increase in the demand price. These percentages are use to simulate the effects of EU subsidy reductions at the current rate and twice the current rate. Since the UR GATT implementation period ends the year 2000, the 72 percent reduction is applied to the period 2001 to 2003.

Table 5 presents the expected quantities of cheese imported into Japan if the upcoming World Trade Organization (WTO) agreement continues subsidy reduction at the current rate or twice the rate of the UR GATT agreement. Although the parameter estimate and cross-price elasticity for the U.S. and EU was insignificant, it was also negative, indicating a complementary relationship between cheese from the EU and the U.S. As a result, EU subsidy reductions resulted in and decrease in the quantity of cheese imported from the U.S. If subsidy reduction were to continue at the same pace in the upcoming WTO agreement, Japan imports of cheese from the U.S. is expected to fall by 211 metric tons to 3,973 metric ton by the year 2003. If reduction were to double beginning the year 2001, imports would decrease even more to 3,819 metric tons. Given that the U.S./EU cross-price elasticity was insignificant, it is also possible that

Table 5 Japan cheese imports given a 36 and 72 percent EU export subsidy reduction: 1999-2003

Year	U.S.	Australia	New Zealand	EU	ROW <sup>a</sup>
36% Subsidy Reduction:1999-03					
<i>Metric tons</i>					
1999	4,184.37	71,963.68	53,634.56	37,795.55	16,456.86
2000	4,130.45	73,295.56	53,760.41	36,843.70	16,644.85
2001	4,077.22	74,652.09	53,886.55	35,915.82	16,834.99
2002	4,024.67	76,033.73	54,013.00	35,011.30	17,027.30
2003	3,972.81	77,440.94	54,139.73	34,129.56	17,221.80
36% Subsidy Reduction:1999-00 72% Subsidy Reduction:2001-03					
1999	4,184.37	71,963.68	53,634.56	37,795.55	16,456.86
2000	4,130.45	73,295.56	53,760.41	36,843.70	16,644.85
2001	4,023.99	76,008.62	54,012.70	34,987.93	17,025.12
2002	3,920.27	78,822.11	54,266.18	33,225.64	17,414.08
2003	3,819.23	81,739.74	54,520.84	31,552.11	17,811.93

<sup>a</sup> ROW = rest of the world.

the subsidy reduction would have no effects on imports from the U.S or lead to an increase in imports. The primary beneficiary to a reduction in export subsidies is Australia. For the period 1999 to 2003, cheese imports from Australia are expected to increase to 77,441 metric tons if subsidy reductions in the future are at the same pace, and increase to 81,740 metric tons if the rate in subsidy reductions doubled beginning 2001. In both scenarios imports from Australia are expected to increase by 5,477 and 9,776 metric tons for the 36 percent and 72 percent reduction scenarios respectively and imports quantities in the year 2003 are expected to be 77,441 and



81,740 metric tons respectively. Import from New Zealand are expected to increase but by a smaller amount. For the period 1999 to 2003, cheese imports from New Zealand are expected to increase by 505 and 886 metric tons for the 36 percent and 72 percent reduction scenarios respectively and ending quantities by the year 2003 for both policies are 54,140 and 54,521 metric tons respectively. The own price demand elasticity for the EU is  $-0.678$ , which indicates inelastic demand. As a result imports from the EU decreased by 3,666 metric tons for the period 1999 to 2003 when reduction were maintained at 36 percent. If reduction were twice the previous rate, imports would have decreased by 6,224 metric tons. Ending quantities for the EU by the year 2003 for both policy scenarios are 34,130 and 31,552 metric tons respectively. Imports from all other sources are expected to increase by 764 metric tons and 1,355 metric tons if reductions were 36 percent and 72 percent respectively.

## **Summary and Conclusion**

This study is an attempt to assess the competitiveness of U.S. cheese imported into Japan when compared to cheese imported from other countries. Overall the own-price elasticities for all the exporting countries consider indicated that Japan's demand for cheese is inelastic. The Divisia Import elasticities indicate that as total cheese imports increase the largest percentage increase in source-specific imports will be from the rest of the world, second Australia, then the U.S.

The Japanese market is one of the world largest markets for imported cheese, however, estimation and simulation results suggest that the U.S. will see little benefit from EU subsidy reductions. Although result indicate a possible reduction in imports of U.S. cheese as a result of EU subsidy reduction, imports from the U.S. may remain steady or even possibly increase.

However, results indicate that the primary beneficiary of subsidy reductions is likely to be Australia. According to results imports of Australia cheese into Japan is projected to increase by as much as 13.5 percent.

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