FAO TRADE POLICY TECHNICAL NOTES
on issues related to the WTO negotiations on agriculture

No. 11. Dairy - Measuring the impact of reform

CONTENTS

1 Introduction

Determining the impact of reforms to dairy sector policies is problematic and controversial. The extent and pervasiveness of intervention in the sector, and the resulting distortions to the international market, would suggest that liberalization could potentially lead to large gains, and indeed these are consistently reflected in most model-based analyses. The size of impacts has long been thought of as the key reason why dairy reforms and trade discussions have been so difficult. However, there are reasons for questioning estimates of the likely magnitudes of such impacts across different importing and exporting countries.

In addition to the difficulties involved in representing complex dairy policies in modelling frameworks, a key reason for the need to be cautious in the interpretation of the model results is the inadequate attention that has been given to the critical impact that reforms could have on the structure of the dairy industry in different countries and how this in turn would affect levels and patterns of production and trade. Despite the large gains anticipated from liberalization, these come at apparently large costs to many, and the perceived high adjustment costs are a principal factor impeding reform itself.

This technical note[1] begins by providing a brief overview of the production and trade in the international dairy sector, and trends in farm structure. It then considers which players (both within and between countries) are likely to be competitive in an undistorted market, first discussing the definition of a "world price" and then examining the current cost structures of different producers as a way of identifying the main determinants of the potential response to liberalization. The next section reviews the types of policies that are used to support dairy producers. The note then reviews the key dairy sector modelling studies in terms of their approach and their estimated impacts on prices, production, trade and welfare, as well as the potential impact of reform on developing countries' dairy sectors. The results are compared with reference to the pros and cons of the different analytical approaches that have been taken, in particular the challenges faced by analysts in adequately representing policies in a modelling framework.

2 Production, trade and farm structure

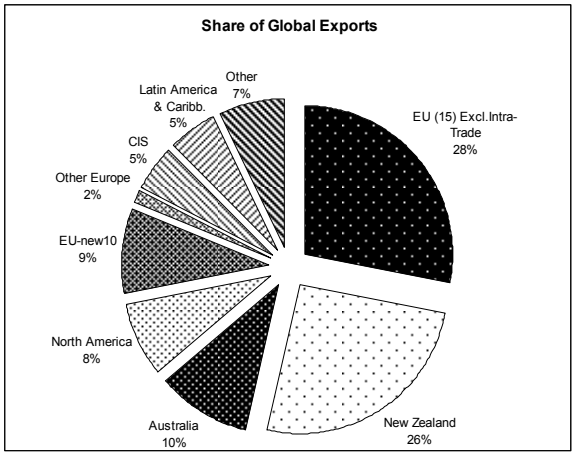
In terms of milk equivalents,[2] dairy product trade is currently about seven percent of global milk production. Growth in trade has been very slow and international prices are volatile, reflecting fluctuating supplies, very restricted market access by most countries and high prevalence in the use of export subsidies. Exporters are relatively few in number and some have significant shares of

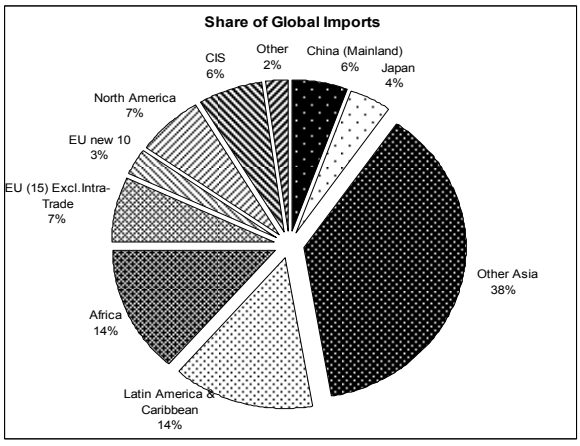
[1] This technical note benefits from discussion of dairy sector modelling at an informal expert consultation held at FAO, Rome in November 2004. It draws on a background information prepared for the consultation by Tom Cox, University of Wisconsin.

[2] Five main methods are available to calculate milk equivalents and each produces different estimates of a country's net trade position (see IDF (International Dairy Federation) (2004). For example, the self sufficiency rate in Germany is estimated to be between 102 and 130 percent depending on the method used.

global exports, as shown in Figure 1. Importers are found across south and south east Asia, Africa and Latin America. Many countries are largely self-sufficient. In fact, out of 150 countries in FAO's database, 26 countries were within 2 percent of self-sufficiency in the period 1999-2003, including some large producers such as the United States, India, and Pakistan. Of the same sample, only 18 countries had a surplus exceeding 2 percent, but 106 were less than 98 percent self-sufficient. For many developing countries that are not self sufficient, demand for dairy products is growing more rapidly than supply.

Figure 1: Shares of global trade





Source: FAOSTAT 2003.

The size structure of exporters and importers has important implications for the quantitative model results that are used to assess the impact of policy liberalization. While these results consistently agree that prices will rise significantly following dairy sector liberalization (see Section 6 for more detailed discussion of impacts), such estimates depend on the supply response from current and potential exporting countries.

For example, presuming an estimated fall in production in heavily subsidized regions, combined with higher demand associated with lower prices following a move to a more liberal policy regime, it is of critical interest to determine where the supply response will emerge to fill market requirements: that is, whose market share will expand and whose will contract. Equally, if the world price increases as predicted, policy makers and negotiators are interested in the extent to which the many net importers of dairy products would be negatively affected.

In reflecting upon these issues it is important to note that many countries both import and export dairy products and that liberalization may result in more countries becoming net exporters. As discussed later in this note, many models have difficulties in handling such switches in trade status for many reasons, including technical ones resulting from product aggregation, or the use of functional forms for trade which do not allow such switches.

A further challenge for analysts in addressing such issues is that because the global dairy market is fragmented and markets are not well integrated, highly diverse production systems and cost structures have developed both across and within countries. Policy benefits have been capitalized into cost structures of both producers and processors of dairy products, making estimates of market impacts on ultimate costs difficult to measure. As a result, different countries' dairy sectors are characterised by different proportions of small and large units, and often have high-cost production units co-existing with more efficient lower-cost ones. Whilst some large units may be profitable at high domestic prices, their production costs are often far above those of internationally competitive suppliers. Attempting to determine how the structure will change in each country following a change in producer incentives is a challenge, but critical in determining the full impact of reform.

Countries of the Organization for Economic Cooperation and Development (OECD) have by far the largest farm herd sizes. The largest milk farms are found in the United States, and also in Australia and New Zealand where the rate of government support is low. The smallest average farm sizes are found in certain highly supported countries of Europe, such as Norway, Switzerland and Austria. In many OECD countries, the number of producers has been falling considerably even in the presence of high support, in some cases by 50 percent or more in the last 15 years. As a consequence, while in virtually all areas average farm sizes are growing, size depends critically on the availability of factors of production, such as land, feed, capital and importantly other alternatives for labour. But a critical influence is the incentive structure of domestic policy, which may include benefit limits according to size, or geographical marketing limitations.

In developing countries, herd sizes are often very small. For example in India, the world's largest producing country, the average herd has 1.3 cows. In Pakistan, the average has 1.8 cows. But in other developing regions, particularly in low cost producing countries in South America, herd sizes are much larger, and are growing. However, even in developing regions, producer numbers are also declining almost everywhere. China is a most notable exception, where production has recently been growing by 20 to 25 percent per year due to increases in farm numbers and farm productivity.

In the context of this very diverse production structure, reform which significantly lowers incentive prices in highly supported countries, but raises them in low support countries, can possibly lead to large changes in structure. Such anticipated changes are difficult to capture in any model-based analysis.

3 What will determine the market and production structures post reform?

There are two critical determinants that must be considered in analyzing post reform production structures: (a) the incentives that producers will face post reform and (b) the costs of production.

(a) What is the price of milk?

Key to determining the impact on producer incentives is to understand what price they face and what this price is likely to be in a more open market.

Milk prices are generally quoted in terms of US$/100kg or US cents/kg of milk standardized to 4 percent fat and 3.3 percent protein content.

The International Farm Comparison Network (IFCN) summarizes the pattern of milk prices from the period 1996 to 2003:

- In the European Union (EU), average prices ranged between 29 and US cents/kg, with producers in the United Kingdom and Ireland receiving prices at the lower end of the range, and those in Scandinavia receiving the highest prices.
- Producers in Switzerland and Norway received prices 23 US cents/kg and 14 US cents/kg higher respectively than in the EU. By contrast, producers in the central and Eastern Europe (CEE) region generally received less than the EU price (Czech Republic 24 percent less and Estonia 45 percent less) although prices in Hungary were roughly equivalent to those in the EU.
- In Canada, the producer price was an average of 38 US cents/kg and in the United States ranged from 28 to 36 US cents/kg.
- By contrast prices in Australia, New Zealand, Brazil and Chile (16 to 17 US cents/kg) and in Argentina (12 US cents/kg) were significantly lower.
- Prices in developing countries are more difficult to determine accurately due to the high incidence of small farms and the existence of informal markets, but range from 15 US cents/kg in Pakistan, 20 to 22 US cents/kg in China and India to 28 US cents/kg in Thailand.

Attempting to determine an indicative world market price for milk is problematic, not least because of the volatility of the exchange rates among the major currencies: averaging international prices of dairy products over the past three years, and allowing for a margin for product processing, a figure of 18 US cents/kg is currently considered to be a benchmark. Countries whose milk prices are above this figure are not generally considered competitive on international markets, without significant product quality advantage or resort to export subsidies.

(b) Where are the competitive producers?

Table 1 provides a general picture of costs of milk production in different countries.

The information in this table illustrates that competitive producers are for the most part located in Oceania and southern parts of South America. Notably competitive producers are also found in India, Pakistan and China.

Table 1 - Costs of producing milk in selected regions/countries

Cost of production (US cents/ kg of milk)	Countries
< 18	Poland, Argentina, Pakistan, Vietnam, New Zealand, Western Australia, Brazil (larger farms), India (larger farms); Chile (smaller farms), China (smaller farms), Australia (smaller farms)
18-28	Estonia, Czech Republic, Brazil, Bangladesh, China, Thailand, Brazil (smaller farms)
28-35	Spain, Denmark, Ireland, United Kingdom, Hungary, United States of America, Germany (larger farms), Netherlands (larger farms), Israel (larger farms)
35-45	Austria, France, Sweden, Netherlands (smaller farms), Israel (smaller farms)
> 45	Switzerland, Norway, Finland, Canada, Germany (smaller farms)

Source: International Farm Comparison Network (IFCN) Dairy Report 2004.

3.1 Is cost of production lower on larger farms?

What is evident from Table 1 is that many small farms are competitive. However, these aggregations hide to a large extent the situation within countries. For example, a recent study of the UK dairy industry (Colman, Zhuang and Franks , 2004) suggests that at a price of 18.02 pence (32 US cents) per litre in 2002/3, 40 percent of farms would have produced at a loss. They also note a significant increase in efficiency since 1996/7, which they attribute largely to structural change with higher cost producers leaving the industry, as well as operational improvements and innovations. However, the analysis suggests that in terms of net margin/litre, farms with herd sizes of 40 to 69 perform almost as well as farms with herds of 100 to 149. In other words, medium sized farms often outperform those with larger herds. The authors suggest that the ongoing reform of the Common Agricultural Policy (CAP) is likely to result in efficient (at today's prices) farms with large herds going out of business and farms with medium sized herds growing to replace them. Understanding why this may happen can be complicated by the fact that the EU milk quota system has transferred rent value from land to quota. With the land market beginning to be more liberal, small farms are being bought out. In the United Kingdom and Ireland, there is a lot of flexibility in the land market which allows increases in the size of dairy holdings.

A slightly different picture emerges in the United States where at a price of 12.5 US cents/kg, 64 percent of small producers lose money on full cost basis while 39 percent of large farms make a loss.

These examples exemplify a universal picture of wide range in performance and the importance of a country's particular structure and policy set in understanding the process of structural change.

Based on cost of milk production only, highest performing farms in the IFCN survey by region are:

- South America: Argentina 350 cows (10 US cents/kg)
- Asia: Pakistan 10 cows (11 US cents/kg); Vietnam 4 cows (12 US cents/kg)
- Oceania: Western Australia 605 cows (12 US cents/kg)
- CEE: Poland 50 cows (14 US cents/kg)
- Western Europe: United Kingdom 183 cows (28 US cents/kg)
- North America: United States 1 710 cows (28 US cents/kg)

But what will determine how a farm actually reacts to a price change? From a cashflow perspective, a farm may have no reason to change, but from the point of view of economic success it may. For example an 80-cow farm in Germany may make no economic profit but may have a sufficient cashflow if it has no outstanding loans ,etc. This is in contrast to a farm in the United States which may be profitable but have a cashflow that is sensitive to small reductions in the producer price. A response is more likely with the latter. In general, many consider that with reforms of marketing systems in highly supported countries, considerable pressure would be placed on both very small and very large farms, with medium sized producers tending to increase in number and in production.

4 Current policies

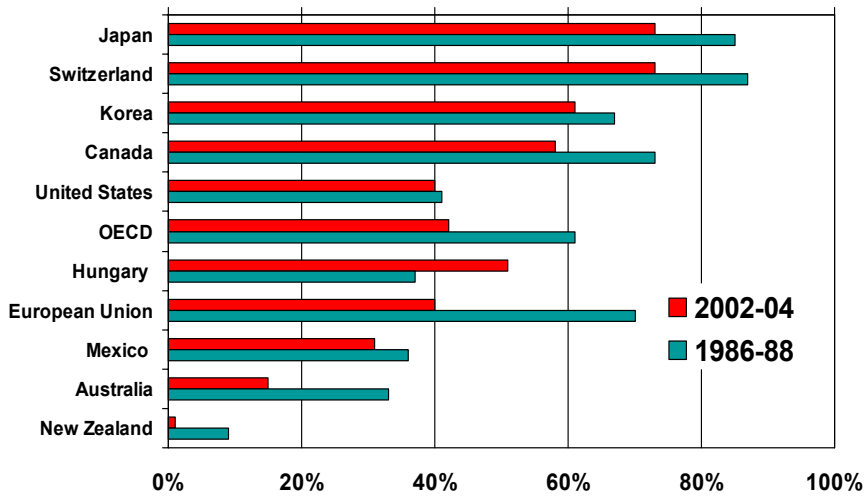
Dairy sector interventions vary widely in type and extent across countries. A broad indication of the level of support to OECD producers is provided by the Producer Support Estimate (PSE).[3] Figure 2 records the support to producers as a proportion of gross farm receipts for the period 1986-88 (the Uruguay Round base period) and for 2002-04. In recent years, the PSE has declined considerably, largely as a result of much higher international prices against which the market price support component is measured. Over 80 percent of the PSE has been market price support, largely secured by high tariffs, or tariff rate quotas (TRQs) with high over-quota tariffs.

With the exception of cheese, average global tariffs (including within and over tariff quota) for milk products tend to be at the higher end of the range for agricultural commodities. Cheese (67 percent) is at a similar level to oilseeds at 63 percent and sheepmeat at 69 percent. Skim milk powder at 115 percent exceeds sugar at 92 percent, but is less than wheat (117 percent) or coarse grains (124 percent). By contrast, whole milk powder (150 percent), butter (167 percent) and whey powder (217 percent) are amongst the most highly protected commodities.

But these are average tariffs across both in and out of quota levels; average over-quota tariffs for dairy products in the OECD range from 138 percent for cheese, to over 1 000 percent for whey powder and protection varies widely across the Quad countries as depicted in Table 2.

[3] The Producer Support Estimate is a measure of the transfers made to producers by governments either by direct subsidy to output or to inputs, or by support to market prices through intervention purchases and or import tariffs.

Figure 2: OECD Producer Support Estimate for milk (percent of gross receipts)



Source: OECD (2005)

Table 2: Average tariff rates in selected OECD countries

	EU	Japan	United States	Canada	OECD
Butter (within-quota)	66	35	9	6	45.0
Butter (over-quota)	144	679	117	306	304.7
Cheese (within-quota)	42	31	12	1	46.2
Cheese (over-quota)	97		84	246	138.9
SMP (within-quota)	35	16	2	2	47.5
SMP (over-quota)	88	275	60	201	289.0

Note: Percent *ad valorem* equivalents at end of the implementation period under the Uruguay Round.
Source: OECD, 2005.

Note that these are averages across numerous tariff lines and can mask differences in profiles across countries and in particular can hide tariff peaks. For example butter, skim milk powder (SMP) and whole milk powder (WMP) have between 30 and 40 lines, cheese has 224 in-quota and 240 out of quota lines. The widespread use of complex tariffs also makes it difficult to present average tariffs (i.e. due to difficulties in determining a tariff's *ad valorem* equivalent (AVE) and thus the values in the table should only be taken as indicative.

Market access is also highly restrictive in many non-OECD countries, but tends to be more open in countries where domestic demand is growing rapidly. Bound tariffs are typically high while applied tariffs may often be low.

International dairy product markets are significantly affected by extensive use of export subsidies. This impact has moderated in recent years as subsidies have declined, and as the relative market share of those using them has diminished. However, in comparison with most other commodities their use is still significant. About two-thirds of dairy exports were subsidized in the period 1995-1998, and dairy accounts for about one-third of total export subsidy expenditures and 7 percent of use in volume terms.

In many domestic markets, particularly the OECD, milk marketing systems are complicated by policies such as production quotas or marketing orders for fluid and manufacturing milk, with pricing schemes which discriminate among markets based on end use. These obscure market signals and allocate benefits to the various agents throughout the marketing chain, affecting industry investment and structure.

4.1 Reform problems

Reform of these policy sets is difficult in highly supported countries because of the potential re-distributional impacts and structural changes that could occur throughout dairy supply chains. Capital values that have accumulated under these policies are also large and the significant asset value reductions that would likely occur as a result of the reforms generate significant resistance among stakeholders. These changes could significantly affect producer incomes, employment and local rural economies, and cause governments to seek means of compensation for those who lose in the reform process. There is no easy means for those who gain from reform to compensate those who lose.

4.2 Where does the pressure for reform come from?

In the context of the WTO negotiations, a useful distinction can be made between those trying to protect their domestic markets (many) and those seeking to increase exports (few). Many of the WTO members are concerned with the very high levels of protection in the developed countries, notably in dairy, sugar and cotton, which are among the most heavily protected sectors. Both domestic support and border protection limit market access to potential developing country exporters. In general, these distortions lower world prices making it difficult for milk sectors in developing countries to be potentially competitive in export markets.

However, it is notable that in dairy, pressures for change in OECD policies are not coming from developing countries (although several are increasing their voice, such as Argentina and Brazil); rather negotiations are mainly within OECD countries. Among OECD countries, those pressuring most for reform have been New Zealand and Australia.

In WTO negotiations, the Framework Agreement of July 2004 has introduced some further reform options for highly supported sectors such as the dairy sector. A critical one concerns the categories of “sensitive” and “special” products, and how these categories will affect negotiations and subsequent implementation by member countries.

For OECD countries in which dairy support is high, dairy products will likely be classified as sensitive products. With such a designation, required tariff formula reductions could be traded against increased market access via tariff rate quota increases. Over-TRQ dairy tariffs are often among the highest, and also contain a lot of “tariff water” or “overhang”.[4] This means that where TRQ fill is high, TRQ expansion may lead to greater market access than would over-quota tariff reduction.

The designation of special products also offers a means to developing countries to protect their dairy sector if they wish to do so. In this case, it would mean that little or no change would be required in market access of these countries. It is difficult to anticipate which countries would choose to designate dairy products in this way. However, given that developing countries are now the major area of future increased demand, such designation could significantly affect international market growth over the longer term.

Many consider that dairy policies in developed countries may face future pressures internally, and be reformed under their own weight. Such pressure stems largely from new producers or processors who must face or carry large fixed entry costs due to the high capital values caused by such policies as quotas and restrictive milk allocations to plants. Other pressures stem from either high fiscal costs to governments, or equity considerations from other sectors that do not have similar support. For example, there is a movement to reform in the EU which has committed to eliminating production quotas and to cut intervention prices further. It is not clear to what extent this is driven by internal budgetary pressures or the need to conform to WTO commitments, in particular the elimination of export subsidies. The fact that at present in the EU, 86 percent of support is market price support suggests that since this is a transfer from consumers, who are less concerned about price, but more about food and animal safety etc, the main pressure is not budgetary. However, with the move to the Single Farm Payment (SFP), the budgetary implications will become more significant and visible, perhaps promoting further reform.

5 What are the estimated impacts of the removal of support?

Estimates of the impact of global reform help enlighten the discussion concerning the size and distribution of potential gains and losses that may result from reform, not only across countries, but also across the supply chain within these countries. They provide policy analysts and negotiators with a picture of what is at stake in reform. Negotiations related to the reform of trade and domestic policy are increasingly informed by model-based analyses, since they provide a systematic and consistent set of information which

[4] Tariff water refers to the difference between the tariff equivalent of market price support, and the applied tariff; it can exist when a given applied tariff prohibits trade, due for instance to quotas, and domestic prices are not linked to world markets. Tariff overhang refers to the difference between the WTO bound tariff and the applied tariff.

can be traced to specific parameters and assumptions.

A number of recent studies have been used to underpin arguments in favour of radical dairy sector reform. In this section, the pros and cons of a number of approaches to modelling the impact of dairy sector liberalization are reviewed. The main messages regarding estimates of impacts on production, trade and welfare are then expanded.

The main dairy sector studies can be categorised as follows:

1. Based on Computable General Equilibrium (CGE) Models: ABARE (2004), CARD (2004), World Bank LINKAGE.
2. Based on Partial Equilibrium Econometric (Time-Series or Equilibrium Displacement) models: OECD Aglink, FAPRI, ERS/Penn State WTO Model: Langley *et al* (2003); Abler *et al* (2001) and the Guelph Model: Lariviere and Meilke (1999).
3. Based on Partial Equilibrium Programming models: Toulouse EU Dairy Sector Model, Bouamra-Mechemeche, Chavas, Cox and Requillart (2002, 2004) and the University of Wisconsin World Dairy Model (UW-WDM) Hedonic Spatial Equilibrium: Cox, Coleman, Chavas and Zhu (1999); Cox and Zhu (2004); Zhu, Cox and Chavas (1999).

5.1 Computable general equilibrium (CGE) models

General equilibrium models are multi-sector models covering agriculture, manufacturing, and services with various levels of sectoral disaggregation. These models have been used to estimate impacts on incomes, relative prices and activity changes across sectors. Hence, they can provide an overall picture where gains/losses to trade liberalization in one sector can be considered in the context of gains or losses in other sectors.

CGE models generally assume somewhat stylized production technologies (Cobb-Douglas, generalized Leontief, etc.) due to the strong aggregation assumptions required to consistently aggregate/disaggregate individual sectors from national accounts data. The breadth of coverage often comes at the expense of depth of coverage on commodity, country, and policy detail that is often required to analyze distorted sectors such as agriculture in general and the dairy sector, in particular.[5]

Two examples of CGE applications are:

- *ABARE Global Trade and Environment Model (GTEM):*

This model computes a 1997-2014 Baseline using the Global Trade Analysis Project (GTAP) Data Base (Version 5). It includes 211 countries/66 regions; 57 sectors. The model computes GDP, GNP, population, capital stock, production, consumption, imports, exports and prices. It uses the WTO Integrated Tariff and Consolidated Tariff Schedule Databases to analyze the effect of cutting applied as opposed to bound tariffs[6]. The dairy sector is modelled only in aggregate and four policy scenarios are evaluated:

  - 15 percent reduction in bound agricultural tariffs which demonstrates minimal impacts;
  - 50 percent reduction in bound agricultural tariffs which demonstrates that large tariff reductions are required for significant impacts when applied rates are less than bound rates;
  - Additional 50 percent comprehensive trade reforms which measure the impacts of cuts to applied tariffs, rather than bound tariffs;
  - 50 percent unilateral (tariff) cuts by India which demonstrates India's importance in a liberalized global market.

- *World Bank LINKAGE Model.*

This model computes a 1997-2015 Baseline using GTAP (Version 5.4) Data[7]. It includes 23 Regions and 22 Sectors (15 agricultural, with an aggregate dairy sector). The model has both macro and micro-economic assumptions on the mobility of factors, production technologies and income, and price and trade elasticities. Labour and land productivity growth are exogenous but the model has savings driven investment and capital accumulation, and differential supply/demand and GDP growth are modelled. The model incorporates six protection instruments: import tariffs, export subsidies, capital subsidies, land subsidies, input subsidies, and output subsidies. There are no preferential policies (GSP and regional agreements) in this version and no changes in investment flows. Likewise, there are inherent dynamic gains from savings and investment behaviour, but no induced productivity changes. Tariff reductions dominate all liberalization impacts in the three liberalization scenarios: global merchandise trade reforms, agricultural and food trade reforms and agricultural trade reforms.

[5] FAO Trade Policy Technical Note 13 discusses in detail the use of CGE models for analysing the impacts of global trade reforms.

[6] Note that application of cuts to maximum bound rates, as if they are actually applied tariffs, will overstate liberalization impacts.

[7] See FAO Trade Policy Technical Note 13 for information on more recent changes to the LINKAGE model and the implications for estimated impacts.

5.2 Partial equilibrium (PE) models

Multi-commodity partial equilibrium models allow modelling interactions between agricultural sectors, and often include detailed policy specifications for each sector. Examples include modelling the impacts of feed grains or other livestock (e.g., beef, sheep) prices on dairy production (supply shifters) and the impacts of dairy beef on the livestock sectors (see Box 1 for details). Hence, partial equilibrium models can analyze the tradeoffs within agricultural sectors due to trade and/or domestic policy liberalizations and may allow for more detailed policy analyses than CGE models.

Box 1. The importance of sectoral interactions

Supply Impacts

Many developed economy milk production regions (New Zealand, Ireland and other primarily grazing based milk production regions are prominent exceptions) use feed grain and protein concentrates to enhance milk yields. In these regions, with broader liberalization that includes the grain and oilseed sectors in which many of these countries are also net exporters, impacts on milk supply response would reflect changes in the milk/feed price ratios. For "quasi-competitive" regions such as the west and southwestern United States , relative milk/feed prices may have large impacts. A fall in domestic milk prices, combined with an increase in feed ration prices could have important implications for the regional trade flow and welfare analyses resulting from liberalization. In a similar fashion, liberalization of the livestock sector, which for example, causes beef prices to change, will also impact on milk supply via effects on aggregate profitability with beef as a joint output, in some areas, or as an alternative enterprise exploiting pasture resources in others. Partial equilibrium dairy sector models will not handle these interactions well, without adjustment to a milk/feed price supply shifter, or to a cow herd/beef price shifter. PE and CGE models include these effects and can be used to help quantify the magnitude of these cross sectoral impacts.

Demand Impacts

On the demand side, relative price and substitution impacts (dairy versus other fats and proteins) can be significant. Cross price elasticities among dairy products and between meats, grains, oilseeds, and other food commodities are required to capture these effects. However, there can be difficulties in obtaining good own and cross price effects for disaggregated food items that are amenable to world policy simulations. PE models can be used to help quantify the magnitude of these impacts, but without an appropriate demand system, capturing all substitution possibilities, demand effects may be overstated.

On the negative side, partial equilibrium models generally do not address the non-agricultural sectors that can be an important part of trade negotiations. Key examples of these limitations include modelling the income impacts of both agricultural and non-agricultural trade liberalization and modelling the impacts of productivity growth and factor mobility (labour and investment). In addition, partial equilibrium models themselves often lack commodity and policy detail. Key examples of these shortcomings in dairy sector modelling include: lack of attention to milk proteins and lactose as opposed to butter, SMP, cheese, and WMP commodity specifications, and the absence of classified and other multi-tiered pricing and/or implicit export subsidy schemes.

5.3 Econometric/time-series models

These partial equilibrium models generally estimate multi-region, multi-commodity trade linkages with structural excess supply and demand, regional and world price linkage and quantity balance equations. Econometric time series based world trade models provide statistical estimates of key structural relationships and parameters such as quantity and price linkage and balancing equations, farm supply, processor derived demand for milk (and/or milk components), and commodity supply and demand price response elasticities. This allows for statistical hypotheses tests on both key structural and parameter specifications. Time-series based models also provide a recursive multi-year static policy simulation framework, allowing for dynamic simulations (via time-series linkages) and Monte Carlo simulations to assess model-based distribution of impacts utilizing the statistical distribution of key econometric/structural parameters (e.g., FAPRI's domestic United States policy simulations).

On the negative side, estimation of excess supply/demand curves under domestic and trade policy distortions is a difficult econometric challenge. This is particularly true when there are multiple policy regimes over a time period of sufficient length necessary for the reliable estimation of parameters. Time varying (as a function of policy regime) parameter modelling often resorts to dummy variables to characterize the different policy regimes and fails to capture these in a satisfactory way in the model's structural equations.

A second key shortcoming is the explicit modelling of spatial and hedonic (milk and product) characteristic linkages. Current dairy processing technology trends are likely to be quite important to more fully characterizing and modelling the behaviour of increasingly large, integrated, and often multi-national dairy processors. In this context, a multiple output/multiple component (input) and scale sensitive cost function is one way to proceed. This type of approach is crucial to better modelling of trade and domestic policy induced business structure and processing technology innovation,

where the size of the domestic–world price "margin" drives the economic incentives to innovate, which is a key driving force in the world dairy sector. It is difficult to estimate such cost functions using standard econometric techniques (for data availability reasons alone) and hence, modelling processor commodity supply remains a key econometric challenge.

5.4 Programming/spatial models

Mathematical programming, spatial equilibrium based world trade policy models are an alternative to econometric time-series based models, although these models can often be complementary to each other.

One advantage of the spatial equilibrium approach is that it implicitly provides excess supply and demand curves with explicit detailing of domestic and trade policy distortions. Specification of regional milk and/or milk component supply, processor derived milk and/or component demands and commodity supply via a multiple output/multiple component input cost function, and commodity demand functions imbedded in a regional spatially based trade model with detailed domestic and trade policy distortions is possible. Two tiered TRQs and applied versus bound rates on within- as well as over-quota imports, bilateral and/or other preferential tariffs and quota regimes, are then applied directly to the spatial (price/quantity) arbitrage conditions governing spatial trade flows. Implicit excess supply and demand functions are then generated by the optimization modelling, including all of the policy distortions in all of the potential trade markets.[8]

A second key advantage of the programming/spatial equilibrium approach is the explicit modelling of spatial and hedonic (milk and product) characteristic linkages. Generally, processing sector technology is characterized via component balance constraints and explicit processor optimization behaviour. Such optimization routines are commonly used to allocate milk (component) supplies[9] to the highest valued commodity utilization. Optimized interplant and interregional flows of dairy based ingredients are common and increasingly important to attaining efficient milk component (procurement and marketing) utilization.

It is also somewhat easier to explicitly impose disaggregated and detailed domestic and trade policy distortions (two tiered TRQ's, in particular) in a spatial programming model rather than using aggregated policy wedges such as the OECD's Aggregate Measures of Support (AMS) or PSEs.

However, severe data limitations, particularly for disaggregated commodity, and detailed domestic trade policy modelling, remain a key limitation. Reliable data on commodity and trade policy details (aggregating tariff/subsidy lines; maximum bound versus applied rates), country/regional GDP and exchange rate forecasts, farmer versus processor versus retailer market power, and details on the increasingly important dairy based ingredient markets are often difficult to obtain. Spatial models also require parameterization of supply/demand price response (elasticities). These are generally borrowed from econometric time-series models or their results, and, therefore, key price and behavioural responses used in these models often import many of the shortcomings of the econometric time-series approach.

The University of Wisconsin World Dairy Model (UW-WDM) is an example of a country/regional, commodity, and policy detailed spatial hedonic equilibrium, programming model. It incorporates 26 country/regions, 9 dairy products (cheese, SMP, WMP, butter, dry whey, lactose, casein, evaporated/condensed, and a residual - mainly non-traded fluid, frozen and soft product - category, and four milk components (fat, casein, whey protein and lactose). It models both domestic support (milk quotas, production and consumption subsidies, intervention price, and classified pricing policies) as well as trade distortions (including TRQs (two tiered tariffs and quantitative import quota/access restrictions), and export subsidy (both quantitative and expenditure) commitments. However, maximum bound rates versus applied rates are used to model both tariffs and export subsidies.

The model is solved recursively over multiple years with exogenous supply shifts modelled from five-year moving average technology trends, and exogenous demand shifts driven by country/region GDP and population growth projections and regional income elasticities. Previous year endogenously determined solutions for milk and commodity production, consumption and prices are used to recursively initialize the next year solution with the exogenous supply and demand changes and both the exogenous or endogenous (recursively) determined domestic support and trade policy changes.

In addition, the UW-WDM incorporates a hedonic based processing sector where regional milk component availabilities are allocated to their highest valued usage subject to regional component balance and technology constraints.

[8] In contrast, econometrically estimating say, Oceania's export demands as a function of all the domestic/trade policy distortions in all (or even in the major) commodity and regional markets as reflected in 30 years of time series data is likely to be exceedingly difficult.

[9] Some of this will be raw milk, while increasingly, others will be dairy based ingredients such a skim milk, evaporated/condensed bulk skim, SMP,WMP, MPCs etc.

Developing countries are assumed to freely utilize intermediate dairy products (SMP, WMP, dry whey, evaporated/condensed milk) to reconstitute their locally consumed cheese and residual (fluid, soft and frozen product) production. In contrast, developed countries, via local standards of identity constraints, are not able to source intermediate dairy products to produce cheese or residual dairy products.

While the country/regional, component/ commodity, and policy detail in the UW-WDM are an improvement over many world dairy sector models discussed above, it does suffer from a number of limitations. Bound as opposed to applied tariffs are assumed to link domestic and world prices. To the extent that applied rates are less than the maximum bound rates, model results will tend to overestimate the impacts of dairy sector liberalization. Productivity and GDP growth are assumed as exogenous, as is common in most partial equilibrium modelling and the extent that more general (non-dairy) liberalization generates GDP induced dairy demand growth, the impacts of dairy sector liberalization will be understated under these assumptions.

Another limitation is the assumption of competitive farm/processor and processor/retail markets which may be inappropriate. Whether these potential deviations from competitive pricing substantively affect dairy liberalization scenario impacts will obviously depend on the nature and magnitude of these deviations and little empirical work is available to answer these questions. Oligopsony power by processors over dairy farmers will result in lower farm milk prices than competitive solutions. The existence and magnitude of potential countervailing oligopoly power by dairy farmer cooperatives could lessen or even eliminate these impacts. Similar analogies for the processor/retailer market power potentialities also apply where wholesale/retail prices could be higher and respond asymmetrically (slower downward adjustment) under non-competitive pricing. These issues require substantive additional research with potentially severe data limitations concerning farmer coop, processor and retailer market shares, prices received, etc.

Lastly, the UW-WDM is parameterized using elasticities from previous studies and is subject to the limitations of these estimates. This practice is common among models. However, as model specifications and data bases differ, use of estimates from other studies in these circumstances may not fully use the information consistently with its own specification or data set.

6 Comparing the impacts

Before considering the estimated impacts of liberalization generated by these models it is first useful to determine the main factors that, in addition to differences in the general model approach and structure, might affect the comparability of the results.

The time periods of analysis, for example, whether pre-Uruguay Round (UR), the UR implementation period for developed countries (1995-2000), or post-UR implementation (2000 and after), differ across the studies and can have a significant impact on the results. In some respects, post-2000 based models are attractive as starting points for modelling further liberalizations as they reflect many of the major adjustments induced by the UR Agreement on Agriculture.

As described above, most of the models have highly aggregated dairy sectors (e.g. four dairy products and no milk components) and blunt representations of policy instruments (e.g., aggregate PSE-type policy wedges as opposed to detailed domestic and/or trade policy distortions). Thus, modelling and data assumptions are a key reason for possible divergences of results.

The comprehensive and complex nature of dairy policy, the complications of the multi-component nature of milk and milk products and their diverse consumption attributes, make it very difficult to model the impacts of policies and identify the eventual industry supply response for a number of reasons. The approaches taken to addressing these issues in the models need to be taken into account when interpreting their results:

(1) Product differentiation

This represents a problem for both net trade models and spatial models. Measuring domestic milk processing responses is complicated by allocation of milk components, fat, protein and other solids to diverse milk products such as butter, cheese, and milk powders.

Aggregation of dairy product lines, required to some extent in all models, is a problem in several respects. Decisions must be taken as to what conversion factors should be used, importantly, whether they should reflect fixed proportions technology or variable proportions technology. How to model aggregate border measures is another issue that must be broached, for example, what weighting factors should be used to aggregate tariff levels across lines. It is important to note that products can be differentiated simply by virtue of the aggregation process.

Decisions must also be taken as to product coverage. What products and characteristics should be modelled? It is preferable to model with components (fats, solids-non fat, and protein) rather than raw milk equivalents. Commodity coverage (butter, SMP, WMP, cheese) should be disaggregated enough to be meaningful, but the model must be tractable.

(2) Border protection

In addition to the issue of aggregation, modelling tariff liberalization is complicated by compound tariffs and tariff preferences. The effects of complex tariff systems depend in part, on the method of aggregation. Aggregation problems make the use of *ad valorem* equivalents (AVEs) attractive, but since the world price will change, the AVEs should be determined endogenously. Incorporating *ad valorem* tariffs into programming models is also a challenge.

In determining changes in trade patterns an important assumption in some models is the degree of substitutability between domestically produced product and imported product (see FAO Trade Policy Technical Note 13 for further discussion of this key assumption). In the case of dairy, however, high tariffs have often been prohibitive and prevented all trade, limiting empirical analysis of import substitutability with domestic products.

A number of issues can confound attempts to model the impacts of reform where TRQs are extensively used. Perhaps most important, given the structure of global trade as discussed in Section 2, is that the import/export regime can switch with liberalization. Additionally, quotas are sometimes binding and sometimes not. Under-fill may be due to administration and not to deficient demand (Skully 2001). Imperfect competition also has implications for quota fill.

It is therefore hard to measure accurately the extent of tariff “water” or “overhang” and to assess tariff rate quota systems correctly. But it is important, particularly where price uncertainty or demand growth exist.

(3) Export subsidies

Most models are configured in such a way that if the domestic price exceeds the world price, an export subsidy exists, otherwise it does not. They also tend to use bound as opposed to applied subsidy rates. But this avoids the fact that either the volume commitment or the expenditure commitment will be binding and it is possible for countries to reformulate policies to fall within the commitments if one ceiling is breached. An additional issue is how differentiated products are dealt with in this context.

(4) Domestic policy

Modelling domestic policies such as classified pricing has important implications. Price discrimination mechanisms allocating milk to different product categories, such as fluid and manufacturing milk can obscure marketing margins. Often blended producer prices or class differentials form a part of policy and these are frequently poorly represented in the models (Sumner 2000, OECD 2005). A potential effect of these is to raise producer prices and shift milk from non-traded fluid to traded manufacturing classes.

(5) Milk processing sector

Modelling processing structure and technology correctly is important to capturing milk product production and trade. Perfect competition and constant returns to scale are often assumed in models although evidence suggests that this is far from being the case. In addition, while milk allocation should depend on relative profitability, it is regulations and system rigidities that often determine this in practice. Identifying the processing margin under these situations is not easy. Lack of market power, with many farmers marketing a fresh, non-storable product to a few processors has long been a problem in the dairy sector.

(6) Cost structures and supply response

Observed cost structures have arisen in large degree as a result of past and current policies. Cost structures that would exist under free market conditions are difficult to anticipate. The problem for modelling is that the structure referred to in Section 2 is not well reflected in supply and demand functions. In the case where production quotas apply, for example, the supply function is not observed, and locating the free market supply curve from quota values is problematic. In addition, the short run supply elasticity is probably quite low due to the limited capacity for structural transformation, but adjustment takes place in the longer run. Given these difficulties, it is often unclear to what extent there will be a supply response, and indeed whether it will be negative or positive (see Box 2).

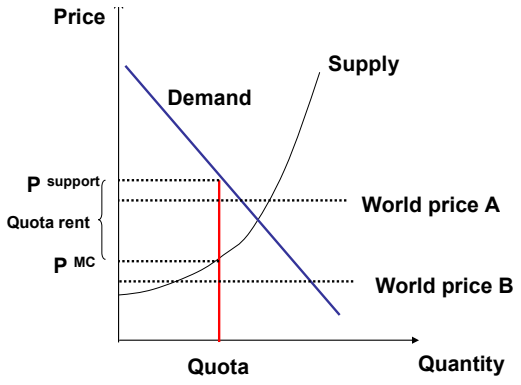
Often, it is assumed that a move to decoupled payments will induce a reduction in supply. However, the evidence on this is disputed (see FAO Trade Policy Technical note 4 on Domestic Support). Colman and Franks (2005) note that in a recent survey of United Kingdom dairy producers, only 20 percent will treat the SFP as a non farm payment. In contrast, 52 percent suggested that they would invest the SFP in dairy production and 19 percent in other farming activities.

(7) Demand for dairy products

Identifying consumer demand within each country is important in determining how trade may change under policy reform. Without a complete demand system, and without robust parameters that can capture demand changes with large reductions in supported prices, demand effects may be overestimated. Some models with ad hoc demand specifications have large dairy product demand elasticities with few identified substitutes.

Box 2. The challenge in estimating supply response where supply restrictions apply

For a number of important markets, production quotas and/or marketing orders are in effect. Estimating supply impacts in the presence of production quotas is difficult since observation of the underlying supply curve is not possible. Production quota is typically set to reflect demand requirements at producer support prices that are specified above industry marginal costs, and hence increases or decreases with demand conditions. Quota rents are determined by price and cost conditions. In the figure below, quota rents per unit of production are $P^{support}$ minus P^{mc}, where the former is the effective price to producers under the quota and the latter is the marginal costs of producing milk at the quota volume. Under liberalization, or with substantially reduced prices, it is important to know the position of the underlying supply curve, to be able to predict how production will respond. Even if reform leads to a fall in the price to the world price level A, the quantity supplied may increase if quotas are eliminated. However, if prices fall to world price level B, supply will decrease. However as prices fall, rent losses are faced by producers, and imply a large reduction in producer wealth. Models differ in their assumptions about how to locate the underlying supply curve, and hence often have very different results about a quota country's trade position after liberalization.



7 What are the impacts?

With the difficulties in interpreting how different models have addressed (or not addressed) the issues above in mind, this section considers the insights that might be drawn from models results.

7.1 Price effects

Various studies examine the impact of different degrees of policy reform, either to assess a particular WTO proposal, the impact of a regional trade agreement, or at the extreme, complete policy liberalization. Only the last two are easily comparable and also tend to provide the best benchmark for assessment of model results. However, such drastic reform is far beyond what is likely and, importantly, results in changes large enough to question the accuracy of models which simulate situations far outside historical experience.

Despite the many difficulties in assessing policies, there is, perhaps surprisingly, substantial agreement on the main impacts of policies on international markets. Table 3 summarizes the anticipated price impacts of full policy liberalization on key market participants and international markets.

Almost all studies have a fair degree of convergence regarding the size of impacts of full dairy sector liberalization on Canadian (-27 percent to -44 percent), United States (-0 percent to -12 percent), Oceania (+25 percent to +36 percent) and Southern Cone (+17 percent to +24 percent) milk prices. Impacts of full dairy sector liberalization on the EU (-5 percent to -26 percent) vary more dramatically, due to alternative assumptions concerning specification of domestic supports in general and EU milk quotas in particular. Additionally, in the OECD model, the CAP reform is assumed in the baseline and hence a lower estimated impact is generated by the model. Similarly the UW-WDM model applications in 1999 (using a 1995 base) and 2004 (using a 2000) base show a -12 percent difference in price impact in the United States as a result of the incorporation of the 1996 Farm Bill in the latter.

These results also show that farm prices of dairy product exporters, typically represented by prices in Oceania markets, would increase by at least 25 to 35 percent under full liberalization. Dairy product prices would increase similarly, and the butterfat (butter) component of milk would be affected more than the protein (skim milk powder) component, implying this market is relatively more distorted.

Table 3: Farm price impacts of full dairy sector liberalization
(percent change from base scenarios)

	Canada	EU	US	Oceania	Latin America Southern Cone	World dairy prices (Oceania)		
						Cheese	SMP	Butter
Cox and Zhu (2004)	-43.8	-22.6	-12.2	25.9	24.0	22.3	19.9	46.0
Langley *et al* (2003)	-35.0	-5.0	-8.0	26.6	22.0	33.0	10.0	60.0
Lariviere and Meilke (1999)	-36.0	-18.0	0.0	-	-	-	-	-
OECD (2005)	-27.9	-9.8	-12.7	28.4	20.0	34.5	21.5	57.4
Zhu, Cox and Chavas (1999)	-32.0	-25.8	-0.4	35.5	17.2	20.3	22.1	46.2

Table 4: Alternative scenarios: Price impacts of less than full liberalization
(percent change from base)

Scenario	Butter	Cheese	SMP
Gradual 50 percent TRQ expansion	1.4	0.3	0.7
Gradual 50 percent TRQ expansion and 36 percent reduction of in-quota tariffs	2.3	0.4	0.8
Gradual 36 percent reduction; out-of and non-quota tariffs	8.5	4.7	0.8
Gradual 36 percent reduction; in- out-of and non-quota tariffs and 50 percent TRQ expansion	9.5	5.0	1.9

Source: OECD (2005).

However, industry experts suggest that the estimated price effects from these models should be tempered by the emergence of new producing regions in South America and several transition countries, which appear to have considerable potential to expand output at higher international prices and would dampen any price increase in the longer run. However, it is generally agreed that dairy policy liberalization will increase international dairy product prices significantly, although perhaps not by 25-35 per cent as suggested by most studies, given supply potential in some low-cost producing areas.

Clearly, all of the results suggest that the heavily protected, developed economy dairy sectors will suffer milk price declines under full liberalization with these impacts varying with the degree of existing market distortions. Similarly, all of the results suggest that competitive exporters (Oceania and the Southern Cone of South America) will experience substantive milk price increases under full dairy sector liberalization.

As concerns world commodity prices (assuming the Oceania or New Zealand price as the world price), the spatial equilibrium UW-WDM (1995 as well as 2000 base results) suggests that cheese (+20 percent to +22 percent), SMP (+19 percent to +22 percent), and butter (+46 percent) prices will rise substantively under full dairy sector liberalization. While the ABARE results are twice as large for cheese price increases (+40 percent), results for SMP and butter are quite similar across all models.

Alternative scenarios are run in most models but are difficult to compare across models. OECD is illustrative in attempting to model possible WTO outcomes. It is clear from Table 4 that less than full liberalization will result in far less substantive world price impacts, even where fairly optimistic reform scenarios are assumed.

But will liberalization really make any difference to long-term declines in real international milk product prices? Whereas some increase might be foreseen if expectations of reform are factored in, there are a number of potential reasons for believing that longer term trends will be largely unaffected. For example, productivity is the key driver of long-term trends, not market size or access; supply is shifting from subsidized to non-subsidized exporters and as a result, new suppliers are likely to appear. Note that although the EU prices will fall especially for commodities,

there is the potential for the EU to re-emerge as a competitive non-subsidized producer of higher value dairy products. This is likely to result in intense competition in cheese/fresh products and further commoditization (e.g. WPC/MPC, Emmental, and mozzarella),

Industry experts believe that trade liberalization is likely to have some impact on price, but that some of that impact on price is already happening, so any impact will be indirect and hard to measure, and that the supply response is likely to result in a resumption of the long-term price decline as technology improves and its diffusion is increasingly adopted in emerging markets.

There is also the question as to what proportion of any potential price increase would be realised by producers. The power of retail chains has a major influence on processor and producer prices. There is evidence of farmers losing share of the dairy chain to retailers, especially where farmer structures are weak and they have little control over processing. A United Kingdom Milk Development Council study (2005) suggests that retail margins rose from 35 percent to 60 percent on mature cheddar over a 10-year period. Limited price transmission means that producers are not likely to see a significant price increase at the farm level.

7.2 Production effects

What is less clear from the various studies of policy reform is the impact on milk production. High farm gate prices in some OECD countries have encouraged investment in large dairy farms, with production costs well above those of low cost international producers. In a liberalised market, post-reform, it is estimated that competitive milk producers would produce at a farm gate price of about 23 US cents/kg, an increase of 5 US cents/kg over the pre-reform world prices. Producers, both small and large whose costs exceed this, including any associated transaction costs and processing and marketing cost differentials, would face significant adjustment pressures. The cost profile shown in Table 1 provides an indication of both the location and degree of potential adjustment pressures. However, it needs to be borne in mind that this cost profile is a pre-reform profile, and would be expected to change under a new policy environment within each country.

Figure 3 presents milk production impacts from two recent studies by Cox and Zhu (2004) and OECD (2005). The most surprising and perhaps controversial result is the impact on the EU where Cox shows production increasing, while OECD shows a decline. While the bases of the studies are different, the difference largely reflects how the underlying market supply curve is positioned; the Cox study estimates a quota rent of about 40 percent of the current price (that is, industry marginal production costs are 60 percent of current price, at the quota output – see Box 2), while the OECD assumes a rent value of about 20 percent. The studies also differ for Mexico, where OECD anticipates a more negative production effect, apparently due to how domestic support has been treated in the two models.

Other than these differences, both the OECD and Cox studies suggest that milk production adjustment will occur most in the US, Canada, Mexico and Japan . However, global production would increase in other areas with New Zealand, Australia and Argentina the main gainers.

Figure 3: Milk production impacts from full liberalization (percent change)

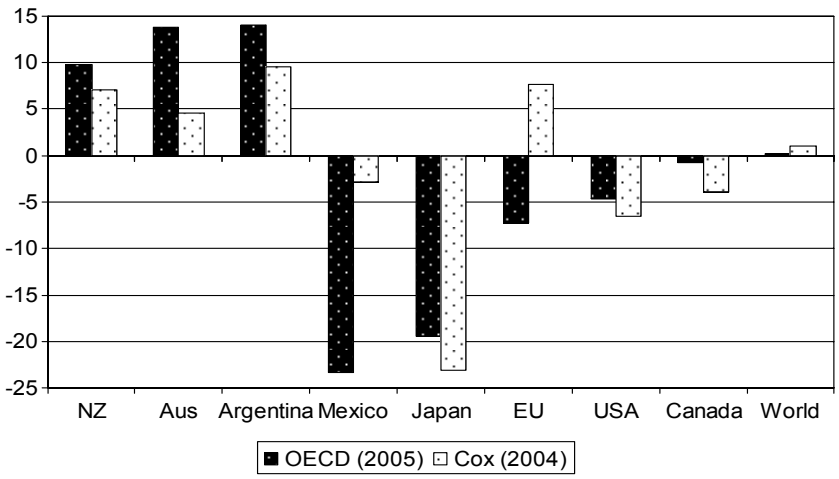
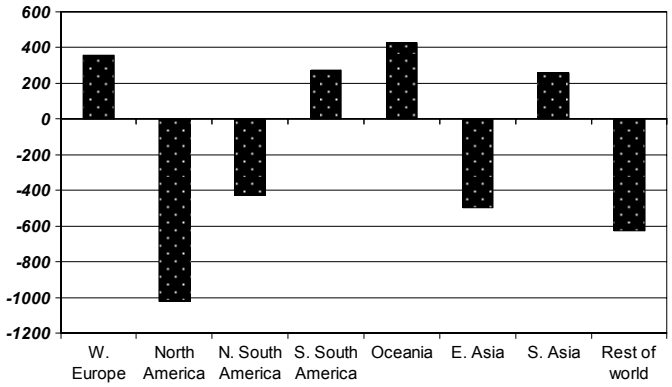


Figure 4: Changes in net exports from full liberalization
(000 tonnes)



Source: Cox and Zhu (2004)
Note: Quantities in product milk equivalents

7.3 Trade effects

Trade estimates vary across models, reflecting the differences in model results across the product balances. The most comprehensive regional results are provided by Cox and Zhu (2004). These are summarized in Figure 4. These results show Europe, South Asia, Southern South America and Oceania, as increasing their net export supply, while North America, East Asia, and the rest of the world increase their net import position. The positive net-export increase for the EU is not indicated by OECD results, given the estimated production differences.

The Cox study shows a large 36 percent increase in world milk equivalent trade that would result from full liberalization. OECD (2005) also indicates a positive effect on total world trade, although much lower than indicated in Cox, largely in view of the different assumptions concerning the EU.

In terms of trade patterns, Europe is likely to become less attractive as an export destination if more domestic product remains on the domestic market.

7.4 Welfare effects

While the estimated increases in world dairy commodity prices will generate export potential for competitive developed and developing country exporters, they will also increase consumer expenditures (hence decrease consumer welfare) for developing country consumers. This could dominate any producer welfare gains with the net impact of welfare losses, depending on the specific country/regional context.

Studies are similar in assessing the winners and losers from global reform in welfare terms. All studies show consumers in highly supported OECD and developing countries and producers in low cost and low support countries as clear and sizable winners from reform. They also show sizable and concentrated per unit losses for milk producers in highly supported countries. Consumers buying in international markets will also lose in these analyses. Governments in importing regions lose tariff revenue, while those in highly protected and subsidizing countries spend less.

Globally, the welfare gains of reforming dairy policies are estimated in the Cox study to be around US$3 billion. As net importers of dairy products, developing countries lose from reform while the net exporting countries among them would gain. Since market price support dominates and direct dairy subsidies are low, the impact of reform on the agricultural support budgets in developed countries is also low. However, the $3 billion net welfare effect is small when compared to the estimated $80 to150 billion estimated gains in recent agricultural and manufacturing trade liberalization modelling exercises. The important effect in the dairy sector appears to be the change in the location of production, rather than the net welfare gain.

7.5 Impacts on developing countries

The impact of dairy policy reform on many developing countries is estimated to be small in the models. This may be due to currently high tariffs in some of these countries. If tariffs are reduced this would offset higher international product prices, or high internal transaction costs

which effectively isolate internal and largely rural producers and consumers. It could also be due to the high level of country aggregation where positive effects for some potential net exporters are offset by negative impacts on importers.

An important feature of the dairy industry in developing countries is the domestic market share of the informal sector. These markets are traditional, largely non-commercial and extremely important in some countries, as Table 5 indicates. This suggests that for a large number of countries, particularly in Africa, Asia and parts of Latin America, international dairy policy reform could have little effect on producer and consumer livelihoods for some time, to the extent that these markets remain isolated from international market activity. This includes countries such as India, the world's largest dairy producer. Of course, newly emerging developing country dairy exporters would gain considerably in such reforms.

Table 5: Share of the informal dairy markets in the domestic market, selected countries

Regions/ countries	Informal market share (percent)
Sub-Saharan Africa	
Kenya	88
Tanzania	98
Uganda	90
Latin America	
Mexico	33
Nicaragua	86
Costa Rica	44
Brazil	44
South Asia	
India	85
Sri Lanka	40
Pakistan	98

Source: International Livestock Research Institute

In determining the impacts on different types of country, it is useful to group countries according to their interests:

- Countries interested in domestic and regional market expansion – this includes net exporters in South America (Southern cone)
- Countries where strong multipliers are likely given high consumption potential such as in East Africa.
- Countries more dependent on imports – South East Asia/China; West Africa, Middle East and North Africa.
- Countries (including India) not concerned about OECD policies as long as they have access to high tariffs to protect their domestic industry.

Such countries are not looking to export into developed countries for reasons of quality and sanitary and phytosanitary (SPS) standards which will be difficult to meet.

It should be noted that virtually all countries have a local industry to supply fresh product which provides a buffer against imports and distinguishes dairy from other sectors. Disappearance of subsidized exports should help industries, even those of milk-deficit countries as their producers face greater stability in their incentives.

In developing countries in particular, analyzing the impact of an increase in price requires assumptions about domestic market potential. Assumed rates of growth in population and GDP are crucial as are "Westernization trends" in many markets. In determining supply response, industry structure (number, size and market share of firms) and the state of infrastructure are crucial. Local versus multinational ownership in terms of access to and cost of capital and the extent to which foreign direct investment can avoid market access limitations and affect quality and procurement standards, will also affect market conditions.

8 Conclusions

The high level of support to the dairy sector in OECD countries has been one of the stumbling blocks to the wider reform of agricultural policies in the trade negotiations, despite the relatively large net welfare benefits which the models suggest that reform could bestow on the reforming countries. However, the qualifications discussed above, raised the issue of how meaningful are the estimated gains, and precisely which countries will gain and which will lose – this is an issue that is not well addressed in the various models.

Even where estimated gains are likely, the high potential adjustment costs for dairy producers have been one key factor limiting tariff, domestic support, and/or export subsidy reductions. Any proposed reduction formula is likely to impact significantly on dairy policy parameters and, hence, production and industry structure. At the same time, there has been much less interest in reforming the international dairy sector from many developing countries, as their perceived benefits from reform are smaller or even negative.

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