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The Problems and Pitfalls in Modeling International Dairy Trade Liberalization

by
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THE PROBLEMS AND PITFALLS IN MODELING INTERNATIONAL DAIRY TRADE LIBERALIZATION*

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Abstract

The international dairy sector is one of the most heavily protected commodity sectors in agriculture. Following the Uruguay Round of multilateral trade liberalization all nontariff barriers to trade were converted, through the process of tariffication, into tariffs. However, in the dairy sector, the border measure most commonly adopted by developed countries was a system of tariff rate quotas. Tariff rate quotas are two-tiered tariffs which allow a small quantity of the product to be imported at a low or zero tariff, while quantities above the minimum access amount are charged much higher and often prohibitive tariffs. Tariff rate quotas cause the excess supply curve facing an importing country to be discontinuous at the minimum access amount. The objective of this paper is to review key issues related to modeling trade liberalization for the international dairy economy, given the existence of tariff rate quotas and export subsidies.

1.0 INTRODUCTION

World trade in dairy products has been distorted for decades by both domestic and border policies. In spite of regional and multilateral trade agreements, dairy policies continue to distort resource use and increase the prices of dairy products in most of the industrial market economies (Barichello, 1981; Meilke et al, 1996, 1998; Moschini, 1989; OECD, 1996; Tyers and Anderson, 1992). In the mid-1980s the dairy products producer subsidy equivalent (PSE) for OECD countries exceeded US$ 50 billion. This amount was approximately 30 percent of the global PSE for the agricultural sector (OECD, 1996). In Canada and the US, milk producers continue to receive two to three times more support than the average of all other commodities. In the US alone, spending on dairy programs averaged US$ 1.5 billion per year between 1980 and 1989 (OECD, 1996).

The level of the PSE has remained high in most developed countries throughout the 1990s, accounting for a significant proportion of the overall value of milk production in 1997 (Table 1).

Table 1: Producer Subsidy Equivalents for Milk in Selected OECD Countries (percent).

Regions	1986-88	1992-94	1995	1996p	1997e
Australia	31	29	25	17	23
Canada	78	72	57	55	59
EU	64	62	60	57	54
Japan	90	88	88	83	82
New Zealand	12	2	1	2	2
Mexico	47	52	3	26	36
US	65	54	38	46	47

Source: OECD Secretariat, 1998; e : estimate ; p :provisional

With such large income transfers it is not surprising to observe intense lobbying activity to preserve the protection. Conversely, there is a growing debate about the costs of the dairy policies in all of the OECD countries. In addition, Canadian dairy policy has been questioned several times by the US, since the signing of the CUSTA and the NAFTA. The debate has also been intense in Europe, with the reform of the Common Agricultural Policy (CAP) and the enlargement of the European Union (Tangermann, 1999). The lack of transfer efficiency in traditional agricultural programs, and the export subsidies provided to foreign consumers have been criticized by both agricultural and non-agricultural interests.

The completion of the Uruguay Round of multilateral trade negotiations in 1994 resulted in the adoption of tariffication as part of a comprehensive package by which government interventions in the agricultural sector were to be reformed. Tariffication required replacing non-tariff barriers to trade with bound tariffs. For many agricultural commodities such as dairy products, tariffication was implemented through tariff rate quotas. Tariff rate-quotas are two-tiered tariffs where the minimum access quantity is charged a low tariff (within quota tariff) while imports above the minimum access quantity are charged higher tariffs (over-quota tariff).

The introduction of tariff rate quotas has maintained a complex policy making environment. For example, following the UR, minimum access for most dairy products was increased slightly but over-quota tariffs were set at prohibitive levels, limiting market access to the within-quota level for most dairy commodities. Consequently, the rents associated with nontariff barriers have not been eliminated and in many cases they have been increased.[1]

A new round of multilateral trade negotiations for agriculture are scheduled to begin in 1999 and countries will have to negotiate further reductions in border protection. Tariff rate quotas could be modified in several ways. Minimum access, within-quota and over-quota tariffs could be changed simultaneously, two-by-two or individually, in the same or opposite directions.

This paper discusses some of the problems and pitfalls in modeling the international dairy sector. Quantitative analysis of trade liberalization options are crucial in understanding the costs and benefits of various scenarios. Section 2 reviews the dairy policies and pricing mechanisms used in selected OECD countries. Section 3 analyzes trends in dairy production, consumption and trade. Section 4 presents the economic implications of tariff rate quotas and export subsidies. Section 5 identifies the major problems in modeling the international dairy sector. Section 6 reviews the literature on modeling agricultural commodities under tariff rate quotas and export subsidies. Finally, section 7 presents a stylized multimarket trade model of the international dairy sector before concluding in section 8.

2.0 AN OVERVIEW OF DAIRY POLICY IN SELECTED OECD COUNTRIES

It is a challenging task to discuss the dairy policies of OECD countries because of the number of policies affecting this industry. Even those countries whose economies are largely based on free enterprise, such as Switzerland and the United States have complicated systems of subsidization and regulation in the dairy sector.

[1] If there are no imports there can be no import quota rents.

Nonetheless, Table 2 illustrates the major policies used by several OECD countries to support their dairy industry prior to the completion of the UR of trade negotiations. Government support may be differentiated into two major categories: domestic measures and border measures. Domestic measures include output price support and input subsidies, as well as supply controls such as production quotas and herd termination plans. Border measures prior to the UR involved import quotas, licenses and export subsidies. Following the UR import quotas were replaced by tariff rate quotas. Sanitary regulations usually apply to milk and dairy product trade even though not explicitly identified in Table 2.

Table 2: Dairy Industry Support and Protection Policies in Selected OECD Countries, 1994

	Domestic measures		Border measures	
Region	**Price support**	**Supply management**	**Import control**	**Export enhancement**
Australia	Market and supplementary support	Quotas on fluid milk	Tariffs, Quotas	Licenses
Canada	Target price, Subsidy payments	Quotas	Tariffs, Quotas Licenses	Producer financed
EC (12)	Target price	Quotas	Variable levies	Variable refunds
Japan	Deficiency payments	Quotas	Tariffs, Quotas	
Mexico	Feed subsidies		Licenses, Tariffs	
New Zealand				State Trading
USA	Price support	Diversion and Termination plans	Quotas and Tariffs	Export subsidies

Source: Agriculture and Agri-Food Canada (1995).

A common feature of the domestic dairy sector in OECD countries is its insulation from market forces largely as a result of production quotas, tariff rate quotas, licenses and export subsidies. Burrell (1990) found that out of the 21 OECD countries he studied, all except New Zealand and the United States had national milk production restrictions. Formal leasing of production quota was in most cases prohibited or subject to very stringent regulations.

3.0 THE WORLD DAIRY MARKET

The dairy sector is economically important in most industrialized countries. Policy reform in this sector will have significant impacts since milk production generates more than 20 percent of farm cash receipts in most OECD countries. This section reviews the major trends in production, consumption and trade of dairy products.

- ***Dairy Production***

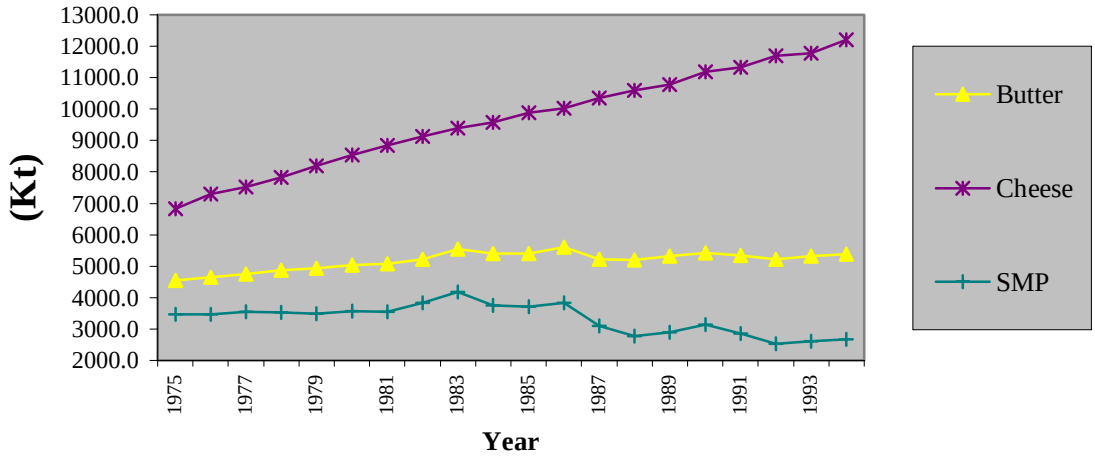
Cow milk represents more than 90 percent of world milk production. Approximately 75 per cent of cow milk production is concentrated in the industrialized countries with the European Union(15) and the United States accounting for 35 percent of the total in 1994 (OECD, 1996; WTO, 1995). Some developing countries such as India and the former USSR are also important producers of milk but small exporters.

World milk production trended upward from the late 1960s to the late 1980s (WTO, 1995). In 1987, world milk production declined as a result of a five per cent output reduction in the EC as it attempted to curb domestic surpluses. Since the 1980s, world milk production has grown by 1 percent a year, on average. However, milk production has remained relatively stable at about 525 million metric tonnes since the early 1990s.

Medium term forecasts indicate that world milk production will increase because of expected low feed prices, genetic improvements, biotechnology that will increase milk yields i.e. rBST, and improvements in farm management. Trade liberalization will increase consumption and help to absorb productivity gains, hence limiting further rationalization of the farm sector. With or without freer trade, the high growth potential for milk production indicates that the dairy industry will go through major structural changes over the next few years.

Since the early 1980s, skimmed milk powder production has decreased by 1.3 per cent a year while butter production has stayed relatively stable (Figure 1). Conversely, whole milk powder and cheese production have increased by more than 3 percent per year.

Figure 1: World Dairy Production, 1975-1994, Kt



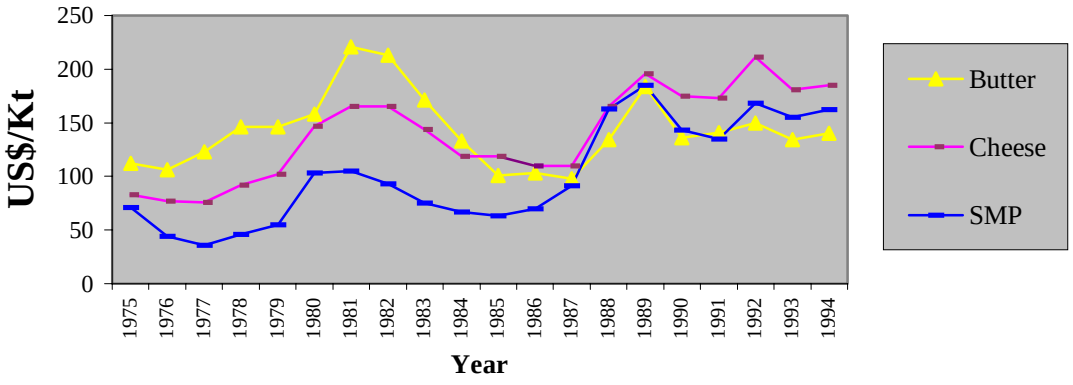
- ***Consumption of Dairy Products***

Per capita consumption of milk and milk products at the world level was 75kg in milk equivalents in 1994. However, there has been a decline in the overall consumption of milk and milk products since the beginning of the 1990s (WTO, 1995). World skim milk powder consumption has decreased by 15 per cent between 1980 and 1996. World butter consumption has increased by 8 percent, in spite of declines of more than 10 per cent in the International Dairy Agreement member countries.[2] These trends indicate the need for new trade opportunities for large producers of milk fat.

World cheese consumption in OECD countries has increased substantially in the 1980s. In the rest of the world, cheese consumption grew slower in the 1980s and a slight reduction has occurred since 1990.

Without a significant increase in income growth in developing countries or a reduction in the price of dairy products, the trend in consumption growth will be difficult to maintain. Nominal prices of most dairy products are increasing (Figure 2). In the 1990s, higher international prices, partially due to a reduction in export subsidies, limited the capacity of developing countries to maintain import levels and access new products. These countries are the main importers of dry milk surpluses.

Figure 2: World Wholesale Prices of Dairy Products, 1975-1994, $US/Kt



[2] In 1995, the following countries were parties to the International Dairy Agreement: Argentina, Bulgaria, European Community (12), Japan, New Zealand, Norway, Romania, Switzerland and Uruguay. The stated objectives of the IDA are to advance the expansion and liberalization of world trade in dairy products under stable market conditions, on the basis of mutual benefit to exporting and importing countries, and to further economic and social development in developing countries.

- ***Trade in Dairy Products***

The division between the use of milk for fluid consumption and its use in manufactured dairy products is essential in understanding the world dairy industry and trade flows. In all industrialized countries the market for fluid milk is more lucrative for farmers, but its growth is limited due to slow population growth and an aging population. In general, fluid milk accounts for less than one third of the raw milk sales in most countries, with a few exceptions such as Japan and England.

Trade in dairy products is extremely concentrated in terms of buyers and sellers. The market is restricted to about ten countries. In general, low value products are exported to developing countries, while high value products are exchanged largely among high income countries. Historically, less than five percent of the worlds milk production has been traded, at least partially because of high barriers to trade and technological constraints.

Dairy products are generally traded in processed form. Among the dairy commodities traded, cheese, skim milk powder and more recently whole milk powder and protein components dominate the market. Traditionally, fluid milk has been sold mainly to the domestic market. However, over the 1980s, trade in non-processed milk has been growing rapidly (Table 3) due to advances in technology and reductions in trade barriers. In OECD countries, imports of processed products have been growing twice as fast as exports, over recent years, indicating the potential for much more trade as market access improves.

Table 3: Imports and Exports of Dairy Products in OECD Countries, (1980-82/1990-92)

Product type	1980-82	1990-92	Annual growth rate (%)
	(millions $US)		
Non processed milk			
• Imports	21	41	6.8
• Exports	79	197	9.6
Processed milk products			
• Imports	1 636	2 433	4.0
• Exports	5 852	7 197	2.1
Balance of trade	4 274	4 920	

Source: OECD, 1996.

The major world traders of dairy products are summarized in Table 4 and Table 5. Exports of dairy products are dominated by the European Community(EC), New Zealand and Australia.

Table 4: Major World Exporters of Dairy Products, 1994 ('000 tonnes)

Regions	Butter		Cheese		Skimmed milk powder		Total processed	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
European Community (12)1	88	19.9	516	66.2	144	23.9	748	41.0
New Zealand	191	43.2	159	20.4	149	24.8	499	27.4
Australia	43	9.7	104	13.4	191	31.7	338	18.5
United States	79	17.9	----	----	49	8.1	128	7.0
Poland	18	4.1	----	----	69	11.5	87	4.8
Finland	23	5.2	----	----	----	----	23	1.3
Total	442	100.0	779	100.0	602	100.0	1823	100.0

Source: WTO, 1995 [1] Excluding intra-EC trade

Although these figures vary from year to year, the EC usually accounts for about 40 percent of butter, cheese and skimmed milk powder exports. New Zealand, with 27 per cent of the world exports, is the largest single country exporter and the only country not subsidizing its exports of dairy products. Figures 3 and 4 illustrate the EC and New Zealand export's of dairy products since 1975.

Figure 3: Dairy Exports - EC, 1975-1994, Kt

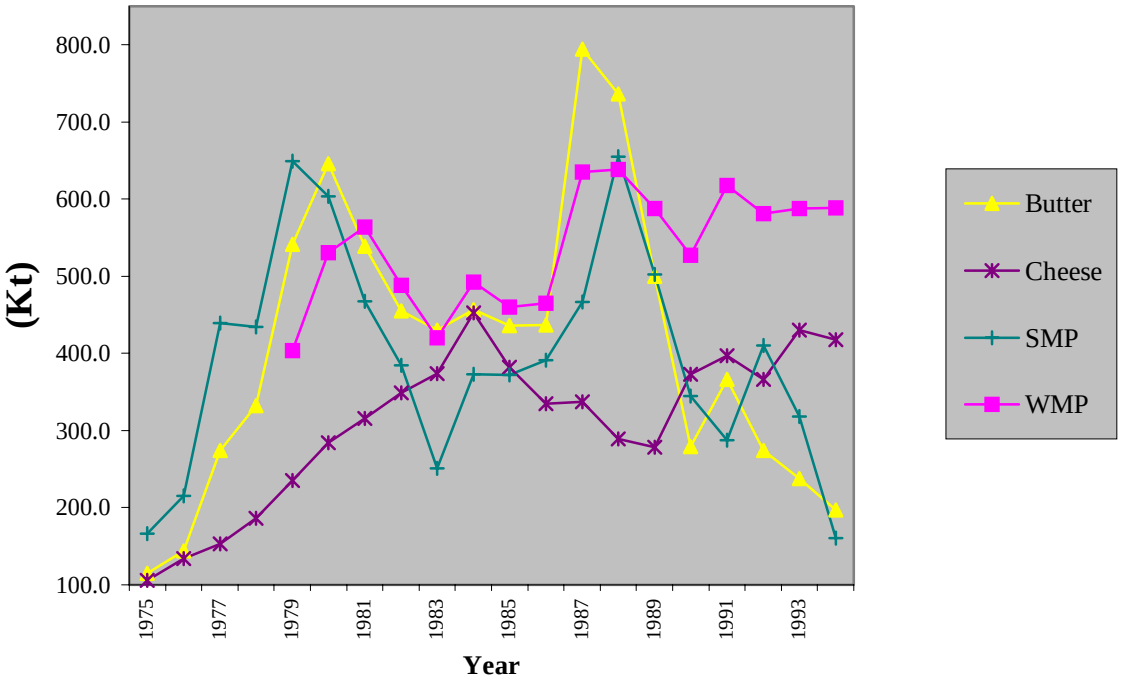
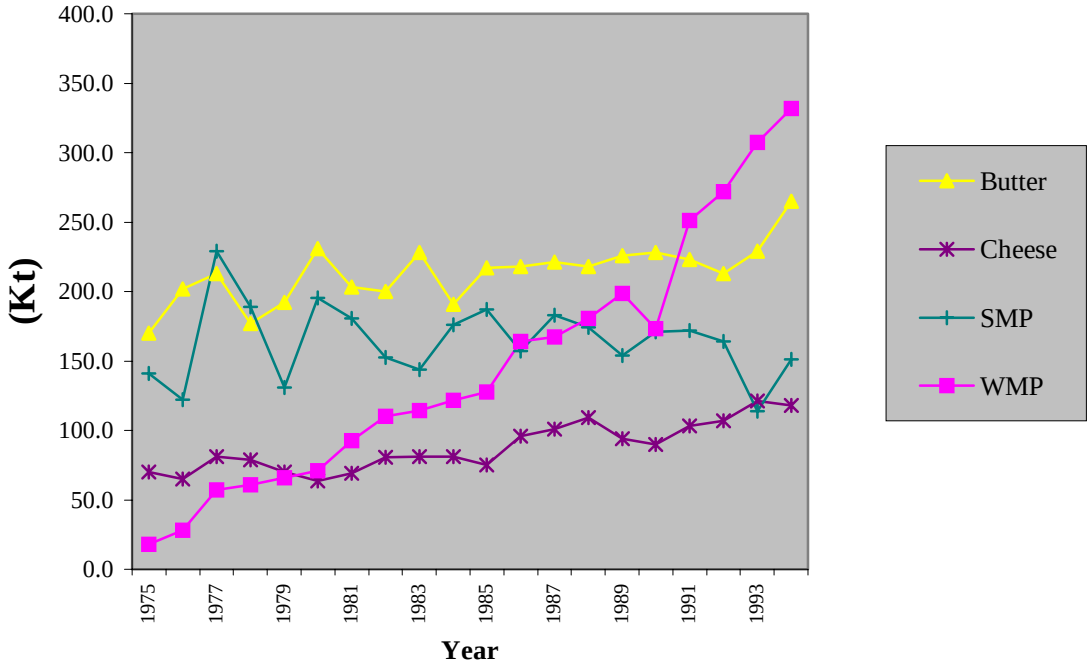


Figure 4: Dairy Exports - New Zealand, 1975-1994, Kt



The most significant importers of butter and skimmed milk powder are developing countries. These two products are usually in surplus in OECD countries and subsidized for export. The reduction commitments under the UR Agreement could mean higher prices and thus, lower imports by developing countries in the medium run.

After Russia and Japan, Mexico is the largest importer of dairy products. For the cheese category, which includes both low and high value products, the number of importers are more differentiated. Usually, specialized products are shipped to developed countries (Table 5).

Table 5: Major World Importers of Dairy Products, 1994 ('000 tonnes)

Regions	Butter		Cheese		Skimmed milk powder		Total processed	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
United States	----	----	152	25.1	----	----	152	11.2
Japan	----	----	140	23.1	86	18.7	226	16.6
European Community (12)1	65	22.0	127	21.0	----	----	192	14.1
Russia	172	58.3	76	12.6	----	----	248	18.2
Iran	----	----	80	13.2	----	----	80	5.9
Mexico	18	6.1	----	----	200	43.6	218	16.0
Algeria	30	10.2	----	----	128	27.9	158	11.6
Brazil	10	3.4	----	----	45	9.8	55	4.0
Egypt	----	----	30	5.0	----	----	30	2.2
Total	295	100.0	605	100.0	459	100.0	1359	100.0

Source: WTO, 1995. [1] Excluding EC intra-trade

4.0 ECONOMIC IMPLICATIONS OF TARIFF RATE QUOTAS AND EXPORT SUBSIDIES

A host of direct and indirect policies are used to protect the dairy industries in OECD countries from foreign competition and to promote exports. There are three major issues in the context of modeling trade liberalization: 1) reductions in both within and over-quota tariffs; 2) increases in minimum access; and 3) reductions in export subsidies. The objectives of this section are: 1) to provide a graphical representation of tariff rate quotas; 2) to illustrate the impacts of tariff rate quotas on economic rents; and 3) to show the impacts of export subsidy reductions on domestic and world markets. In all cases, it is assumed that the exporting or importing country is large enough to affect the world market.[3]

- ***The Economics of Tariff Rate Quotas***

Tariff rate quotas are essentially two-tiered tariffs. They allow only small quantities of product to be imported at low tariffs, while imports above the minimum access quantity are charged much higher, and often prohibitive tariffs.

Figure 5 illustrates the effects of a tariff rate quota on the excess supply curve facing an importing country. The line labeled ES_f is the free trade excess supply curve. The minimum access amount is IM_{min}. As a result of the two-tiered tariff there is a kink in the excess supply curve at IM_{min}. If the within-quota tariff is greater than zero it can be illustrated by line segment

[3] This section draws upon the work of Moschini, 1991.

ES' – this tariff applies to imports up to the minimum access amount. For imports above this quantity the over-quota tariff applies, as shown by ES''. As a result the effective excess supply curve with a tariff rate quota is the bold line in Figure 5 - ES' up to IM_{min} and ES'' for quantities above IM_{min}. The tariff rate quota introduces a discontinuity in the excess supply curve, represented by the vertical line segment, at IM_{min}.

Figure 5: The Effect Of Tariff Rate Quotas On The Excess Supply Curve Facing An Importer

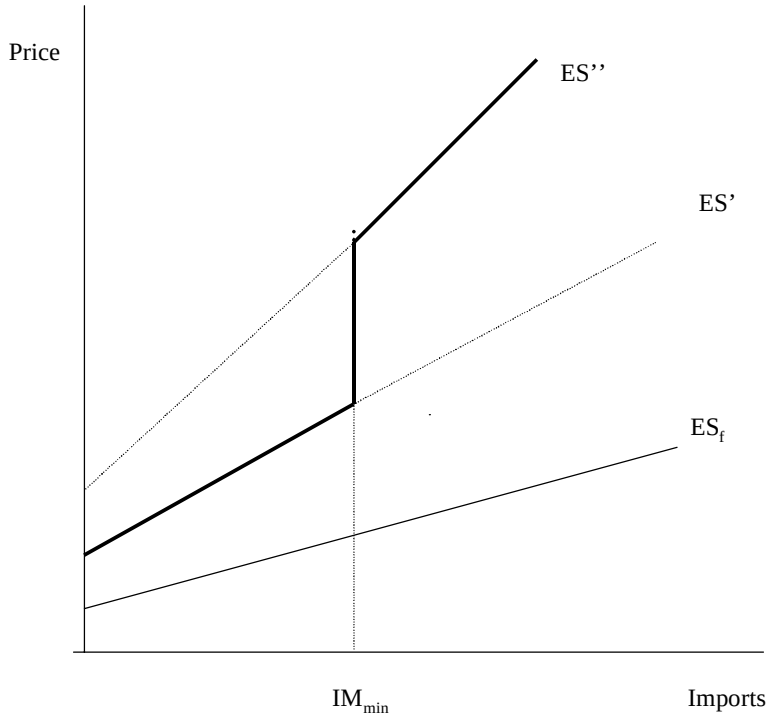


Figure 6 shows that there are three possible trade and price outcomes when an importing country has a tariff rate quota. With no loss in generality it is assumed that the within-quota tariff is zero.

- When the excess demand curve is ED_1 imports (IM') are below the minimum access amount and the domestic price (P_d') equals the world market price (P_w'). In this situation, the within-quota amount is not filled but the country is not imposing any border measures so the tariff rate quota is not trade distorting.

- When the excess demand curve is ED_2 imports are equal to the minimum access amount, the domestic price equals P_d'' and the world price equals P_w''. Economic conditions in the importing country can shift the excess demand curve up or down over a relatively wide range (the vertical segment of the ES' curve), depending on the size of the over-quota tariff, without effecting imports or the world market price.

- When the excess demand curve is ED_3 imports (IM''') are greater than the minimum access amount. In this situation, the domestic price (P_d''') is equal to the world price times the over-quota tariff (P_w'''$(1+t_o)$)

The modeling task is to determine which of the three economic situations (ED_1, ED_2, ED_3) prevails in a country, and when it switches from one to another.

Figure 6: The Effect Of A Tariff Rate Quota On Imports

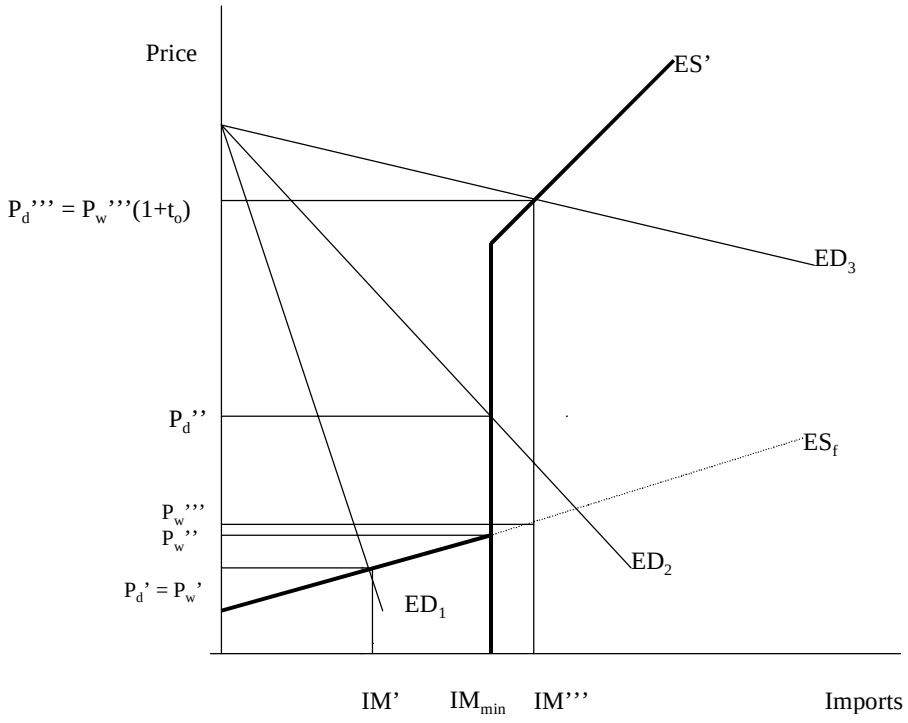
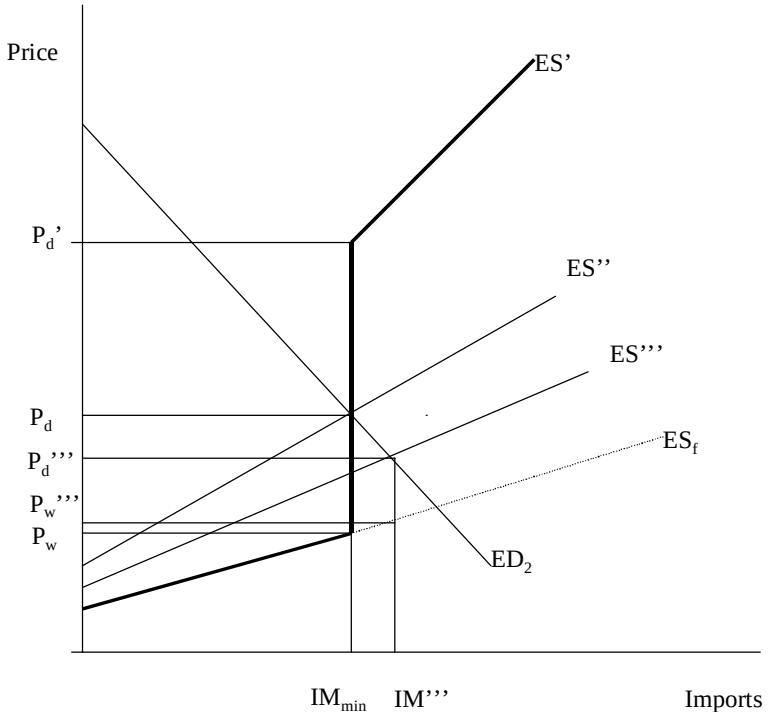


Figure 7 shows an importer with domestic price P_d and imports at the minimum access amount. In this situation there is considerable "water" in the over-quota tariff as a result of dirty tariffication. In this situation, the water in the tariff is equal to P_d'-P_d and the "true" tariff

equivalent is P_d-P_w.

The over-quota tariff can be lowered from that represented by ES' to ES'' with no effect on the domestic price, imports or the world price P_w. As over-quota tariffs are lowered to the level represented by ES''' they begin to effect imports and trade. With ES''' the domestic price falls to P_d''', the world price rises to P_w''' and imports expand to IM'''.

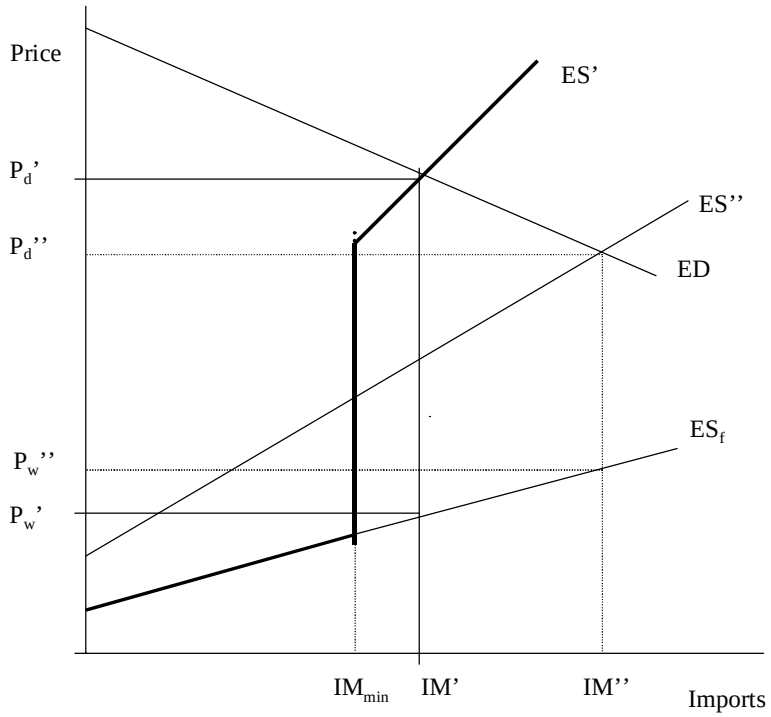
Figure 7: The Effect Of Lowering Over-Quota Tariffs On An Importer



The effect of reducing over-quota tariffs can be modeled by lowering tariffs and determining which of the three economic zones prevails in the country. Alternatively, a logistics curve could be used to "smooth" the kink in the effective excess supply curve.

Figure 8 shows the effects of lowering over-quota tariffs from ES' to ES'' when the importer is initially importing above its minimum access commitment. In this situation, the effect is to increase imports from IM' to IM'', while the domestic price drops from P_d' to P_d'' and the world price increases from P_w' to P_w''. In both the before and after situations the domestic price is equal to the world price plus the over-quota tariff.

Figure 8: The Effect Of Lowering Over-Quota Tariffs On An Importer When Its Imports Are Above The Minimum Access Amount



In Figure 9 the effects of increasing the minimum access commitment from IM_{min} to IM_{min}' are illustrated. As a result of the minimum access increase the domestic price drops from P_d to P_d' and the world price increases from P_w to P_w'. Unfortunately, in conducting scenario analysis it is not this easy. The importer has a number of choices of how to accommodate the increased imports:

1) it could let the domestic price fall as illustrated in Figure 9;

2) it could reduce its domestic supply by the full amount of the increase in imports and maintain its price at P_d.

3) it could reduce its domestic supply by something less than the full amount of the increase in its imports and let its domestic price fall to a level between P_d and P_d';

4) it could reduce its domestic supply and increase its domestic price by the amount allowed by the water in its over-quota tariff; or

5) if the country has room within its export subsidy commitments it could export an amount equal to the increase in imports.

As a result of these options it is unlikely that modeling increases in minimum access commitments can be handled without considerable thought being given as to how countries might implement trade liberalization, which comes in the form of increases in minimum access commitments.

Figure 9: The Effect On An Importer Of Increasing Its Minimum Access Commitments

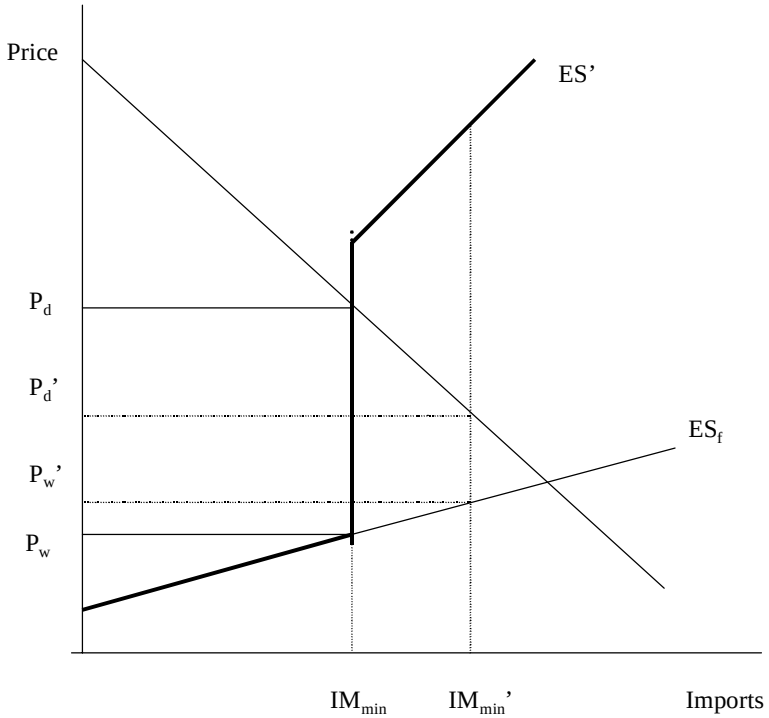
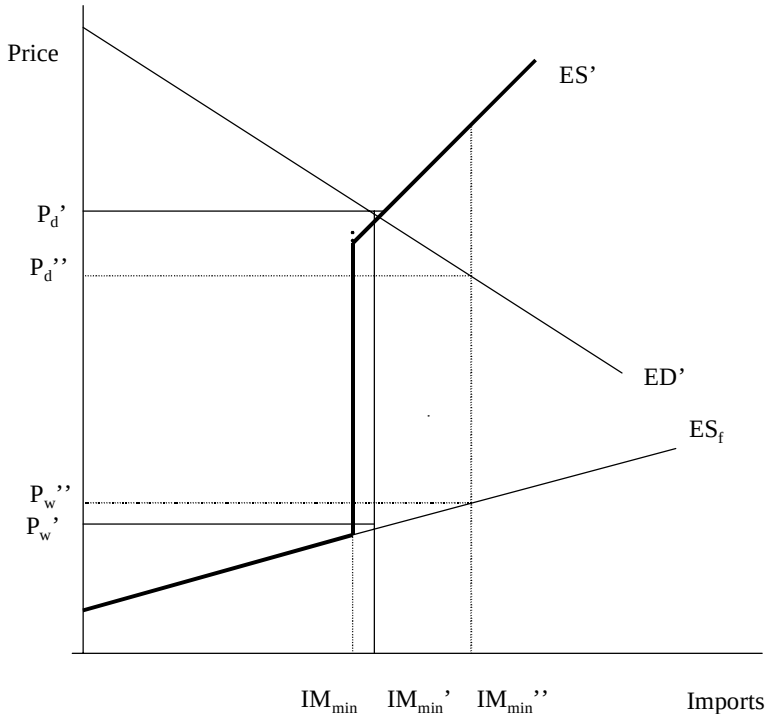


Figure 10 shows how increases in the minimum access commitment effect an importer when they are initially importing amounts above their minimum access quantity. In this situation, two outcomes are possible. If the new minimum access amount is less than what the country is currently importing, i.e. a quantity between IM_{min} and IM_{min}' then it has no effect on trade. However, if the new minimum access amount is greater than the amount currently being imported, say an amount equal to IM_{min}'', then imports expand and the domestic price falls to P_d'' and the world price rises to P_w''. Again this domestic price adjustment could be offset by domestic supply reductions.

Figure 10: The Effect On An Importer Of Increasing Minimum Access Commitments When It Is Importing More Than Its Minimum Access Amount



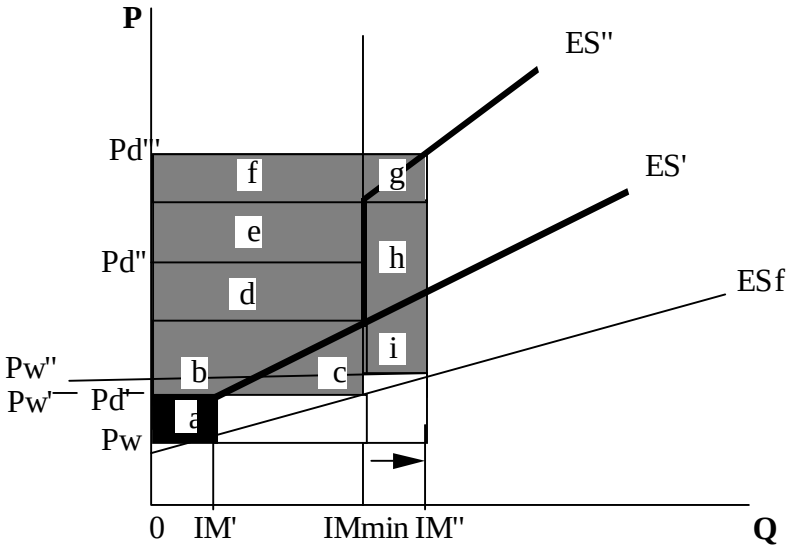
- ***Rent Implications of Tariff-Rate Quota***

Once a tariff rate quota is in place, the effective excess supply curve is given by the dark kinked excess supply curve in Figure 11.[4] The magnitude of the rent created by a tariff rate quota depends on where the excess demand curve of the importing country intersects the step-wise excess supply function. Recalling Figure 6, three outcomes are possible.

- The first case, represented in Figure 11, assumes the excess demand curve (not shown) intersects the excess supply curve at (IM') where the domestic price is Pd' and the world price Pw. The importing country is imposing an *ad valorem* tariff on within-quota imports shifting the excess supply curve from ES_f to ES'. The tariff revenue represented by area (a) is captured by the government.

[4] In Figure 11 it is assumed there is a positive within-quota tariff.

Figure 11: Economic Rents Resulting from Tariff Rate Quotas



- The second case assumes the excess demand intersects the excess supply at P_d'' such that the minimum access is binding. The world price is P_w'. Imports between zero and IM' are subject to the within-quota tariff. Thus, the government captures tariff revenue equal to area (b+c) and importers get a rent equal to area (d). The share of the economic rent received by each participant depends on the price level and on the way import quotas are allocated. Usually the economic rent is captured by domestic importers.

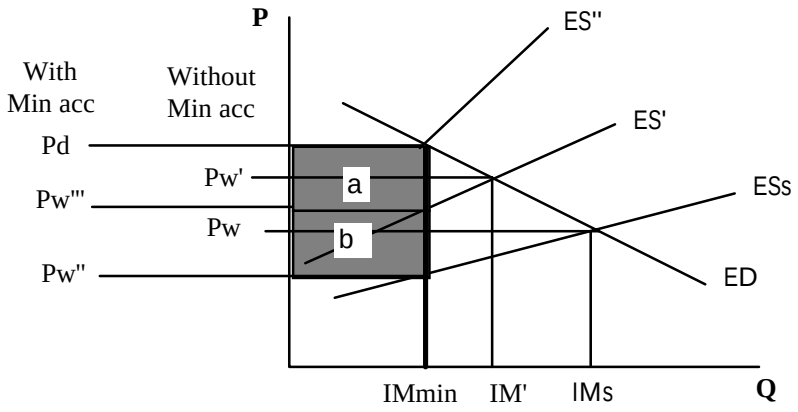
- The third case assumes the excess demand curve crosses the excess supply curve in the upper segment of the excess supply curve where the over-quota tariff is effective. The imports (IM'') are above the minimum access amount and the domestic price equals P_d'''. The government gets additional tariff revenue equal to area (g+h+i) but lose a share of area (b) and area (c) equal to (IM_{min} * (P_w''-P_w')) due to an increase in the world price to P_w''. Importers obtain additional rents equal to area (f+e), in comparison to situation two, and total import quota rents equal (f+e+d).

As Figure 11 shows a tariff rate quota imposes no absolute ceiling on import volumes as is the case with traditional quotas. The magnitude of the economic rent generated is determined by the minimum access level, within and over-quota tariff levels and any other policies that reduce the cost of production or increase the output price.

- ***Rent Implications of Export Subsidies***

The rent effects of export subsidy reductions are presented in Figure 12. In a free trade environment, a reduction in export subsidies shifts the excess supply curve (ES_s) to the left to (ES') reducing exports from IM_s to IM' while increasing world price from P_w to P_w'.

Figure 12: The Effects of a Reduction in Export Subsidies



Introducing a tariff rate quota changes the results presented in Figure 12. The dark vertical line represents the minimum access level. In this case, there is no effect on the quantity traded as a result of the export subsidy reduction (the move from excess supply curve ESs to ES') because of the binding import quota. The entire effect is transmitted to the world price that increases from P_w'' to P_w'''. The subsidy cost in the exporting country is reduced from area (a+b) to area (a).

The magnitude of the price change depends on the size of the shift in the excess supply curve and on the level of the tariff rate quota in the importing country. There are at least two distinct effects to consider. First, a reduction in export subsidies shifts the excess supply curve to the left and increases the world price. Second, there is a reduction in the import quota rents in the importing country due to the increase in the world price.

Figure 13 presents the combined effects of increasing market access and reducing export subsidies. Imports and world price levels are expected to increase. The expansion of market access from IM_{min} to IM'$_{min}$ lowers the domestic price from P_d to P_d', this combined with a shift in the excess supply curve from ES_s to ES' increases the world price from P_w' to P_w'' and reduces the

wedge between the world price and the domestic price. The importer's rent is reduced from the large gray area to the small black area.

Figure 13: The Effects of Enlarged Market Access and Reduced Export Subsidies on the World Market

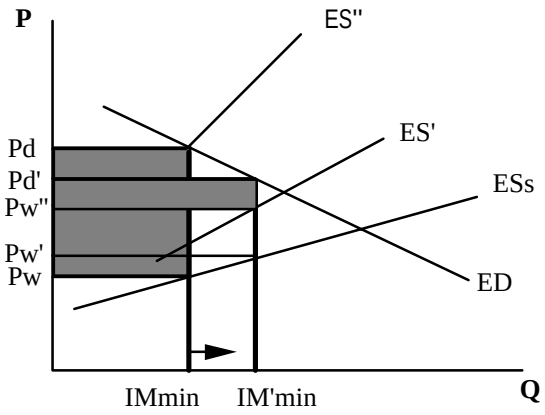


Figure 13 also shows that a tariff rate quota has a direct effect on the level of export subsidies a country can provide. Once the over-quota tariff is determined, export subsidies can never be set above that level. In other words, the over-quota tariff combined with minimum access puts a cap on export subsidies, as these over-quota rates are reduced, export subsidies are also restricted.

This review of the economic implications of tariff rate quotas and export subsidies highlights some of the problems that need to be overcome when modeling trade liberalization in the current policy environment.

5.0 PROBLEMS AND PITFALLS IN MODELING THE WORLD DAIRY SECTOR

There are several issues that need to be addressed when modeling the international dairy sector that are more basic than the analysis of tariff rate quotas and export subsidies. The following appear to be the most significant.

- The need for representative internal and world prices to determine the amount of "water" in the over-quota tariffs. The measured tariff equivalents will include the following items related to protection: 1) tariffs, 2) market access commitments, 3) consumer taxes/subsidies, 4) market price supports and 5) imperfect competition. In addition, they may also contain 1)

product quality and composition differences, and 2) market level and location differences that should not be ascribed to protectionism.

- The lack of variability in some time series and the erratic variations in others make behavioral equations difficult to estimate. Historically, production, stocks and trade flows have been determined by regulators in many OECD countries. The responses have not always been consistent with market conditions, but rather guided by political considerations. This has made changes in some variables very erratic and unpredictable. Other policy arrangements, like supply management where production is determined by the regulator, reduce the variability in prices and quantity produced.

- There is a difficult compromise between the need for disaggregating the developing world into smaller regions and the lack of consistent and reliable data for these countries. Developing countries are the major importers of surplus dairy products from OECD countries. Modeling the demand side for these developing countries is of increasing importance with the reduction in export subsidies. The capacity of these countries to import as world market prices increase may be reduced substantially. Unfortunately, the quality of the data available for developing countries is often questionable.

- The heterogeneity in the units of measurement for milk and dairy products make standardization an issue for international comparisons and modeling. Different countries report the production, consumption and prices of milk and dairy products using different units of measurement. The fat and non-fat content of milk and the technical transformation of fat and non-fat into dairy products also varies by country. While these differences cause little problem conceptually, developing a database free of errors so international comparisons can be made is not a trivial task.

- The large variety of dairy products of differing qualities make the homogenous product assumption shaky. Almost all international dairy trade models have utilized the homogenous product assumption, however butter and cheese are not homogeneous goods. For this reason intra-industry trade is common, and it is not appropriate to attribute all inter-country price differences to trade barriers.

- The allocation of import market access based on historical market shares, as opposed to market based allocations through auctioning may create unexpected trade flows and leave import quotas unfilled. Do unfilled quotas imply an absence of trade barriers or an inefficient

allocation of import quotas? The answer to this question is crucial in modeling trade liberalization and economic rent sharing.

- The necessity of conducting the analysis in terms of milk components and the lack of reliable technical conversion factors by country and dairy product. Technical coefficients for dairy product production and component milk prices are available for only a few of the most developed countries.

- The need to establish linkages between raw milk production, processing demand/supply and consumer demand. Supply functions, by product, for the milk processing sector are required to model trade liberalization. Unfortunately, the decision of which dairy product a processing plant will produce has been largely determined by domestic dairy policy. In this environment it is difficult to get reasonable parameter estimates from econometric estimation.

- The existence of supply management in many countries makes estimating supply curves difficult if not impossible. If supply curves cannot be estimated the "true" marginal cost of production must be inferred from other sources. Cost of production data is available in some countries, but even for these countries it is difficult to determine marginal costs based on average cost data (Larivière and Meilke, 1998; Moschini, 1989).

- The implementation of tariff rate quotas with export subsidies makes the closure of a trade model more challenging. Tariff rate quotas kink the excess supply curve making constrained trading solutions difficult to model. This is the issue considered in section 6.0.

6.0 MODELING INTERNATIONAL AGRICULTURAL COMMODITY MARKETS

Several trade models have been used to assess the impacts of agricultural policy reform and trade liberalization on the welfare of economic agents.[5] These models can be classified in three categories: 1) single commodity partial equilibrium models; 2) multimarket partial equilibrium models; and 3) general equilibrium models. Many of the more recent trade models are synthetic

[5] The Static World Policy Simulation Model (SWOPSIM-Roningen et al. 1991); the Trade Liberalization Model (TLIB-Shoven and Whalley 1992); the North American Trade Model of Animal Products (NATMAP-Hahn 1993); the World Food Model (WFM- FAO 1995); the Agricultural Trade Policy Simulation Model (ATPSM-UNCTAD 1995); the Rural-Urban North-South Model (RUNS-Goldin et al. 1995); the World Trade Organization Model (FMN-Francois et al. 1995); the FAPRI model (Devadoss, et al. 1989); the Multi-Regional Trade Model (MTR-Harrison et al. 1995); and the FAPRI-UMC World Dairy Model (Cox and Zhu 1997) are important contributions.

models, using estimates of supply and demand parameters from the literature. This section reviews some of the models used to assess trade liberalization in the agricultural sector, and the way tariff rate quotas and export subsidies have been incorporated in these models.

- ***Review of Trade Models***

Appendix I presents an overview of several models that have been used to assess trade liberalization in the agricultural sector, and in some cases to address policy issues specific to the dairy sector. While this review is not exhaustive, it appears that multi-region partial equilibrium models are the most common framework used to assess government interventions and trade liberalization in the agricultural sector. The structure of these models is generally consistent with economic theory and the supply and demand framework offers an adequate level of disaggregation for market analysis. The linkages with the rest of the economy are usually treated exogenously.

Most of the empirical models reviewed in Appendix I account for government interventions through price linkage equations. However a few models include policy variables directly in the supply and demand functions. All of the models treat dairy commodities as homogeneous products and dairy markets are assumed competitive in most cases. Only a few of the models account for multiple market levels and when they do, the models usually assume fixed marketing margins. Finally, a wide variety of policies have been simulated ranging from total trade liberalization to a gradual reduction of protection as a result of the UR agreement.

- ***Handling tariff rate quotas and export subsidies in trade models***

Most domestic dairy markets are linked, through trade to international markets. For this reason, trade flows and conditions underlying potential exchanges need to be incorporated in a dairy model. Trade flows can be endogenized by relating the domestic market to the world market through a price linkage (transmission) equation. For a small open economy, the domestic price will adjust to the world price after accounting for any factors or policy distortions that create a wedge between the domestic price and the world price. The price relationship is given by the following equation, where P_d is the domestic price, P_w the world market price and t an ad valorum tariff:

(1) $P_d = P_w(1+t)$

When the small country assumption is relaxed the domestic industry has an influence on the world market. In this situation, the world price must be determined endogenously along with trade. The price linkage equations must account for tariff rate quotas, export subsidies and any

other policies that put a wedge between domestic and world market prices. Sharma et al. (1996) review several trade models that have incorporated tariff rate quotas and export subsidies. In modeling tariffication, the approach followed by the WFM, RUNS and MRT models was to use the Producer Subsidy Equivalents (PSE) as a starting point for quantifying the base period protection level. The three components of the PSE used in the RUNS and MTR models are:

(2) $PSE = M + D + IP$

where,

M: per unit market price support, representing the wedge between the world price and the domestic producer price (subject to reduction commitments);

D: per unit total direct payment (not subject to reduction commitments); and

IP: per unit total indirect payment such as input subsidies (subject to reduction commitments);

The WFM model uses a more detailed disaggregation of the PSE to specify the price transmission equation as:

(3) $P_d = A + D + IP + T_s (1 - r_s) + ((1 + T_v (1 - r_v))) P_w$

where,

A: is a constant reflecting quality differences in the products;

D: represents those policies that are not subject to reduction commitments;

IP: represents those domestic policies that are not related to changes in world market prices, such as input subsidies, but subject to reduction commitments;

T_s and T_v are specific tariffs and *ad valorem* tariffs, in the base period (usually taken from country schedule); and r_s and r_v are the actual or assumed rates of tariff reductions.

As long as the first four constant terms are positive, the elasticity of price transmission will be less than unity. Where tariff and PSE data was not available, the WFM model used a price transmission elasticity of less than one to relate world prices to domestic producer prices. In these cases, the price equation is:

(4) $P_d = ø (P_w)^{\mu}$

where, μ is the price transmission elasticity, estimated or compiled from the literature. The WFM model was than calibrated for the base period, yielding values for the constant term (ø).

The RUNS model used the following price transmission equation:

(5) $P_d = (ß\ P_w + (1 - ß)\ \underline{P}\ ) * (1 + T\ (1 - r))$

where,

$\underline{P}$: is a domestic price index;

ß: is a coefficient that determines the relative weight of the domestic price index to the world price (the elasticity of price transmission);

T: is the tariff equivalent; and

r: is the rate of tariff reduction.

When ß is equal to one, the case of perfect price transmission, equation (5) reduces to:

(6) $P_d = P_w\ (1 + T\ (1 - r))$

The effect of assuming perfect price transmission in the presence of other domestic distortions is to overstate the effect of world price changes on domestic price changes. The expression used in the RUNS model to define the price wedge for the base period (T) is derived from the market price support component of the PSE.

Market access has usually been introduced in trade models as a constraint on imports. If the model is not generating enough imports to meet national commitments, domestic production is forced downward or domestic demand is forced to increase to ensure compliance. Both the WFM and the ATPSM models use this approach. The FMN model incorporates market access commitments as tariff-rate quotas. This implies that imports up to the current or minimum access level benefit from a lower tariff but face over-quota rates when exceeding minimum access amounts.

In most of the models, commodities are aggregated into large categories making increases in minimum access for individual products difficult to capture in the simulations. Aggregation introduces obvious limitations for sectoral analysis. Introducing market access on a less aggregated basis may change the results substantially.

The WFM incorporates export subsidy reduction commitments that differ according to the subsidizing country. In some cases, a maximum was introduced on the volume of exports according to the country's export subsidy commitments for a given commodity and year. In order to accommodate this constraint, *ad hoc* adjustments were made to: 1) increase domestic demand; 2) decrease production by lowering yields, or restricting the cultivated area.

For countries which subsidize only a part of their exports and target the subsidies to certain countries, no such constraint was modeled, but it was still assumed that part of the exporter's competitiveness would be eroded with export subsidy reductions. This was done by including an additional element in the price transmission equations that reflects a price reduction in the domestic market of the subsidizing exporter. Conversely, for the targeted importing countries benefiting from the subsidies, the adjustment in the price transmission equations reflected the higher price that would prevail in the domestic market as a result of a reduction in subsidized imports.

The RUNS model allowed for reductions in export subsidies by lowering per unit export subsidy rates from the base period level.[6] The MRT model incorporated reductions in expenditures on export subsidies based on the countries UR commitments.

Each of the models used a different way to incorporate tariff rate quotas, export subsidies, or both. As a result, their assessment of the impacts of trade liberalization on world market prices, trade flows and income vary accordingly. These variations are related to the partial incorporation of commitments in some cases, different practices in modeling tariff reductions, the use of different base periods and aggregation of countries and commodities, and differences in demand and supply elasticities.

7.0 A STYLIZED TRADE MODEL OF THE INTERNATIONAL DAIRY SECTOR

Modeling the dairy sector in any country is difficult. Many of the problems stem from the nature of the commodity. Raw milk is consumed in a wide variety of forms ranging from fluid milk to exotic cheeses. It is a major task in modeling the sector to be certain that the domestic supply of dairy products totally exhausts the domestic supply of milk. Older models of the dairy sector often accounted for products in terms of “raw milk equivalents”. In fact, milk contains a number of components (fat, solid non-fat, protein) which are combined in various proportions to produce a wide range of dairy products. Even fluid milk comes in a variety of forms. In Canada,

[6] These per unit subsidy rates were translated to *ad valorem* rates and the reduction commitments applied to them.

you can buy whole milk, 2% milk, 1% milk and skim milk. Hence, the concept of constant raw milk equivalents for modern dairy products is not very accurate.

Older dairy models did not contain explicit dairy product supply equations. Instead, milk was allocated to product categories in a hierarchical fashion. Typically, fluid milk, milk for soft products and milk for cheese was allocated all of the milk required to meet domestic demand. Any milk left over was processed into butter and skim milk powder. While somewhat arbitrary, this allocation mechanism was largely consistent with the dairy policies in most developed countries. In this allocation scheme the profitability of processing individual dairy products played no role in determining the allocation of milk supplies, except by assumption.

In modeling the most important aspects of dairy product trade liberalization: 1) the lowering of over-quota tariffs; 2) the expansion of minimum access commitments; and 3) lowering export subsidies, the older dairy models come up short. The lowering of tariffs will influence the relative prices of dairy products in the domestic market. As the relative prices of dairy products change, processors will reallocate milk from low margin products to high margin products. In a world of free trade, the marginal cost of producing a dairy product should equal the price received for the product. The expansion of minimum access commitments will have much the same effect, lowering the domestic prices of dairy products at differential rates and causing a reallocation of milk from low margin to high margin products. Hence, explicit dairy product supply curves are an essential part of any model which is to be used to analyze international dairy product trade liberalization.

The stylized dairy model presented below is based on the following assumptions:

- The country is an importer, and all of the issues surrounding the use of export subsidies are ignored. Clearly, for some countries such as the EU and the US this is a major issue which will further complicate the modeling task.
- Milk consists of two components (fat and solid non-fat) that are combined to make four dairy products: 1) butter, 2) cheese, 3) skim milk powder and 4) all other products, which in most countries will be dominated by the fluid milk market. While it would be advantageous to have more products and components this appears to be the greatest degree of disaggregation that international data will allow.[7]
- Butter, cheese and skim milk powder are traded internationally while raw milk, fat, non-fat and all other processed dairy products are not traded.

[7] There is considerable international trade in whole milk powder but the data does not appear to support detailed analysis of international trade flows. In this model whole milk powder is combined with skim milk powder.

- The domestic supply of butter, cheese and skim milk powder respond to the domestic processing margins for these commodities.
- Domestic markets clear by adjusting the price of fat and non-fat which in turn determines the price of milk.
- Inventories of products are ignored.
- The dairy sector is protected by two-tiered tariffs and the within-quota tariff is zero.
- The county meets its minimum access commitments for dairy products.

With these assumptions a dairy model for a typical dairy importing country is illustrated in Table 6.

Table 6: A Stylized Model of the International Dairy Sector

1)	Butter Price (P_b) $P_b = P_b^w + TE_b$	Cheese Price (P_c) $P_c = P_c^w + TE_c$	SMP Price (P_{sm}) $P_{sm} = P_{sm}^w + TE_{sm}$
2)	Butter Demand (D_b) $D_b = f(P_b)$	Cheese Demand (D_c) $D_c = f(P_c)$	SMP Demand (D_{sm}) $D_{sm} = f(P_{sm})$
3)	Butter Imports (IM_b) $IM_b = D_b - S_b - IMMIN_b$	Cheese Imports (IM_c) $IM_c = D_c - S_c - IMMIN_c$	SMP Imports(IM_{sm}) $IM_{sm} = D_{sm} – S_{sm} – IMMIN_{sm}$
4)	Butter World Price (P_b^w) $IM_b + IMMIN_b = ROWEX_b$	Cheese World Price (P_c^w) $IM_c + IMMIN_c = ROWEX_c$	Cheese World Price (P_c^w) $IM_{sm} + IMMIN_{sm} = ROWEX_{sm}$
5)	Fat Used in Butter ($D_{f,b}$) $D_{f,b} = z_1 S_b$	Fat Used in Cheese ($D_{f,c}$) $D_{f,c} = z_3 S_c$	Fat Used in SMP ($D_{f,sm}$) $D_{f,sm} = z_6 S_{sm}$
6)	Non-Fat Used in Butter ($D_{nf,b}$) $D_{nf,b} = z_2 S_b$	Non-Fat Used in Cheese ($D_{nf,c}$) $D_{nf,c} = z_4 S_c$	Non-Fat Used in SMP ($D_{nf,sm}$) $D_{nf,sm} = z_7 S_{sm}$
7)	Residual Fat Demand ($D_{f,r}$) $D_{f,r} = f(P_f)$		
8)	Residual NonFat Demand ($D_{nf,r}$) $D_{nf,r} = f(P_{nf,r})$		

9) Domestic Price of Fat (P_f)

$D_{f,b} + D_{f,c} + D_{f,sm} + D_{f,r} = S_f$

10) Domestic Price of Non-Fat (P_{nf})

$D_{nf,b} + D_{nf,c} + D_{nf,sm} + D_{nf,r} = S_{nf}$

11) Domestic Supply of Butter

$S_b = g[(P_b - z_1 P_f - z_2 P_{nf}), (P_c - z_3 P_f - z_4 P_{nf}), (P_{sm} - z_6 P_f - z_7 P_{nf})]$

Domestic Supply of Cheese (S_c)

$S_c = g[(P_b - z_1 P_f - z_2 P_{nf}), (P_c - z_3 P_f - z_4 P_{nf}), (P_{sm} - z_6 P_f - z_7 P_{nf})]$

Domestic Supply of SMP (S_{sm})

$S_{sm} = g[(P_b - z_1 P_f - z_2 P_{nf}), (P_c - z_3 P_f - z_4 P_{nf}), (P_{sm} - z_6 P_f - z_7 P_{nf})]$

12) Supply of Fat (S_f)

$S_f = z_5 S_m$

13) Supply of Non-Fat (S_{nf})

$S_{nf} = z_8 S_m$

14) Supply of Milk (S_m)

$S_m = g(P_m)$

15) Domestic Price of Milk (P_m)

$P_m = z_8 P_{nf} + z_5 P_f$

For tariff reduction analysis let TE_b, TE_c and TE_{sm} represent the base period "true" tariff equivalents for butter, cheese and skim milk powder. Let T_b, T_c and T_{sm} represent the UR over-quota tariff levels. The following IF/THEN statements need to be added to the model.

- If $TE_b > T_b$ then $P_b = P_b^w + T_b$
- If $TE_b < T_b$ then $P_b = P_b^w + TE_b$
- If $TE_c > T_c$ then $P_c = P_c^w + T_c$
- If $TE_c < T_c$ then $P_c = P_c^w + TE_c$
- If $TE_{sm} > T_{sm}$ then $P_{sm} = P_{sm}^w + T_{sm}$
- If $TE_{sm} < T_{sm}$ then $P_{sm} = P_{sm}^w + TE_{sm}$

These if/then functions are discontinuous and it might be useful in reaching model solutions to replace these relations with a smooth function that quickly moves domestic prices towards the world price plus over-quota tariff when the excess demand function shifts to the right and towards the world price when the excess demand function shifts to the left.

It is more difficult to model the effects of minimum access expansions because the importing country has four potential options for compliance: 1) let domestic prices fall to accommodate the additional imports; 2) reduce domestic supply by the amount of the increased imports and hold domestic prices constant; 3) some combination of supply reductions and price declines; or 4) increase exports to partially offset the increased imports if export subsidy commitments allow for this. Given the range of options open to the importing country it is unlikely that less than full liberalization alternatives can be analyzed in a totally "hands-off" modeling approach. The following method should work in the situation where the decision has been made to let domestic prices fall to accommodate the minimum access increases.

Solve the reduced form equation for the equilibrium domestic prices (P_b^*, P_c^*, P_{sm}^*) as a function of the enlarged minimum access amounts (IM_c^*, IM_b^*, IM_{sm}^*), i.e.

$P_b^* = g(IM_c^*)$, $P_c^* = h(IM_b^*)$ $P_{sm}^* = m(IM_{sm}^*)$

then add the following IF/THEN statements:

If $P_b^* > P_b^w$ then $P_b = P_b^*$
If $P_b^* < P_b^w$ then $P_b = P_b^w$
If $P_c^* > P_c^w$ then $P_b = P_c^*$
If $P_c^* < P_c^w$ then $P_c = P_c^w$
If $P_{sm}^* > P_{sm}^w$ then $P_{sm} = P_{sm}^*$
If $P_{sm}^* < P_{sm}^w$ then $P_{sm} = P_{sm}^w$

8.0 CONCLUSIONS

The completion of the Uruguay Round of multilateral trade negotiations resulted in the adoption of "tariffication" as a replacement for traditional nontariff barriers to trade. For dairy products, as for many other agricultural commodities, tariffication was implemented through a two-tiered tariffs (tariff rate quotas) where the minimum access quantity is charged a low tariff while imports above the minimum access quantity are charged much higher tariffs. While this creates more transparent border policies, the adoption of tariff rate quotas makes the modeling of policy change a difficult task. This paper reviews some of the problems in modeling policy changes in the international dairy sector, and propose a stylized trade model of the international dairy sector which could be used to analyze trade liberalization scenarios which involve less than full trade liberalization.

After reviewing the policy and pricing mechanisms in selected OECD countries, and the world trends in production, consumption and trade of dairy products, the paper focuses on analyzing the economic implications of tariff rate quotas and export subsidies on trade flows and economic rents. The implications of tariff rate quotas are analyzed within a partial equilibrium framework. The analysis shows that the impact of tariff rate quotas on trade flows, world price, and economic rents depend on: 1) the level of within and over-quota tariffs; 2) where the excess demand curve crosses the kinked excess supply curve; and 3) the elasticities of excess supply and excess demand. Moreover, the analysis shows that the economic implications of tariff rate quotas

are sensitive to the way a country chooses to implement border policy changes. For example, a country has a number of different choices it can make to accommodate an increase in minimum access commitments. Each choice of policy response has its own economic implications.

The paper also reviews the way in which tariff rate quotas and export subsidies have been handled in trade models. The review provides an indication of the major issues that should be considered when modeling trade liberalization in the face of tariff rate quotas. A stylized trade model is proposed to account for the most important aspects of potential dairy product trade liberalization. The model includes two milk components (fat and solid non-fat) that are combined to make four dairy products: 1) butter, 2) cheese, 3) skim milk powder and 4) all other products. It is assumed that butter, cheese and skim milk powder are traded internationally while raw milk, fat, non-fat and all other processed dairy products are not traded. The domestic supply of butter, cheese and skim milk powder respond to the domestic processing margins for these commodities. Domestic markets clear by adjusting the price of fat and non-fat which in turn determines the price of milk.

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Appendix I : Characteristics of seclected trade models used to assess trade liberalization in the agricultural and dairy sectors

Authors	Model	Estimation	Countries	Policy	Commodities	Simulation	Product assumption	Market structure
Griffith, G., R. Lattimore and J. Robertson (1993)	Non spatial Econometric/ synthetic dairy model	Econometric single equation	Australia, EC New Zealand U.S. and ROW	Endogenous policy specification	Whole milk equivalent and SMP	Unilateral liberalization in US and EC	Homogenous	Competitive
Cox, T. and Y. Zhu (1997)	Spatial dairy model	From literature (SWOPSIM)	25 countries/ regions	Exogenous shocks	7 dairy commodities and FAT and SNF	Total trade liberalization	Homogenous	Competitive
OECD (1991)	Non spatial agricultural model	Econometric/ synthetic	OECD (11) and ROW	PSE reduction	Liquid milk and processed products	1. Reduction 10% in support prices ; 2. 10% reduction in prod. quotas 3. Other broder policy reforms	Homogenous	Competitive
Blayney, D. P., and R. Fallert (1990)	Multimarket/ multi-regions non spatial		New Zealand, EC Australia and US		Dairy, cereals livestock and sugar	Total trade liberalization	Homogenous	Competitive
Meilke, K., R. Sankar and D. LeRoy (1996, 1998)	Synthetic/ non spatial of Canadian dairy sector	Literature Sensitivity analysis on parameters	Canada and US	Price equation	Industrial products and fluid milk	1. Reduction of blend price 2. Reduction of industrial milk price	Homogenous	Competitive
Duff, S. (1996)	Econometric/ partial equili-brium of the Canadian dairy sector	Econometric	Canada and US	Price equation	Fluid milk	1. Tariff reductions 2. Total trade liberalization	Homogenous	Imperfect competition

UNCTAD (1995)	Synthetic/ partial	Econometric and literature	145 countries	Price equations and quantative constraints	12 groupss of food commo-dities	1.Tariff reduction following UR 2.Minimum access following UR 3.Export reductions following UR 4.Domestic reduction following UR	Homogenous	Competitive
FAO (1995)	Synthetic partial of ag. sector	Econometric and literature	130 countries	Price equations	12 aggregates	1. Tariff reduction following UR 2.Minimum access following UR 3.Export reductions following UR	Homogenous	Competitive
OECD/AGLINK (1995)	Econometric/ synthetic non spatial multimarket	Econometric/ literature	7 OECD countries	Price equations	19 commodities 5 dairy products	No specific studies on dairy	Homogenous	Competitive
Cox, T and Y. Zhu (1997)	Synthetic non spatial	Assumed elasticities	All USDA's current PS&D data set	Price equations	Butter, cheese, SMP, WMP, milk		Homogenous	Competitive
Doyon, M., A.J.E. Pratt and A.M. Novakovic (1996)	Partial linear multiregions multi-products	Minimum cost network flow	Quebec, Ontario and Northeast US	Price equations	7 dairy products	1. Total trade liberalization	Homogenous	Competitive
Harrison, H., T. Rutherford and D. Tarr (1995)	General equilibrium	Econometric and literature	24 regions	Price equations	7 ag. products	1. Tariff reduction following UR 2.Export reduction following UR 3.Export reductions following UR	Homogenous	Competitive

Goldin, I. and D. van der Mensbrugghe (1995)	General equilibrium	Econometric estimation	22 regions 10 countries	Price equations	15 agricultural and 5 non-agricultural products	1. Tariff reduction following UR 2.Minimum access following UR 3.Export reductions following UR	Homogenous	Competitive
Roningen, V. O., J. Sullivan and P. Dixit (1991)	Synthetic partial equilibrium of agriculrural sector (SWOPSIM)	Econometric estimation	11 regions	Price equations	13 agricultural products	Two scenarios: 1) High world eco. growth 2) Full liberalization of farm support	Homogenous	Competitive
Hallberg, M .C. and A. D. Baker (1994)	Spatial equilibrium	Econometric estimation	Canada and US	Price equations	Raw milk	Free trade	Homogenous	Competitive
Rude, J. (1992)	Econometric and synthetic partial equlilibrium	Econometric estimation and literature review	Canada and Rest of World	Price equations and exogenous	5 dairy products	Five scenarios : 1)Dunkel proposal 2) Domestic reform 3) Optimal classified milk 4) Tariffication 5) Total liberalization	Homogenous	Imperfect Competitive