TRADE IN LIVESTOCK PRODUCTS, THE WTO MILLENIUM ROUND AND EAST ASIA: PROJECTIONS TO 2005[*]

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ABSTRACT

Livestock consumption is expanding rapidly in East Asia. Governments have responded by supporting and protecting domestic production but resource constraints and environmental problems are adding to the costs of self-sufficiency objectives. Rising costs to consumers and taxpayers are also causing such an approach to be questioned, both domestically and internationally. While the Uruguay Round resulted in greater transparency of agricultural trade barriers and limited liberalization, substantial barriers to trade in livestock products remain. This paper makes a projection of the global economy to 2005, and then seeks to determine the impacts of alternative outcomes of the next WTO Millenium Round. Three options for reform are explored – one is restricted to freeing up grains trade, while the others evaluate across-the-board reductions in tariffs and export subsidies in agriculture. The outcomes with regard to East Asia and its trade in livestock products differ substantially across the e scenarios.

1. INTRODUCTION

The way in which dietary patterns are changing in Asia as economic growth and development proceeds is now well documented. Due to factors such as income growth, urbanisation and the modernisation of marketing infrastructures, consumption patterns are switching from an emphasis on traditional foods (such as some cereals and root crops) to non-traditional cereals (eg wheat-based foods) and value-added processed and high-protein foods such as those derived from animal products (Huang and David 1993, Huang and Bouis 1996, Rae 1997 and 1998, Delgado *et al*. 1999). This typically involves a switch in the domestic utilisation of grains from human consumption to feeding of livestock. Much recent debate has centered on the impacts of such consumption changes on world food markets, especially those for grains, although until recently less attention has been paid to the implications for trade in livestock products.

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For a variety of reasons, East Asian countries have a comparative disadvantage in the production of certain livestock products, and sometimes feedstuffs also (Rae 1992). Thus government assistance, including trade barriers, has been aimed at encouraging domestic production to help meet the growing demand. Such assistance has in some cases led to the achievement of near self-sufficiency, and has also encouraged the rapid growth of feedgrains imports into the region as it became clear that their demand for feedstuffs exceeded their own ability to supply from domestic sources. The countries of Northeast Asia in particular are major importers of feedgrains, with Japan and South Korea accounting for one-third of global maize imports in 1997-98.

Such government assistance has also resulted in mixed incentives to producers, for example where assistance offered to animal feed production produces disincentives to livestock production (Rae 1992, Rae *et al*. 1992, Rae and Kasryno 1993). Even where self-sufficiency has been achieved, its sustainability into the future must be questioned. Increasing pressures on land and labour, along with environmental degradation due to livestock farming, are all increasing the marginal costs of livestock production in East Asia. Further, national and international pressures for trade reforms are resulting in a reduction of trade barriers. A consequence is that imports of final product may increasingly substitute for imports of animal feeds (this process is already underway, as shown in Figure 1).

2. DEVELOPMENTS IN LIVESTOCK PRODUCTS CONSUMPTION AND TRADE

Over the past 20 years there has been a steady increase in the share of the average diet contributed by animal food products in East Asia, most noticeably in the Republic of Korea and China. Over this period, the percentage of total calorie intakes contributed by animal products rose from just 6% to over 18% in China. The increases in Northeast and Southeast Asia were less spectacular, but by 1998 the average consumer in Northeast Asia obtained almost 20% of total calories from foods of animal origin (Table 1).

The extent of the switch to meats in the diets of East Asians is made clear by Table 2 which shows that of the total global increase in meat consumption over the 1970-98 period, over half occurred in East Asia and over 40% in China alone. East Asia's contribution to global increases in dairy product consumption is less dramatic – while global consumption increased by 185 million tonnes over 1970-98, less than 10% of that increased consumption took place in East Asia.

Average levels of per capita consumption of meats and dairy products in East Asia are given in Table 3. Regional meat consumption per person prior to 1990 was highest in Northeast Asia. Since then, it has been overtaken by China due to that country's rapid consumption increase. Even so, meat consumption per capita has doubled since the late 1970s in both Northeast and Southeast Asia. The countries of Northeast Asia dominate as far as consumption of dairy products is concerned and by 1998 consumption levels were about one-third higher than in 1978. While the consumption per person of dairy products showed little growth over this period in Southeast Asia,

Chinese consumers had increased consumption of milk and dairy products by over 150% from a low base.

East Asia is a net importer of meats and dairy products, with Japan dominating this trade. Table 4 shows that of the total increase in the tonnage of meat traded globally between 1970 and 1998, East Asia absorbed nearly 30%. In contrast, the region accounted for less than 10% of the total growth in global meat exports over the same period. For dairy products, East Asia accounted for 15% of the expansion in global imports over the 1970-98 period. Close to 25% of the total world meat trade by value is imported into East Asia, with Japan's share of global imports varying between 15% and 20% depending on the meat type. Despite her huge population and rapidly increasing consumption of meats, China remains a net exporter. However, her trade balance in meats of US$1 - 3 billion in recent years is dwarfed by Japan's trade deficit of $7 - $9 billion. East Asia's net trade deficit in dairy products has exceeded US$2 billion in recent years, with around one half of that deficit due to Southeast Asia's dairy imports. Japan has the single largest trade deficit, of a little under $1 billion. In contrast to her position as a meats trader, China is a net importer of dairy products. Japan is the region's major cheese importer, while milk powders are prominent in Southeast Asia's dairy imports (FAOSTAT).

3. LEVELS OF PROTECTION IN LIVESTOCK PRODUCTION

Governments use a variety of instruments to provide protection to their livestock industries. These include support prices, input subsidies, import tariffs, quantitative restrictions on imports, sanitary and food safety regulations that restrict imports, and export subsidies when domestic prices are supported above world prices.

There are a number of ways in which the extent of such protection can be measured by a single indicator. For example the effective rate of protection (ERP) compares value-added at domestic prices with value-added at world prices. The OECD makes extensive use of the producer subsidy equivalent (PSE) which measures the total funds transferred to farmers through agricultural policies as a percentage of farmers revenue. Other possible indicators are the levels of the tariffs applied to imports, or subsidies paid on exports. All of these measures have been calculated for some livestock products and countries at various times, and together help form a picture of the extent of livestock protection.

While the PSE measure excludes the impact of non-agricultural policies on farm production incentives, the OECD estimates comprise arguably the most comprehensive comparable collection of farm protection data. In 1999, total funds transferred to farmers through agricultural policies in all OECD countries amounted to US$283 billion. Of this, one-third was directed to livestock producers. Of the major livestock products, milk was by far the most heavily supported, this commodity alone accounting for 18% of total OECD support payments to agriculture. Beef accounted for 9% of the total transfers, while total spending on support of pig and poultry meat and eggs amounted to just 5% of total support.

Table 5 shows trends in the PSE payments as a percentage of dairy and beef farm revenues over the past 15 years. Of the countries shown, dairy protection is highest by far in Japan and Korea with around 70-80% of farm revenue derived from support payments. This measure of dairy protection is around 50-60% in the EU and North America, and also similar to the OECD average. Dairy protection is lowest in New Zealand, with zero transfers recorded in 1999. For beef production, protection is highest in Korea and the EU, followed by Japan. In contrast, the beef sectors of Australasia and North America receive very little government support.

Obtaining comprehensive data on the extent of livestock protection in the non-OECD countries of Asia is more problematic. Rae (1992) gives ERP estimates for livestock protection in Southeast Asian countries, although based on late-1980s data they are somewhat outdated. At that time, dairy production was highly protected with ERP values ranging between 70% in Thailand to over 300% in Malaysia. Effective protection of beef production in Thailand exceeded 80% but was negative in Indonesia due mainly to the impact of restrictive trade policies on feeds prices. For the same reason, effective protection of non-ruminants in Indonesia was also negative. Protection of non-ruminant livestock production in Malaysia and Thailand was relatively low, in the range of –25% to +15%. Thus the overall picture in Southeast Asia was one of high protection to ruminant livestock and lower if not negative protection of non-ruminant production.

Little information also seems to be available on the extent of protection offered to livestock sectors in China. Imports of both meats and dairy products are constrained by tariffs, import licensing requirements and restrictions over the permitted domestic distribution activities of foreign suppliers. The levels of tariffs, especially for dairy products (up to 50% or more), appear to provide substantial support to domestic producers (APEC).

The GTAP Version 4 database (McDougall *et al.* 1998) contains tariff equivalents for 1995. On average, the global agricultural tariff was four times as great as that on manufactured imports (Table 6). Within agriculture, some of the highest tariffs are levied on livestock products. The average global tariffs on beef and dairy products, for example, were over 25% compared with 17% for all agricultural commodities on average. Turning to East Asia, the average tariff on manufactured imports was identical to that of the world as a whole, but the average agricultural tariff of 45% was much higher than the world average. East Asian tariffs on livestock products were also considerably higher than world average tariffs, at up to 50% for meat imports and 145% for dairy products. Future reductions in agricultural tariffs could have a major impact on East Asian agriculture, and especially livestock production and imports.

Given their restrictive impacts on trade in livestock products, mention should be made of tariff rate quotas (TRQs), instituted in the Uruguay Round Agricultural Agreement (URAA) where tariffs had replaced non-tariff barriers. They were designed to permit a minimum level of market access (the quota volume) but to offer the possibility of much higher domestic protection through the tariff that applies on any imports beyond the quota amount. A large number of countries have TRQs in place for meats and/or dairy products, including major importers such as the EU, USA, Japan and Korea. A total of 247 TRQs exist on meat products, the third-highest total after fruits

and vegetables, and cereals. The EU has 28 meat TRQs, although the maximum number is applied in Norway. Ten meat TRQs are applied in Malaysia, nine in the Philippines and seven in Korea. For dairy products, 181 TRQs are in place. Of these, 24 are applied by the USA, 12 each in the EU and Japan and another 11 in Canada.

The within-quota tariffs (which are not bound) show considerable variation across countries, as can be seen from the examples in Table 7. For that group of importers, the meats tariffs vary between 2% and 40% (*ad valorem* equivalent). The out-of-quota tariffs (which *are* bound) for meats and dairy products are often much higher than the within-quota tariffs, and are sometimes so high that profitable trade beyond quota volumes would normally be impossible. A mix of *ad valorem* and fixed tariffs, plus markups in some countries, are often combined to put formidable trade barriers in place. In Table 7 these tariffs have been expressed as their *ad valorem* equivalents – for this group of countries they range between 26% and 128% for meats, and from 70% to 344% for dairy products. Another problem area with TRQs is the procedure used to allocate quota to importers or exporters, especially when a monopoly importer may restrict the volume of imports below the quota. Table 7 includes the proportion of the various quotas that were filled in 1996 – for whatever reason, Japan imported only 56% of its quota volume for dairy products, and similar fill rates have been recorded for 1997 and 1998 (WTO). Also in the latter year, Korea filled less than 60% of its dairy and meat quota (compared with around 80% the previous year) due perhaps to the impacts of the Asian crisis on domestic demand.

4. POSSIBLE MILLENIUM ROUND IMPLICATIONS FOR LIVESTOCK TRADE: PROJECTIONS TO 2005

Trade model and database

We use a slightly modified version of the GTAP applied general equilibrium model (Hertel 1997) to project national and regional production, consumption and trade flows between 1995 and 2005. This is a relatively standard, multi-region model built on a complete set of economic accounts and detailed inter-industry linkages for each of the economies represented. The GTAP production system distinguishes sectors by their intensities in five primary production factors: land (agricultural sectors only), natural resources (extractive sectors only), capital, and skilled and unskilled labour. In trade, products are differentiated by country of origin, allowing bilateral trade to be modeled, and bilateral international transport margins are incorporated and supplied by a global transport sector. The model is solved using GEMPACK (Harrison and Pearson 1996).

The 50 commodities in the version 4 GTAP database have been aggregated up to 15 commodity groups, of which 6 commodities (rice, wheat, other grains, oil crops, other crops and processed food) compete for use in the feedstuffs composite. We modify the model to incorporate feedstuff substitution into the livestock production functions. Livestock farming is represented by three aggregates: beef cattle (i.e. ruminant livestock), other livestock (primarily non-ruminants)[1] and

[1] While we refer to these aggregates as beef cattle and other livestock, it should be remembered that the former also includes sheep, goats and horses, while the latter comprises eggs, honey, hides and skins in addition to pigs, poultry and live animals not otherwise covered. Further disaggregation was not possible.

raw milk production. These farming sectors provide inputs to the beef processing (ruminant meat), other meat (non-ruminant meat) and dairy products industries in each region. All remaining production sectors are aggregated into manufactures, services, and other natural resource based commodities.

Some of the protection data in the GTAP version 4 database were modified to reflect more recent estimates of agricultural protection, especially for East Asian economies. Import tariffs were modified for Korea (wheat, beef cattle, beef and dairy products), Southeast Asia (wheat, other grains, beef and dairy products), and the EU (beef and dairy products). Export subsidies on wheat, other grains, beef and dairy products were removed in Southeast Asia and Korea, that on other meats in Southeast Asia was reduced, and the export subsidy on dairy products in Australia was eliminated. Output subsidies were increased for dairy products in Australia, and for beef and dairy products in the EU. Following Hertel *et al.* (1999) we also removed all export subsidies in China[2]. Details of the regional and commodity aggregations are to be found in Appendix Tables 1 and 2.

Macroeconomic projections

What will be happening in the world economy in the coming years, that ought to be captured in our projections? Income growth will tend to boost the demand for livestock products relative to grains, and in some regions there will be a strong shift away from food products altogether. On the supply side, the accumulation of skilled labor and capital in China and some other developing regions can be expected to continue to promote the shift of activity away from agriculture, in favor of manufacturing and services. Various sectors, including livestock farming, will be experiencing technological change and productivity levels in developing countries could be converging on those of the developed world.

As has become standard with the GTAP model, following the work of Gehlhar *et al.* (1994), projections are made through exogenous shocks to each region's endowments of physical capital, skilled and unskilled labor, population, and technology.[3] Appendix Table 3 reports the shocks to population, endowments and productivity that we assume in this paper. Forecasts for population, investment (capital stock), and labor force are based on forecasts from the World Bank. Projected changes in skilled labor are based on expected increases in the stock of tertiary educated labor and are taken from Ahuja and Filmer (1995) for developing countries. Projections for the OECD countries are based on inputs developed for the World Bank's Global Economic Prospects (1997 and 1998). The stock of farmland in each region is simply held constant.

Forecasting productivity growth is notably difficult. Therefore, we adopt a rather simple approach

[2] These additional tariff and output subsidy data had been prepared by Dr David Vanzetti of the Australian Bureau of Agricultural and Resource Economics. Selection of the changes to export subsidies was guided by Hertel *et al.* 1999.

[3] We also follow Gehlhar's suggestion that increasing the standard trade elasticities is appropriate in longer run simulations. For this eleven year period, we double the standard GTAP values for the elasticities of substitution between imports and domestic goods and among imports from different sources.

which is transparent and which can be easily modified. First of all, based on the work of Bernard and Jones (1996), we observe that productivity growth tends to be more rapid in agriculture than in manufacturing, which in turn has a higher productivity growth rate than services. (They find virtually no evidence of productivity growth in mining where quality of reserves confound the usually difficult measurement problems.) Based on their averages for the OECD as a whole (Bernard and Jones, 1996, Table 1), we obtain the following multiples of the manufacturing productivity growth rate for the other sectors: (non-livestock) agriculture = 1.4 * manufactures, services = 0.5 * manufactures, and mining = 0 * manufactures. In this way, we are able to link productivity growth in each sector of the economy to a common metric - namely the rate of manufacture's productivity growth.

We then divide economies into four groups according to their overall rate of productivity growth: low, medium, high and very high. The assumed annual growth rates of productivity in manufacturing value-added for these groups are as follows: 0.25%, 0.75%, 1.25% and 1.75% per year. As can be seen from the entries in Appendix Table 3, the low growth group includes Japan, Southeast Asia, and New Zealand. The medium group includes North America, Sub-Saharan Africa and ROW. Higher productivity growth rates are foreseen for Australia, the EU, and South America. Finally, Korea and China's productivity growth rates are expected to remain quite high – although somewhat lower than implied by the period prior to the Asian crisis. As a check on the plausibility of these assumptions, we compare our baseline cumulative GDP growth (second to last column) to that forecast by the World Bank, in the last column of Appendix Table 3. Apart from China and Korea, all of these GDP projections are reasonably close. In order to hit the World Bank targets for these regions, we would have to raise the very high growth category still further. In light of the current macro-economic uncertainty in that region, we opt for our more conservative projections.

There is mounting evidence that livestock productivity in some developing countries (for example China and Korea) has been converging on that in developed countries (Rae and Hertel, 2000), which trends we seek to continue in the projections. Our livestock productivity projections have been updated from those reported in Hertel *et al.* (1999b). Following those authors, we apply these livestock productivity shocks to both value-added and to the feed composite, in order to maintain a constant ratio of feed use per animal. Provided these shocks are positive, feed consumption per unit of output (the feed conversion ratio) will decrease. If this is the case, then the implications for feed demand, and hence for trade in grains and oilseeds as well as livestock products could be substantial.[4]

[4] There is considerable evidence to support this assumption. A recent survey conducted by Wailes *et al.* (1998) gathered data on feed use across a range of enterprise and livestock types in seven provinces of China where the trend is towards development of specialised livestock production units and larger, more intensive management systems. They concluded that such structural changes will contribute to a declining demand for feedgrains per kg of meat production. Another set of livestock and feeds projections for China are those of Simpson *et al.* (1994, Tables 7.6, 7.7 and 8.1), covering the period 1989-91 to 2000. Their projections imply little increase in feed inputs per animal so feed per unit output (the feed conversion ratio) shows negative growth, indicating increases in feed efficiency especially for poultry. This is consistent with the projections of Wang *et al.* (1998) who assume improvements in feed efficiency

Trade policy projections

Significant trade policy developments over the 1995-2005 projections period include completion of the manufacturing tariff cuts under the Uruguay Round, implementation of the Agreement on Textiles and Clothing (ATC) and the probable accession of China to the WTO. These changes are incorporated in our projection by using the results of Francois and Strutt (1999) to specify the remaining UR manufacturing tariff cuts to be made from our 1995 base period.[5] It is assumed that the abolition of quotas under the ATC will have been completed by the year 2005 and that China, as a WTO member, will also benefit fully from these reforms. These were modeled by removing the implicit export taxes due to the quotas on textile and clothing exports from developing countries to the industrialised regions. China's WTO offer is based on the manufacturing tariff data in the US-China Bilateral Agreement[6]. As regards agriculture, while reforms were negotiated during the Uruguay Round, they were based on the late-1980s when prices were very low and hence measured protection was high. In contrast, our base year of 1995 was one of much higher world prices and hence lower protection. Because of this, and the extent of "dirty tariffication" in agriculture (Ingco 1996) we assume no change from 1995 protection in agriculture[7].

WTO Millenium Round Scenarios

The UR Agreement on Agriculture established rules that improved the conditions for market access for agricultural goods, and reduced export subsidies and domestic support payments (OECD 1995). However there is mounting evidence that the Agreement did little to liberalise agricultural trade (Ingco and Hathaway 1996, Josling 1998). For example in many cases, including livestock products, the "tariffication" process put in place tariffs that were so high that profitable trade is largely impossible.

How might such high barriers to agricultural and livestock products trade be lowered in the next Round? Given the prevalence of TRQs in agricultural (and livestock products) trade and the opportunities they provide for non-transparent trade barriers, they are bound to be a focus of attention in the new Round. Options for reform include the lowering of the tariff both within but particularly outside the quota, and the expansion of the quantity constraint imposed by the quota.

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for all animal types and technologies. Finally, Tweeten (1998) reports projected annual USA growth rates in output per feed of 0.2% (beef and pigs), 0.6% (milk) and 2.0% (poultry). If the US is the source of much of the new livestock production technology that is transferred to China, then such improvements will eventually be felt in China.

[5] Thanks are due to Dr Anna Strutt for supplying the relevant shock files.

[6] See http://www.chinapntr.gov. The current and proposed tariffs in that agreement were used, weighted by the import values in the GTAP 1995 database These specified current tariffs were often less than those in the GTAP 1995 database. By basing the tariff shocks on a comparison of the proposed tariffs with current tariffs, rather than those in the GTAP database, we could have underestimated those shocks in the event that China's tariffs had been reduced since 1995. The details in the agreement with respect to agricultural tariff cuts are clouded by uncertainty over the future role of STE's in China's agricultural imports, and also over estimates of her current levels of agricultural protection, so no adjustments to China's agricultural tariffs were made.

[7] Others have also taken a similar approach – see Hertel *et al.* (1999a) and Anderson *et al.* (2000).

While procedures have recently been developed to allow the modeling of TRQ reforms (Elbehri *et al.* 1999) our examination of this particular aspect of the negotiations with respect to livestock products trade must await a later paper.

Apart from TRQ reforms, three possible approaches to reducing trade barriers are (i) to reduce the average level of agricultural tariffs, (ii) to reduce the variability of such tariffs across both countries and sectors, and (iii) to completely liberalise only selected sectors. These approaches will be reflected in the experimental scenarios outlined below, along with a comment on their implications for the reduction of export subsidies. In each case, any resultant expansion of imports of commodities constrained by TRQs will be assumed to be accompanied by an expansion of the quota, a reduction in the out-of-quota tariff, or a combination of the two. We have not allowed for any further reduction in domestic support - such support, totaled over the entire agricultural sector, was agreed in the URAA to be reduced by 21%. Our reason for excluding the possibility of further reductions in our simulations is that a large component of domestic support in both developed and developing regions is, one way or another, exempt from this reform commitment. The major domestic support programs of the EU and USA, for example, were linked to production controls and hence exempt, while more recently US support has been re-instrumented such that it may now be considered 'decoupled' from trade impacts and hence not liable for future reduction. Also, many regions are shifting the emphasis of agricultural support payments away from direct production subsidies to payments linked to environmental improvements.

One approach to future trade liberalisation in agriculture that has been put forward by some countries (eg the USA) is to completely eliminate tariffs on particular goods (the so-called zero-for-zero approach). An advantage is that resistance to liberalization in 'politically-sensitive' sectors (such as dairy) need not hold up progress in the negotiations. A downside is that the politically-difficult sectors may never get addressed unless a framework were to be agreed that ensured no long-term exclusions. A zero-for-zero agreement in grains and oilseeds has been mooted. It would likely be acceptable to the USA as they are a major exporter, and could also be acceptable to the EU if the Agenda 2000 cuts in grains intervention prices were to be followed by further cuts that resulted in internal EU prices being closer to world levels. This scenario is of interest here, since grains and oil crops are important ingredients in animal feeds.

The Uruguay Round Agreement on Agriculture includes the commitment to reduce agricultural tariffs by an average of 36%. Another approach in the new Millenium Round, then, would be to agree a further 36% cut in all agricultural tariffs and this is mimicked in our second experiment[8]. Such an approach does little, however, to reduce the extreme variability present in current agricultural tariffs. Thus a third approach is to negotiate some modality that will result in greater percentage reductions in the higher tariffs, thus reducing the height of these tariff peaks (such as

[8] The GTAP database includes instances of negative tariffs (market prices less than border prices). In all experiments, these negative tariffs were not adjusted. Further, the Version 4 GTAP database applied observed domestic/world price gaps at the commodity level on both the import and export sides. Thus in the experiments, reductions in export subsidies are identical to those applied to import tariffs.

exist for several livestock products). Specific formulas may be used to compute such cuts, such as the Swiss Formula that was used for tariff reductions in industrial goods in the GATT Tokyo Round. However once the Swiss formula is calibrated to give politically-acceptable cuts to the highest tariffs, such a formula might result in rather small cuts to the lower tariffs. One way around this is to negotiate a 'cocktail' mix of modalities that cuts lower tariffs by an agreed percentage, and the very high tariffs according to the Swiss formula. Such an approach is illustrated in our third scenario. There, the mix is to completely remove agricultural tariffs that are less than 5%, to cut by 36% tariffs within the 5%-85% range, and to apply the Swiss formula[9] to all agricultural tariffs that exceed 85%.

5. PROJECTIONS & SIMULATION RESULTS

The baseline projection: 1995-2005

The objective of the baseline is to project the global economy to the year 2005, by which time the policy reforms of the UR should be fully implemented. What might be expected to occur over this projection period? The changes in population, resource endowments, productivity and tariffs that we model have implications on both the demand and supply side of each regional economy. Income growth, for example, will boost the demand for livestock products relative to grains, and in some regions there will be a shift away from food products altogether. In addition, accumulation of skilled labour and capital will tend to promote a shift in production away from agriculture in favour of manufacturing and services perhaps further encouraged by increased access to foreign markets for textiles, clothing and manufactures due to the UR reforms. These forces together will help shape the changes in regional trade and therefore the sectoral trade balances.

Livestock productivity growth was projected to be most rapid (at least in the meat sectors) in China, and the results suggest around 80% growth in livestock outputs over the projection period. Even so, China's net trade surplus in livestock products deteriorates somewhat since domestic demand for such products is also projected to increase substantially. Further, China's manufacturing and service sectors are projected to increase output by over 100% compared with their 1995 base. Other regions to experience relatively rapid manufacturing and services growth (although by half the rate projected for China) are the developing regions of Southeast Asia and Korea, as well as North America.

Although the manufactures sectors are not the focus of this paper, their sheer size in most regions means that policy reforms in these sectors can have a major impact on the rest of the economy. Over the 10-year projection period, assisted by the completion of the UR manufacturing tariff cuts plus those that result from China's assumed accession to the WTO, China's trade surplus in manufactures more than doubles. Korea's manufacturing trade surplus is projected to double, while the EU trade surplus is reduced and North America's trade deficit in this sector worsens.

[9] The Swiss formula $t1 = a*t0/(a+t0)$, where t0 and t1 are the original and reduced tariff, respectively. The value of 'a' was chosen such that a tariff of 85% would be cut by 36%.

Turning to the livestock products, base-period beef trade surpluses in Australia, New Zealand and South America all increase, while that for North America is reduced. The EU is projected to shift from a net importer to a net exporter of beef, and China's small base trade surplus is projected to increase. China has been a not insubstantial exporter of non-ruminant meats in the past, and this trade surplus is projected to be cut by a third. Other traditional non-ruminant exporters such as the EU, North America and Southeast Asia all increase their net non-ruminant exports. The traditional dairy exporters – Australasia, North America and the EU – are all projected to increase their trade surpluses, whereas the deficits of Northeast and Southeast Asia are projected to worsen. In the case of China, the small base trade deficit worsens substantially.

Changes in the size of the livestock sectors in each region also contribute to the projected changes in the net trade situation with respect to grains and oilseeds. We project that China's 1995 trade deficit in these commodities of US$2.5 billion will expand to $7.5 billion by 2005, and Southeast Asia's deficit worsens by 50%. North America's trade surplus in grains and oilseeds increases substantially.

The Zero-for-Zero Liberalisation of Grains and Oilseeds: 2005

Our interest in this scenario is fueled by likely changes in domestic and world prices of grains and oilseeds,[10] and the direct and indirect effects they will have on the costs of feedstuffs and therefore livestock production incentives[11]. Grains and oilseeds contribute 5% to 10% of total livestock production costs[12] in most regions. An exception is North America where grains and oilseeds comprise 25% of beef cattle production costs and 40% of those for milk. Thus price changes for grains could have a direct impact on the level of livestock production in North America. The indirect effects come through recognition of the share of grains and oilseeds in the processed food sector, which in the GTAP database includes processed animal feeds. This share is typically in the range of 5% to 15%, and the processed food sector has a 30% to 50% share of livestock production costs in Japan and Korea and at least 10% in most other regions.

The removal of all tariffs and export subsidies on wheat, other grains and oilseeds in 2005 boosts world prices of these commodities by 3-5% for grains and by 3% for oilseeds (Figure 2)[13]. Volumes traded globally expand by over 40% for other grains and by 20% for oilseeds (Figure 3), but global trade in livestock products contracts. For those regions with high tariffs on grains and oilseeds, the liberalisation results in a substantial fall in domestic prices of 15% in Japan, and by more than 30% for other grains in Korea. As a result Northeast Asian livestock sectors expand by up to 5%, while their grains outputs decline significantly. Both Japan and Korea decrease their

[10] These are the wheat, other grains and oils sectors.

[11] Recall also that we modified the GTAP model to allow substitution among grains, oilseeds and other feedstuffs (the latter are rice, processed food and other crops)

[12] As recorded in the GTAP version 4 database.

[13] In this and all subsequent experiments, reported changes in variables are measured in relation to the projected 2005 base data.

net imports of livestock products (ie their trade balances improve in Figure 4) but increase grains imports, and most world livestock product prices fall (Figure 2).

In many other regions, where grains tariffs are either very low or zero, domestic grains prices rise with world prices, by as much as 5% in North America. Hence net exporters of grains such as Australia, North and South America expand international sales, but this expansion draws resources out of livestock production. The impact of higher grains costs on livestock trade balances in the traditional exporting regions is interesting. Higher feeds costs reduce beef exports from North America (where grains are an important feedstuff), but beef exports from the primarily grass-fed industries of Australia and South America expand. Grains are more widely used as a major feedstuff in non-ruminant livestock production, so this trade balance worsens in most regions except Northeast Asia.

Who would be the 'winners' should this reform be agreed in the Millenium Round? The welfare results of Table 8 clearly show that almost the entire global gain is shared by Japan, the EU and North America. In the cases of Japan and the EU, most of this gain in welfare comes from efficiency gains as the grains sectors are downsized and resources put to better use elsewhere in those economies. However, these efficiency gains are not as high as they would have been had not the highly-subsidised livestock sectors been encouraged to expand through lower feed costs. In contrast, North America benefits primarily from improved terms of trade, especially higher prices for grains exports. Welfare gains to other regions are either relatively small, or are negative.

A 36% Cut in all Agricultural Import Tariffs & Export Subsidies: 2005

In this scenario, trade barriers are reduced for all agricultural commodities, not just grains and oilseeds. In several regions, including the EU, North America and Northeast and Southeast Asia, the tariffs on imports of livestock products are substantial. Reductions in these tariffs will reduce domestic prices and increase the import demand for such commodities. Export subsidies on several products, including dairy products and beef, are also very high such as in the EU and (for dairy products) North America. Cuts in these export subsidies will discourage domestic production of the affected commodities and will therefore reduce the volume of export surpluses. Hence the impact of simultaneous cuts to tariffs and export subsidies on global trade volumes and prices is unclear. The simulated results are found in Figures 2 and 3. While the volume of trade in dairy products falls, that in most other agricultural commodities increases. A major factor in the dairy result is the impact of lower export subsidies on the EU's dairy export volumes which decline by more than 15%. Average export prices increase the most for dairy products, and meat export prices rise by not quite half that for dairy products.

Impacts on regional exports and imports can be summarised by changes in the trade balances. For livestock and meats, the largest increases in trade balances occur from North and South America, but also from New Zealand, Australia and China (Figure 4). By far the greatest decrease occurs in the EU, with smaller deteriorations in Japan, Korea and Southeast Asia. Changes in regional dairy trade balances are dominated by the increased exports out of Australia, New Zealand and South

America, with a smaller export increase from North America. The EU decreases its dairy exports substantially, and dairy trade balances of Japan and the rest of East Asia also deteriorate (Figure 5).

Some changes in regional grains trade balances are worth noting. This scenario leads to smaller deteriorations of the grains trade balances in Northeast and Southeast Asia and the EU, compared with the zero-for-zero experiment. This is because the livestock sectors of these regions now generally decline due to reduced livestock protection, rather than expand under zero-for-zero, with consequent reductions in feedstuffs demands. As a result, North America's trade surplus in grains is lower than under the former experiment.

Changes in regional welfare due to the cuts in all agricultural tariffs and export subsidies are quite different from those that result when reforms are limited to the grains and oilseeds sectors (Table 8). Globally, welfare rises by US$31 billion, well above the gain of $12 billion estimated to result from the zero-for-zero scenario. The largest welfare gain by far is enjoyed by the EU, primarily due to improvements in allocative efficiency but also improved terms of trade. Japan receives the second highest welfare gain, due to improvements in resource use. North American welfare increases by less than when the grains sectors only were liberalised, and these gains arise mainly from improved terms of trade. The traditional livestock product exporters of Australia and South America, who gain little from the grains liberalisation, receive considerably enhanced welfare gains when liberalisation is spread across all of agriculture. Improved efficiency in resource use contributes to this result, but the major gains are due to higher export prices. The situation is somewhat different in New Zealand – although the terms of trade improve, expansion of the protected non-ruminant sector results in a less efficient use of resources. Finally, Southeast Asia (which suffered a decline in welfare under the zero-for-zero scenario) now experiences an increase in welfare due mainly to improvements in the allocation of its resources.

The 'Cocktail' Formula of Agricultural Liberalisation: 2005

The major difference between this scenario and the previous one is that the highest tariffs and export subsidies are reduced by more, in some cases much more, than the 36% applied previously. Some of the highest agricultural tariff equivalents in the database are in excess of 400% for grains and over 300% for dairy products into Japan, close to 200% for other grains into Korea, and around 100% for beef and dairy product imports into the EU. The Swiss formula component of our 'cocktail', which applies when tariffs are in excess of 85%, results for example in cuts of 50% on tariffs of 150% and 75% on those of 450%. Differences in the results from this scenario, compared with the previous one, are likely to be driven by these extra large cuts to grains protection in Northeast Asia, and to components of the livestock sectors of Northeast Asia and the EU. Once again, the direction of these changes cannot be predicted since lower grains protection will provide a boost to livestock production which will be offset to some extent by reduced livestock protection.

The volume of global grains trade increases by more than in the scenario of 36% tariff cuts, as a result of decreased domestic output in Japan and Korea, and consequently increased grains imports (Figure 3). The volume of world trade in beef expands and that of non-ruminant meats increases but by less than in the last scenario. In the present scenario, the EU's beef export subsidies are cut by more than 36% with consequent impact on the volume of the EU's beef exports. The volume of global dairy trade increases. While the EU's dairy export subsidy is now cut by 45%, rather than by the 36% of the previous experiment, the high dairy import tariffs in some regions are also now cut by more than 36% producing increased import demand from such regions. Consequently the world price index for dairy exports rises by nearly 7% compared with less than 6% when tariff cuts are restricted to 36% (Figure 2). This price increase encourages even greater output responses and hence exports from Australia and North and South America than was previously the case.

The livestock and meats trade balances of New Zealand and South America increase, and by more than when tariffs and export subsidies were cut by 36% (Figure 4). These trade balance also improve under this scenario for North America and Australia, by about the same as in the previous experiment. That of the EU falls by more than with 36% tariff cuts. Japan, whose trade balance in livestock and meats worsened under a scenario of 36% cuts to tariffs, now experiences a substantial improvement in this trade balance from the 2005 base. One reason is that with such large cuts to Japan's grains tariffs, livestock production costs fall relative to the previous scenario, and non-ruminant production receives an additional boost. The dairy trade balances of Australasia and North and South America improve, and by more than when tariffs were cut by 36% (Figure 5). In contrast, those of the EU and Japan decline and by more than resulted in the previous experiment, substantially so in the case of Japan whose dairy tariff was reduced by 70% under our Swiss formula.

Global welfare increases by about 15% more than was the case when tariffs were cut by 36% (Table 8). The regions experiencing the greatest gains were again the EU and Japan due mainly to better resource allocations. The traditional agricultural exporters obtain even larger welfare gains than in the previous experiment, due primarily to improved terms of trade for Australasia and North America, and both efficiency and terns of trade improvements in South America.

6. SUMMARY AND CONCLUSIONS

Global forces driving rapid changes in human diets and the level of livestock products consumption are nowhere more clearly evident than in East Asia. Over the 1970-98 period, FAO data reveals that this region accounted for over 50% of the global increase in meat consumption and nearly 30% of the global increase in the volume of meat imports. Japan and South Korea, in particular, are major regional importers of both meats and dairy products. Thus far at least, China has managed to largely supply its increased consumption of livestock products from domestic supplies and has been a net exporter of meat.

Many factors, such as land scarcity, small farm size and unsuitable climatic conditions, cause livestock production in many regions of East Asia to suffer from lack of international competitiveness. Nevertheless, governments have encouraged the survival and growth of livestock sectors through provision of assistance of one type or another. Dairy production, in particular, has been heavily protected in both Northeast and Southeast Asia. By and large, the same can be said of beef production. Perhaps because its technology is more easily transferred, the picture is somewhat different for non-ruminant livestock production where protection levels tend to be lower and even appear to have been negative in some cases. Formidable trade barriers help to maintain high levels of protection in the region, especially for dairy products and beef. Several countries in the region also apply tariff rate quotas on meats and dairy products.

This paper offered quantitative assessments of three agricultural trade liberalisation options with particular reference to livestock products and East Asia. It had two major objectives. The first, a stepping stone to the second, was to project the 1995 global economy to the year 2005. This incorporated projections of population, labour and capital growth, and changes in productivity. Particular attention was paid to projecting recent trends in livestock productivity, as the convergence of such productivity towards Western levels has been a major recent feature in parts of East Asia. The projections also attempted to incorporate the completion of the Uruguay Round outcomes, including the removal of quotas on textiles and clothing trade, as well as (partial) account of China's accession to the WTO. The resulting measures of GDP growth over the projection period were very similar to recent independent projections of the World Bank. As to the resulting projections of trade in livestock products, traditional exporters increased their net exports, with this result especially evident for South America and the EU. Japan, Korea and Southeast Asia all increased their net imports while China's net export status diminished somewhat.

Our second, and major, objective was to explore the impacts of possible future trade reforms on East Asian trade in meats and dairy products. Three imagined outcomes of the next WTO Round of multilateral trade negotiations were (i) a complete removal of trade barriers on just grains and oilseeds, (ii) a 36% cut in all agricultural import tariffs and export subsidies and (iii) a formula approach that reduced the highest agricultural tariffs by more than 36%.

In the first of these scenarios, most of the benefits were enjoyed by three major players in global grains trade – North America, the EU and Japan. Benefits to the traditional livestock products' exporters were severely curtailed since lower feeds costs in the formerly-protective economies of Northeast and Southeast Asia encouraged expansion of livestock farming there and hence lower demand for imports. Such an expansion of the highly-protected livestock sectors of East Asia also contributed welfare losses in those regions through less-efficient use of their scarce resources. In summary this scenario, while freeing trade in grains, led to worsened distortions in the markets for livestock products.

The second and third scenarios applied across-the-board reductions in agricultural trade barriers, including those to livestock products trade. Results for livestock products are rather similar in

both scenarios, although welfare gains are somewhat higher for the third experiment since some tariff/subsidy cuts are larger than in the second scenario. Compared with the projected base 2005 situation, net imports of livestock products into both Northeast and Southeast Asia increased substantially when tariffs were cut by 36%. In total, this increase was from a base of US$16.4 billion to net imports of $19.3 billion. In contrast, the zero-for-zero grains scenario resulted in a decrease in net imports to $15.4 billion. Under the often larger tariff cuts of the cocktail formula, this region's net imports declined slightly from the base of $16.4 billion to $16.0 billion, since much lower feeds costs encouraged expansion of domestic livestock supplies. These agricultural trade reforms also encouraged livestock exports from China, and her 2005 net exports of livestock products exceeded the level that applied in 1995. As expected, cuts to the EU's livestock product trade barriers such as export subsidies considerably curtailed its exports and actually changed its status to that of net importer, while those from Australia, New Zealand, and North and South America expanded.

Two issues, in particular, ought to be the objects of future studies in this area. The first is the impact of further reforms in manufactures trade on production and trade in livestock products. The recent work of Hertel *et al.* (1999), for example, indicated that the food trade balances of certain regions, including Southeast Asia and China, were quite sensitive to manufacturing tariff cuts. In the case of China it may be that the latter, rather than agricultural trade reforms, make the major contribution to China's welfare gains from WTO membership. The second issue deserving of more detailed analysis is that of tariff-rate-quotas, given their prevalence in livestock products trade barriers and the extent of the protection they provide. More specific attention needs to be paid to the without- and within-quota trade flows, the resulting domestic price impacts and the size and distribution of any resulting quota rents. Such aspects were swept under the carpet in the current analysis, since a single tariff equivalent was applied to all affected trade flows.

Finally, the results of the simulations should be viewed as preliminary and will be subject to refinement as improved measures of protection become available. Some such revisions will be possible following the release of the GTAP version 5 data, based on 1997 statistics. In particular, improved estimates of livestock protection and effective trade barriers in China and Southeast Asia are urgently required.

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Table 1 Animal Products in the Total diet

	Per cent of calories from animal products		
	1978	**1988**	**1998**
China	6.2	10.7	18.4
NE Asia	15.6	17.8	18.4
SE Asia	6.1	6.8	8.3

Source: FAOSTAT

Note: China includes Hong Kong
NE Asia = Japan and South Korea
SE Asia = Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam.

Table 2 East Asia's Share of Global Consumption Growth

	Consumption increase 1970-98 (million tonnes)	
	Meat	**Milk**
Global	120.4	185.4
China	51.7	8.4
NE Asia	5.1	4.9
SE Asia	6.4	3.2
East Asia as % global	52.5	8.9

Source: FAOSTAT

Table 3 Livestock Products Consumption Per Capita

	Consumption per capita (kg)					
	Meat			Milk		
	1978	**1988**	**1998**	**1978**	**1988**	**1998**
China	11.3	23.5	46.9	3.1	5.7	8.1
NE Asia	23.8	33.3	41.2	42.5	52.1	56.3
SE Asia	9.1	12.5	18.0	9.4	10.2	10.9

Source: FAOSTAT

Table 4 East Asia's Share of Global Livestock Trade Growth ('000 tonnes)

	Change in exports 1970-98	Change in imports 1970-98	
	Meats	**Meats**	**Dairy**
Global	15740.2	14360.7	39862.5
China	1156.5	1426.9	2172.3
NE Asia	108.3	2259.9	1162.8
SE Asia	198.7	309.6	2502.8
E Asia as % global	9.3	27.8	14.6

Source: FAOSTAT

Table 5 Producer Subsidy Equivalents for Dairy and Beef: Selected OECD Countries

	1986-88	1991-93	1997-99
Dairy			
Japan	84	82	78
Korea	73	73	67
Australia	32	34	21
New Zealand	9	1	0
Canada	61	61	57
USA	60	52	54
EU	56	57	54
All OECD	58	56	54
Beef			
Japan	44	35	33
Korea	54	68	59
Australia	5	4	3
New Zealand	7	1	1
Canada	9	7	7
USA	6	5	4
EU	48	54	58
All OECD	30	30	32

Source: OECD (1999, 2000)

Table 6 Tariffs on Merchandise Trade: 1995

	World	East Asia
Beef	28.0	44.6
Other meat	17.4	49.0
Dairy products	25.8	144.0
All agriculture	17.4	45.7
All manufactures	4.3	4.3

Source: GTAP version 4 database

Table 7 Some Tariff Rate Quotas for Livestock Products (1996)

	Number of tariff rate quotas	Simple average Quota fill rate (%)	In-quota Ad valorem tariff	Out-of-quota Ad valorem tariff
USA				
Dairy	24	64	11	70
Meat	1	59	5	26
EU				
Dairy	12	92	24	91
Meats	28	78	19	128
Japan				
Dairy	12	56	29	344
Canada				
Dairy	11	94	7	262
Meats	4	99	2	27
Korea				
Dairy	5	70	21	107
Meats	7	99	40	42

Source: Elbehri *et al.* (1999), WTO.

Table 8 Changes in Welfare from Trade Policy Reforms: 2005 (US$million)

	zero-for-zero	36% cuts	cocktail
AUS	61	651	946
CHN	-432	131	11
JPN	3279	4790	10005
KOR	771	449	628
NZL	625	474	733
SEA	-169	1817	1524
NAM	1791	1429	1431
EU	3941	18881	21125
SAM	211	1762	1910
SSA	-73	36	-12
ROW	1922	478	-3098
GLOBAL	11930	30897	35203

Table 9 Grains and Oilseeds Trade Balances (US$million)

	1995	2005			
	Base	Base	Zero-for-zero	36% cuts	Cocktail cuts
CHINA	-2551	-7477	-7045	-7294	-7263
JAPAN	-6360	-7166	-9137	-7746	-8461
KOREA	-2599	-3274	-4790	-3744	-4069
NE ASIA	-8959	-10439	-13927	-11490	-12530
SE ASIA	-3178	-4801	-5729	-4927	-4984
EAST ASIA	-14688	-22718	-26702	-23711	-24777
AUS	1442	1949	2500	1924	2023
NZL	-51	-72	997	-99	-1
NAM	24736	34561	48513	37976	38917
EU	-4242	-1496	-6934	-2612	-2439
SAM	-1465	-452	1412	-420	-460
SSA	-595	-918	-1017	-1005	-1011
ROW	-8063	-14760	-23913	-16118	-16387

Table 10 Livestock & Products Trade Balances (US$millions)

	1995	2005			
	Base	Base	Zero-for-zero	36% cuts	Cocktail cuts
CHINA	1592	997	828	1754	1629
JAPAN	-11568	-12046	-11161	-14361	-10775
KOREA	-2387	-3099	-2972	-3422	-3374
NE ASIA	-13955	-15146	-14133	-17783	-14149
SE ASIA	-1010	-1291	-1238	-1531	-1859
EAST ASIA	-13373	-15440	-14543	-17560	-14379
AUS	4734	5618	5623	8269	9959
NZL	4337	5085	4316	7717	8554
NAM	7542	8833	6530	14635	15052
EU	1929	11835	12094	-3162	-8048
SAM	383	4012	4211	10809	11878
SSA	-703	-1297	-1300	-501	-171
ROW	-10436	-25657	-23835	-27726	-31114

Appendix Table 1 Regional Aggregation

Region	(Acronym)	Description
Australia	(AUS)	
China	(CHN)	
Japan	(JPN)	
South Korea	(KOR)	
New Zealand	(NZL)	
Southeast Asia	(SEA)	Indonesia, Malaysia, Philippines, Thailand
North America	(NAM)	Canada, USA
EU	(EU)	EU15
South America	(SAM)	Mexico, Central and South America
Sub-Sahara Africa	(SSA)	South Africa, rest of Sub-Sahara and Southern Africa
Rest of the World	(ROW)	

Appendix Table 2 Sectoral Aggregation

Region	(Acronym)	Description
Paddy rice	(rice)	
Wheat	(wheat)	
Other grains	(othergrains)	Cereal grains, nec
Oilseeds	(oils)	
Other crops	(othercrops)	Sugar cane/beet, plant-based fibres, fruit & vegetables, crops, nec
Beef cattle	(beefcattle)	Bovine cattle, sheep & goats, horses
Non-ruminant livestock	(otherlvstk)	Livestock and animal products nec
Milk	(milk)	Raw milk
Beef	(beef)	Bovine cattle, sheep & goats, and horse meat products
Non-ruminant meat	(othermeat)	Meat products nec
Dairy products	(dairyprod.)	
Processed food	(procfood)	Processed rice, sugar, food products nec
Other natural resource	(othnatres)	Wool, forestry, fishing, mining & minerals
Manufactures	(manufacture)	Beverages & tobacco, textiles & clothing, all other Manufacturing
Services	(services)	

Appendix Table 3 Annual growth rates of exogenous variables used in the projections and GDP growth

	Popu-lation	Endowments			Livestock productivity			Manufacture's productivity	Forecast GDP	World Bank Forecast
		Unskilled labor	Skilled labor	Capital	Beef cattle	Other livestock	Milk			
Australia	0.91	1.04	4.72	1.59	0.70	2.49	2.79	0.75	3.0	2.9
China	0.75	1.06	3.33	8.22	4.57	5.39	-0.29	1.75	6.6	6.9
Japan	0.18	-0.26	2.57	0.33	2.33	2.55	2.15	0.25	0.8	0.9
Korea	0.74	0.64	4.74	1.53	4.48	3.23	2.03	1.75	2.9	3.4
New Zealand	0.73	0.71	4.72	2.28	2.39	2.89	0.82	0.25	2.4	2.3
South East Asia	1.36	1.89	6.27	2.31	0.51	2.51	2.07	0.25	2.6	2.6
North America	0.78	0.89	3.02	3.04	0.86	2.37	2.17	0.75	2.7	2.5
E.U.	0.09	0.02	3.02	0.76	2.91	2.19	2.17	1.25	1.9	2.3
South America	1.37	1.94	5.50	0.96	3.15	2.91	2.79	1.25	2.8	3.0
Sub-Saharan Africa	2.55	2.84	5.97	1.05	-0.03	1.85	0.30	0.75	3.1	3.3
ROW	1.38	1.86	5.45	2.47	0.30	0.97	2.07	0.75	3.3	3.2

Source: Hertel *et al.* (1999b)

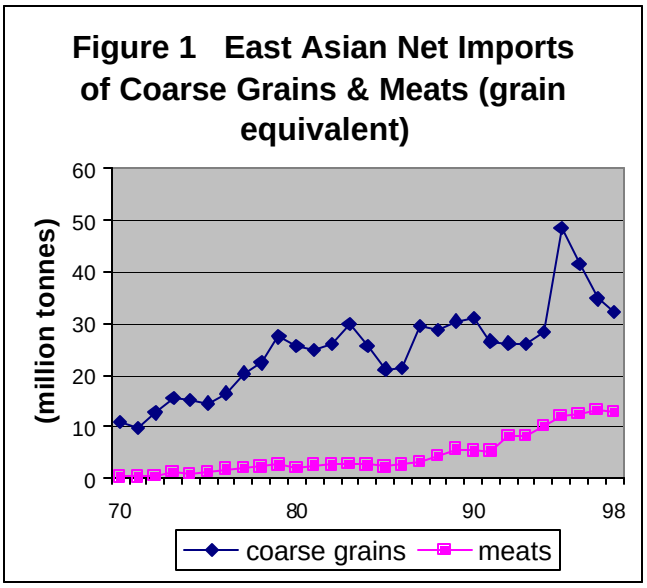
Figure 1 East Asian Net Imports of Coarse Grains & Meats (grain equivalent)
(million tonnes)
60
50
40
30
20
10
0
70
80
90
98
coarse grains
meats

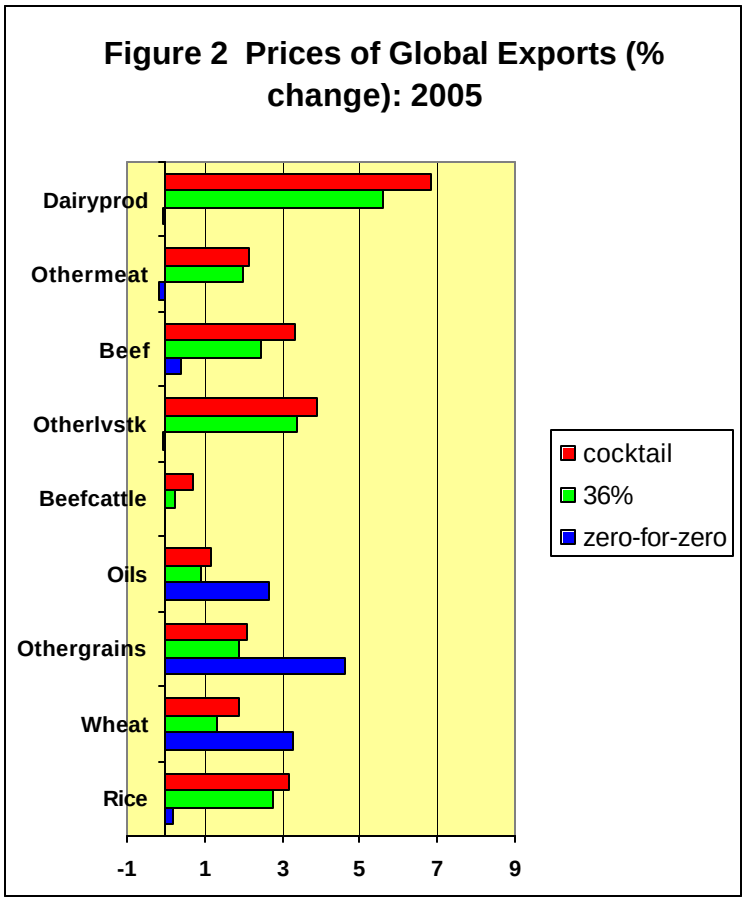
Figure 2 Prices of Global Exports (% change): 2005
Dairyprod
Othermeat
Beef
Otherlvstk
Beefcattle
Oils
Othergrains
Wheat
Rice
-1
1
3
5
7
9
cocktail
36%
zero-for-zero

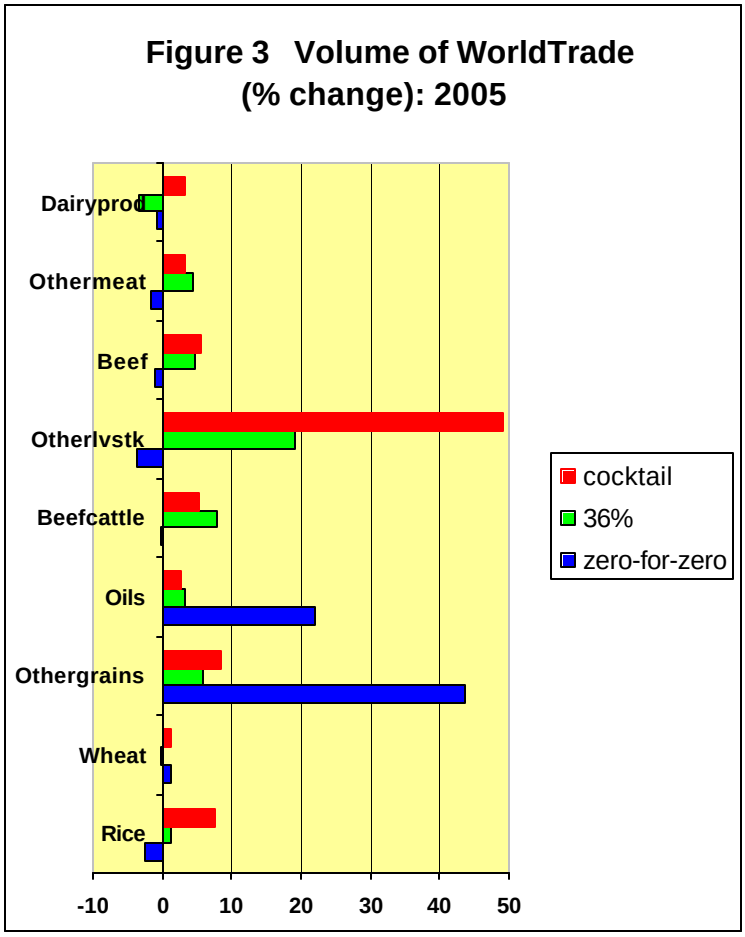
Figure 3 Volume of WorldTrade (% change): 2005
Dairyprod
Othermeat
Beef
Otherlvstk
Beefcattle
Oils
Othergrains
Wheat
Rice
-10
0
10
20
30
40
50
cocktail
36%
zero-for-zero

Figure 4 Change in Trade Balances: Livestock & Meats (US$million)

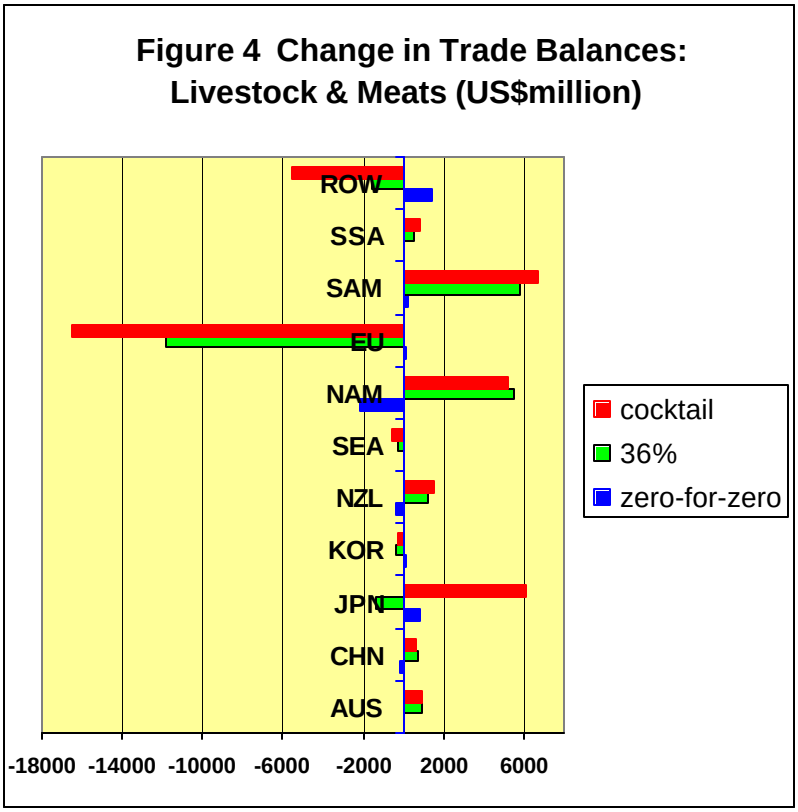

Figure 5 Change in Trade Balances: Dairy Products (US$millions)