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The impacts of the Thailand-Australia Free Trade Agreement and Thailand-New Zealand Closer Economic Partnership on Thailand dairy import prices

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The impacts of the Thailand-Australia Free Trade Agreement and Thailand-New Zealand Closer Economic Partnership on Thailand dairy import prices

Abstract

This study investigates the impacts of the Thailand-Australia Free Trade Agreement (TAFTA) and Thailand-New Zealand Closer Economic Partnership (THNZCEP) on Thailand dairy import prices. The study employs an import price model to examine the effects of the Thailand tariff reduction for New Zealand and Australian dairy products on the prices of New Zealand and Australian dairy products.

The results show that the reduction in tariffs for New Zealand and Australian dairy products has small effects on the Thailand import prices of dairy products from both countries while other factors such as exchange rate, competitor price and the dummy variable for drought have significantly larger effects. Surprisingly, the effect of import tariff on Thailand import prices for New Zealand and Australian dairy products are negative. This indicates that the tariff reduction in Thailand increases Australian exporters' mark-ups and Thailand import prices for Australian dairy products. This is because Thailand import demand for dairy products is inelastic. As a result, Australian dairy exporters can take advantage to increase their prices in Thailand dairy market according to the tariff reduction

Keywords: Free trade agreement, exchange rate pass-through, tariff rate pass-through, dairy products.

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1 Introduction

Thailand is a small player in the world dairy market. Most Thai dairy farms are small scale farming operations each farm having around 20 cows on average. Thai dairy farmers have low productivity and efficiency compared to the world leaders in dairy production such as New Zealand and Australia. Thailand domestic raw milk supply is insufficient to serve its domestic demand. Thailand processors need to use both domestic raw milk and imported ingredients to produce a few categories of dairy products such as Pasteurized and UHT milk, condensed milk, evaporated milk, yogurt, butter and cheese (Rabobank, 2004).

Thailand main dairy imports are concentrated milk and cream (skim and whole milk powder) and whey, which are important raw materials in dairy and food processing. Imports of buttermilk and yogurt, butter, cheese and curd, and non-concentrated milk and cream are in low volumes with 20% of total dairy imports. The major sources of Thailand dairy imports are New Zealand, Australia, United States, the Netherlands, France, the Czech Republic and Ireland. Thailand also exports some dairy products to neighbouring countries such as Philippines, Malaysia, Indonesia, Cambodia, Lao PDR, Myanmar, Hong Kong, Singapore and China. The most important Thailand dairy exports are concentrated milk and cream which are in terms of re-exported, followed by non-concentrated milk and cream, buttermilk and yoghurt, and whey. Exports of butter, and cheese and curd are insignificant (Thailand Customs Department, 2010)

Thailand signed the free trade agreement with Australia and New Zealand in 2005, namely Thailand-Australia Free Trade Agreement (TAFTA) and Thailand-New Zealand Closer Economic Partnership (THNZCEP), respectively (Thailand Department of Trade Negotiations, 2005). Under the agreements, Thailand dairy products are put on sensitive product lists therefore tariff elimination for Australian and New Zealand dairy products are to be phased out over a longer period than other products. Tariff rates for dairy products from the two countries will be steadily reduced to 0% within 2025 (Australian Department of Foreign Affairs and Trade, 2004; New Zealand Ministry of Foreign Affairs and Trade, 2005).The free trade agreements with both countries in dairy products directly affect the Thai dairy market. There are both advantages and disadvantages for Thai stakeholders. For example, a joint study investigating the benefits of a Closer Economic Partnership (CEP) agreement between Thailand and New Zealand showed that consumers and processors in Thailand benefit from the CEP agreement in dairy products (Thailand Ministry of Commerce and New Zealand Ministry Foreign Affairs and Trade, 2004). Thai consumers consume higher quality dairy products at lower prices while processors work to reduce their production costs and improve their export competitiveness to Southeast Asian countries in dairy products. This leads to an increase in the demand for imported

dairy ingredients. However, Rabobank (2004) argued that the THNZCEP has a negative effect on the Thai raw milk market. Thai dairy farmers will lose price competitiveness since the pledged price of Thai raw milk is higher than the imported dairy ingredients. Furthermore, processors prefer to use imported dairy ingredients because of their higher quality and lower prices.

The study employs an import price model to examine the effects of the Thailand tariff reduction for New Zealand and Australian dairy products on the prices of New Zealand and Australian dairy products. This study is the first study to evaluate the effects of THNZCEP and TAFTA on Thailand dairy import prices from New Zealand and Australia.

2 An overview of the TAFTA and THNZCEP Agreement

Thailand has eliminated tariffs for 2,724 imported items from Australia, accounting for 49% of all Australian imported products whereas 5,083 products from Thailand to Australia have had tariffs abolished, 83% of Thailand imported products under the TAFTA agreement (Australian Department of Foreign Affairs and Trade, 2004). Similarly under the THNZCEP agreement, Thailand has cut tariffs to zero for 2,978 New Zealand products (54% of New Zealand imported products), whereas New Zealand has removed tariffs from 5,878 of Thailand products (to 79% of the products from Thailand) (New Zealand Ministry of Foreign Affairs and Trade, 2005). The tariffs on the rest of the products will be phased out over a longer period, especially products from sensitive sectors of Thailand such as dairy and beef products. These will be duty- free and non-quota by 2025 whereas Australia and New Zealand will be completely liberalised products from Thailand by 2015. In addition, all products that qualify for tariff reduction must be under Rules of Origin.

Under the TAFTA and THNZCEP agreement, the two parties agree to set up procedures to resolve business obstacles in terms of Rule of Origin, phytosanitary me (SPSs), customs processes, intellectual property, electronic commerce, competition policy and transparency. In addition, both countries agree to share information and cooperate in these areas to develop their business environment (Australian Department of Foreign Affairs and Trade, 2004; New Zealand Ministry of Foreign Affairs and Trade, 2005).

The TAFTA and THNZCEP also established cooperation between both parties in terms of service and investment. For example, Thai chefs and Thai masseurs who have specialist certificates may apply for the Australian and New Zealand work visa without skill testing. Similarly, Australian and New Zealand business people and their spouses can easily enter Thailand.

According to the TAFTA terms, Australia permits 100% Thai ownership of companies that operate any businesses in Australia, excluding the audio-visual, broadcasting or media sectors and Australian

international or domestic airlines, Australian airports or Telstra. Thailand, however, allows up to 50% Australian ownership in any businesses and provides greater market access of up to 60% for Australian companies in mining, distribution, construction, management consulting and hospitality ventures, science and technology institutions and maritime cargo services. Under the THNZCEP agreement, Thailand and New Zealand support access for 100% equity participation from overseas investors. Thailand allows New Zealand entrepreneurs to invest in manufacturing sectors, such as machinery, appliances, software production, food processing, paper products, and furniture whereas Thai entrepreneurs may invest in any business in New Zealand except fisheries (New Zealand Ministry of Foreign Affairs and Trade, 2005).

The content on dairy products of both agreements is very similar. Thailand include their dairy products on sensitive product lists, therefore tariff elimination for Australian and New Zealand dairy products is to be phased out over a longer period than for other products. Tariff rates for dairy products from the two countries will gradually decrease to 0% over different time periods. For instance, tariffs on skim milk powder and liquid milk will be eliminated in 2025 because these products significantly impact Thai dairy farmers. Tariffs on whole milk powder, butter and cheese will be eliminated in 2020. Tariffs for butter milk and evaporated milk will be eliminated in 2015. Tariffs on whey will be eliminated in 2009 and tariffs for butter fat in 2008. However, tariffs on other dairy products such as milk powder and milk food for infant feeding, caseinates and lactose, which Thailand does not produce, will be eliminated once the agreement is implemented (see Table 1).

Some dairy products such as whole milk powder, butter milk, cheese, sweetened whole milk powder, butter and evaporated milk are protected by Special Safeguards (SSGs) and Tariff Rate Quotas (TRQ), which reduce tariff rates step by step and increase the trigger volume by 5% annually. However, if import volumes are larger than the trigger volume, the surplus volume will be taxed at 90% of the Most Favoured Nation (MFN) tariff clause of the WTO agreement (New Zealand Ministry of Foreign Affairs and Trade, 2005). Therefore, domestic producers will have time to adjust their production efficiency and improve their competitive ability before facing duty-free imports milk.

Table 1: Tariff reduction programme for dairy products under the TAFTA and THNZCEP

Dairy products	Previous tariff	Phase-out
Milk powder and milk food for infant feeding	5%	Eliminated 1/7/2005
Skim milk powder	5% (under quota) 216% (over quota)	Tariff and quota removed 1/1/2025
Whole milk powder	18%	Reduced to 15% 1/7/2005 Phased to zero 1/1/2020 (SSG)
Butter fat	5%	Eliminated 1/1/2008
Butter milk	18%	Reduced to 15% 1/7/2005 Phased to zero 1/1/2015 (SSG)
Cheese	30%	Phased to zero 1/1/2020 (SSG)
Sweetened whole milk powder	18%	Reduced to 15% 1/7/2005 Phased to zero 1/1/2020(SSG)
Other dairy preparations	5%	Eliminated 1/7/2005
Caseinates	5%	Eliminated 1/7/2005
Lactose	1% (under quota) 10% (over quota)	Eliminated 1/7/2005
Butter	30%	Phased to zero 1/1/2020 (SSG)
Whey	5%	Reduced to 3% 1/1/2008 Eliminated 1/7/2009 (SSG)
Evaporated milk	30%	Phased to zero 1/1/2015 (SSG)
Liquid milk and cream	20% (under quota) 41% (over quota)	Tariff and quota removed 1/1/2025

Sources: Australian Department of Foreign Affairs and Trade, (2004); New Zealand Ministry of Foreign Affairs and Trade, (2005)

3 Method and data

3.1 Data

The import price models for Thailand dairy imports from New Zealand and Australia are estimated using data from 1991:Q1-2009:Q4 for six dairy product categories following the Harmonized System (HS) 4-digit level: concentrated milk and cream (HS0402), buttermilk and yogurt (HS0403), whey (HS0404), butter (HS0405), cheese and curd (HS0406) and total dairy products. Non-concentrated milk and cream (HS0401) is not included in this analysis due to missing data in the import price during the study period. The data are obtained from the Information and Communication Technology Centre Team, Office of the Permanent Secretary, Ministry of Commerce, Thailand, the Customs Department of Thailand and the Bank of Thailand.

3.2 Import price model

The conceptual framework used in our study is based on the exporter profit maximization under imperfect competition (Tantirigama, 2006; Mallick and Marques, 2008). The import demand is

determined by the import price. The import price is the foreign export price denoted in the importer currency which is expressed by the following equation:

$$p_m = pe(1+t) \quad (1)$$

where p_m is the price in the importer currency, p is the price in the exporter currency, e is the exchange rate in terms of the importer currency per unit of the exporter currency, and t is the import tariff.

The study employs the import price model to investigate the effects of the Thailand tariff reduction for New Zealand and Australian (FTA member countries) dairy products on the prices of New Zealand and Australian dairy products. The prices of Thailand dairy imports from the two countries are determined by exchange rates, import tariff rates, competitor prices, input costs, exporter market shares in Thailand and a dummy variable for drought in exporting countries. This relationship is expressed as a double log-linear form in equation (2) estimated by regressing separately for each exporting country and dairy product.

$$\ln pm_{ikt} = \alpha_{ik} + \beta_{1ik}\ln e_{it} + \beta_{2ik}\ln tar_{ikt} + \beta_{3ik}\ln cp_{ikt} + \beta_{4ik}\ln mc_{it}$$
$$+\beta_{5ik}\ln z_{ikt} + \beta_{6ik}D_{it} + v_{ikt} \quad (2)$$

i = New Zealand or Australia; *k* = 1…*m*; and *t* = 1,…,*T*

where

$\ln pm_{ikt}$ = log import price (unit value) of dairy product *k* from exporter *i* (New Zealand and Australia) denoted in Thai baht;

$\ln e_{it}$ = log exchange rate defined as Thailand currency per exporter *i*'s currency;

$\ln tar_{ikt}$ = log average import tariff rate for Thailand dairy import *k* from exporter *i*;

$\ln cp_{ikt}$ = log competitor price of exporter *i* for dairy product *k* (unit value denoted in Thai baht);

$\ln mc_{it}$ = log input cost for dairy products of exporter *i*;

$\ln z_{ikt}$ = exporter *i*'s market share for dairy product *k* in Thailand;

D_{it} = dummy variable for drought in exporting countries where D_{it} equals 1 if country *i* encounters with drought in year t, and where D_{it} equals 0 otherwise;

α_{ik} = constant terms among source country *i* for dairy import *k*;

$\beta_{1ik}, \beta_{2ik}, \beta_{3ik}, \beta_{4ik}, \beta_{5ik}, \beta_{6ik}$ are elasticities of the import price of dairy product *k* from exporter *i* with respect to exchange rate, tariff rate, competitor price, exporter input cost, exporter market share and the dummy variable for drought in exporting countries, respectively;

V_{ikt} = disturbance term.

β_{1ik} = degree of exchange rate pass-through of dairy products from different source countries which explains how the prices of dairy imports denoted in Thai baht changes with respect to the exchange rate movement.

The degree of exchange rate pass-through can indirectly reflect the degree of pricing-to-market which explains how a dairy exporter adjusts its price in the domestic currency according to exchange rate fluctuations or the degree of pricing-to-market and indicates the market competition status in Thailand dairy import markets (Tantirigama, 2006).

If β_{1ik}=0, there is no exchange rate pass-through. This explains that the import price expressed in Thai baht is unchanged with respect to an increase in the exchange rate (Thailand currency devaluation) because an exporter fully reduces its mark up to stabilise the price in Thailand. If β_{1ik} = 1, there is a complete exchange rate pass-through into the price of Thailand dairy imports. When the Thai baht moves higher against the exporter currency, the exporter does not adjust its domestic currency mark-up or price (non-pricing-to-market). Therefore, the import price expressed in Thai baht increases proportionally with Thailand currency devaluation. This implies that Thailand dairy import market is perfect competition. If β_{1ik} < 1, it implies that there is a less than complete exchange rate pass-through into the import price known as an incomplete exchange rate pass-through. When devaluation in the Thai baht (the exporter currency appreciation) occurs, the exporter reduces the mark-up partially to maintain its market share, hence the import price expressed in Thai baht increases incompletely with Thailand currency devaluation. If β_{1ik} > 1, it implies that there is a more than complete exchange rate pass-through into the import price. The exporter increases the mark-up partially according to devaluation of the Thai baht, then the import price expressed in Thai baht increases more than the exchange rate changes (see Table 2). The last two cases both imply that the Thailand dairy import market is imperfect competition.

There is an inverse relationship between the degree of pricing-to-market and the degree of exchange rate pass-through in which PTM = 1-ERPT. If the degree of exchange rate pass-through is low, the degree of pricing-to-market is high (Pholphirul, 2007). If the coefficient of exchange rate pass-through (β_{1ik}) is known, we can approximately measure the absolute value of the degree of

pricing-to-market by 1-β_{1ik} (Tantirigama, 2006). This study also reveals the pricing behaviour of New Zealand and Australian dairy exporters in the Thailand dairy market.

Table 2: Relationship of theexchange rate pass-through and pricing-to-market

Types of exchange rate pass-through	Exchange rate (THB/NZD)	Export price (NZD)	Import price (THB)	Types of pricing-to-market
No exchange rate pass-through (β_{1ik}=0)	Increased 1% (Depreciation)	Reduced mark up 1%	Unchanged import price	Negative complete pricing-to-market
Complete exchange rate pass-through (β_{1ik}=1)	Increased 1% (Depreciation)	Unchanged mark up	Increased 1%	No pricing-to-market
Less than complete (incomplete) exchange rate pass-through (β_{1ik}<1)	Increased 1% (Depreciation)	Partially reduced mark up	Increased less than 1%	Negative partial pricing-to-market
More than complete exchange rate pass-through (β_{1ik}>1)	Increased 1% (Depreciation)	Partially increased mark up	Increased more than 1%	Positive partial pricing-to-market

Source: Tantirigama (2006)

The elasticity of the import price with respect to the tariff (β_{2ik}) is expected to be positive which indicates tariff rate pass-through into the import price. The interpretation of the tariff rate pass-through is similar to the exchange rate pass-through. If β_{2ik}=0, there is no tariff rate pass-through. When Thailand tariff rate for New Zealand and Australian dairy products reduces, exporters from both countries increase their mark-up or price in proportion to the tariff reduction, hence the import price in Thai baht is constant. If β_{2ik}=1, there is a complete tariff rate pass-through. The import price of dairy products in Thai baht decreases proportionally with the tariff reduction because the exporters keep their mark-ups stable. If β_{2ik}<1, there is an incomplete tariff rate pass-through. The import price of dairy products in Thai baht decreases partially with the tariff reduction because the exporter partially increases its mark-up or price in the local currency. If β_{2ik}>1, there is a more than complete tariff rate pass-through. The exporter partially decreases its mark-up or price of dairy products in the local currency with respect to the tariff reduction, and then the import price in Thai baht decreases more than the tariff reduction (Tantirigama, 2006; Nicita, 2009).

β_{3ik} is the elasticity of import price with respect to the competitor price. A positive effect of the competitor price on the import price indicates the co-movement in the pricing strategy between the

exporter and its competitor (Lee and Tcha, 2005; Tantirigama, 2006). β_{4ik} is the elasticity of import price with respect to the marginal input cost which is expected to be positive. β_{5ik} is the elasticity of import price with respect to the exporter market share which would be negative or positive. β_{6ik} is the coefficient of the drought dummy variable in the exporting countries and is hypothesized to be positive.

The tests for the import price equation in this study include three hypotheses:

1. The hypothesis of complete exchange rate pass-through ($H_0 : \beta_{1ik} = 1$, all *i* and *k*).
2. The hypothesis of complete tariff rate pass-through ($H_0 : \beta_{2ik} = 1$, all *i* and *k*).
3. The hypothesis of symmetric pass-through of exchange rate and tariff ($H_0 : \beta_{1ik} = \beta_{2ik}$, all *i* and *k*).

The three hypotheses imposed the restrictions in the regression analysis and are tested with Wald statistics.

3.3 Estimation of the import price equation

New Zealand and Australian price models are analysed separately. In each country model, six price equations for six Thailand dairy import categories are estimated simultaneously using by the seemingly unrelated regression estimation (SURE). According to Zellner (1962), the SURE model is an efficient technique to analyse a system of multiple equations with cross-equation parameter restrictions and correlated error terms (Greene, 2002). The SURE based on Generalized Least Squares method uses the correlations of the errors among different equations to improve the efficiency of parameter estimates which are better than running equations separately by the OLS method (Alaba, Olubusoye and Ojo, 2010). There are two methods for the SURE estimation: Generalized Least Squares (GLS) and GLS with a first-order autoregressive AR (1). If serial correlation is presence in the model, the GLS AR (1) method can address the serial correlation which provides more efficient estimates than the GLS method (Greene, 2002; Tantirigama, 2006).

The estimated results by the GLS method in all regressions show that the presence of the positive serial correlation among cross-section regressions. The Durbin-Watson statistics in New Zealand and Australian regression models are below 2. To correct for the positive serial correlation, the GLS AR (1) method is employed to re-estimate all regressions. It can be clearly seen that all estimated

results by the GLS AR (1) method show higher adjusted R2 and lower residuals sum of squares than the GLS method. In addition, the Durbin-Watson statistics from the GLS AR (1) method in all regressions increase and are closer to 2 which indicate no serial correlation. These evidences suggest that the GLS AR (1) method provides more efficient and reliable results than the GLS method. Therefore, the estimated results from the GLS AR (1) method are used to identify the determinants of the import price models for Thailand dairy imports from New Zealand and Australia. The correlation coefficients show that dairy production costs, consumer income and industrial productivity index are highly correlated to other independent variables in each dairy product categories. To avoid the multicollinearity problem, these three variables are excluded from Thailand import price model for dairy products.

4 Results and findings

The import price models for six Thailand dairy imports from New Zealand are shown in Table 3 and from Australia in Table 4. The models includes exchange rate (LE), import tariff (LTAR), competitor price (LCP) and exporter market share (LZ) and a dummy variable for drought (DDROU). Overall, the explanatory powers (adjusted R^2) and F-statistics suggest that the regression results in the model are more efficient and reliable.

4.1 Import price models for Thailand dairy imports from New Zealand

Exchange rate

The estimated coefficients of Thailand import prices for dairy products from New Zealand with respect to exchange rate movement are positive and statistically significant in three dairy product categories: concentrated milk and cream, buttermilk and yogurt and total dairy products (see Table 3). These results show that when the Thai baht depreciates against the New Zealand dollar by one percent, import prices for New Zealand concentrated milk and cream, buttermilk and yogurt and total dairy products (denoted in Thai Baht) increase by 0.52, 0.32 and 0.54 percent, respectively.

The null hypothesis of complete exchange rate pass-through to dairy import prices from New Zealand is rejected at the 1% level of significance. This implies incomplete exchange rate pass-through in Thailand import prices for New Zealand concentrated milk and cream, buttermilk and yogurt and total dairy products. When Thai baht depreciates (New Zealand dollar appreciation), New Zealand dairy exporters reduce their mark-up partially to maintain their market shares in Thailand, hence the import price expressed in Thai Baht increase partially. These results are consistent with the exchange rate pass-through theory and previous literatures. For example, Pholphirul (2003)

found that incomplete exchange rate pass-through in the prices of Thailand import in nine industries ranging between -0.08 and 0.53. The degree of exchange rate pass-through in buttermilk and yogurt from New Zealand is 0.32 which is close to the exchange rate pass-through coefficients in the food industry from Pholphirul (2003)'s study which is 0.40.

Import tariff rate

Thailand import tariffs are included in the import price models to measure the effects of import tariff changes on Thailand import prices of dairy products from New Zealand. The effects of tariff changes on import prices are known as the degree of the tariff rate pass-through into import prices. The estimated elasticities of Thailand import prices for dairy products from New Zealand with respect to the import tariff are negative and significance in only three dairy product categories: buttermilk and yogurt, butter and cheese and curd. The results show that when Thailand import tariffs for these three dairy products decrease by one percent, Thailand import prices of these three dairy products from New Zealand increase by 0.20, 0.09 and 0.23 percent for buttermilk and yogurt, butter and cheese and curd, respectively (see Table 3). The null hypothesis of complete tariff rate pass-through to dairy import prices from New Zealand are rejected at the 1% level of significance in these three dairy product categories. This implies that New Zealand dairy exporters increase their domestic currency price more than proportionately to a decrease in Thailand import tariff. As a result, Thailand import prices for New Zealand buttermilk and yogurt, butter and cheese and curd increase.

Previous literature documented positive effects of tariffs on import prices (see Feenstra, 1989; Mallick and Marques, 2008; Nicita, 2009). The signs of the estimated coefficients of import tariffs in this study are not similar to the hypothesized sign but the findings are similar to Tantirigama (2006)'s study which showed that import tariffs has a small negative impact on New Zealand import prices of motorcars from Australia, France, Italy and the US. The negative sign indicates that car exporters practise a more than proportionate decrease (increase) in their domestic currency prices with respect to an increase (decrease) in tariffs. Mallick and Marques (2008) described the negative tariff rate pass-through in Indian import prices of beverages and fibres are caused by an inelastic demand in these two sectors. Although, the tariffs for beverages and fibres have reduced but foreign exporters in these two sectors can take advantage to increase their foreign currency prices more than proportionately to the tariff reduction.

Table 3: Import price models for Thailand Dairy imports from New Zealand (using GLS AR (1) method)

Dairy product	Concentrated milk and cream (HS0402)	Buttermilk and yogurt (HS0403)	Whey (HS0404)	Butter (HS0405)	Cheese and curd (HS0406)	Total dairy products
Explanatory variable	**Estimated coefficients**					
Constant	2.24***	2.25***	3.51**	1.16***	3.34***	2.18***
	(4.33)	(4.04)	(1.98)	(3.76)	(3.08)	(4.13)
Log of exchange rate	0.52***	0.32**	-0.23	0.01	0.25	0.54***
(LE)	(3.80)	(2.18)	(-0.51)	(0.07)	(1.54)	(3.99)
Log of import tariff	-0.03	-0.20***	-0.16	-0.09**	-0.23**	-0.04
(LTAR)	(-0.37)	(-3.40)	(-0.60)	(-2.52)	(-2.03)	(-0.63)
Log of competitor price	0.12***	0.38***	0.43*	0.81***	0.29**	0.14***
(LCP)	(3.15)	(5.95)	(1.93)	(18.03)	(2.02)	(3.79)
Log of market share	-0.07**	0.05**	-0.03	0.03**	0.01	-0.05*
(LZ)	(-2.42)	(2.25)	(-1.15)	(2.10)	(0.35)	(-1.66)
Dummy variable for drought	0.19***	0.15***	0.19	0.04	0.12***	0.18***
(DDROU)	(4.34)	(2.94)	(1.52)	(1.63)	(2.84)	(4.38)
No. Of observations	60	60	60	60	60	60
Degrees of freedom	54	54	54	54	54	54
Mean	4.38	4.17	3.84	4.25	4.63	4.36
Standard deviation	0.26	0.38	0.43	0.33	0.27	0.27
Residuals sum of squares	0.94	1.09	4.37	0.36	0.89	0.82
R^2	0.7290	0.8545	0.5507	0.9391	0.7684	0.7800
Adjusted R^2	0.7039	0.8411	0.5090	0.9335	0.7470	0.7597
F-Statistics	29.10***	63.40***	13.20***	166.60***	35.80***	38.30***
Durbin-Watson	1.71	1.00	1.77	1.39	1.77	1.52
Autocorrelation coefficient	0.15	0.50	0.11	0.31	0.12	0.24
RHO used for AR(1)	0.39	0.31	0.61	0.07	0.26	0.42
Hypothesis testing	**Wald Statistics**					
1) H_0: $b_{1i} = 1$, all i	11.83***	21.79***	7.43***	156.50***	22.48***	11.39***
2) H_0: $b_{2i} = 1$, all i	200.24***	430.33***	18.80***	861.51***	120.24***	248.28***
3) H_0: $b_{1i} = b_{2i}$, all i	18.15***	14.91***	0.02	1.54	8.65***	22.35***

Note: 1. t statistics are in parentheses
2. ***, ** and * are significance at 1%, 5%, 10% level respectively.

Similarly, the null hypothesis of the symmetry of the exchange rate and tariff rate pass-through is rejected in all dairy product categories at the 1% level of significance. This implies there is a

difference between exchange rate pass-through and tariff rate pass-through in all dairy product categories. Therefore, the response of import prices to exchange rate movements cannot be used to predict the effect of change in tariffs in all cases.

Competitor price

Australian dairy product prices are used as competitor prices of New Zealand dairy products. The estimated coefficients of Australian prices are positive and statistically significant in all dairy product categories. These results mean that the prices of Thailand dairy imports from New Zealand increase when the prices of Australian dairy products increase. This indicates that there is a positive co-movement of New Zealand pricing strategy with its competitor (Australia) in Thailand dairy import market.

The finding is consistent with previous studies. For example, Tantirigama (2006) found positive responses of New Zealand exporters to their competitor (Australia) prices on milk and cream in Thailand with an elasticity of 0.04 while the elasticities in other Asian countries are between 0.01 and 0.31. The elasticity of New Zealand export price of butter with respect to Australian price in the main export destinations is between 0.05 and 0.39 while the elasticity of New Zealand export price of cheese and curd with respect to Australian price varies from -0.07 to 0.85 across its export destinations. In addition, the positive co-movement in the pricing strategy on the export price between New Zealand and Australia was found in other products as well such as sheep meat (see Lee and Tcha, 2005) and wool products (see Tantirigama, 2006).

Market share

The estimated coefficients for New Zealand market share are negative and significant in concentrated milk and cream and total dairy products. These results show that New Zealand exporters reduce their export price (mark-up) for concentrated milk and cream and total dairy products when New Zealand market shares for these two product categories in Thailand increase. This indicates that New Zealand pricing strategy for concentrated milk and cream and total dairy products in Thailand are based on perfect competition.

The estimated coefficients for New Zealand market share in buttermilk and yogurt and butter are positive and statistically significance. These results show that a larger market share of New Zealand buttermilk and yogurt and butter in Thailand results in an increase in the mark-ups and prices in Thailand. This reflects the monopolistic status of New Zealand for these two dairy products in Thailand. The market shares of New Zealand in the buttermilk and yogurt and butter are significantly high with 53 and 30 percent of total import market shares in Thailand, respectively. The estimated coefficient for New Zealand market share in butter is consistent with Tantirigama (2006)'s study

which showed positive effect in New Zealand market share on its export price for butter in Asian countries.

Drought

According to New Zealand Treasury (2008), severe drought resulted in a decrease in fresh milk production in 1998, 1999, 2001, 2003, 2007 and 2008. As a result, New Zealand dairy products prices increased significantly in those years. The estimated coefficients for the dummy variable for New Zealand drought are positive and statistically significant in most dairy product categories (concentrated milk and cream, buttermilk and yogurt, cheese and curd and total dairy products). These findings indicate that a drought in New Zealand leads to an increase in Thailand import price of dairy products from New Zealand.

4.2 Import price models for Thailand dairy imports from Australia

Exchange rate

The estimated coefficients of the Thailand import prices for dairy products from Australia with respect to the exchange rate movement are positive and statistically significance in four dairy product categories: concentrated milk and cream, buttermilk and yogurt, butter and total dairy products (see Table 4). Table 4 show that when Thai baht depreciates against the Australian dollar by one percent, import prices for Australian concentrated milk and cream, buttermilk and yogurt, butter and total dairy products denoted in Thailand currency increase by 0.53, 0.43, 0.30 and 0.33 percent, respectively. The null hypothesis of complete exchange rate pass-through to dairy import prices from Australia is rejected at the 1% level of significance. The result shows incomplete exchange rate pass-through into Thailand import prices for Australian concentrated milk and cream, buttermilk and yogurt, butter and total dairy products. When Thai baht depreciates, Australian dairy exporters reduce their mark-up partially to maintain their market shares in Thailand. As a result, the import prices of Australian dairy products expressed in Thai baht increase less than proportionately to Thailand currency depreciation. These results are consistent with Pholphirul (2003) who found that incomplete exchange rate pass-through to the Thailand import prices in nine industries.

Import tariff rate

The estimated tariff rate coefficients for Australian dairy products are negative and statistically significance in three dairy product categories (whey, cheese and curd and total dairy products). The results imply that when Thailand import tariffs for the three Australian dairy products decrease by one percent, Thailand import prices increase by 0.19, 0.43 and 0.11 percent for whey, cheese and curd and total dairy products, respectively (see Table 4). The null hypothesis of complete tariff rate pass-through to dairy import prices from Australia are rejected at the 1% level of significance. This

implies the presence of incomplete exchange rate pass-through in Thailand import prices for Australian whey, cheese and curd and total dairy products. When Thailand import tariff for an Australian dairy product decreases by one percent, Australian dairy exporters increase their domestic currency price more than proportionately to the tariff reduction. As a result, the prices of Australian dairy product in Thailand currency increase.

Table 4: Import price models for Thailand selected dairy imports from Australia (using GLS AR(1) method)

Dairy product	Concentrated milk and cream (HS0402)	Buttermilk and yogurt (HS0403)	Whey (HS0404)	Butter (HS0405)	Cheese and curd (HS0406)	Total dairy products
Explanatory variable	**Estimated coefficients**					
Constant	0.51	-0.43	1.52	0.11	4.46***	1.21**
	(0.87)	(-0.79)	(1.63)	(0.40)	(6.48)	(2.05)
Log of exchange rate	0.53***	0.43***	0.36	0.30***	0.20	0.33**
(LE)	(3.70)	(3.23)	(1.54)	(4.83)	(1.42)	(2.47)
Log of import tariff	-0.10	0.05	-0.19*	-0.03	-0.43***	-0.11*
(LTAR)	(-1.47)	(0.93)	(-1.71)	(-0.96)	(-6.02)	(-1.68)
Log of competitor price	0.53***	0.72***	0.40***	0.78***	0.25***	0.52***
(LCP)	(7.20)	(9.93)	(4.21)	(28.47)	(3.63)	(8.20)
Log of market share	-0.01	-0.02	0.03	0.07***	-0.01	0.02
(LZ)	(-0.35)	(-1.31)	(0.98)	(4.46)	(-0.18)	(0.59)
Dummy variable for drought	0.17***	-0.03	0.27***	0.003	0.003	0.15***
(DDROU)	(4.29)	(-0.63)	(3.89)	(0.18)	(0.09)	(4.22)
No. Of observations	65	65	65	65	65	65
Degrees of freedom	59	59	59	59	59	59
Mean	4.31	4.13	3.33	4.25	4.70	4.23
Standard deviation	0.31	0.33	0.39	0.31	0.27	0.28
Residuals sum of squares	0.53	0.82	1.65	0.19	0.53	0.53
R^2	0.9063	0.8701	0.8114	0.9658	0.8709	0.8853
Adjusted R^2	0.8983	0.8591	0.7954	0.9629	0.8600	0.8755
F-Statistics	114.10***	79.10***	50.70***	332.90***	79.60***	91.00***
Durbin-Watson	1.81	1.93	1.21	1.88	1.92	1.69
Autocorrelation coefficient	0.09	0.03	0.40	0.06	0.04	0.16
RHO used for AR(1)	0.46	0.12	0.36	-0.02	0.17	0.33
Hypothesis testing	**Wald Statistics**					
1) H_0: $b_{1i} = 1$, all i	10.60***	17.90***	7.57***	123.61***	33.68***	24.23***
2) H_0: $b_{2i} = 1$, all i	247.65***	367.43***	112.96***	1,258.46***	394.88***	293.20***
3) H_0: $b_{1i} = b_{2i}$, all i	26.40***	9.68***	7.17***	36.45***	34.18***	15.87***

Note: 1. t statistics are in parentheses
2. ***, ** and * are significance at 1%, 5%, 10% level, respectively.

Similarly, the null hypothesis of the symmetry of the exchange rate and tariff rate pass-through is rejected in all Australian dairy product categories at the 1% level of significance. This implies that there is a difference between the exchange rate pass-through and tariff rate pass-through in all Australian dairy product categories. We conclude that the response of the import prices to exchange rate movements cannot be used to predict the effect of tariff changes in all Australian dairy product categories.

Competitor price

New Zealand dairy product prices are used as competitor prices of Australia in Thailand market. The estimated coefficients of New Zealand prices are positive and statistically significant in all dairy product categories (see Table 4). These finding shows that the significant positive co-movement of pricing strategy between Australia and New Zealand. An increase in the prices of New Zealand dairy products results an increase in the prices of Australian dairy products. The finding is consistent with Tantirigama's study (2006) which reported positive co-movement in the pricing strategy on the export price between New Zealand and Australia milk and cream, butter, and cheese and curd. Similarly, Lee and Tcha (2005) found a positive response of Australian export price to New Zealand export price in sheep meat.

Market share

The estimated coefficients for Australian market share vary across dairy product categories but the magnitudes of the estimated coefficients are small. Only the butter coefficient is positive and statistically significance (see Table 4). This result implies that a larger market share of Australian butter in Thailand results in an increase in its mark-ups and prices in Thailand. This reflects the monopolistic status of Australia in Thailand butter market.

Drought

The estimated coefficients for the dummy variable for Australian drought are positive and statistically significant in concentrated milk and cream, whey and total dairy products (see Table 4). These findings indicate that drought in Australia results in an increase in the prices of the three Australian dairy products.

5 Conclusion and implications

The results of this study show that the pattern of pricing behaviour of New Zealand and Australian dairy products in the Thailand market is similar. Competitor price, drought and exchange rate showed significant positive impacts on Thailand import prices for New Zealand and Australian dairy

products. New Zealand and Australian dairy exporters compete with each other in Thailand dairy import market and there is a significant positive co-movement in dairy product prices between New Zealand and Australian dairy products. Drought positively influences New Zealand and Australian dairy products prices. Severe droughts in New Zealand in 1998, 1999, 2001, 2003, 2007 and 2008 (New Zealand Treasury, 2008) and in Australia in 2001, 2002, 2003, 2007 and 2008 (Dairy Australia, 2003; Armstrong et al., 2005; Jesse, 2005; Griffith, 2010) affected a shortage of milk supply and an increase in prices of New Zealand and Australian dairy products significantly as a result of reduced export volumes. Incomplete exchange rate pass-through into Thailand import prices is found in most dairy products from New Zealand and Australia. When Thai baht depreciates against the New Zealand and Australian dollars by one percent, New Zealand and Australian dairy exporters reduce their mark-up partially to maintain their market shares in Thailand, hence the import price expressed in Thai baht increases less than one percent. This implies the presence of monopolistic behaviour of New Zealand and Australia in the Thailand dairy import market.

The study shows that the effect of import tariff on Thailand import prices for New Zealand and Australian dairy products is negative. When Thailand reduced import tariffs for New Zealand and Australian dairy products, New Zealand and Australian dairy exporters reacted to the tariff reduction by increasing their mark-ups, thus partially (or totally) offsetting the tariff reduction. As a result, the prices of New Zealand and Australian dairy products in Thai baht increased. This indicates that the implementation of THNZCEP and TAFTA leads to an increase in Thailand import prices for New Zealand and Australian dairy products. However, an increase in dairy product prices would be partially caused by Thai baht depreciation and the presence of monopolistic behaviour of New Zealand in the Thailand dairy import market. In addition, Thai consumers do not mind paying extra because New Zealand and Australian milk products are regarded as higher quality products with more varieties than Thailand milk products.

The effect of exporter market share on Thailand import prices for New Zealand and Australian dairy products is minimal. The estimated coefficient of exporter market share shows mixed results across dairy products in New Zealand and Australian models. A significant positive relationship between exporter market share and price is found in buttermilk and yogurt and butter for New Zealand and in butter for Australia. This indicates that New Zealand and Australian pricing strategies for these dairy products are based on monopolistic. A significant negative relationship between exporter market share and price is exhibited in New Zealand's concentrated milk and cream and total dairy products. This reflects the perfect competition of New Zealand concentrated milk and cream and total dairy products in Thailand. However, exchange rate, competitor price, and drought play a larger role than

tariff rate and market share in New Zealand and Australian pricing for dairy products in Thailand market.

The results from the import price models for New Zealand and Australian dairy products provide some information for Thai dairy processors and traders to predict the cost of dairy imports and to set their dairy product prices in Thailand. For example, Thailand import prices for New Zealand and Australian dairy products increase significantly when competitor price, drought and exchange rate increase. A reduction in Thailand tariffs for dairy imports from New Zealand and Australia leads to an increase in Thailand import prices for New Zealand and Australian dairy products. Thai policy makers can also apply the findings from the prediction of dairy import price to set the price guarantee for raw milk and the ceiling price for ready-to-drink milk (Pasteurized and UHT milk) in Thailand. Most of ready to drink milk depends on imported milk ingredients such milk powder and whey. If the import price of skim milk powder, whole milk powder and whey increase, the price guarantee for raw milk and the ceiling price for ready-to-drink milk should increase.

The implementation of THNZCEP and TAFTA helps trade liberalization in dairy products. But due to the monopoly power of New Zealand and Australia in Thailand dairy market, Thai policy makers should be concerned with improving market competition between imported dairy products and domestic dairy products. The government policies toward market competition for Thai dairy farmers and processors are dairy production assistance programs such as technical support and training and low interest loan supports. Thai policy makers should also consider liberalizing the dairy market with other dairy exporting countries such as the US and European countries. This will enhance global dairy trade liberalization and improve perfect competition in the global dairy market.

The Thai government should cooperate with FTA member countries in dairy industry development joint projects. For example, Fonterra is collaborating on a joint project of milk quality improvement with Thailand government. This project aims to develop milk quality management systems and processes on farm and at milk chilling centre for enhancing the quality and food safety of raw milk from farm to factory in Thailand. The transfer of technology or know-how between Thailand and FTA-member countries is an essential and suitable way to improve long-term dairy industry productivity and development in Thailand. This can also increase export potential for local high quality milk.

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