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University of Wisconsin-Madison
Department of Agricultural & Applied Economics

Staff Paper No. 490

August 2005

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Liberalization on Asian Dairy Market**

By

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**AGRICULTURAL &
APPLIED ECONOMICS**

STAFF PAPER SERIES

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An Economic Analysis of the Impacts of Trade Liberalization on Asian Dairy Market

Tingjun Peng

And

Thomas L. Cox^{*}

Abstract

The objective of this paper is to develop an economic analysis of the impacts of further trade liberalization on Asian dairy markets. In order to achieve this, we first make a review of Asian dairy policies from the perspective of domestic support, market access and export subsidy. Then a world dairy model is employed, which reflects both vertical and spatial characteristics of the world dairy sector. We analyze the separate and combined impacts of eliminating Japan's domestic dairy subsidy, removing other Asian countries dairy trade policies excluding Japan, eliminating all Asian countries domestic dairy and trade policies, and multilateral dairy trade liberalization around the world. We find that Japan and Korea's producers will suffer much bigger losses from trade liberalization than other countries in the region; Japan and Korea's producers get much more protection from trade distortions than from domestic subsidy; India is a potential competitive exporter in Asia and the world; China is a potential importer in Asia but a potential competitive exporter in the world; South East Asia and other South Asian countries are potential importers in Asia and the world; greater trade liberalization around the world will help to increase exports for potential exporters and/or ease importing pressure for potential importers; the order of competitiveness of Asian economies from least competitive to most competitive is Japan, Korea, South East Asia, other South Asia, China and India; China and India consumers will lose from world trade liberalization, but the other countries consumer surplus will increase.

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An Economic Analysis of the Impacts of Trade Liberalization on Asian Dairy Market

Introduction

With over 60% of world population, Asia's dairy products consumption increased rapidly in recent years. Asia also produces large amounts of milk reaching 91 million MT in 2002. From 1989 to 2002 its consumption of dairy products (simple summation) increased from 90.8 million MT to 170 million MT, with an annual average growth rate of 5%. Butter is the largest product category consumed with consumption exceeding 3.2 million MT in 2002. The consumption of whole milk powder (WMP), skimmed milk powder (SMP), condensed evaporated milk (CEM) and cheese all exceeded 600 thousand MT. Except casein, all other products consumption exceeds 170 thousand MT. The annual average growth rate of butter, cheese and dry whey exceeds 5% during this period. However, Asia's per capita dairy consumption is still low compared with Western developed countries. The per capita dairy consumption in China, India, Indonesia, Japan, Malaysia, Philippines, South Korea, Thailand, and Vietnam average 4.5kg, 35.7kg, 2.1kg, 44.2kg, 7.7kg, 2.4kg, 35.2kg, 9.8kg, and 1.8kg per capita, respectively, in the last decade, in contrast with 105 kg per capita in the EU-15, 120 kg per capita in Australia, and 113 kg per capita in the U.S (Fengxia Dong, 2005). This also means that there is huge potential for further development of the Asian dairy market.

With the world's largest population and area, Asia is a highly unevenly developed region. There are developed countries and regions such as Japan, Singapore, South Korea, Hong Kong and Taiwan. There are developing countries with fast economic growth rates such as China, India, Thailand, Malaysia and Indonesia. There are also least developed countries such as Nepal. Due

to different stages of economic development, consumer's taste and farming styles, different countries play quite a different role in this region's dairy consumption. More than 90% of Asian regional casein, dry whey, lactose and residual are consumed by China, Japan, Thailand, South Korea, Singapore, Philippines, Malaysia, Indonesia and India. At least 80% of other dairy products are consumed by the above 9 countries. There is inequality in the consumption share among these countries. Japan consumes about 70% of regional casein and lactose, 50% of cheese and 30% of skimmed milk power in Asia. China consumes more than 30% of regional cheese, dry whey and residual products. India consumes about 60% of regional butter. Malaysia consumes about 20% of regional condensed evaporated milk.

Dairy industries around the world are one of the most distorted agricultural sectors. In order to resolve the issue of trade distortion and promote trade liberalization of dairy products, GATT concluded the Uruguay Round Agreements in late 1993 after eight years of painstaking negotiations. As a component of the agreement, GATT/WTO Agreement on Agriculture (AoA) requires all GATT members to make reduction commitments on domestic support, market access, and export subsidy. The commitment would be fulfilled by developed countries at the end of 2000 and by developing countries at the end of 2004, with 1986-1988 as the base period for reduction. The least developed countries are not required of any reduction commitment. Now after the implementation periods has passed for both developed and developing countries, a new round of trade liberalization in dairy sector will be initiated. How will it impact Asian dairy markets?

Hyunok Lee, *et al* (2005) examined the effects of: (1) decreasing Korea's high over-quota dairy product tariffs by 50 percent by 2015 and the much lower within quota tariffs and single tariffs decline by 25 percent by 2015 (Doha scenario); and (2) Korea completely opening its

border for dairy product imports with zero tariffs. They conclude that dairy trade liberalization would cause significant increases in imports, lower prices of processed dairy products for Korean consumers, but quite small reductions in returns to resources owned by Korean dairy farmers.

Fengxia Dong (2005) pointed out that both Asian dairy consumption and supply show upward trends over the next decade. Asian dairy demand growth in next decade is mostly driven by its income and population growth. Given a 1% additional growth in income, cheese consumption will increase 0.45% and WMP consumption will increase 0.39%. With a technology change which increases the yield per cow, Asian domestic milk output increases and consequently decreases its dependence on imports.

Other authors have studied other issues associated with Asian dairy markets, like efficiency, competitiveness and trade potential. One limitation of current studies is that the classification of dairy products is very crude. Generally dairy products are limited to less than five products while not considering their component differences. As dairy products are much different from each other even for the same product, this will lead to some misunderstanding.

The objective of this paper is to develop an economic analysis of the impacts of further trade liberalization on Asian dairy markets. A world dairy model is employed, which reflects both vertical and spatial characteristics of dairy sector. The vertical characteristics include the processing of farm milk components into many different dairy products. The spatial characteristics include the distribution of milk production, demand, and trade for dairy products in different regions of the world. Both domestic and trade policies changes in Asia are examined by the model. The analysis indicates how trade liberalization is likely to affect farm milk price, dairy production, consumption and trade, and consumer and producer surplus in Asian countries.

Policies

China, Japan, Thailand, South Korea, Singapore, Philippines, Malaysia, Indonesia and India are the main dairy products producers and consumers in Asia. For policy analysis, we will focus our analysis on these countries. As all of the nine countries are now WTO members, we analyze dairy policies in this region according to WTO Agreement on Agriculture of the Uruguay Round, i.e. from the aspects of domestic support, market access and export subsidy.

1. Domestic support: According to their different impacts on trade, domestic support policies are classified as “Green Box” policies, “Amber Box” policies, and “Blue Box” policies. “Amber Box” policies are those policies that distort international trade and have a direct effect on production. They should be cut back. WTO members have calculated how much support of this kind they were providing (using calculations known as “total aggregate measurement of support” or “Total AMS”) for the agricultural sector per year in the base years of 1986-88. Developed countries have agreed to reduce these figures by 20% over six years starting in 1995. Developing countries are making 13% cuts over 10 years. Least developed countries do not need to make any cuts. “Green Box” policies are measures with minimal impact on trade that can be used freely. They include government services such as research, disease control, infrastructure and food security. They also include payments made directly to farmers that do not stimulate production, such as certain forms of direct income support, assistance to help farmers restructure agriculture, and direct payments under environmental and regional assistance programs. “Blue Box” policies are between the above two, and exempt from reduction. They include policies such as direct payments under production-limiting programs, certain government assistance measures to encourage agricultural and rural development in developing countries.

From their notifications to WTO Committee on Agriculture, we find that currently only Japan uses “Green Box” policies to support its domestic dairy market. In its School lunch programs, Japan supplies rice, milk, and fruit juice for school children at subsidized prices. Another potential user of this policy maybe China. In its “Tenth-Five” country economic development blueprint (2001-2005), dairy is identified as an important industry. It has implemented “school student milk program” to provide subsidized milk for school student at some developed cities, and is expected to expand it all over the country.

Most countries in this region have a negative or de minimus aggregate measurement of support for agriculture (i.e. amber box policy) except Japan and Korea. Japan uses price support programs for certain dairy products (mainly butter and skimmed milk powder), and also gives deficiency payments for calves and manufacturing milk. Japan’s price support program works with production quota, which belongs to “Blue Box” policies. Production quota is under the control of the national and prefectural councils, but farmers also have the right to adjust it. In 2004, Japan’s milk producer support estimate (PSE) reaches \$4.3 billion (OECD, 2004). Korea also use a price support program for dairy products; its milk PSE reached \$0.8 billion in 2004 (OECD, 2004). None of the other Asian countries use “Blue Box” policies to support their dairy markets.

2. Market access: Although Asia doesn’t have comparative advantage in dairy production, the dairy industry plays an important role in this region’s economy development. Many countries use tariff and Tariff Rate Quota (TRQ) to protect domestic markets, and there are large differences in the tariffs they apply to dairy products. From table 1 we can see that China, Japan, India and Korea use relatively higher tariffs than Indonesia, Philippines, Malaysia and Singapore for dairy product imports. As shown in table 2, ten dairy products exports to Japan are subject to

TRQ administration, five to South Korea, two and one to Malaysia and Indonesia, respectively. Japan and Korea's TRQs are allocated on global basis. For whey and skim milk powder for other purposes, Japan's TRQs are allocated to producers and producer organizations of mixed feed or sellers. For skim milk powder, whole milk powder, and other milk and cream, Korea's TRQs are allocated according to the highest price bidders at quota auctions held by the Livestock Products Marketing Organization. In Japan, the TRQ fill rates for skimmed milk powder, whey and butter are around 50%. South Korea and Malaysia have higher fill rates, but real imports are still lower than TRQ. One interesting thing is that for Indonesia, there exist out of quota imports; the TRQ fill rate is 100%. This indicates that Indonesia's over-quota tariffs are not prohibitive or are not enforced. As this region's dairy imports are distorted by tariff and TRQ, world dairy trade liberalization will increase this region's imports¹.

3. Export subsidy: As Asia plays a much more important role in world dairy imports than in dairy exports, no country exports much dairy products to international markets except to regional Asian markets. Therefore, no country in this region uses export subsidy to support dairy exports.

Table 1 Asia Country's Dairy Tariff (%)

Tariff Heading	Description	China	Japan	India	Indonesia	Phillipenes	South Korea	Malaysia
0401	Milk and cream, not concentrated nor containing added sugar or other sweetening matter	23.67	25	30	5	3	39.4	0
0402	Milk and cream, concentrated or containing added sugar or other sweetening matter	32.6	22.54	42	5	4.3	28	2
0403	Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit, nuts or cocoa	43	30.35	30	5	6.8	39.4	16.67
0404	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included	25	22.88	30	5	3	22.43	0
0405	Butter and other fats and oils derived from milk; dairy spreads	44	34	33.3	5	7.7	40	4.17
0406	Cheese and curd	43.2	0	32	5	5.5	37.57	8.33

Note (1) tariff is the simple average under the same heading.

(2) Singapore applies zero tariff to all dairy products, Thailand tariff data is not available.

Source: APEC tariff database.

Table 2 Tariff Rate Quota Administration for Asia Countries (Metric tons)

Country	Product	1995		1996		1997		1998		1999		2000	
		NOTRQ	IMP	NOTRQ	IMP	NOTRQ	IMP	NOTRQ	IMP	NOTRQ	IMP	NOTRQ	IMP
Japan	Skimmed milk powder (school lunch)	7264	4245	7264	4615	7264	4066	7264	3783	7264	3808	7264	3592
	Skimmed milk powder (other purposes)	85878	41789	85878	34278	85878	37949	85878	32569	85878	33468	85878	33776
	Evaporated milk	1585	663	1585	779	1585	823	1585	1429	1585	1459	1585	1470
	Whey and modified whey (feeding purposes)	45000	20456	45000	22463	45000	24255	45000	20913	15000	21686	45000	23999
	Prepared whey (infant formula)	25000	7329	25000	8743	25000	10048	25000	8432	25000	10287	25000	10623
	Butter and butteroil	1873	511	1873	375	1873	430	1873	372	1873	347	1873	335
	Mineral concentrated whey	14000	1944	14000	1465	14000	1543	14000	2185	14000	4654	14000	3559
	Prepared edible fat	18977	18994	18977	18701	18977	18804	18977	18641	18977	18752	18977	18699
	Other dairy products for general use	124640	114642	126500	117366	128360	127171	130220	120841	132080	129293	133940	131363
	Designated dairy products for general use	137202	248275	137202	232471	137202	212514	137202	137022	137202	138266	137202	139270
Korea													
	Skim milk powder ... fat content not exceeding 1.5%	621	621	667	649	713	713	759	756	804.6	804.6	850.5	743.3
	Whole milk powder ... fat content exceeding 1.5%	344	344	369	16	395	395	420	80	445.8	445.8	471.2	60
	Other milk and cream, (Evaporated ...)	78	78	84	50	90	0	95	0	101.1	0	106.9	19.2
	Whey powder	23000	22250	26470	22973	29941	23367	33411	23642	36881	30644.5	40351	38752.2
	Butter	250	250	269	268	288	288	307	307	325.6	325.6	344.5	344.5
Indonysia	Milk and cream of fat and its products	414700	857413	414700	644916	414700	597838	414700	466806	414700	875112	414700	1150816.5
Malaysia													
	Milk and cream not concentrated nor...	600000	58987	640000	1195412	640000	1195412						
	Milk and cream not concentrated nor...	90	0	92	696	92000	696000						

Note (1) NOTRQ: Tariff rate quota notified to WTO Committee on Agriculture.

(2) IMP : actual imports.

(3) Thailand, Philipines, India and Singapore don't apply TRQ on dairy products

(4) During China's WTO accession negotiation, China committed not to apply TRQ on dairy imports.

Source: WTO database.

The model

The UW-Madison World Dairy Model (UW-WDM) is a hedonic, spatial equilibrium, interregional competition model with 21 regions including the US, Canada, Mexico, China², India, Japan, Korea³, South-East Asia⁴, other south Asia⁵, Australia, New Zealand, Western Europe, Eastern Europe and the Former Soviet Union (FSU). Five types of farm milk (cow, buffalo, camel, sheep and goat) with 4 milk components (milk fat, casein, whey protein and lactose) can be processed into eight dairy products (cheese, butter, whole milk powder (WMP), skim milk powder (SMP), dry whey, casein, evaporated/condensed milk, and other dairy products). The model assumes intermediate run (3-5 year) supply/demand response, and solves for the regional production, consumption and trade of milk and dairy products that maximizes producer and consumer welfare net of processing and transport costs.

Demand/supply shifters are introduced to the supply/demand functions. In this way, consumption is shifted by regional GDP/Population growth and supply is shifted by 5 years moving average growth rates. Domestic policies (intervention prices, milk quotas, production subsidies, classified pricing) and trade policies (import quotas, two-tiered import quotas, export subsidies) are formulated explicitly in the model.

One difficulty is to model the impact of Japanese domestic support policies. Japan provides subsidy to its milk producers through a price support program, which is working with production quota. Unlike EU and Canada, Japan did not make an initial and final commitment for its milk production quota during WTO negotiations. Hence, there is no formula to predict its change. But as farmers have the right to adjust production quotas, we deem it as decided by market demand. Therefore, we model the impacts of domestic support policies through quota rents. That is, we let quota rents be determined by direct subsidy per unit of milk production (¥8/kg), and set market demand for raw milk equal to production quota.

In revision to the previous UW-WDM, we add two domestic policy changes into the model: (1) US MILC (target price/deficiency payment) program; (2) EU CAP reform starting in 2005. EU CAP reform: reduces intervention prices for butter (-25%) from 2004 to 2007 and skim milk powder (-15%) from 2004

to 2006; limits intervention buying of butter to 30,000 tons by 2008; moves milk quota increases scheduled under Agenda 2000 back one year (beginning in 2006), and adds an extra 200,000 t quota for Greece; pays a dairy premium to dairy producers to compensate for the intervention price cuts beginning in CY2004, based on the milk quota per holding (reduced by the amount by which total national quota have been increased since 1999/2000); allocates to member states an 'additional payment' to be paid to dairy producers according to 'objective criteria.' Both the dairy premium and the supplementary member state payment are to be incorporated into the Single Farm Payment (SFP) beginning in 2007. (A member state can opt to incorporate all or part of the additional payment into the SFP from 2005) (USDA, 2005). We also add the US-Australia free trade agreement (starting from 2005), and the Australia-New Zealand free trade agreement into the model. The model also assumes transportation costs increase 15% every year. The main reasons are the huge increase in demand for raw materials from China, including steel, coal, scrap iron etc, and increasing oil prices.

As the latest data we can get is for 2002, we use it as the base year and forecast out to 2007. We believe five years is a reasonable time period to do these forecasts. We can also extend the forecast to 2010 or 2015, but we have to make more assumptions on macro economy (countries' economic growth rate, oil prices, exchange rates, etc). These assumptions may themselves be misleading, especially when we extend the forecast to 2015. Another reason for just forecasting to 2007 is that our main interests are to see the impacts of tariffs, tariff rate quota and domestic policies on dairy market. After 2004, both developed and developing countries' implementation periods are finished, their final commitments on tariffs, tariff rate quota and domestic support will be binding till a new agreement is reached. Once the trade and domestic policies are unchanged, we should have similar conclusions on their impacts no matter we study five or ten years into the future.

Policy scenarios

Base scenario: The BASE scenario simulates the 2002-07 world dairy situation. It includes domestic supports, tariffs, import quotas and export subsidies from the GATT/WTO. Developed Economies are assumed to fulfill their 2000 GATT/WTO commitments, which means during the simulation period (2002-07) their domestic support, tariffs and export subsidy will be the same as their final AoA commitments. Developing economies are assumed to fulfill their final commitment of AoA in 2005 and stay at this level till 2007. Regional production, price and trade data for 2002 from FAO are used as the starting point of the model. However, FAPRI or OECD data are used wherever possible, especially for regional prices. After a calibration exercise, the BASE scenario was able to replicate the actual data within 5 percent for most regions and product categories, and provide a reasonably good representation of world dairy markets. As a result, we use the BASE scenario as a benchmark to compare results from other simulations. Economic distortions generated by various domestic and trade policy instruments are introduced into the model. Regional milk and commodity prices as well as trade flows, producer and consumer welfare are computed under the alternative policy scenarios. The results are compared with the BASE scenario to assess the ceteris paribus changes induced by the new policy context.

WTO 2007 / Japan No Domestic Subsidy: considering the size of Japan's economy and protection rate, we separate it from the other Asian economies. The policy set of this scenario is the same as the Base scenario but Japan removes its domestic subsidy to dairy producers.

WTO 2007 /Other Asia No Tariff and TRQs: same as Base scenario but Asian countries excluding Japan reduce their tariffs to zero for all dairy products, and eliminate import quotas.

WTO 2007 /Asia liberalization: same as Base scenario but Asia countries including Japan eliminate domestic subsidy and import quota, and reduce their tariffs to zero for all dairy products.

WTO 2007 /World liberalization: same as Base scenario but all countries in the world eliminate domestic support and trade policies. This scenario is presented for comparison.

Other scenarios, such as WTO 2007/World No Tariff and TRQs, WTO 2007/World No domestic, were also simulated. We will mention them whenever necessary, just for the purpose of comparison.

Simulation results

Table 3-5 summarize the impacts of the alternative scenarios relative to the 2007 BASE simulation. These tables are organized in order of increasing liberalization, from no domestic support in Japan through a decomposition of the separate impacts of removing domestic and trade policies in other Asian countries and Japan, and finally, full multilateral trade liberalization around the world (WTO 2007/World liberalization). Given space constraints, we focus discussion on regional producer and consumer welfare impacts (Tables 3-4, million US\$), and farm milk price impacts (Table 5 percentage change).

WTO 2007 /Asia liberalization scenario

This scenario explores the foremost potential of trade liberalization in Asian dairy markets. It provides important information about the competitiveness of each country in the Asian dairy market and serve as a supporting analysis for regional trade liberalization negotiations among Asian countries.

Unilateral trade liberalization by Asian countries will help to decrease world average dairy prices while increasing marginal dairy prices; hence, consumers will benefit from it. Asian consumers will get more than \$4 billion gains from trade liberalization (table 3), its dairy consumption and net dairy products imports will increase 1,584 thousand MT and 357 thousand MT (simple summation), respectively. However, the distribution of the gains varies significantly across different countries. More than 77% of consumer gain is from Japan, and Korea accounts for 11.4%. Japan and Korean dairy consumption will increase 1200 thousand MT and 238 thousand MT, respectively. Their net dairy product imports will increase 351 thousand MT and 67 thousand MT, respectively. This reflects that Japan and Korean domestic consumer prices for dairy products are highly distorted by trade and domestic support measures, especially in the case of Japan; hence, trade liberalization will decrease these distortions significantly, reducing consumption prices, and expanding consumption and imports. China, South East Asia and Other

South Asian countries will gain slightly. Their dairy consumption and net dairy product imports will increase 40-200 thousand MT and 13-44 thousand MT, respectively. This means that those countries' trade policies and domestic measures also create some distortion on dairy products consumer prices, although the magnitude is much less than that in Japan and Korea. One exception is India; its consumers suffer a loss (\$694 million) from trade liberalization. This is because India is potentially a competitive exporter; an increase of the marginal dairy prices will drive its domestic dairy consumer prices up. This will decrease its dairy consumption by 381 thousand MT and increase its net dairy products exports by 153 thousand MT. The same reasoning applies to the rest of the world (consumer loss \$736 million) for the same reasons. Australia, New Zealand and other potential exporters' domestic dairy consumption prices will increase due to an increase in the marginal world dairy prices. As Asian unilateral trade liberalization has minor impacts on EU, US and Canada etc, consumer surplus decreases for the rest of the world. Australia and New Zealand will get most of the benefit from the expansion of dairy markets under liberalization. Their net dairy product exports increase 88 thousand MT and 172 thousand MT, respectively. Overall, the decrease in average consumption prices and increase in marginal world dairy products prices that result from trade liberalization in Asia will increase world total dairy consumption and net dairy products exports by 618 thousand MT and 457 thousand MT, respectively.

Unilateral trade liberalization will lead Asian countries to lose more than \$3 billion in producer surplus (table 4), but most of these losses are from Japan (82%) and Korea (13%). Japan and Korean producer surplus losses will be \$3 billion and \$0.5 billion, which is close to the OECD's PSE (in 2004, Japan and Korea's PSE are \$4.3 billion and \$0.8 billion, respectively). This result is significantly different from Lee et al, who find that unilateral Korean trade liberalization has only modest, negative impacts on Korean milk producers⁶. Our finding confirms that Japan and Korean producers benefit greatly from their tariff, tariff rate quotas and domestic support measures. Elimination of these measures will decrease their farm milk prices by 57.7% and 42.2%, respectively (table 5). As a result, their milk production will

decrease 1,891 thousand MT and 304 thousand MT, respectively. In other words, these two countries dairy production is heavily protected.

China, South East Asia and other South Asian countries' producers will also suffer from unilateral trade liberalization, but only slightly compared with Japan and Korea (they lose 33, 65, and 63 million \$, respectively). Their farm milk prices will also decrease 0.77%, 9.91% and 1.09% respectively. Their milk production will decrease 22 thousand MT, 68 thousand MT and 31 thousand MT, respectively. Indian producers will gain from unilateral trade liberalization (484 million \$), and farm milk price (+3.04%) and milk production (+ 286 thousand MT) will increase. This supports the finding by Rakotoarisoa's et al. (2005) that 'with less distorted world dairy markets, India could be competitive and would emerge as a net exporter of whole milk powder benefiting dairy industries and milk producers in India'. This also holds for the rest of the world (producer gains \$821 million), as Australia, New Zealand and other potential exporters' producer surplus increases while their farm milk prices and milk production increase (Australia and New Zealand farm milk price increase 12.9% and 12.1%, and their milk production increase 523 thousand MT and 512 thousand MT, respectively).

Decomposing the WTO 2007 Scenarios: Japan's domestic subsidy, other Asian countries trade policy, all Asian countries trade and domestic policies

Tables 3, 4 and 5, provide a cross-scenario summary of various degrees of trade liberalization in the Asian dairy market in the context of eliminating trade distortion measures in different regions. The simulation results suggest that Japan's producers get more protection from trade restrictions than from domestic subsidy. Without domestic subsidy, Japan's producers suffer a loss of \$94 million, and farm milk price and milk production decrease 1.63% and 54 thousand MT, respectively. But without domestic subsidy, tariff and tariff rate quota they will suffer a welfare loss of \$3 billion, and farm milk price and milk production decrease 57.7% and 1891 thousand MT, respectively. Although there maybe some interaction effects between trade and domestic policies (which means \$3 billion is not a pure summation of loss from domestic subsidy and trade policies), these results still suggest that trade protection is much

more important than domestic policies for Japanese dairy producers. We confirm this by using WTO 2007/World No Tariff and TRQs and WTO 2007/World No Domestic Support scenarios (not reported here). That is, if all 21 regions of the world remove trade policies Japanese dairy producers suffer a loss of \$2.4 billion, while suffering a loss of \$95 million from multilateral elimination of domestic policies. The same story holds for Korea. Korean dairy producers suffer a loss of \$452 million from the multilateral removal of trade policies, while suffering a loss of \$238 million from multilateral elimination of domestic policies. The elimination of trade protection measures in other Asian countries has little impacts on Japan. This is reasonable as Japan is not a potential competitive exporter, trade liberalization in other countries can not help to improve its production efficiency and therefore won't increase production.

Elimination of Japan's domestic subsidy (WTO 2007/Japan No Domestic Subsidy) has little effect on other Asian countries' consumer surplus, producer surplus and farm milk prices. But if this is combined with the elimination of trade policies in Japan (WTO 2007/Asia liberalization), it will help to increase exports for potential exporters and/or ease importing pressure for potential importers in this region. If other Asian countries except Japan eliminate tariffs and tariff rate quota (WTO 2007/Other Asia No Tariff and TRQs), Korea's dairy producer surplus will decrease \$507 million, but China, South East Asia and other South Asian countries' dairy producers surplus only decreases slightly (less than \$70 million). The farm milk price of Korea, China, South East Asia and other South Asian countries will decrease 44.8%, 1.33%, 9.94% and 1.21%, respectively. Milk production of Korea, China, South East Asia and other South Asian countries will decrease 304 thousand MT, 22 thousand MT, 68 thousand MT and 31 thousand MT, respectively. Together with above analysis, this indicates that Japan, Korea, China, South East Asia and other South Asian countries can be classified as potential dairy importers under unilateral trade liberalization in Asia. The exception is India; it is the only country that can compete with other countries from the rest of the world to pick up some gains (\$40 million) from the unilateral trade liberalization in Asia. This indicates India is a potential competitive dairy exporter in Asia and the world. Now if Japan opens its market (WTO 2007/Asia liberalization), other Asian potential dairy importers'

producer surplus losses will slightly decrease except Japan and South East Asia. The magnitudes range from \$7 million (other South Asia) to \$28 million (Korea). Their farm milk price will slightly increase, ie. -0.77% vs -1.33 for China, -42.18% vs -44.8% for Korea, and -1.09% vs -1.21% for O.S.Asia, respectively. As a potential competitive exporter, India's producers gain a lot from Japan's trade liberalization. Compared with WTO 2007/Other Asia No Tariff and TRQs, India's producer surplus gains increases \$444 million under WTO 2007/Asia Liberalization scenario, and farm milk price and milk production increase will change from 0.25% to 3.04%, and 23 thousand MT to 286 thousand MT, respectively.

While producer surplus decreases for all potential Asian dairy importers except Japan under the WTO 2007/ Other Asia No Tariff and TRQs scenario, their consumer surplus increases from \$174 million (China) to \$565 million (Korea). Given that India is a potential competitive exporter, it is not surprising that its consumer surplus will decrease \$213 million under WTO 2007/ Other Asia No Tariff and TRQs scenario. One thing to be noted is that under WTO 2007/Other Asia No Tariff and TRQs scenario, while Japan's producer surplus and farm milk price do not change, its consumer surplus decrease \$8 million⁷.

From the consumer surplus change under WTO 2007/Other Asia No Tariff & TRQs and WTO 2007/Asia liberalization, we can also see that when Japan opens its market this helps to increase exports for potential exporters and/or ease importing pressure for potential importers. Compared with WTO 2007/Other Asia No Tariff and TRQs, China, Korea, South East Asia and Other South Asia's consumer surplus gains will decrease 54, 25, 60 and 25 million \$ under WTO 2007/Asia liberalization, respectively(column 3 minus column 2 of table 3). This is because there is less import pressure to decrease those countries domestic dairy consumption prices (some of the imports are diverted to Japan's market). India now has more export opportunity and domestic average dairy consumption prices increase further; therefore India consumer suffers further loss (\$481 million).

WTO 2007 /World liberalization scenario

The role of this scenario is similar to that of WTO 2007 /Asia liberalization scenario. This broader liberalization scenario provides insight on Asian countries foremost potential under trade liberalization in the context of world dairy markets. It will provide important information about the competitiveness of each economy in Asia under world trade liberalization and serve as a supporting analysis for the future WTO negotiations for Asian countries.

World trade liberalization will result in a decrease of world average dairy products prices and therefore increase consumer surplus. Asian dairy consumption and net dairy products imports will increase 1159 thousand MT and 230 thousand MT, respectively. As a result, Asian consumers will get a total welfare gain of \$3 billion, but 82% and 12% of the gains come from Japan and Korea. Japan and Korea's dairy consumption will increase 1092 thousand MT and 207 thousand MT, respectively. Other South Asia and South East Asia also gain slightly, 182 and 45 million \$, respectively. As mentioned above, India is a potential competitive exporter in Asia and the world, its net dairy products exports will increase 207 thousand MT. But its dairy products consumption decreases 440 thousand MT when marginal world dairy prices increase, and its consumers consequently suffers a loss of \$686 million. Compared with WTO 2007 /Asia liberalization, two changes need to be noted. One is that now China's consumers suffer a loss (\$42 million), which means its average dairy consumption prices increase while marginal dairy price increases; therefore its dairy consumption decreases 72 thousand MT. It is now a minor potential competitive exporter as its net dairy products exports increase 19 thousand MT. The other change is that now consumer surplus gains for those potential importers (Japan, Korea, S.E.Asia and O.S.Asia) decrease. This indicates that world trade liberalization will ease importing pressure for Asian potential importers (this can also be seen from producer surplus and farm milk price changes). Actually, the importing pressure is mainly absorbed by EU, US and Canada, as more than 80% of the consumer surplus gains for the rest of the world comes from these three economies.

World trade liberalization will result in a producer surplus loss of \$2.8 billion in Asia, with 84% and 13% of the loss coming from Japan and Korea, respectively. Japan and Korea's dairy production will

decrease 1875 thousand MT and 280 thousand MT, respectively. South East Asia and other South Asia producers only lose slightly, 63 and 40 million \$, respectively. As India and China are now competitive exporters in world dairy markets, their producers will get some benefits from world trade liberalization. But India has a competitive edge over China; its producer gains (\$613 million) are much larger than that of China (\$35 million), and its milk production increases 362 thousand MT vs 22 thousand MT in China. For farm milk price, Japan and Korea will be hammered by world trade liberalization (decrease 57% and 39%, respectively). For the other two potential importers (S.E.Asia and O.S.Asia), their farm milk price will also decrease (9.6% and 0.7%, respectively). India and China's farm milk price will increase 3.8% and 0.8%, respectively. This suggests the order of competitiveness of Asian economies from least competitive to most competitive is Japan, Korea, South East Asia, other South Asia, China and India. 92% of the producer surplus losses for the rest of the world are from EU, US and Canada, which is the result of the elimination of CAP (EU), MILC program (US), price support, price discrimination schemes (US and Canada) and trade measures. But Oceania country's producers (Australia and New Zealand) will gain from world trade liberalization. Milk production will increase 914 thousand MT and producer surplus increases \$349 million consequently. This indicates world trade liberalization will have large impacts on heavily protected economies, small impacts on slightly protected economies, and benefit potential competitive exporters.

Concluding remarks

This paper investigates the impact of trade liberalization on Asian dairy markets beyond the year 2005 by extending the current URAA/GATT agreement to 2007. We analyze the separate and combined impacts of eliminating Japan's domestic subsidy, removing other Asian countries trade policies excluding Japan, eliminating all Asian countries domestic and trade policies, and world multilateral trade liberalization. This provides useful insights on the effects of changing trade policies on the Asian dairy sector. One unifying theme across these simulation results concerns the impacts of dairy trade

liberalization on the more protected dairy regions (Japan and Korea) versus the low cost potential exporting regions (India and China), and the other slightly protected economies.

The impacts from unilateral trade liberalization by Asian countries and world multilateral trade liberalization on Japan and Korea are significantly different from other Asian countries. Japan and Korea's producers suffer a loss of more than \$2.9 billion and \$444 million, respectively. Their farm milk price will be hammered (decrease more than 57% and 39%, respectively). Their milk production will decrease more than 1875 thousand MT and 280 thousand MT, respectively. But their consumers will benefit more than \$3.2 billion and \$469 million, respectively. From a decomposition analysis we find that Japan and Korea's producers get more protection from trade restrictions than from domestic subsidy, as they suffer smaller losses from eliminating domestic subsidy than from elimination of trade policies.

India is a potential competitive exporter to Asia and the world. Trade liberalization will help to increase its farm milk price and producer surplus while decreasing consumer surplus. China is a potential importer in Asia but a potential competitive exporter in the world. Trade liberalization does not have much impact on China.

South East Asia and other South Asian countries are potential importers in Asia and the world. Their consumers will benefit from trade liberalization while producers suffer a loss. But these impacts are very small compared with Japan and Korea.

Greater trade liberalization around the world will help to increase exports for potential exporters or ease importing pressure for potential importers. For potential importers, their producer surplus loss and consumer surplus gains will decrease. For potential exporters, their producer surplus gains will increase.

Finally, the WTO 2007/World Liberalization scenario indicates that the order of competitiveness of Asian dairy economies from least competitive to most competitive is Japan, Korea, South East Asia, other South Asia, China and India. Therefore, world dairy trade liberalization will increase average dairy consumption prices in China and India, and decrease it in the other economies of Asia. China and India's consumers will lose from trade liberalization, but the other countries consumer surplus will increase.

Asia's net dairy products imports will increase 230 thousand MT, most of which will come from Australia and New Zealand.

While this research sheds useful light on the impacts of trade liberalization on Asian market, its limitations should be noted. First, the dairy trade policy is not negotiated in isolation. Impacts of trade liberalization on other agricultural sectors (grains, oilseeds, and livestock products) can have significant influence on negotiators' multi-commodity bargaining positions. Exploring these multi-commodity impacts under alternative liberalization proposals can provide useful additional insights on the policy making process. Second, the linkages between the agricultural sector and the macro-economy can also be quite important (e.g., monetary policy, exchange rates, etc.). Further work is needed to explore these linkages.

The need to analyze other scenarios based on policy proposals emerging of the upcoming negotiations offers further applications of the model. Proposals already advanced include maximum tariff ceilings (e.g., no more than 50 percent for any product), or tariff reductions using the "Swiss Formula" (a formula that reduces higher tariffs by a greater proportion than lower tariffs). These types of domestic and trade policy interface will become increasingly important in the next Round discussions.

Table 3: CONSUMER SURPLUS IMPACTS

	WTO 2007/Japan No Domestic Subsidy	WTO 2007/Other Asia No Tariff&TRQs	WTO 2007/Asia liberalization	WTO 2007/World liberalization
	Change from base (million US \$)			
China	-1	174	120	-42
Japan	-144	-8	3635	3191
Korea	0	565	540	469
S. E. Asia	-1	207	147	45
India	0	-213	-694	-686
O. S. Asia	0	308	283	182
Asia total	-146	1033	4031	3159
Rest of world	83	-370	-736	22781

Table 4: Producer SURPLUS IMPACTS

	WTO 2007/Japan No Domestic Subsidy	WTO 2007/Other Asia No Tariff&TRQs	WTO 2007/Asia liberalization	WTO 2007/World liberalization
	Change from base (million US \$)			
China	0	-57	-33	35
Japan	-94	0	-2954	-2932
Korea	0	-507	-479	-444
S. E. Asia	0	-65	-65	-63
India	0	40	484	613
O. S. Asia	0	-70	-63	-40
Asia total	-94	-659	-3110	-2831
Rest of world	-99	432	821	-30231

Table 5: FARM MILK PRICE IMPACTS

	Base Milk Price		WTO 2007/Japan No Domestic Subsidy	WTO 2007/Other Asia No Tariff&TRQs	WTO 2007/Asia liberalization	WTO 2007/World liberalization
	\$/MT	\$/CWT	Percentage Change from base			
China	349	15.84	0.0	-1.3	-0.8	0.8
Japan	657	29.83	-1.6	0.0	-57.7	-57.2
Korea	434	19.69	0.0	-44.8	-42.2	-38.9
S. E. Asia	253	11.48	0.0	-9.9	-9.9	-9.6
India	372	16.91	0.0	-0.2	3.0	3.8
O. S. Asia	148	6.73	0.0	-1.2	-1.1	-0.7
Rest of world	145	6.58	0.0	6.0	12.6	9.4

Note: price for rest of the world is the average price of Australia and New Zealand.

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Endnotes

¹One thing to be noted is that some country TRQs do not increase during the study period. This is not a mistake. It is because their current TRQs satisfy the requirements of WTO AoA. According to AoA, TRQs provide for the maintenance of current access opportunities and the establishment of minimum access tariff quotas (at reduced-tariff rates) where current access is less than 3 per cent of domestic consumption. These minimum access tariff quotas are to be expanded to 5 per cent over the implementation period.

² China includes mainland of China, Taiwan, Hongkong, Macao, Mongolia.

³ Korea includes North and South Korea.

⁴ South East Asia includes Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

⁵ other South Asia includes Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Sri Lanka.

⁶ Although we both do not allow fluid milk trade and include milk components (they consider fat and non-fat-solid (NSF)), we use different approaches. Firstly, they assume the prices of raw milk for fluid use is set by the government and the prices of milk components are set by border prices, while we solve these prices endogenously. As they assume a large percentage of raw milk is used for fluid consumption whose price is determined exogenously, it is not surprising that trade liberalization has only modest, negative impacts on milk producers. Secondly, they treat fat and NSF as final products, whereas we use milk components as a linkage between raw milk and final consumption products (cheese, butter, etc). Therefore, to consider the impact of tariffs and TRQs, we can directly apply countries' WTO commitments while they calculate the component tariff rates as weighted averages of product tariffs, and it is not clear how they deal with TRQs. The impacts of trade liberalization on final consumption products will be fully passed on to raw milk production in our model through the milk component linkage, but it

will only be partially passed on to raw milk production in their model. That's why they find significant increases in imports but quite small reductions in returns to resources owned by dairy farmers.

⁷One explanation is that this spatial nonlinear model is solved by using GAMS, there maybe some fractional change when policy scenario changes. But this fractional change is within the solver tolerance, and given the magnitude of consumer surplus (\$29 billion for Japan in 2007) \$8 million should not be statistically significant.