Factors Affecting Cheese Trade in Asia

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Introduction

The economic determinants of Asian cheese imports of cheese are under-researched. This area is of potential importance to Australia because Asian cheese consumption is growing and Australia has the capability to capture a highly profitable market share. At the same time Australian dairy producers face competition from overseas cheese exports in the domestic market. Two stage demand models with the first stage being total expenditure on cheese and the second stage being expenditure on cheese differentiated by country of origin are estimated over the period from 1965 to 1995. For this study, the determinants and elasticities are estimated for three countries, Australia, Japan, and Singapore. Understanding the price, expenditure and income elasticities of demand by country is useful to aid Australian cheese producers / exporters in providing the right mix of products to maximise their profit in each market.

Background

"Regulation in the Australian dairy industry has the state governments regulating market milk and the Commonwealth government regulating manufacturing milk. The origins of this split of regulations come from the Australian constitution which has the states being responsible for agriculture and the federal government being responsible for international trade" (Lembit et al. 1991). Dairy industry policies can be divided into three periods: Pre Kerin Plan, Kerin Plan and Post Kerin Plan. It is arguable that Australia is still in the Kerin plan period, that the Crean Plan and current policy are just modifications of the Kerin Plan, but that will not be discussed here. For a further discussion see Dwyer (1995).

Pre Kerin Plan:

The Pre Kerin Plan period consists of a number of policies. From 1917/18 to 1920/21 Australian dairy policy was an extension of general wartime legislation. There were three main parts of this policy, and they were as follows: to arrange sales of butter and cheese to Britain; to set domestic prices for butter and cheese; and to maintain domestic prices for butter and cheese. This policy ended when Britain had recovered from the war and the Australian dairy industry was un-regulated until 1926. From 1926-1934, the Patterson plan aimed to stabilize domestic market prices of butter and cheese through the use of voluntary levies on the production, and bonuses paid on exports of these products. After the Patterson plan ended, the Commonwealth Dairy Produce Equalisation Committee Limited was formed. Its function was to pool the returns from all butter and cheese sold in order to equalise payments to farmers. It was in place from 1934/35 to 1976/77. The same type of policy was in place up to 1984/85, but the pools were underwritten by the Commonwealth government.

Kerin Plan:

The Kerin plan was in place from 1986 until 1992. The way it was implemented was that a levy was charged on all whole milk produced in Australia. The revenue from this levy was then used to support returns from exports. This export support scheme was intended to provide support to domestic producer prices by increasing the returns from exports. Higher returns for exports make exporting dairy products more attractive and should thus reduce the quantity supplied to the domestic market and force domestic wholesale prices up, until returns from the two markets are equal. Thus the domestic wholesale prices for dairy products approximate the relevant world prices plus the uniform support percentage (Lembit et al. 1991). As well, the Kerin Plan included a comfort clause which enabled the suspension of export support in the light of interstate fluid milk incursions occurring (Dwyer, 1995) and minimum prices for different commodities.

Post Kerin Plan:

The Kerin plan was followed, in 1992, by the Crean plan. The Crean plan was basically the same as the Kerin plan, except that the minimum pricing arrangements were ended. The main effort of the Crean plan was to reduce market support payments to 10% above export prices by 2000.

The current dairy policy is a modification of the Crean plan. It was modified to be consistent with Australia's signing of the Uruguay Round of General Agreement on Tariffs and Trade (GATT) negotiations. The current policy provides the same benefits as the previous plan, but now they are independent of exports. The reduction of market support payments is still on schedule. Market milk is still

controlled and priced by each state government and manufacturing milk is not subject to production or pricing controls (ADIC 1998).

Australia

Milk produced in Australia is consumed as either fresh (market) milk, or is processed (manufacturing milk) into a range of dairy products such as butter, cheese, milk powders, casein, and ice cream. Historically, around 25% of Australian milk production has been required to satisfy fresh milk demand. The remaining 75% has been used as manufacturing milk (Lembit et al. 1991).

Australia has been producing cheese since the 1870s (ADIC 1998). The industry has grown from a few small cheese factories, to a total cheese production of 272,495 metric tonnes in 1996 (ADC 1997). This corresponds to 2,683 million litres of milk or 30.8% of the year's total production of milk. When this is compared to market milk, at 21.9% of total production, it quickly becomes apparent how important cheese is to the Australian dairy industry. Domestic consumption of cheese in 1996 was 156,343 metric tonnes or 57% of the total cheese production (ADIC 1998). This trend is seen in all dairy products, with production being larger than domestic consumption.

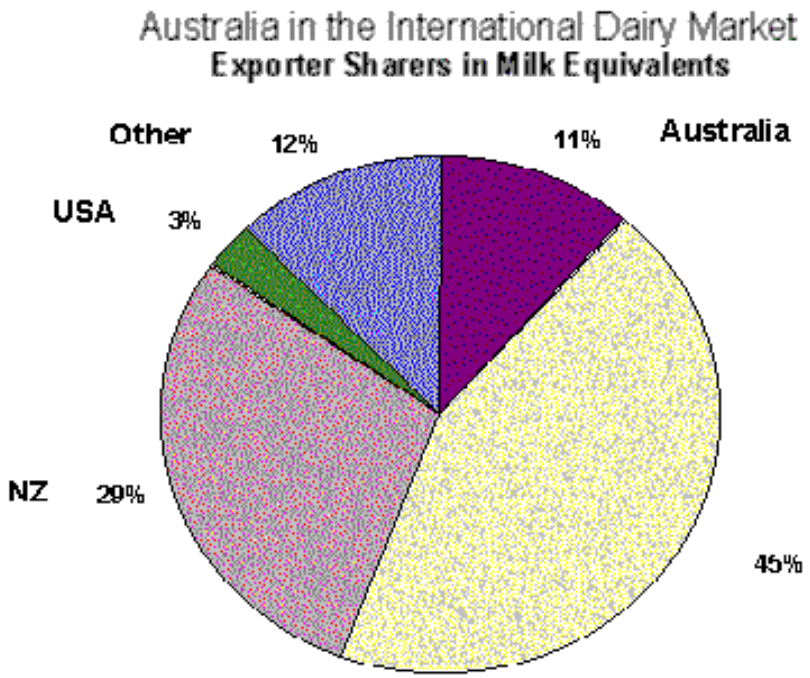
Since Australia produces more milk than is consumed domestically, much dairy produce is exported. In recent years exports have made up more than 40% of the total production. The domestic market growth has been steady, but slow in past years, therefore any increase in production will be for the export market. Australia is looking to export 50% of its total production by the year 2000 (ADC, 1998).

Only a small portion (7%) of world milk production is traded internationally each year. This limited amount traded reflects the policies pursued by many countries. Dairy policy in many countries is geared towards the promotion of domestic self-sufficiency and supporting farm incomes through the maintenance of artificially high domestic prices. As these aims can only be achieved in conjunction with restrictions on imports, international market access has traditionally been heavily restricted (ADC, 1997). As these restrictions on imports are lowered, new and larger export markets will open up for more efficient producers.

Australia exports cheese to a large number of countries. The main export markets are: Japan, Philippines, Hong Kong, Indonesia, Singapore, Malaysia, Thailand, Saudi Arabia and the US. Together, these countries take 76% of Australian cheese exports. The two countries that will be looked at in this paper are Japan and Singapore. They were chosen because one is a relatively closed economy and one is relatively open. Also both have a low per capita consumption of cheese, which is growing and is expected to continue growing.

Trade liberalisation has been very important for Australian dairy exports. Traditionally the farm sector, and dairy in particular, have been highly protected in many countries. The GATT has been reducing the trade barrier of its signatory members for a number of years. This has made it possible for Australia to find markets to sell their cheese. Only in the latest (Uruguay) Round of the GATT was agriculture fully brought under the domain of the World Trade Organization (WTO). As part of the Uruguay Round, all non-tariff barriers were converted to tariffs, and these tariffs are scheduled to be lowered over time. Therefore as the tariffs are reduced, more and/or larger markets will emerge for Australian cheese.

Figure 1



Since 1973, Asia has been of great importance for Australian dairy exports typically accounting for more than 80% of total exports. One of the reasons that Asia accounts for such a large percentage of Australian exports is because Australia has a competitive advantage in Asia due to their proximity (ADIC 1998). This proximity advantage is an important one for short-lived foods, such as dairy products. Another benefit, specifically for dairy products, is that many Asian countries are becoming more westernized in their diets and consuming greater and greater amounts of dairy products. Consumption in many of these countries is reaching, or has passed, the point where it is possible for domestic production to supply the amount demanded, and consequently imports of dairy products are rising.

Australia's main competition for dairy export markets comes from the EU, New Zealand, and the US. Together these countries make up 88% of the world dairy trade (see Figure 1). As can be seen from the chart, the EU has the largest share of the market, followed by NZ, Australia, and the US. Since fluid milk is a perishable commodity and for all practical purposes cannot be shipped very far, almost all of the trade is in manufactured products.

This group of exporters can be split into two classes, the low cost producers, and the subsidisers. Australia and NZ are the low cost producers who actually produce for the export market, while the EU and the US subsidize their exports to dispose of excess domestic production. Although the US is a major exporter of dairy products as a whole, it is a major importer of cheese, taking around 150,000 tonnes annually. A significant portion of this market is restricted to imports from the EU (48,000 tonnes) and other European countries (25,000 tonnes) by bilateral agreements (ADC, 1997). In 1996, the US was Australia's fourth largest market for cheese, taking 5,134 tonnes.

Japan

"Japan is the major export market for Australian cheese. Traditionally this trade is dominated by sales of cheddar cheese for processing, but in recent years there has been strong growth in the sales of natural cheeses for direct consumption such as cream cheese, mozzarella and shredding type cheeses. Japan is also a significant purchaser of skim milk powder and specialty powder formulations for use in industrial food processing" (www.supermarkettoasia.com.au, 1998).

For the last 15 years, Japan has taken more than 40% of Australian cheese exports and is the largest single importer of Australian cheese. However, over the last 30 years Australia's market share of the Japanese market has been falling. Over that time, total Japanese cheese imports have increased more than twelvefold in volume terms and more than 54 times in value. Australian exports to Japan have only increased approximately tenfold over the same period. The reason Australia is losing market share is that, despite a tenfold increase in exports to Japan, the Japanese market is growing too fast for Australian production to keep up. Total Australian exports have only doubled over the same 30 years. This shows that

exports have shifted from other countries to Japan and that Australia does not have the production capacity to maintain its market share in such a rapidly growing market. For these reasons declining market share may not be a major problem.

Australia has been moving from the lower towards the higher price segment of the international cheese market. The average price per tonne of Australia's cheese exports has increased 80% in real terms from 1965 to 1993, but it is still lower than the average price per tonne of Japanese cheese imports from the rest of the world. This suggests that Australia supplies low quality cheese to the Japanese market and that Japanese imports of high quality cheese comes from elsewhere.

Japan's per capita consumption of cheese was 1.6 kg per person in 1996. Consumption levels in Japan have been rising for many years and are expected to continue. Japan is one of the most westernized of the Asian countries, but in terms of cheese consumption, it has a long way to go before it reaches the consumption levels of moderate countries like Canada (9.6 kg per person), let alone the silliness in France (~23 kg per person). Even if Japan only reaches half the consumption levels of Canada, it will still be a threefold increase and will provide plenty of opportunities for increased imports.

The Japanese cheese market is relatively deregulated. Imports of processed cheese were partially liberalized in April, 1989. The import quota was removed and replaced by a nominal tariff of 60%. This tariff is now down to approximately 40%. There is no tariff at all on the imports of natural cheese. Japan chose cheese as one of its 'sacrificial lambs' for the last WTO Round. Japan reduced the tariffs on cheese by a large amount in order to meet the required average reduction, while keeping high tariffs on other products.

Singapore

In terms of cheese consumption, Singapore is very like Japan. Singapore has the same per capita consumption levels (1.6 kg in 1995) and it has also been growing rapidly, with further growth expected. Unlike Japan, Singapore has no domestic cheese production and therefore is totally reliant on imports. There is no specific tariff on any cheese imports, however, since 1 April 1994, a GST at the rate of 3% is imposed on all imports into Singapore.

Problem

The purpose of this paper is to establish the determinants of Australian cheese exports by destination in order to:

a) determine the impacts of foreign export subsidies on Australian cheese exports;

b) determine the influence of real or perceived product heterogeneity by exporter on Australia's export position.

In the process the strengths and weaknesses of the current positioning of Australian cheese and the current export strategies will be identified. As well the market demand characteristics for particular countries in the Asian cheese market will be estimated.

There are two main objectives in this paper. These objectives are:

Objective 1: estimate a model of cheese trade for Australia, Japan, and Singapore allowing for product heterogeneity and distinction by country of origin

Objective 2: simulate the model with reduced EU export subsidies to examine their impact on Australian cheese exports and imports.

Is Australia exporting the optimal product to Japan and Singapore to maximize profits for Australian dairy farmers or are there impediments to Australian exports? One impediment may arise from the real or perceived quality of Australian exports in the minds of Japanese and Singaporean consumers or importers. Another impediment may arise from the reliability of the Australian export process. Yet another obstruction could be the effects of subsidies by the US and the EU, or that importers may not want to rely on a single supplier. Still another explanation could be that there are barriers to trade or bi-lateral trade agreements that shut out certain Australian product. As the world is developing into a collection of major

free-trading blocks, it is of great importance and interest to Australian cheese and dairy producers what effects these impediments may be having on Australian cheese exports.

Cheese exports have a large effect on the profitability of Australian cheese producers, and ultimately on dairy farmers. Producers and exporters need market information to be able to determine the optimal quantity and quality of cheese to sell on the export market, both for the short-term profitability and long-term growth of the industry. The problem facing the Australian cheese industry is what to produce and where to export it so as to maximise profits for the Australian cheese industry.

Model Specification

In order to answer the above questions a two stage demand system of Japanese, Singaporean and Australian cheese imports was estimated using an Armington specification with a translog functional form. The Armington trade model specification was originally presented as a consistent, relatively simple model for trade differentiation by country of origin. "Although the model was not intended for econometric use (Winters, footnote 4, in Davis and Kruse, 1993), its popularity growth came from the perceived simplicity with which it estimates complicated substitutability relationships" (Davis and Kruse, 1993). The Armington model (with a CES functional form) is based on the assumptions of two-stage budgeting and that the products are imperfect substitutes between export sources. The model assumes that import demands are homothetic and separable among import sources. Thus within a market trade patterns change only with relative price changes, and the elasticities of substitution between all pairs of producers are identical and constant. These are strong restrictions on demand. Alston (et al. 1990) rejected the Armington model with a CES functional form because of the severity of the imposed

restrictions on demand, but said nothing about the appropriateness of the Armington specification with other functional forms. A number of studies have been conducted in an attempt to discriminate among some of the available functional forms. In different contexts, on the basis of conformity to standard restrictions and statistical tests, the translog has been found to be the preferred form by Berndt et al. (1977). "In a variety of studies comparing functional forms and in explicit tests of acceptability of certain functional forms (e.g. Wales 1977; Appelbaum 1979; Goddard 1984; Amuah 1985), frequently the translog functional form could not be rejected."(Goddard 1988).

Traditional consumer theory assumes that consumers allocate a fixed income across all commodities that generate utility. The concept of weak separability allows for total consumption to be broken down into components made up of groups of commodities for which the marginal rate of substitution is independent of the other commodities consumed. Consumption of a component section can then be determined using a two stage process. In the first stage the total expenditure on the goods is regressed on the weighted average price of the goods. Then the set of expenditure share equations are estimated as the second stage of the demand system.

In the first stage, the log of total expenditure on cheese was regressed on the log of the weighted average price of cheese and the log of income (see equation 1).

(1)

For the second stage the expenditure share of the countries were jointly estimated using the translog functional form (see equation 4). As well, a time trend

was added in each of the equations. All the estimations were done using TSP version 4.4. The first stage was estimated using ordinary least squares and the second stage was estimated using maximum likelihood methods.

For the translog functional form, utility can either be written as direct or indirect form. However, empirical implementation of Roy's Identity (equation 2) requires that the indirect utility (V) form is used.

(2)

The translog functional form can be written in the following manner:

(3)

Applying Roy's Identity to (3) results in the following expenditure share equation:

(4)

For this study annual data for the period 1965 to 1995 were used. The volume and value of imports was supplied by the UN, and domestic production was supplied by each country.

Results

The results of the first and second stage of the demand system for each country are presented in this section. The following tables present the results for the first stage of the Singaporean, Japanese, and Australian demand systems (estimated over a shorter period to establish correctly signed price response). One asterisk (*) means that the coefficient is significant at the five percent level, and two asterisks (**) mean that it is significant at the one percent level.

Table 1. Results from Singaporean aggregate expenditure model (1980-1997).

Variable	Coefficient	t-statistic	Elasticities
Constant	-6.22	-13.82**	
Log of weighted average price	0.46	2.12*	-0.54
Log of income	0.74	13.90**	0.74
Adjusted R^2	0.94		
DW statistic	1.73		
F statistic	139.41**		

The overall results from the Singaporean aggregate model suggest that the constant and the log of income are significant at the 1% level. The elasticities both have the theoretically correct signs. A one percent increase in Singaporean income should result in a 0.7 percent increase in cheese consumption. As indicated by the R^2, 94 percent of the variation in the data is explained by the equation. The DW statistic lies in the uncertain range.

Table 2. Results from Japanese aggregate expenditure model (1970-1995).

Variable	Coefficient	t-statistic	Elasticities
Constant	-14.84	-38.41**	
Log of weighted average price	0.75	5.05**	-0.25
Log of income	0.78	17.98**	0.78
Adjusted R^2	0.96		
DW statistic	1.05		
F statistic	288.69**		

For Japan, the constant and the log of income and price are significant. The signs on the log of income and price are theoretically correct. The equation explains 96% of the variation in the dependant variables and the DW statistic lies in the indeterminate range.

Table 3. Results of Australian aggregate expenditure model (1975-1995).

Variable	Coefficient	t-statistic	Elasticities
Constant	7.89	2.50*	
Log of weighted average price	0.83	3.45**	-0.17
Log of income	-0.63	-1.68	-0.63
Adjusted R^2	0.56		
Durbin's h statistic	0.87		
F statistic	13.52**		

In the Australian case, price is significant and inelastic. The equation explains 56% of the variability in the data, and there is evidence of autocorrelation.

The following three tables (Tables 4,5 & 6) present the own price, cross price and expenditure elasticities for cheese imports to Singapore, Japan, and Australia. The elasticity results are presented with the t-statistics in brackets underneath. As can be seen from the tables (Tables 4,5 & 6), about half the elasticities are significant at at least the five percent level. Also there may be a problem with positive serial correlation in some of the Japanese and Singaporean equations.

Table 4. Own, Cross and Expenditure Elasticities For Singapore

	NZ	EU	AUS	US	SUI	OTH	EXP
NZ	-0.651 (-4.389)**	-0.143 (-1.384)	-0.094 (-0.599)	0.015 (0.216)	-0.186 (-2.526)*	-0.009 (-3.729)**	1.07 (10.72)**
EU	-0.050 (-1.100)	-0.820 (-11.760)**	-0.117 (-1.967)*	0.007 (0.262)	0.001 (0.018)	0.005 (2.522)*	0.974 (30.65)**
AUS	-0.047 (-0.693)	-0.160 (-2.376)*	-0.825 (-6.655)**	-0.026 (-0.550)	-0.034 (-0.676)	0.001 (0.578)	1.09 (21.12)**
US	0.067 (0.298)	0.052 (0.236)	-0.159 (-0.470)	-1.259 (-5.366)**	0.360 (1.983)*	-0.019 (-3.508)**	0.959 (4.79)**
SUI	-0.376 (-2.123)*	0.188 (1.033)	0.038 (0.146)	0.288 (2.126)*	-0.600 (-3.249)**	-0.0002 (-0.045)	0.463 (3.04)*
OTH	-1.851 (-3.900)**	1.541 (2.155)*	-0.068 (-0.128)	-1.030 (-3.588)*	-0.125 (-0.351)	-0.628 (-8.457)**	2.16 (6.00)**

Table 5. Own, Cross and Expenditure Elasticities For Japan

	AUS	NZ	EU	NOR	US	OTH	EXP
AUS	-2.319 (-5.14)**	0.768 (1.764)	0.490 (2.035)*	-0.644 (-2.943)**	-0.080 (-1.170)	0.168 (3.122)**	1.618 (8.412)**
NZ	1.035 (1.967)*	-2.016 (-3.523)**	-0.877 (-4.056)*	0.660 (2.139)	0.068 (0.790)	0.096 (1.816)	1.035 (5.261)**
EU	0.680 (3.081)**	-0.585 (-3.313)**	-0.493 (-1.947)	-0.135 (-0.910)	-0.024 (-0.654)	-0.145 (-2.555)	0.700 (3.799)**
NOR	-1.248 (-2.093)*	1.868 (2.804)**	-0.148 (-0.359)	-0.077 (-.1298)	-0.111 (-0.908)	-0.133 (-1.131)	-0.151 (-0.365)
US	-0.771 (-1.120)	0.469 (0.658)	-0.544 (-1.464)	-0.582 (-1.254)	-0.223 (-1.110)	0.115 (1.243)	1.536 (4.540)**
OTH	2.729 (2.685)**	1.165 (1.429)	-3.369 (-2.955)**	-1.087 (-1.351)	0.179 (1.106)	-1.811 (-3.829)**	2.193 (1.532)

Table 6. Own, Cross and Expenditure Elasticities For Australia

	AUS	EU	NZ	OTHER	EXP
AUS	-1.099 (-13.276)**	0.098 (2.078)*	0.109 (4.832)**	0.015 (1.684)	0.878 (16.406)**
EU	0.612 (1.065)	-1.129 (-3.006)**	-0.538 (-3.713)**	0.002 (0.039)	1.053 (2.939)**
NZ	0.305 (0.461)	-1.511 (-4.384)**	-1.591 (-4.778)**	-0.193 (-2.610)**	2.991 (6.735)**
OTHER	0.089 (0.116)	-0.010 (-0.054)	-0.166 (-1.549)	-1.118 (-7.383)**	1.214 (1.536)

Simulations

This section presents the results of the simulations. For each country, the import volume is reported at the base level, with a ten percent reduction in EU subsidies and with a thirty percent reduction in EU subsidies (Tables 7,8 & 9). The effect of a reduction in EU subsidies was mimicked by multiplying the EU price of cheese by 1.1 and 1.3 for ten and thirty percent respectively. In Singapore, the reduction in EU subsidy lowers not only the EU volume, but Australia and New

Table 7. Singaporean imports with lowered EU subsidies (tonnes 1985-97).

	Base	EU -10%	EU -30%
NZ	877	876	870
EU	1025	944	814
AUS	1357	1352	1339

US	153	154	155
SUI	137	139	142
OTHER	109	117	131
Total Exp ($ pc)	4.38	4.40	4.42

Zealand's as well. Only the smaller exporters seem to benefit. Overall expenditure on cheese does however increase.

Table 8. Japanese imports with lowered EU subsidies (tonnes 1985-1997).

	Base	**EU -10%**	**EU -30%**
AUS	16513	19183	23550
NZ	50337	47827	43182
EU	19511	16712	12680
NOR	29609	31454	34389
US	170	225	316
OTHER	2137	2302	2557
Total Exp ($ pc)	2.05	2.06	2.07

For Japan, the increase in EU price causes both the EU's and New Zealand's exports to fall and a rise in exports from all other countries. Again, total expenditure increases.

In Australia, the reduction in EU subsidy only decreases the EU export volume. All others increase along with total expenditure (albeit marginally).

Table 9. Australian imports with lowered EU subsidies (tonnes 1985-95).

	Base	**EU -10%**	**EU -30%**
AUS	121985	122182	122351
EU	9123	8322	7075
NZ	3665	3750	3895
OTHER	4523	4532	4542

Total Exp ($ pc)	20.49	20.54	20.59

Conclusions and Comments

There are a number of issues that need to be addressed before this study can reach its potential and be of great use to the Australian dairy industry. There may be a problem with autocorrelation in some of the equations and other functional forms can be tested for robustness.

Cheese is clearly not a homogenous commodity and disaggregation solely by country of origin may be identifying differences in cheese elasticities by type more than by origin. Further analysis should focus on cheese by type and then by region of origin to specifically establish export and domestic potential.

The strong income elasticities (in Japan and Singapore) suggest positive growth with good expenditure elasticities for Australian cheese.

The simulations indicate that reductions in the EU's level of subsidies will have a negative impact on the EU's export volume (as expected) and will increase the exports of at least one other country. As well, lower EU subsidies increase the total expenditure on cheese in all cases. In certain cases, due to the estimated cross price effects, there exists a complementary relationship between the EU and other exporters so a reduction in EU export volume may not increase the demand for cheese from other countries. It actually decreased the demand in some cases.

When completed, this study should help Australian cheese exporters to maximise their profits in each of the markets that was studied by providing them with market determinants. This will have benefits for the entire dairy sector and should

increase returns to milk production. Also this study adds to the body of knowledge as there do not seem to be any published studies about Australian cheese flows.

Not only does this research need to be completed properly, but the market determinants need to be estimated for other countries as well. In my thesis, I am going to look at Australia, EU, US, New Zealand, Japan, Philippines, Hong Kong, Indonesia, Singapore, Malaysia, Thailand, and Saudi Arabia.

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